RECONSTRUCTIVE MEMORY AND THE IMPACT OF TECHNOLOGY IN TED CHIANG'S *THE TRUTH OF FACT* AND *ANXIETY IS THE DIZZINESS*

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RECONSTRUCTIVE MEMORY AND THE IMPACT OF TECHNOLOGY IN TED CHIANG'S *THE TRUTH OF FACT* AND *ANXIETY IS THE DIZZINESS*

ABSTRACT

Fallible and reconstructive memory has been frequently interpreted in science fiction stories and examined in studies as a major drawback that is inferior to digitalized memory and vulnerable to capitalist manipulation. There are still insufficient studies about technology's non-capitalist and humanistic impacts on human reconstructive memory. American author Ted Chiang's novellas *The Truth of Fact, the Truth of Feeling* and *Anxiety is the Dizziness of Freedom* reveal reconstructive memory's unobtrusive nature and delve into the humanistic impacts of technology on people's cognition and relationships. This research examines how Chiang embeds his postulation about technology's humanistic impacts in his narrative thought experiments in the form of fiction, in which he creates an intense and dynamic interaction between science fiction devices and multiple characters. Applying Frederic Bartlett's theory of *Reconstructive Memory* and the theory of *Reading Fiction as Thought Experiments*, this dissertation focuses on two main characters the father and Dana's cognitive transformations having interacted with science fiction devices *Remem* and *Prism*, elucidating the complicated mutual influences between technology and human reconstructive memory. Chapters two and three discover that these science fiction devices represent sharp-end technology with rich symbolic meanings and are essential tools of Chiang's narrative thought experiments. This dissertation also found that these science fiction devices engender schematic changes in characters, allowing them to reappraise their attitude toward a guilty relationship. This study contributes to a

humanistic and nuanced approach to technology in science fiction stories which is addressed as techno-realism, and stimulates rumination over technology's humanistic impacts on human reconstructive memory and a possible direction for the development of memory-modulating technology.

Keywords: Reconstructive memory, Science fiction devices, Thought experiments, Technology-mediated memory

MEMORI REKONTRUKSI DAN KESAN TEKNOLOGI DALAM KARYA TED CHIANG, *THE TRUTH OF FACT* AND *ANXIETY IS THE DIZZINESS*

ABSTRAK

Fallible dan memorinya yang boleh dibina semula sering kali ditafsirkan dalam cerita sains fiksyen dan dikaji sebagai satu kelemahan utama yang lebih rendah berbanding dengan memori yang telah digital di dan terdedah kepada manipulasi kapitalis. Namun, masih terdapat kajian yang tidak cukup tentang impak teknologi yang bukan kapitalis dan humanistik terhadap memori pembinaan semula manusia. Novel novella penulis Amerika, Ted Chiang, *The Truth of Fact, the Truth of Feeling* dan *Anxiety is the Dizziness of Freedom*, mendedahkan sifat yang tidak ketara memori pembinaan semula dan meneroka impak humanistik teknologi terhadap kognisi dan hubungan manusia. Kajian ini mengkaji bagaimana Chiang menyematkan postulasinya tentang impak humanistik teknologi dalam eksperimen pemikiran naratifnya dalam bentuk karya fiksyen, di mana dia mencipta interaksi yang intens dan dinamik antara peranti sains fiksyen dan pelbagai watak. Dengan menggunakan teori Memori Pembinaan Semula Frederic Bartlett dan teori Membaca Fiksyen sebagai eksperimen pemikiran, tesis ini memberi tumpuan kepada dua watak utama, bapa dan transformasi kognitif Dana yang telah berinteraksi dengan peranti sains fiksyen Remem dan Prism, menjelaskan pengaruh timbal balik yang rumit antara teknologi dan memori pembinaan semula manusia. Bab dua dan tiga menemui bahawa peranti sains fiksyen ini mewakili teknologi berujung tajam dengan makna simbolik yang kaya dan merupakan alat

penting dalam eksperimen pemikiran naratif Chiang. Tesis ini juga mendapati bahawa peranti sains fiksyen ini menimbulkan perubahan skematik dalam watak, membolehkan mereka menilai semula sikap mereka terhadap hubungan yang bersalah. Kajian ini menyumbang kepada pendekatan humanistik dan nuansa terhadap teknologi dalam cerita sains fiksyen yang digambarkan sebagai tekno-realisme, dan merangsang pemikiran tentang impak humanistik teknologi terhadap memori pembinaan semula manusia serta arah pembangunan teknologi memori.

Kata Kunci: Memori rekonstruktif, Peranti-peranti fiksyen sains, Kajian pemikiran,

Ingatan pengantara teknologi

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CHAPTER 1: INTRODUCTION

1.1 Problem Statement and Research Background

1.1.1 Problem Statement

Reconstructive memory, a pivotal concept in psychology, unveils the dynamic and fallible nature of human memory, elucidating the intricate processes of information storage and retrieval in within the brain. Rather than "a static storage box", the British psychologist Frederic Bartlett prefers to describe the way of remembering as "an actively developing pattern" (201). Analogous to a bag of mixed chemical elements, memory exhibits flexibility, fallibility, and a propensity for ingenious reconstruction. In the realm of memory studies, Technology-Mediated Memory (TMM) is a term that encapsulates memories digitalized by technology, allowing for manual revisitation, editing, enhancement, or deletion. This term draws attention to the intersection of human reconstructive memory and technology, prompting an exploration of the implications and challenges that may arise in the future.

Beyond its psychological implications, technology-mediated memory has also been a prominent topic of exploration in science fiction studies and memory studies, particularly concerning memory editing, enhancement and manipulation. Works such as Issac Asimov's *Foundation and Empire* (1955) and Yōko Ogawa's *The Memory Police* (2019) and alike depict dystopian scenarios where powerful entities manipulate and control individuals through their memories. Their narratives underscore the potential vulnerabilities of reconstructive memory in the face of technological intervention. Conversely, stories like William Gibson's *Neuromancer* (1984) and Hannu Rajaniemi's *The Quantum Theif* (2010) present a nuanced perspective, allowing characters to engage

with their digitalized memories and experiences through technology. While these narratives emphasize the side effects of TMM and the vulnerability of reconstructive memory, they also shed light on the complex interrelationship between technology and reconstructive memory within the pervasive impact of capitalist forces. Many scholars such as Artie Konrad have extended this analysis beyond the capitalist context and consider the ethical, emotional and cognitive implications of TMM. By doing so, we can gain a holistic understanding of how technology and reconstructive memory intersect. Previous research on the non-profit-driven impacts of memory-modulating technologies contributes significantly to this discourse, offering a comprehensive perspective that emphasizes the impact on human experiences and well-being. Scrutinizing the narratives and plots of science fiction stories addressing the humanistic impacts of TMM is a practicable way to enrich the current discourse about TMM in memory studies. This study aims to provide a nuanced perspective on TMM's cognitive implications and contribute to the current scholarship about technology-mediated memory's humanistic impacts reflected in science fiction stories.

American science fiction writer Ted Chiang embeds his rumination over the interaction between reconstructive memory and technology into his heartful and witty science fiction stories. *Exhalation* (2019) is Chiang's latest collection which incorporates nine intriguing stories of delicately woven plots and mind-blowing concepts such as determinism, virtual reality (VR), bioethics and time travel. This dissertation targets two novellas from *Exhalation* which are: *The Truth of Fact, the Truth of Feeling* ("The Truth") and *Anxiety is the Dizziness of Freedom* ("Anxiety"). These two novellas, as winners of Nebula and Hugo Awards, are magically fastened

together by two common grounds: a new science fiction device's intrusion into characters' lives and an insightful embodiment of technology's humanistic impact on the main characters. Ted Chiang's narratives in "The Truth" and "Anxiety" contribute to current discussions about technology-mediated memory's impacts on human experiences by zooming in on characters' personal, autonomic and unforgettable stories about memory. Chiang's stories "The Truth" and "Anxiety" engage in how and why reconstructive memory is non-negligible and what we risk suffering once we lose it. By inventing and applying science fiction devices *Remem* and *Prism*, Chiang illuminates how technology shapes characters' perspectives and behaviors, ultimately transforming their understanding of past relationships, mistakes, and guilt. In the field of memory studies within science fiction literature, this study explores the relationship between technology and the nature of human reconstructive memory while highlighting the cognitive impact of technology on the reconstructive nature of memory.

The central research question is how Ted Chiang's narratives of reconstructive memory in his two novellas enhance our holistic understanding of technology-mediated memory's non-profit-driven impacts on personal experiences, relationships and cognition. This thesis highlights Chiang's humanistic approach towards technology's role in two selected science fiction stories and the intention to unpack technology-mediated memory's cognitive impact on the way people revisit and deal with mistakes and guilty relationships. Technology in this dissertation is represented by two science fiction devices *Remem* and *Prism*, which are the inseparable elements of Chiang's thought experiments. *Remem* in "The Truth" is a wearable life-logging device that digitally records and archives the users' memories, and automatically displays in

the form of a video clip at the left corner of the users' visions. *Prism* in "Anxiety" is the para-selves connector that upholds video calls with the main characters' para-selves on the other universes. Two new devices *Remem* and *Prism* denote a familiar setting being permanently altered by a new technological invention, corresponding to Chiang's ideal setting of science fiction mentioned in an interview (Chiang, qtd. in Marcus). Chiang's narratives of characters' interaction with two science fiction devices epitomize a meditation on futuristic technology's potential roles in challenging people's reconstructive memory and views of their defective relationships.

The first objective of this study is to assess the importance of reconstructive memory in Ted Chiang's science fiction narratives and examine how it contrasts with digitalized technology. Furthermore, this study aims to analyze the impact of specific science fiction devices on characters' personal experiences and relationships, particularly on how they revisit past mistakes and process guilty feelings. Lastly, this research also scrutinizes Ted Chang's techno-realistic narratives in two selected science fiction stories, with a focus on his narratives about the humanistic impact of science fiction devices on characters. With F. C. Bartlett's reconstructive memory as the main theoretical framework, this study conducts a qualitative textual analysis of the narratives, plots and characters' interactions with the science fiction devices.

There are numerous significances of this dissertation in the field of memory studies and science fiction studies. To begin with, this dissertation unfolds a humanistic approach to technology-mediated memory in science fiction novels by focusing on the noble human capacity to overcome guilt. By studying two science fiction devices' interference with individual memory, this thesis arouses readers' attention to the

significance of reconstructive memory. Besides, Chiang's narration of characters' diverse interactions and stories with *Remem* and *Prism* charts a path for a balanced, measured and non-capitalist view of technology in science fiction as Chiang classifies his stories as neither techno-pessimistic nor techno-optimistic. Moreover, the prominence of quantum mechanics in "Anxiety" demonstrates Chiang's endeavors in presenting the huge gap between hard science and pure literature and also makes evident Chiang's interest in devising thought experiments that mend the gap between science and art. Most importantly, this dissertation's exploration of memory-modulating technologies has influences beyond the fictional and psychological worlds, inspiring technological development in the future to better concern nuanced humanistic needs, experiences and well-being.

The interdisciplinary nature of thought experiments and Chiang's stories cohere with Chiang's personal background in computer science and his comprehension of physics. After graduating from Stony Brook University with a degree in computer science, Chiang possesses meticulous persistence with scientific truth and humanistic narratives. Chiang embeds accurate physical terminologies about quantum mechanics and parallel universes in "Anxiety". Chiang's inspiration to draft "Anxiety", as stated in the story note, is to test whether the Many-World Interpretation would cancel out people's decisions in the main universe and shatter who we believe we are. The literary background renders a humanist way to approach how technology will affect our lives, while the scientific side of the story re-orients fiction into a theoretically rooted debate in the scientific world. This echoes what the English novelist C.P. Snow suggests that the Western intellectual society has been polarized into the scientists and the literary

intellectuals, two groups that are extremely insulated from each other and ignorant of each other's significance in their works (4). Snow initiates the idea to mind and mend the gap between art and science and perceives that educational specialization further divides the cultural gap (20). "The Truth" and "Anxiety" serve as the modern counterparts of Snow's accusation since they prove it is difficult to draw a line between the sciences and the humanities due to the affinity between the two (Blackford 2). This dissertation points out the interdisciplinary nature of Chiang's science fiction stories and theorizes how Chiang's thought experiments straddle hard science and soft science.

1.1.2 Research Background

(a) Thought Experiments

Since thought experiments and reconstructive memory concern bountiful knowledge in multiple fields including but not limited to literature, this part will render an overview of the history of thought experiments and reconstructive memory as well as science fiction devices. Lastly, this part will conclude by rendering an outline of chapters.

A thought experiment is a term that has drawn wide attention from both the scientific and fictional worlds due to its interdisciplinary nature. The term "thought experiment" has an extremely diverse range of applications ever since it is presented to the general public. A comprehensible definition of a thought experiment summarized in the *Stanford Encyclopedia of Philosophy* is an imagined scenario as a potent tool carried out for diverse reasons such as education, conceptual analysis, exploration, hypothesizing, theory selection, theory implementation, etc. Andrew Irvine further narrows the definition of a thought experiment as an instance of hypothetical reasoning

whose antecedent assumptions may well be false but which lead us to conclusions about the nature of the world or our surroundings (149). Meanwhile, Irvine also puts forward the potential shortcoming of how to differentiate thought experiments from hypothetical reasoning that is not scientific enough (149).

Despite the more well-known side of thought experiments (TEs) initiated by Einstein and Kant, the term "thought experiment" has a non-English origin. In the chapter "H.C. Ørsted: Immanuel Kant and the Thought Experiment", Witt Hansen denies the saying that Ernst Mach is the first one to bring the term "Gedankenexperiment" into scientific and philosophical vocabulary and indicates Danish chemist Hans Christian Ørsted was the first to use the German term "Gedankenexperiment" in 1811 (62). To further explicate and keep track of Kant's philosophical influence and on Ørsted's earlier academic thought, Hansen braids into his narration Ørsted's knowledge background as a scientist and a philosopher, especially while his studies Kant's philosophy of mechanics in college (67, 70). Hansen cited Ørsted's reflection on the thought experiment in physics as follows: "If one does not perceive clearly, under which law of nature a definite effect or set of effects can be subsumed, then one attempts to restore this deficiency through a guess, which could also be perceived as hypotheses or thought experiment (69). Hansen clarifies Ørsted invented thought experiment within the paradigm of his own philosophy and has diverted from Kant though Ørsted used the analytical tool furnished by Kant (75).

Hansen's article clears doubts about the origins of thought experiments and advocates interpreting Ørsted's theories only in the context of his generation. Buzzoni, who has been dedicated to thought experiment studies in natural science, injects more

objectivity into the perspectives on Ørsted's contribution to the evolving thought experiment. Buzzoni starts by acknowledging Kant's impactful contributions to the concept of thought experiments but denies him as neither the one who distinguished thought experiments from real experiments nor the one who used the German term Gedankenexperiment (327). Furthermore, Buzzoni believes Ørsted's wavering attitude is what undermines his discourse on thought experiment's evolving history: sometimes Ørsted deems thought experiments as a pure derivative to real experiments while other times he empowers it as determining a priori in the law of natural science (327).

To categorize and summarize Robert Brown and Fehige Yifach's interpretation, there are a few overarching features of thought experiments that are worth mentioning: firstly, it could be conducted without any physical, technological, ethical or financial limitations since it is purely imaginative; secondly, despite its variety in meanings, purposes and active fields, all thought experiments point to one unitary end: enhancing the understanding of the nature of things. Thirdly, most often, thought experiments are communicated in narrative form; fourthly, thought experiments are interdisciplinary and involve biology, economics, history, mathematics, philosophy and physics.

However, Brown and Fehige's narration tends to zoom in on the advantages and convenience of thought experiments. Comparatively, the Canadian scholar Andrew D. Irvine brings up the negative features of the thought experiment that might be disturbing to an extent since being imaginary does not assure it of being authentic and well-grounded just as real experiments. Thought experience varies in nature from physical experiments since it excludes any actual intervention within the physical environment, but what's disorienting is how to differentiate authentic, valid and

valuable thought experiments from a sea of conceptual hypotheses (Irvine 150). One fundamental nature summarized by Irvine that composes the threshold of thought experiment and excludes it from loosely defined hypotheses is its consideration of past empirical observations and background theories and the counterfactual assumptions embodied (150). For instance, the experiment is presumed to happen in a vacuum or frictionless space (Irvine 151). Irvine also illustrates a few characteristics of thought experiments: it has to involve some hypotheses, supported by empirical observations, set out by enough details, identify a number of independent variables and have repercussions for the original background theory (159). One disadvantage of the thought experiments is their inability to introduce new empirical data (160).

Thought experiments are most primarily employed in science and philosophy. The most classic thought experiments in physics are Einstein's *Relativity*, *Schrodinger's Cat Paradox* and Galileo's *Rolling Ball without Friction*. Due to the preciseness of science, the current debate on thought experiments is whether it's feasible to approach the world just through imagined scenarios (Brown and Fehige). However, the scope of this thesis will be limited to the examination of thought experiments in fiction, particularly in Chiang's science fiction novellas. While thought experiments have significant applications in science and philosophy, they extend beyond the research topic of this thesis. Therefore, this introduction will provide a general overview of thought experiments, and their specific application in science fiction will be explored further in the literature review.

(b) Reconstructive Memory

Another main section is about Bartlett's theory of reconstructive memory. British psychologist Bartlett has been renowned for his endeavors in cognitive science especially schema theory and reconstructive memory in memory studies. Bartlett's reconstructive memory suggests the remembering and recalling processes are influenced by many cognitive factors, such as previous knowledge, experiences, habits, beliefs and so on. Sub-topics such as false memory, Bartlett's schema, and cognitive restructuring are all highly relevant to reconstructive memory.

Two emblematic works by Bartlett most relevant to this dissertation are his paper "Some Experiments and the Reproduction of Folk-Stories" (1920) and his book *A Theory of Remembering* (1932). This first major work "Some Experiments and Reproduction of Folk-Stories (1920)" rises to its prominence since it illuminated that memory is not static but is constantly affected by multiple cognitive processes, thus laying the foundation for the theory of reconstructive memory. In this paper, Bartlett carried out a psychological experiment to study reconstructive features of natural memory by comparing and contrasting participants' multiple recalls of Indian folklore that they are unfamiliar with. The main research methods Bartlett applied in his experiment are serial reproduction and repeated reproduction. The first refers to a number of participants with diverse backgrounds who are asked to recall the same folklore; the second one requires the same individual to recall one folklore multiple times after different intervals with the new knowledge he/she learned (Bartlett 33). These two techniques are thoroughly illustrated by Bartlett in chapter five of his book *Remembering* (1932) (63;118) and won't be further elaborated on in this paper. Compared with serial reproduction, repeated reproduction fits this study more since this

dissertation analyzes the father and the therapist Dana's individual memory. One detail in this experiment is that the selection of folklore for the subjects who participated in this experiment is particularly evasive of popular content and social influences (63). The experimental result based on a preliminary observation is the reproduced story seems to be more coherent, concise and consequential with noticeable omissions and transformations than the original one (66). The instability of memory caused by the natural relapse of time has been manifested. From the experimental result, Bartlett discovered that listeners from diverse social groups with different life habits, thoughts, customs and beliefs will make slight changes to the name of objects and many other alterations (31). This gave Bartlett insights into the discrepancies between the original folklore and one individual's repeated reproductions. Bartlett also categorized five major reasons leading to transformations or changes in participants' repeated reproductions: 1) the length and style of the original and the construction of phrases; 2) the persistence of the trivial: the individual's tendency to preserve the peculiar turn of the phrase intact despite much more important incidents being distorted; 3) the attitude of the subject in their early versions of reproduction shows tenacity; 4) the increased visualization favors transformation; 5) the opposition, similarity and subjection in the original incident will be intensified in the reproduction; 6) the individual's effort to rationalize.

The second major work *Remembering* (1932) is essential for the theoretical framework since it marks Bartlett re-introduced the term "schema" explicitly as a memory structure that is constantly developing (Ghosh and Asaf 105) and also because Bartlett's elucidation of the act of remembering solidifies that memory is reconstructive

rather than static. Schemata play a pivotal role in the reconstructive nature of memory: Bartlett claims that social organization gives a persistent framework into which all detailed recall must fit, and it very powerfully influences both the manner and the matter of recall. Moreover, this persistent framework helps to provide those "schemata" which are a basis for the imaginative reconstruction called memory (296). Schema theory serves as the bricks that contribute to the functioning castle of reconstructive memory. Reconstructive memory indicates the instability and malleability of individual memories, which means the flood of memories could hardly represent what really happened in the past but only reflect a result that has been constantly shaped by our stable beliefs and ongoing experiences. Bartlett summarizes that the act of remembering is not the re-excitation of innumerable fixed, lifeless and fragmentary traces, but an imaginative reconstruction built out of our attitude towards a whole active mass of organized past reactions or experiences (213). In simple terms, our memory never mechanically records and recall past events, but proactively reorganizes events in alignment with current beliefs, habits and experiences. Bartlett's discovery signals a maturer stage of reconstructive memory as a theory.

This dissertation will employ Bartlett's application of schema theory in reconstructive memory studies. Bartlett's schema theory lucidly describes the way information is organized, stored and evoked, the processes of which explain how the act of remembering happens: memory only makes sense while explained by the functioning schema. Though described by Wagoner as sketchy and indecisive, Bartlett's schema theory still holds much weight since it decisively defined schema as an ongoing activity that is socially embedded and interest-driven (Wagoner 562, 565).

(c) Science Fiction Devices

Lastly, this section will discuss the background of science fiction devices and their roles in fiction. While searching for the term "science fiction devices", the most relevant term that frequently shows up in articles is "science fiction gadgets". Examples of these gadgets are time travel machines, wearable glasses, virtual reality, communicators, etc. While "gadgets" is a word preferred by the colloquial contexts and technical world, the word "device" is more favored by the academic world and better befits the literary context. Even though there are rarely clear-cut definitions of science fiction devices, these devices could be understood as futuristic, imaginary technological devices that are embodied in the fictional plot.

First of all, science fiction devices represent the most cutting-edge technology in the fictional world which transcend human bodily limits. New technological devices are named "novum", describing devices which incur negative influence and could be abandoned or destroyed once it devastates the characters' lives (Phipps 483). The word "novum" is a broad concept in science fiction that does not merely refer to science fiction devices. According to *SFE: The Encyclopedia of Science Fiction,* science fiction novum signals an intrusive novelty that is inexplicable in the beginning such as time travel, disaster, radical scientific and conceptual breakthroughs or hyperintelligent AI (Broderick). This intrusive novelty ranges from a phenomenon, a technic to an object or even a platform that provides epiphanic moments through which a new understanding of the world could be gained (Broderick). Therefore, science fiction devices in this study refer to an object and a subcategory of the concept of "science fiction novum". For example, Lasbury Mark E. claims the most popular genre on American television in

the 1960s is science fiction (ix). Many technologies portrayed in the science fiction series *Star Trek* became a cult phenomenon favored by the crowd for decades. In the book *The Realization of Star Trek Technologies* (2017) by Mark E. Lasbury, each chapter describes a *Star Trek* device and the realization of this device in modern life. Even though Lasbury used the term "device" instead of "science fiction device", the two terms demonstrate high alikeness. For instance, the science fiction device *Tricorder* recounted in chapter nine demonstrates high similarity with Chiang's science fiction device *Remem* in terms of their information gathering, storage and instant target lock of information based on an algorithm (280). In a way, Chiang's science fiction device *Prism* is also an information storage device that triggers the quantum mechanic truth.

Secondly, science fiction devices also germinate symbolic meanings in fiction. There are two types of science fiction devices subjected to their symbolic meanings. The first type of science fiction device symbolizes aggressiveness and the harmful effects caused by weapons. It usually appears more in films than in novels since films are more demanding in portraying thrilling scenes with special effects. It guarantees film as an impelling media that realizes and displays science fiction imaginations more intensively than novels (Roberts 264). These devices are representative of futuristic and cutting-edge technologies and are not devised to convey deep implications regarding the theme. For example, *The Neuralyzer* in *Men in Black* (1997) is used by agents to erase memories of people who have witnessed alien activities. *The Sonic Gun* in *Minority Report* (2002) is a weapon that sends targets flying outwards with a non-lethal pulse. In this case, the gun is no more than a self-preventive weapon to present how would the futuristic policemen carry out tasks. The second type of science fiction device embodies

philosophical considerations. An example of these types of devices is the renowned *Voight Kampff Machine* in Philip K. Dick's *Do Androids Dream of Electric Sheep?* (1968). *Voight Kampff Machine* can differentiate replicants from real humans by monitoring the participant's pupillary enlargement while answering a series of questions during the test. The *Voight Kampff Machine* symbolizes the interrogation of humanity by measuring the individual's reactions to animals' suffering (Clements 185). Chiang's science fiction devices also belong to the second type since *Remem* and *Prism* embody a deeper self-interrogation of technology, humanity and emotions. In general, both *Remem* and *Prism* symbolize the technological advancement and the supernatural power that transcends human bodily limits. However, the supernatural power possessed by *Remem* and *Prism* differs from "The Mule" in Asimov's *Foundation and Empire*: since Chiang's science fiction devices are clearly defined as technology and indicate the impact of technology that is presumably widely reachable in the future, but "The Mule" is depicted as a powerful mutant with no clear-cut association with technology. Moreover, memory manipulation is abhorred in Asimov's story for its detrimental consequences; while Chaing's science fiction devices are promoted by the production companies as an enticement to human beings that are favored by the majority. *Remem* in "The Truth" symbolizes digitalized memory that tends to refine human malleable and fallible memories. *Prism* also symbolizes digitally archived information as a growing trend in the 21st century, such as filming vlogs and creating p-logs (a blog that is primarily used to display photos) that are pursued by global users. Besides, the science fiction device *Prism* also symbolizes mankind's rumination of their identity and many-world interpretations' impact on decision-making.

Another way to categorize and comprehend science fiction devices is by Issac Asimov's article titled "Social Science Fiction", in which Asimov classified all science fiction plots into three categories: 1) Gadget: the story itself is the invention, 2) Adventure: the invention is a medium or 3) Social: the presence of the invention affects people's routines (272). Asimov explains that social science fiction depicts: how new technology such as the automobile exists in a society which is already a problem and calls on people to figure out solutions (273). Chiang's science fiction devices *Remem* and *Prism* belong to the third type "Social" since they are expressive of technology's impacts on human cognition.

In conclusion, science fiction devices in this thesis describe actual objects that represent cutting-edge technological inventions, carry certain symbolic meanings that generate enlightening moments, and are a part of the story plot that is capable of impacting or even challenging the characters' lives.

The opening chapter will begin with a statement of the research topic and research background including an introduction of thought experiments, Bartlett's theory of reconstructive memory and science fiction devices and their roles in fiction. It will be followed by an introduction of the author Ted Chiang and Chiang's two novellas' connection with the research topic. Furthermore, the literature review will be categorized into three sections: the first part covers studies about Chiang's two selected novellas "The Truth" and "Anxiety" as well as other stories in Chiang's book *Exhalation*; the second part probes into studies about Chiang's thought experiments in his science fiction stories while indicating the current study gap; the last part focuses on memory studies in science fiction devices of both literary and technological features.

Lastly, chapter one will conclude with this thesis's theoretical framework mainly composed of Bartlett's reconstructive memory, five factors resulting in memory reconstruction while also embodying other terminologies such as Leon Festinger's dissonance theory, and Clark's cognitive restructuring. Chapter two and chapter three will focus respectively on one novella as a case study. Chapter two, which is grounded on the novella *The Truth of Fact, the Truth of Feeling*, titled "*Remem* and the Father's False Memory: Memory Reconstruction in *The Truth of Fact, the Truth of Feeling*." will define and examine the role of life-logging recorder *Remem* and explore how the father's encounter with *Remem* reinterprets his past and made him more aware of his false memory and the reconstructive nature of memory. The third chapter, titled "*Prism* and Dana's Distorted Memory: Memory Reconstruction in *Anxiety is the Dizziness of Freedom*, similarly defines and examines the para-self connector *Prism*, unpacks the psychologist Dana's guilty memories and analyzes how *Prism* opens up new interpretations of an event which she persistently blames herself for. Lastly, the conclusion summarizes the main findings and suggests a direction for future research. Chiang's techno-realistic view and thought experiments in the form of narratives will be analyzed throughout chapter two and chapter three.

1.2 Introduction of Ted Chiang and Two Selected Novellas

Ted Chiang is an American science fiction writer born in 1967 with four *Nebula awards*, four *Hugo Awards* and multiple other honors and nominations. Meghan Mccarron commented that Ted Chiang is a thoughtful, ambitious, and endlessly curious writer in an article published on *Electric Lit*. Chiang's stories are humanistic even though he never considers himself a humanist. His stories are thought-provoking as well

considering his attempts to ignite readers' philosophical inspirations rather than privileging an emotional catharsis. Chiang as a science fiction writer is famous for rendering meaningful mind-pops about philosophical questions such as the meaning of life and determinism. "Story of Your Life", Chiang's more acclaimed short story, was adapted into the film *Arrival* by Eric Heisserer in 2016. *Exhalation* (2019) is Chiang's latest book includes nine mind-blowing stories that integrated Chiang's meditation about the role of technology, determinism and humanocentrism. This dissertation selected Chiang's two novellas from the book *Exhalation* as the main material, which are *The Truth of Fact, the Truth of Feeling* and *Anxiety is the Dizziness of Freedom*.

Chiang ties both the fictionalized history and the futuristic fiction together by having the plot of each depend on a technological advancement capable of changing the way memory operates (Parker 188). This novella narrates how *Remem*, which prompts an accurate memory system, affects the journalist's relationship with his daughter; and how a man from Tiv village gradually learns how to read and write which leads to a challenge of the oral system. However, this dissertation leans towards the modern half of the story characterized by the thoughtful father. The protagonist is an unnamed father, a journalist who has been single-handedly raising his daughter since his wife left following a heated family argument. Knowing her daughter's childhood is overshadowed by the family argument, the father has been suppressing his emotions while making great efforts to compensate for the pain they caused to his daughter. However, his beliefs are challenged when he encounters *Remem*, a life-logging device that records and displays the past through video clips. This device unveils a different reality about the pivotal confrontation between the father and his daughter: the science

fiction device *Remem* displays that the father, not the daughter, uttered hurtful words. This revelation shatters his trust in his own memory and disrupts his self-perception as a responsible father. Consequently, the father has been more informed of *Remem*'s impact in restructuring users' cognitive processes.

The strong connection between reconstructive memory and the story is evident from several aspects. Firstly, the narrative revolves around the father's discovery of his false memory and his gradual realization of memory's unreliability, aligning with Bartlett's definition of reconstructive memory: a continuously evolving process rather than a passive recording (201). Furthermore, the story's focal point lies in the revelation, explanation, and reflection of the father's false memory, which is a prominent outcome of memory reconstruction. Consequently, a systematic understanding of memory reconstruction sheds light on the phenomenon of the father's false memory and enriches the analysis of the story from a psychological perspective.

The second novella *Anxiety is the Dizziness of Freedom*, the longest novella in *Exhalation*, won the Best Novella, Nebula award in 2020. The novella narrates a world where connecting and talking to your para-selves through the device *Prism* is widely achievable. This story also brings up the topic of existential crises as many people are worried that their choices were rendered meaningless because every action they took was counterbalanced by a branch in which they had made the opposite choice" (Lohier). Besides the worries about identity crisis, this novella presents an engaging perspective on reconstructive memory's functionality in amplifying one's emotional load about the past. This section will briefly talk about the main concept: the disquieting effect along with the origin and meaning of the title *Anxiety is the Dizziness of Freedom*. The

connection between the research questions and the story will also be elaborated on.

The proverbial title *Anxiety is the Dizziness of Freedom* originates from the Danish philosopher Søren Kierkegaard who expounded on "the dizziness of freedom" in the book *The Concept of Anxiety* (1844). Kierkegaard narrates: "In anxiety, there is the selfish infinity of possibility, which does not tempt like a choice but ensnaringly disquiets with its sweet anxiousness" (61). It lays bare the infinite possibilities which ceaselessly loom around oneself but, as Kierkegaard put it, never appear as an option but only unease the mind. The disorienting feeling of "I could have done something different and better" is interpreted as anxiety. In the "Story Note" of *Exhalation*, Chiang confesses: I'm pretty confident that even if the many-worlds interpretation is correct, it doesn't mean that all of our decisions are cancelled out (303). Dana's patient Teresa serves as a vivid example of an anxious person tortured by the disquieting effect: she bemoans that her rejection of her ex-boyfriend Andrew's proposal five years ago crushes out a happier life that could have been hers. Teresa was eager to know did any of her para-self accepted that proposal and lived a happy life ever since then. She's been tethered by the suspicion that her rejection was only a whim rather than a decision based on thorough consideration (Chiang 241). She can no longer recall that day with precision; instead, she starts to fabricate a day that makes sense to her current curiosity, struggle and pride.

This dissertation focuses on the main character Dana, a psychologist who has been disquieted by one intentionally irresponsible act to her friend in school years: when the teacher discovered the drugs in their room, Dana passed the buck to Vinessa alone, which directly led to Dana's suspension from school. Ever since then, Dana, being

overwhelmed by these guilty feelings and pain, indulges Vinessa to take advantage of her guilt in the name of remedial actions. Vinessa's taking-for-granted attitude and rationalization of Dana's financial assistance make it more difficult for Dana to deal with her guilt properly; therefore, Dana can't seem to heal her own pain and is always at Vinessa's beck and call. This story displays one of the functions and consequences of reconstructive memory: memory distortion. Dana's memory of the accuracy and severity of that unforgettable event is gradually restructured by her guilt. Over time, her guilt-ridden mind might alter and embellish certain details about the past, leading to a reconstructed memory of the event that might not accurately reflect what actually happened. It is noticeable that the emotional burden of guilt suppresses Dana from recalling, mentioning or reviewing the past, thus suppressing her perceptions of that event to reject any other interpretation of that event except she's the one that ruined Vinessa's life. While Dana's ignorance of her reconstructive memory, the science fiction device *Prism* renders her a chance to re-process her past through displaying Vinessa's self-abandonment and failure in all branches no matter what Dana did in the past. *Prism,* the cutting-edge technology, speedily persuaded Dana in a few minutes that she should no longer shoulder the responsibility for Vinessa's own mistakes. Additionally, it is worthy of exploring whether Dana has genuinely made peace with her past through self-forgiveness and the understanding of the reconstructive nature of memory.

1.3 Literature Review

1.3.1 Existing Literature on Chiang's *Exhalation* and Other Stories

Since it has been only four years since the book *Exhalation* (2019) was first

published, all relevant studies about two selected novellas are published after 2019 and the latest one is published in 2022. Therefore, these two stories are still under-researched and still demonstrate great vibrancy and potential to be given attention in the future.

There are more studies investigating the novella "The Truth" than "Anxiety". These studies examine "The Truth" from the following three perspectives: views of technology, the father's narrative and memory. For example, James Hughes and Eisikovits Nir investigate Chiang's techno-realistic view in "The Truth" and advocate that Chiang is neither exuberant nor depressed about the potential of technology but is articulately sober (2). Andrew Shephard similarly suggests that Chiang eschews that narrative's pessimism in favor of meditating on the vagaries of human perception and the ways in which technology has mediated our fallible memories over the year (3). Shephard's statement about how Chiang evades a pessimistic tone of technology despite the characters' skepticism echoes Hughes and Eisikovits' techno-realism.

Jo. Parker shifts the focus from technology to Chiang's employment of braided narrative in "The Truth". He has given significant attention to Chiang's insights about malleable memory and intention in devising an alternate narrative that juxtaposes both individual memory and collective memory. In particular, Parker even provides valuable insights that are instrumental to this research: the father's false memory has enabled the narrator to construct a coherent self-image but the discovery of what truly happened compels him to rethink his own identity (189-190). Parker's book chapter sheds light on the malleability of memory but disregards science fiction devices' contribution to the characters' realization of reconstructive memory. So far, there are still no published

journal articles or book chapters available online that classify the novella "Anxiety" in a distinguished academic field for a comprehensive examination; only a few brief reviews cover the novella "Anxiety" with no clear indication of a strong thesis except assorting the story in their favourite story list. For instance, Susan BALÉE pierces into the details of "Anxiety" and confirmed the connection between alternative selves and modern social media persona (328).

However, other stories in Chiang's book *Exhalation* tend to receive a decent amount of attention, which are respectively "Exhalation", "The Life of Software Objects" and "The Great Silence". Gary K. Wolfe and Essi Vatilo both agree on the uniqueness and originality of the cosmology Chiang invented in the story "Exhalation". Wolfe claims that "Exhalation" is a text-dominant fiction in which the invented world inhabits the story rather than the story inhabiting the world (173). Wolfe, while referring to the same core essence of the MWI, explores two major narrative modes of alternate cosmology in American science fiction: the "closed system" and the "open system" (165). Wolfe indicates that Chiang failed to draw readers into his subjective cosmology pertinent to the story but only presents the readers with an astonishing structure while carefully holding his options open (167). Vatilo admits that since "Exhalation" is estranged from the politics and culture of the current world, it possesses the potential to overcome polarization and to reconsider the impact of climate change (48).Sunyoung Ahn and Anne McConnell discover the beauty of humanism in "The Life of Software Objects" and "The Great Silence". Ahn clarifies that Chiang expressed humanism by showing companionship and solidarity; McConnell similarly advocates that "The Great Silence" is full of humanism because it called for concern over the diversity of species.

Since the second selected story "Anxiety" is constructed on a cosmology where the doctrine of Many-Worlds Interpretation (MWI) is validated, it is necessary to investigate scholars' research on the usual implications of MWI in science fiction stories, especially in Chiang's stories. According to the *Stanford Encyclopedia of Philosophy*, the fundamental idea of the MWI, going back to Everett in 1957, is that there are myriads of worlds in the universe in addition to the world we are aware of. The fundamental idea of MWI is that measurements must take place in accordance with the Schrodinger Equation (Albert and Loewer 197). Ever since Hugh Everett proposed the "Relative State Formulation Theory" in 1957, the saying of a multiverse composed of countless similar universes has been exposed to physicists (Dodsworth 20). Everett's claim in the 1950s has been consigned to oblivion but was later renamed and promoted by Bryce Dewitt (Gribbin; Dodsworth 20). In the book *Six Impossible Things*, John Gribbin clarifies that the MWI by Everett is more mathematical while the one by Schrodinger is more philosophical. Other terms such as multiverse, parallel universes and alternate universes all possess a similar meaning to the MWI.

Testing the debates and validity of the MWI in the world of physics is not the mission of this thesis, but how is MWI embodied in Chiang's "Anxiety" will be briefly covered here. The MWI in science fiction features a world constantly splitting into a stupendous number of branches, which is also described as the SWV: the splitting of world views. While capturing various scholars' interpretations and analyses of the MWI in literature, a few scholars' interpretations heave in sight. 1) Dodsworth renders an understandable explanation for the MWI and how has MWI been absorbed in science fiction works in opposition to conventional deterministic plots (20). Dodsworth

concludes the type of science fiction works that worship a Leibnizian philosophy are those that worship the current happenings and believe the ongoing timeline is the one and only scenario that couldn't be tampered with regardless of humans' intentions (23). For instance, Dodsworth asserts that Chiang's "Story of Your Life" has taken the essence of necessity and teleology from Leibnizian since Dr. Louise Bank didn't attempt to change the future even though her linear timeline, under the influence of extraterrestrial being's language, has allowed her to experience the past, present and future all at once (24). Contrary to the Leibnizian philosophy, an Everettian worldview eludes claiming a "best universe" and denies the uniqueness of sequential contingencies (Dodsworth 39). Quite a number of characters in "Anxiety" deem their current life unfair, having exposed that their para-selves are better-off, and turned into green-eyed monsters. However, in a strict sense, "Anxiety" is not typically Everettian since characters can talk and see their para-selves virtually but directly rather than being enveloped by the parallel universes' indirect interference (Dodsworth 38). Yet characters' direct interference and temporary encounter with para-selves rarely bring out positive implications but mostly resentment, jealousy and regrets. The justification and rationalization of every action in the main universe echo the Leibnizian philosophy while opposing the Everettian worldview. But what's more crucial is a critical view behind the theory of the Many-Worlds Interpretation. The second scholar that throws light on the MWI in science fiction is Alan Phipps. Phipps untangles William Sleator's *The Last Universe* by analyzing the way it destabilizes popular mainstream and literary association of quantum mechanics and names "novum" in science fiction narrative as the new discoveries in an "imaginary reality" (483). The literary and critical

employment of quantum mechanics, as Phipps quotes from Barad, are aiming at disclosing the limitation of human knowledge to themselves and to others (486). Phipps also mentioned that *The Last Universe* draws upon the Many-Worlds Interpretation to explore questions of personal identity, the continuity of experience, and links between motives and ethics (483). In conclusion, some scholars think highly of the author's stance on the MWI in science fiction stories as either supportive or oppositional; other scholars perceive the MWI as an advanced concept that serves as a foil to human limitation. This study emphasizes that the setting of the MWI in Chiang's novella "Anxiety" guides characters to learn more about their reconstructive memory; besides, the story "Anxiety" renders a humanist view of people's obsessiveness, reflection and changes while managing to find balance in a new cosmology.

1.3.2 Reconstructive Memory, Technology and Science Fiction

While carrying out a keyword retrieval method, it shows that studies about either science fiction themed on memories or memory studies in connection to science fiction are quite limited and what could be found seem to divert from a psychological study and are built on a posthumanist paradigm, which include discussions about a state of being beyond a human in a highly digitalized or techno-equipped society. Discussion of memory in the paradigm of posthumanism including becoming a cyborg: enhancing memory through the integration between technology and the human body that nullifies one's identity as a human. For instance, both Smelik and Swanstrom bring up memory in science fiction just to emphasize people's increasing sensitivity towards information archivization in this digitalized age while memory itself does not spearhead their research (52; 2). To be more specific, Smelik states that memory in contemporary

science fiction exists as the interrogation of traditional accounts of human subjectivity (52); Swanstrom maps the archive of memory in William Gibson's science fiction to the notion of posthuman development and posits William Gibson's memory device in the context of posthuman discourse. While studies above delve into a post-humanist view of the repercussions of digitalized memory combined with biological memories, there are bereft of an obvious researching trend about a pure exploration of biological lapse and retrieval of memories augmented by wearable or usable devices. To further clarify the difference, Chiang's stories picture a wide imagination of technological devices in the future yet he is careful with breaking the boundary between technology and the human body in the selected two novellas; in other words, Chiang is still very cautious with the possibility of going cyborg or posthuman in his stories. Chiang observes the rule that technology works on the restoration or enhancement of the human body's limits rather than radically changing the nature of "being human" and allowing technology to redefine "human".

It is necessary to briefly bring up the definition of cyborg and human-technology interaction to surface the study gap of memory studies in science fiction. Muhammet Ramoğlu devised a taxonomy to specify the categories of cyborgs. By Ramoğlu's definition, the integration of technology and the human body includes wearable devices as an extension, just like Ted Chiang's wearable device *Remem*. However, Chiang's discussion of technology in relation to memory differs from conventional mind-editing: the physical insertion of chips into human brains or skin for technology to maneuver the mind. Chiang keeps a subtle distance between the devices and the human body and empowers the characters to be physically freed from contact with technology once they

stop using any technological devices. Besides Smelik and Swanstrome's discussions, Susan Schneider posits memory studies in a philosophical discourse while the main focus is would the enhancement of the human brain or a stage beyond the human being, like transhumanism, totally changes the original self (262). Schneider applies Robert Sawyer's *Mindscan* as an example to examine the philosophical consequences of being an "official cyborg" in her chapter "Mindscan: Transcending and Enhancing the Human Brain" (260). Schneider calls for systematic research on the coming development and consequences of an enhanced brain, which determines that she failed to lay emphasis on the biological lapse and retrieval of memory (262).

Aside from examining memory studies in science fiction in a posthumanist context, Elizabeth Phelps and Hofmann Stefan indicate the complexity of memory studies in science as compared to memory studies in fiction due to the experimental danger of applying certain models to humans (43). However, their studies emphasize the memory-editing techniques applicable in the clinic; memory-editing in science fiction is only brought up as a transitory topic to state that memory-editing no longer exclusively exists in science fiction (49). Raffaella Baccolini uses the word "reconciliation" to elaborate on the relationship among utopian genre, history and memory applying Ursula LeGuin's *The Telling* (2000) as an example (114) to elaborate on the redemptive power of collective memory rather than individual memory (118); however, his discussion of collective memory attends to a nation's history and neglected the individual history.

The value of reconstructive memory is no less appreciated in Robert Silverberg's *The Man Who Never Forgot*, despite being far from the realm of technology's impact.

As technology rises to its importance in society, memory as a feature of technical storage is warned to be distinct from any cultural memory (Ernst 43). Digital memory is also addressed by Wolfgang Ernst as the non-social memory performed by a non-human agency (44). The relationship between technology and human reconstructive memory, specifically individual memory instead of collective memory, is epitomized by a major question: what's the impact of digital memory on reconstructive memory except for its "enhancing effect on the accuracy of human memory"? Does technology represented by technology trigger any moral issues, exert any cognitive changes or affect a relationship? This question above is more frequently attended to in the field of cognitive and behavioral psychology than in the field of fiction: Betsy Sparrow and others detected that people are more reluctant to recall when information is digitally stored and assessing information are as easy as lifting a finger (776), implying a recession of reconstructive memory caused by a tendency to refuse proactive recalling and resort to the digital database. Sparrow and others also advised people to be less dependent on the gadgets that store information externally (778). Some discussions about the relationship between technology and human reconstructive memory are tilted to the side of warning against technology's side effects on human reconstructive memory. Nyholm and others call attention to the ethical worries that might be caused by futuristic technologies capable of mind-editing as inspired by science fiction films (2); they conclude that technology creates imagined scenarios which are problematic for the highly complex romantic relationship (13). Sven Nyholm and others define love as a complex system and concur with Bostrom and Sandberg regarding technology's more possible disruptive functions than contributive functions to the inner workings of these complex

systems (13). It is inferred that these complex systems also embody the intricate memory system, in which reconstructive memory is of paramount importance. Zheng and Lim also similarly indicate that the tendency to apply neuroscience technology for memory enhancement and memory editing has far-reaching ethical concerns (1). Zheng and Lim specify that MMTs (Memory Modulating Technologies) are not irreversible since people can discontinue applying them, but the long-lasting effects on memory are rather permanent, such as anxiety and addiction (6). Shawn Zheng and Lee Wei Lim's study is limited to the clinical use of MMTs for patients suffering from memory disorders and deviates from MMTs' influence on human reconstructive memory (13).

Konrad et al. stipulate that technologies that mediate memory such as life-logging devices which allow users to record and revisit personal information grant a better understanding of users themselves (2). They also experimented to evaluate the impact of TMM (Technology-Mediated Memory) on the organic memory processes and found out that TMM displays similar adaptive biases as organic memory and facilitates users to have more consistent perspectives of their past (22). Konrad and others' research diversified and enriched discussions about technology's impact on reconstructive memory through experimentation and quantitative analysis. More studies with the same precision and details as Konrad et al. did are needed to expand the scholarship.

As seen above, abundant studies are digging into the impact of memory-modifying technology on reconstructive memory, but rarely has this issue been pertinently posited in the context of science fiction studies and addressed together with an analysis of science fiction stories. More essentially, this section identifies that current studies about

technology's impact on reconstructive memory in the field of memory studies are predominated by illuminations of the negative consequences, despite some neutral voices such as Konrad et al.. More diverse voices are needed to guide people to view technology's impact on reconstructive memory more cognitively, personally and objectively. Moreover, there is still a need to examine technology's impact on reconstructive memory with more concrete examples and an emphasis on the processes of how and why rather than simply on the result.

1.4 Methodology and Theoretical Framework

This dissertation is a qualitative analysis of Ted Chiang's narratives in science fiction stories *The Truth of Fact, the Truth of Feeling* and *Anxiety is the Dizziness of Freedom*. Analyzing Chang's narratives of the story generates rich insights by discovering the meanings and interpretations of human experiences while highlighting the nuances and complexities of the characters' personal stories. This dissertation widely traces and refers to published journal articles, academic monographs, and book chapters analyzing Chiang's two novellas as well as topics concerning "reconstructive memory", "thought experiments", "technology-mediated memory" and "memory studies in science fiction" as first-hand materials. Besides, this dissertation will also refer to transcripts and original videos of Chiang's interviews and conferences available as second-hand references to further approach Chiang's original interpretations of his stories.

The objective of this research is to unpack what Ted Chiang, instead of rehashing what psychologists said about reconstructive memory, attempts to express through his

narratives about technology's potential role in mediating reconstructive memory. To achieve this goal, Ted Chiang's two science fiction novellas are devised and read as his thought experiments in this research to speculate and illuminate the relationship between technology and reconstructive memory, in which science fiction devices and characters compose the main plot. To analyze Chiang's thought experiments, this research will expound the definition of the science fiction devices and narratives of devices' interactions with the main characters in the story. This study will first examine science fiction devices' functions in two novellas as tools of Chiang's thought experiments as well as technological and literary devices. Furthermore, this study will analyze how the two main characters' encounters with science fiction devices altered the way they interpret their past incidents and relationships and refreshed their understanding of reconstructive memory.

This section aims to expound the theoretical framework of this research and its suitability for this research. The theoretical framework is mainly composed of Bartlett's theory of *Reconstructive Memory* and the theory of *Reading Fiction as Thought Experiments*.

(a) Bartlett's Reconstructive Memory

With an emphasis on human experiences, this dissertation applies F. C. Bartlett's theory of reconstructive memory and five factors resulting in reconstructive memory that Bartlett concluded in his paper "Some Experiments on the Reproduction of Folk-Stories" as the main theoretical framework. Bartlett's theory of reconstructive memory provides the psychological foundation to analyze characters' stories of false memories and reinterpreted pasts. Besides, Chapter Two applies terminologies such as

Tulving's episodic memory, Festinger's dissonance theory, and Clark's cognitive restructuring which further explain the cognitive processes that make memory reconstructive. The concept of "Anxiety" by Kierkegaard, especially the disquieting effect, will also be applied in chapter three's analysis of Dana's ceaseless loop of guilt and remediation.

There are a few essential points in Bartlett's theory of reconstructive memory that contribute to the analysis of body chapters: the act of remembering is an imaginative reconstruction built out of our attitude towards a whole active mass of organized past reactions or experiences (Bartlett 213); schema, which refers to an active organization of past reactions or past experiences, are the basis for memory's imaginary reconstruction (Bartlett 201, 296); memory is affected by the subject's habits of life, thought, customs, beliefs and social institutions (31); false or distortions of memory could be explained by five factors that Bartlett concluded in his paper, which are namely the persistence of the trivial, the tenacity of the attitude, increased visualization, intensified oppositions and effort to rationalize (Bartlett 32-33).

The theory of memory reconstruction is structured on the understanding and application of the four points listed above. This research targets two major forms of memory reconstruction in chapter two and chapter three which are false memory and distorted memory. First of all, Bartlett's clarification of the act of remembering rationalizes and theorizes characters' false and distorted memory. Cognitive processes such as schema and cultural aspects such as life experiences, habits of life and beliefs could be further employed in chapters two and three to analyze why characters have false and distorted memories. Moreover, five factors Bartlett concluded that led to

transformations in repeated reproduction render more nuanced and situational factors catering to different characters' stories.

There are three main reasons why Bartlett's reconstructive memory fits into the existing research. To begin with, the research gap revolves around a few points based on the literature review: fewer fictions anchor biological memory loss and memory retrieval but more anchor artificial memory editing; most fictions focalize people's fear of technology from a capitalist perspective rather than a humanist perspective; thought experiments and science fiction devices are compelling and handy tools in the context of science fiction stories for the authors' self-articulation but they still have rare and limited definition in science fiction so far. Attending to the study gaps stated above, Bartlett's reconstructive memory pierces into the functionality of biological memory and the nuanced changes of human emotions, which naturally puts the limelight on humans themselves rather than capitalism. More essentially, thought experiments are hypothetical situations with imagined tools which might fall short of the credential had there been an insufficient scientific background to uphold it (Irvine 149). While reconstructive memories, being the knowledge that covers the neurons of the brain, renders Chiang's thought experiments more retraceable and credible scientific basics.

Secondly, the research question concerning the relationship between human reconstructive memory and technology is frequently examined from a posthumanist paradigm that deals with a hypothetical state beyond current humans when their physical limitations are extended by mechanical elements built as a part of their bodies. Other scholars apply socio-technical theories to study memory such as Anneke Smelik and Elizabeth Swanstrom. Both socio-technical and post-humanist studies, compared

with schema and reconstructive memory, display less affinity with Chiang's intention to express his contemplation over memory and pursuit of philosophical riddles in his stories. In "The Truth", Chiang wonders what would it do to us to have a truly accurate memory"(300); in terms of "Anxiety", Chiang seeks the truth of whether many-world interpretations would nullify people's decisions in this world. The most prominent reason to select a psychoanalytical approach is that it is the most appropriate for tracking the gradual transformation of a character's mental activities and inner turmoils while undermining the impact and fluctuations of the external environment.

Lastly, Bartlett's experiments about reconstructive memory are concerned with the variety of conditions under which mental processes take place (vi). These conditions could endlessly expand as schorlar's understanding of his project enhances and as more social factors are gradually unveiled. Bartlett's theory is insightful because of the pattern and examples he provided to explore conditions that are vital to examining mental processes, including technology's impact. To be specific, Bartlett was interested in the conditions of individual perceiving, imaging and remembering, the processes of which are heavily influenced by multiple social factors (v). Bartlett's investigation of the group of Swazi natives in Africa enabled him to discover and experiment on the conditions under which mental processes take place, a field that is strangely neglected by psychologists (vi). Bartlett acknowledges social and cultural factors' role in affecting reconstructive memory, which rationalizes that human immersion in technology could affect reconstructive memory and the mental processes related to remembering in the long run. More relevantly, Bartlett summarized in his paper published in 1920 that visual imagery generates impacts on people's reproduction of memory. This illuminates

that one way modern technology could generate an impact on memory is by elevating visual imagery to better precision and advancement. This explicates why Bartlett's theory is constructive to unpack technology's impact on human reconstructive memory. In summary, Bartlett's theory not only upholds the theoretical analysis of reconstructive memory but also provides experimental support in scrutinizing technology's impact on reconstructive memory.

(b) Reading Fiction as Thought Experiments

This section starts by defining *Fiction as Thought Experiments* as a theory and renders a brief overview of previous studies about this theory. Furthermore, this research attempts to trace how other scholars apply this theory in literary analysis. Moreover, scholars' discussions of Ted Chiang's thought experiments will be enumerated together with a study gap about Chiang's employment of thought experiments. Lastly, this section explains why the theory of *Fiction as Thought Experiments* is highlighted in this research and the analytical approach applied in this research to examine Chiang's two selected novellas as thought experiments.

Thought experiments provide epistemic access to the features of the real world (Elgin 222) and are defined as hypothetical situations to speculations about the world. Some philosophers propose a strong analogy between thought experiments and literary fiction (Egan 139) due to their power to engage readers in ethical, philosophical and psychological contemplations. In literary works, authors present scenarios, construct characters, and manipulate narrative structures to encourage readers' critical thinking and intellectual engagement, demonstrating significant similarities with a thought experiment. David Langford defines that any science fiction story that uses science

fiction devices to expound or illuminate a scientific principle may be described as a thought experiment, which approaches the whole fiction metaphorically as thought experiments.

Reading fiction as thought experiments guides readers to focus on the narratives and epistemic implications of the story. The theory of reading fiction as thought experiments invites readers to engage in the cognitive values of the story by rendering them a conceptual framework or category that is applicable to the real world (Davies, qtd. in Vidmar, 7). Readers' cognitive engagement empowers them to resonate with characters emotionally and to be impacted in a more vivid way. Besides the cognitive impacts, Catherine Elgin claims that reading fiction as thought experiments advances readers' understanding of the extra-literary world (Elgin 221). When a story is read in the paradigm of a thought experiment, the story has extended outwards to an imaginative and speculative future. A thought experiment devises and executes events to make some particular phenomenon salient (Elgin 222); likewise, reading a story as a thought experiment stipulates readers gaze beyond sequences and speculate what's behind these phenomena. An intention to explore the relationship between technology and human reconstructive memory is less complex when it is presented and thought in the form of a story.

The notion of "literary fiction as thought experiments" sparks profound discussions about narrative, subjectivity, and conceptual coherence that are essential for this research. Scholars hold polarized opinions about the parallelism between thought experiments and fiction over the feasibility due to multiple reasons. Some scholars such as Egan, Davenport, Davies and Peter Swirski are skeptical about the idea of *Fiction as*

Thought Experiments. But other scholars such as Elisabeth Camp, Elgin, Langford and Margherita Arcangeli are optimistic and have constructive arguments about it.

Davenport acknowledges the challenge of viewing literature as thought experiments due to the perceived conflict between traditional art and science (284). Egan similarly casts doubts on the analogy between literary fiction and thought experiments in the way cognitivists persist (139). Davies also explained that the statement of fictional narratives as thought experiments arouses controversy because some doubt that narratives purely fictional can hardly render cognitive progress (53). The debate over whether a thought experiment is happens in the mind or in the world is also covered by Swirski (97).

Despite the ongoing debates and suspicion over the equation of fiction itself as thought experiments, it is believed by some scholars that thought experiments presented through narratives share considerable similarities with narratives in fiction. Thought experiments in the form of narratives may omit the practical experimental process but still offer valuable insights into cognitive hypotheses, which real experiments can hardly achieve (Elgin 227). Arcangeli and Elgin also adapt themselves to the idea of F*iction as Thought Experiments*: Arcangeli suggests that thought experiments in the narrative form have their own narrative dimension that allows the author to establish a parallelism between them and literary fiction (7).

More scholars give credit to Chiang's endeavors but rarely do they define and clarify what is Chiang's thought experiment. A few scholars approach Chiang's thought experiments holistically while excluding science fiction devices from the context. However, Chiang's thought experiments couldn't be accomplished without applying science fiction devices. Chiang maps multiple unnameable possibilities into his story by

creating all plots on the premises of new technological devices, such as *Remem* and *Prism*. In an interview with Joshua Rothman in 2017, Chiang clearly expressed that his primary goal has to do with engaging in philosophical questions and thought experiments, trying to work out the consequences of certain ideas" (Chiang, qtd. in Rothman, 7), which is also quoted by Jo A. Parker, Hughes and Eisikovits in the introductory part of their papers as a clarification of Chiang's science fiction ideologies.

There are scholars such as Wolfe, Joyce Oates and Dragoş Avădanei who mentioned Ted Chiang's thought experiments and breakthroughs in their studies (174, 148), but none of them has extensively explored Chiang's thought experiments nor discussed the devices Chiang created in the paradigm of his thought experiment. Besides, the current research seems to be completely bereft of systematic studies about the weight of memory in Chiang's stories except for Jo. A. Parker's interrogation of the intertwined cultural, and individual memories and the balance of truth and feelings (185). Wolfe displays multiple nods to Chiang's stories' contribution to philosophical fiction and thought experiments since Chiang's stories attend to science fiction's growing liberation from its own conventions (174). American writer Oates commented that Chiang's stories equalize thought experiments in a narrative mode. Besides, Avădanei generalizes Chiang's thought experiments lucidly as Chiang's multiple "what-if" questions and braides the study of thought experiments together with narration (148). Though Avădanei's research put the limelight on thought experiments, Avădanei's analysis leans towards a mathematical interpretation rather than a philosophical or psychological one. Believing in science fiction thought experiments' intellectual sense of wonder, Langford laureates Chiang's novella "Exhalation" as a

vivid thought experiment attempting to speculate on the nature of entropy by creating an independent universe.

This dissertation recognizes a profound alignment between Ted Chiang's novellas and the concept of thought experiments, positing that Chiang adeptly integrates his hypotheses concerning technology's influence within the narratives of selected works. Science fiction devices, *Remem* and *Prism*, serve as pivotal instruments through which Chiang conducts his thought experiments, symbolizing technology and scrutinizing its interplay with human reconstructive memory. This dissertation aims to scrutinize the narratives encompassing the science fiction devices in Chiang's "The Truth" and "Anxiety" as conduits to his thought experiments and focus on character developments as a result of encountering science fiction devices. The nature of Chiang's thought experiments is creating scenarios where science fiction devices and characters interact, thus gathering insights about the impacts of technology on human reconstructive memory, guilt and people's advanced understanding of their past. This inquiry delves into the dynamic relationship between two variables: technology and human reconstructive memory. Specifically, it examines the cognitive transformations experienced by characters as they interact with technological devices. The analysis aims to unravel the intricate interplay between technology and the reconstruction of human memory. Furthermore, this research serves a dual purpose by not only investigating Chiang's novellas but also encouraging readers to reflect on the broader implications of the relationship between technology and human reconstructive memory. By extrapolating insights gained from the novellas, this study prompts contemplation on the speculative future of this relationship in the real world.

CHAPTER 2: *REMEM* AND THE FATHER'S FALSE MEMORY: MEMORY RECONSTRUCTION IN *THE TRUTH OF FACT, THE TRUTH OF FEELING*

"You're the reason she left. You drove her away! You can leave, too, for all I care. I sure as hell would be better off without you."

The words were just as I remembered them, but it wasn't Nicole saying them.

It was me. (Chiang 186)

Ted Chiang, *The Truth of Fact, the Truth of Feeling*

Chapter two is dedicated to the story *The Truth of Fact, the Truth of Feeling*, a story about a single father's thorny path to his coexistence with the digital device *Remem*. This story features a thought-provoking encounter between human's subtle sentiments and a potent algorithm, which exposes not only a clash between digital and natural memory but also an intense confrontation of facts and feelings. The first section of this chapter analyzes *Remem*'s roles as an impactful technological device that sends waves to people's daily interpersonal engagements and a literary device of bountiful symbolic meanings. An analysis of *Remem*'s contribution to the story's narratives and character development will be covered including a unique narrative perspective as well as a marriage of *Remem* and six narrative elements by Labov. Furthermore, the second section of chapter two will first introduce the plot background of the thoughtful father's false memory, and apply Bartlett's five reasons for inducing reconstructive memory' to demystify the father's false memory. This section also discusses the processes in which *Remem* gradually shattered the father's confidence in parenting, increased the tension with his daughter and prompted him to arm himself with an advanced mentality to face a digitally altered life. To analyze the father's false memory and the cognitive impacts

of *Remem*, this chapter applies three fundamental factors Bartlett concluded in his paper: the persistence of the trivial, the increased visualization, and the individual's efforts to rationalize. Lastly, this chapter focuses on *Remem*'s penetrating impacts on the father's cognition, mainly his evolving perceptions of technology and reconstructive memory. Furthermore, this chapter concludes with the story's implications of understanding the relationship between technology and reconstructive memory beyond the fictional world.

2.1 An Introduction to the Science Fiction Device *Remem*

2.1.1 *Remem* as a Technological Device and Chiang's Techno-realistic View

Remem in "The Truth" is a wearable device that functions as a real-time monitor of users' conversations, a recorder and a projector. As narrated by the father in the opening of "The Truth": "*Remem* monitors your conversation for references to past events and then displays video of that event in the lower-left corner of your field of vision" (Chiang 162). *Remem* crystalizes and makes an extreme version of a trendy phenomenon in the era of rising self-media: video logging (vlog). Vlog is an entertaining form that is tagged with life-sharing, creativity and self-expression. In an article by Joan-Issac Biel and others, a vlog is referred to as a medium of self-presentation and exposure of personality (446). However, *Remem* does not resemble those vlogging devices that are utilized to demonstrate or share personalities. With *Remem*, every single moment in your life is traceable, recorded, and stored to generate a vast personal database widely reusable in the future. Beyond the fictional world, users record videos and engage in life-logging activities to memorize special moments. These moments can hardly be recalled without a video clip as a reminder. The father used the phrase "continuous video of their entire lives" to indicate the device always records real-time ceaselessly

(Chiang 161). An additional salient point regarding *Remem* is that "The Truth" exclusively scrutinizes the utilization of *Remem* within individual contexts and situations, neglecting to extend its examination to communal, corporate, or societal applications. In other words, individual memory is prioritized while collective memory is undermined. Considering Chiang's intention to withdraw his stories from capitalisation, the analysis of *Remem* and its implications are de-capitalized and mostly humanistic. Since Chiang himself does not plan to tether his stories to commercialization and is only concerned with the emotional, interpersonal, and humanistic facets, he crafted "The Truth" as a story only revolves around lower-middle-classed civilian's minutia, such as arguments among couples and families. Since most people approach *Remem* just to settle "domestic squabbles", these situations are named "the situation in which justice was the motivating factor" by the narrator (Chiang 165). Discussing *Remem* from the perspective of vlogging brings more understanding of the device from a cultural perspective in the we-media era. Meanwhile, it is also necessary to understand what's the company's momentum to invent *Remem* and why its quick penetration into the market overwhelms the father with apprehension. The story is narrated from the father's first person point of view; therefore, the father's narration provides abundant resources to delve into *Remem*.

Firstly, it is believed by the father that *Remem* was not originally invented to entertain the public but was created as a substitute for natural memory (Chiang 162). The father's concern over *Whetstone*'s business strategy demarcates itself from cybernetics. Cybernetics indicates the science about communication and control of information in humans and machines and is often scrutinized to understand the impact

of technology on memory (Goodman and Parisi 347). It seems that the father has already been acquiescent to the fact that memory as a database stored by *Whetstone* is commercialized and manipulated, but what worries him more is that digital memory will replace natural memory. The commercialized part will forever exist, but it is just not the focus of Chiang's story. This explains why the father attempted to retreat from *Remem* in parenting and why the device raises concerns for him in a way that no other technological device compares. Based on the father's prediction, it is known that *Whetstone*'s overarching positioning of *Remem* is far beyond providing convenience to the public but maximizing the users' viscosity, thus turning *Remem* into an inseparable part of the users just like an electric organ.

Besides the concept of replacing natural memories, the company's momentum of inventing *Remem* that made the father distraught is that *Remem* will affect or even change people's natural thinking patterns. "But *Whetstone* expects that, as people become accustomed to their product, queries to the system will take the place of ordinary acts of recall, and *Remem* will be integrated into their very thought processes" (Chiang 416). The father displays concerns that *Remem* will affect people's natural, autonomous, and original thinking patterns. One of *Remem*'s impacts on cognition elaborated by the father is the "scorekeeping mindset", exemplified by a couple's experience. *Remem* was utilized by the couple Joel and Deridre to passionately vindicate themselves in family squabbles, which buries a seed of suspicion in the father's mind: would the use of *Remem* incur more score-keeping actions in intimate relationships? The salesperson of *Remem* Erica Meyers skillfully denied the father's suspicion as if *Remem*'s sales are all programmed to answer in the same way (Chiang

167). The "scorekeeping mindset" in relationships pinpointed by the father is what breeds toxic calculation and unhealthy bickering among couples. It denotes the mind game of "I did more than you do" and the endless loop of resentment. "Keeping score" is a sporty analogy that is popularly employed in relationships as an idiom. According to *The Oxford Dictionary*, scorekeeping means you keep a record of the score of games. In the context of relationships, scorekeeping could be discerned as couples calculating the good and bad things each other did to reach an even, showing one party is in a superior position or the weaker position one made another have. There is no official definition of "scorekeeping" in the context of relationships, but it is comprehensible since it happens to everyone. In "The Truth", *Remem* is an authentic weapon for scorekeepers to distinguish themselves.

Thirdly, *Remem* jeopardizes people's learning ability by depriving their initiative in active recalling. Why the father was concerned over the loss of our natural recalling ability and what is the point of preserving the natural ability of recall? The father's concern alludes to one natural reaction people could have: the intention to stop other people's reminding while recalling something with difficulty. Do these few seconds of free recalling matter? People's attachment to *Remem* makes memory lose its lustre because active recalling is invalid. When we are actively recalling something, we are trying to evoke associated memories revolving around the target object. This reflection touches upon the importance of an active recall and how *Remem* might spoil this gifted natural ability. Sadly, the invention of *Remem* means the demise of tip-of-the-tongue moments. Regarding this, Jeffrey Karpicke offers a compelling statement of the necessity to actively recall in learning: knowledge retrieval assesses the learning result

and learning is associated with knowledge encoding. Practising recalling produces meaningful and long-term learning but it is often undervalued (157). Besides, Karpicke also indicates the lop-sided attention on the encoding in knowledge learning rather than decoding in educational research (158). At the beginning of "The Truth", the father bemoans that the retinal projector spoiled his daughter Nicole's writing ability, hinting at a huge void in Nicole's learning process and even in her cognition (Chiang 160). The father further narrated that Nicole's intellectual achievement is still creditable despite the absence of a spelling system in her brain, but she just can not type with a keyboard like the people from the father's generation do (Chiang 161). It could be displayed that *Remem*'s existence means the privation of an important step in the learning process: decoding.

Professor Lawrence Lessig said at a conference that techno-realism is not a top-down philosophy but is a non-extreme and nuanced approach to thinking about the changes that are occurring in computing and communication. Techno-realism as an approach to speculative fiction straddles between techno-pessimism and techno-optimism (Hughes and Eisivokits 1). It ushers users to critically contemplate the role of technology beyond either a good or bad perspective but rather to understand it and apply it in a manner more consistent with basic human values (Holmes 128). Hughes and Eisikovits argue that Chiang's view of technology is neither exuberant nor depressed but is articulately sober (2). They conclude that in Chiang's stories "The Truth" and "Anxiety", technology also engenders self-knowledge, insights and psychological relief while adhering to one rule: technology only refines the understanding of who we already are and doesn't remake us into a new being (1). This

dissertation claims that Chiang's techno-realistic view is not "neutral" towards technology's impact but is a humanist approach to technology. Chiang's techno-realistic view prioritizes technology's influences on an individual's cognition, emotion and relationships rather than technology's influences on a community or society's rise and decline. Chiang's techno-realism ties into his ever more rationalized and meticulous depiction of *Remem*'s role: while the father confessed that *Remem*'s downsides deserve more genuine awareness, he endorses *Remem*'s values and meanings in a few aspects. *Remem*'s most prominent effect articulated by the father is ensuring one's self-knowledge will not stray too far from the truth (Chiang 198). It dilutes one's chances to be caught off guard by unanticipated discrepancies between their self-image and truth and also prevents one from being trapped in a traumatic identity crisis and skepticism having discovered the fallibility of their memories. Another point is that *Remem* presents a more objective picture of both the positive and negative sides of the past compared with over-romanticized fabulations (Chiang 198). Getting used to imperfections could make us more lenient and less judgmental about the fallibility of our own and others. For instance, the father realizes what was promoted by the salesperson as the advantage of *Remem* about being more forgiving to each others' mistakes turned out to be true. Nicole's discovery of her own fallible memory soothes her anger towards the father's fallible memory (Chiang 198), which consolidates technology's humanist function: a juxtaposition of the accurate technology and error-prone biological memory shall bring more appreciation of human imperfection instead of wishing biological memory to be flawless. Lastly, *Remem* guides mindful users to the avenue of deeper self-exploration. The father expresses: "The point is not to

prove you were right; the point is to admit you were wrong" (Chiang 197). The implication of the father's reflection is technology deconstructs the subjectivity in identifying oneself simply by memory and promotes us to reexamine ourselves with the most objective canons; however, the objectivity of technology will not nullify a person's subjectivity in an emotional recalling and narration, which made humans who they are. In conclusion, by means of the narration of science fiction device *Remem*, Chiang's techno-realistic view transcends the shallow and extreme discussion of technology as detrimental or beneficial and adheres to a rational and nuanced view of technology's impact on an individual's self-knowledge and mentality to deal with fallibility.

2.1.2 *Remem*'s Symbolic Meanings as a Literary Device

A. N. Whitehead, while introducing the uses of symbolism, claims that symbolism is no mere idle fancy or corrupt degeneration: it is inherent in the very texture of human life (110), and 'expression' is 'symbolism' (111). In literature, symbolism is the way that the author communicates with the reader and the world in a seemingly obscure way but accurately stings the pain point of certain issues. Symbols become the carrier of the author's self-expression or, in other words, ideologies. Since the object of symbolism is the enhancement of the importance of what is symbolized (Whitehead 111), the science fiction device *Remem*, as the symbolic object, enhances Chiang's intrinsic expression about memories, technology and the clash, mingling and mutual impacts of the two. To decipher the information that *Remem* carries is not as easy as deciphering "red as passion" and "rose as romance" because *Remem* itself is something based on an imaginary scenario. But here are a few perspectives to consider while unboxing the

symbolic meanings of *Remem*: firstly, *Remem* epitomizes the digitalized, errorless and dominant artificial memory, which further implies that artificial intelligence prevails over the natural human ability due to society's restless pursuit of automation without considering the degeneration of human's intrinsic abilities. *Remem*, as a symbol, challenges digitalized memory and critiques the society that fanatically throws worship to digital technologies. Would people applaud the birth of *Remem* the same way as they applaud robot vacuum cleaners, fully automatic toilets and automatic washing machines? *Remem*'s appearance prompts people to ponder on how it feels to be what the father called "cognitive cyborgs that are effectively incapable of misremembering anything" (Chiang 170). *Remem* in this context also deconstructs the concept of "perfection" and "imperfection" in the sense that it touches upon the precious value of having an "imperfect memory": forgetfulness is the cornerstone of some relationships because in order to forgive, people need to forget a little bit to stop feeling the pain as fresh (Chiang 171, 172). Having a perfect memory can make someone lose the emotional value of certain pleasant moments, while having an "imperfect" memory preserves the ability to narrate, to make sense of narration and be the master of one's own memory. Instead of asking "What might it be like to have a perfect memory" (Chiang 170), the question "What are the valuable things of having a natural memory that technology can never replace" is also worthy of deep rethinking.

Moreover, *Remem* is highly approachable and affordable to the general public in the story according to the father's description since *Remem* is ditched by the scientific world due to its perils in functionality and is widely mined by civilians. In this case, *Remem* symbolizes the inclination to apply high-tech devices for an entertaining

purpose. However, can we call *Remem* an entertainment technology? In a way, entertainment technology's primary purpose is to bring users amusement, which sounds at odds with *Remem*'s primary positioning: replacing natural memory. Before categorizing *Remem* into any group, the features of entertainment technology shall be numerated to compare and contrast with *Remem*. Craig Hayden defines entertainment technology as multiple forms of media communication that are primarily purposed to provide forms of play, fantasy, and other forms of recreation (1). Hayden also highlights the term "entertainment technologies" does carry connotations of mass communication and news media technologies such as radio, television, and the internet (1). Whether *Remem* is a form of mass media depends on whether each individual's recorded memory is naked to the public eye for comments. Memory is the dearest to the holder's heart and is one's most confidential and intangible treasure, but *Remem* also permits users the basic sharing rights of their own clips and a viewing right for snippets or footage with their presence in other people's clips. Besides, there are domains like "public video archives" (Chiang 184) as a derivative function of *Remem* sharing similarities with social media platforms. At the end of the story, the father was extremely meticulous about the so-called "truth" displayed by *Remem* between him and his daughter. Being so appalled at misremembering the argument with his daughter, he changed his customary practice by gingerly recording his life with Nicole and granting public access to his lifelog with Nicole's permission (Chiang 198). The concluding mark of the story is the father's invitation for public scrutinization of his lifelogs: "And if you think I've been less than honest, tell me. I want to know" (Chiang 199). The father has granted access to his memory for public communication, which automatically

tagged his videos as mass media for "entertaining". Despite the father's academic orientation to conduct his project regarding *Remem*, his application of *Remem* still falls into the category of mass communication with an entertaining nature because the reception end is countless netizens who probably only scrolls the father's clips at their leisure. Therefore, *Remem* symbolizes the wide application and possibly, abuse of entertainment technology in modern society. When privacy and confidential life fragments become the best time-killers for everyone, entertainment technology declares a generation of "live to entertain" that echoes Neil Postman's book *Amusing Ourselves to Death*.

"What digital memory will do is change those stories from fabulations that emphasize our best acts and elide our worst, into ones that—I hope—acknowledge our fallibility and make us less judgmental about the fallibility of others" (Chiang 198). The father's heartful confession indicates the essence of the enlightenment that *Remem* is supposed to render: instead of picturing a perfect and errorless future, *Remem* brings nostalgic ideas about fragmented and vivid memories with friends and families, which requires more understanding, mercy and leniency to all the mistakes made. When *Remem*'s function is posited out of the paradigm of entertainment technology, it pierces into the minor but authentic perspective of natural memories and the most non-negligible emotions reside in the human mind.

2.1.3 *Remem* and Narratives in Chiang's Thought Experiments

Thought experiments are imaginative exercises designed to postulate what would happen if certain, perhaps unrealizable, conditions were met (Elgin 226). In the story "The Truth", the imaginative scenario is what would happen to humans if biologically

reconstructive memory is challenged by technology-mediated digital memory. The strategy of Chiang's thought experiments, adhering to Elgin's explanation, is to contrive a situation when a mundane feature like our reconstructive memory is isolated by technological advancement to highlight reconstructive memory's significance (232). "The Truth" could also be read as Chiang's thought experiment to speculate the humanist consequences of having a technology-mediated and errorless memory. Thought experiments offer epistemic access to aspects of the world that are normally inaccessible, such as psychological and metaphysical aspects (232), but Elgin claims that the result of thought experiments is not self-evident but requires further interpretations (230). It is discernable that Chiang vindicates his postulations about memory, technology and individual's guilt and pain by creating scenarios of characters' interactions with the science fiction device *Remem* in which the consequences of a perfect memory play out. Chiang's thought experiments are presented through his narratives with different levels of detail and rhetoric (Arcangeli 7), which includes the selection of the narrative point of view, Chiang's imaginative portrayal of *Remem* and character development having encountered *Remem*. This thesis asserts that reading Chiang's novellas as thought experiments requires analyzing the narratives of two variables: science fiction devices and reconstructive memory. Besides, thorough consideration is given to the character development throughout their interactions with science fiction devices to generate insights about technology's cognitive impacts on people's understanding and interpretation of the past. The following analysis discloses Chiang's carefully designed narratives about *Remem*.in order to make salient the aim of his thought experiment. Since *Remem* is one of the variables in Chiang's thought

experiment, it is crucial to analyze the narratives of *Remem* to understand its competency to cause cognitive transformations.

Due to the complexity of the human mind, Chiang's selection of the story's point of view renders his thought experiments a consistent lens to see through the world and to shape readers' perceptions, though the selected point of view is susceptible to cognitive limitations. The father's first-person point of view consolidates Chiang's tendency to present a subjective narration of subjectivity instead of an objective one. The narrative perspective affects readers' impression of science fiction devices: for instance, a first-person point of view displays a restricted and subjective view for the readers. "The Truth" is narrated from the first person point of view by the father in the form of a memoir, which gives readers an intuitive sense of the narrator's seeing and believing and affects readers' take on the story. In "The Truth", the father exposes his conservativeness towards technology in the beginning despite his visible efforts to state in a rational tone, portraying himself as a sturdy supporter of traditional literacy. When he heard that speech recognition and synthesis might replace human speaking and writing ability, he is frank about his worry: "My wife and I were horrified by the idea" (Chiang 160). The father's cautiousness piles up tier upon tier as he grasps more information about how intimidating *Remem* could end up being: So it hasn't been my habit to engage in doomsaying whenever a new product is announced...But when *Whetstone* released its new search tool *Remem*, it raised concerns for me in a way none of its predecessors did (Chiang 161). Despite his concern, the father didn not allow fear to manipulate his narrative tone. A user's narration of *Remem* appears to be more reasonable and coherent with consumers' needs, while a seller's narration of *Remem*

would beam with praises or even overpraise. It would be another story if *Remem* is narrated by someone who's either techno-pessimistic or techno-optimistic. The father's subjective narration of *Remem* interweaved with his personal experiences could close the gap with readers by making readers project the father's side of the story on themselves, thence pondering on the humanistic consequences of digital memory.

Moreover, the science fiction device *Remem* serves as the key of the storyline. This father not only introduces the functionality of the device, but also delves into users' experiences with the device. The narration usually concludes with the father's reflective thoughts on the user's story. For instance, when *Remem* was used by a married couple to prevail over their partner in an argument, the father contemplates that the pursuit of truth might not be an intrinsic good but harmful (Chiang 165, 166).

A fully developed natural narrative, according to Labov, includes six sections: abstract, orientation, complicating action, evaluation, resolution and coda (Scholes 7-8). In Chiang's thought experiments, *Remem* serves as the independent variable that promotes smooth narrative transitions. For example, it is the father's reflection on how would *Remem* affect relationships that leads him to his recalling of an argument with his daughter Nicole, which is considered the complicating or rising action of the story (Chiang 171). The story's resolution is intricately tied to the reconciliation between *Remem* and the father: the father's confession of mistreating his daughter serves as a catalyst for his quest for a flawless and precise memory. This request manifests in his meticulous recording of life and his willingness to allow his life clips for public scrutiny (Chiang 199). These instances underscore the vital role played by science fiction devices in shaping the narrative of Chiang's thought experiments.

The next section examines the father's interaction with the *Remem* following another essential clue of reading fiction as thought experiments: what are the epistemic and cognitive implications of the two variables' interactions?

2.2 The Father's False Memory and His Encounter with *Remem*

Reconstructive memory is a cognitive process through which information is restructured into a coherent narrative with the interference of prior knowledge and schema. This process is highly susceptible to errors and distortions. In this story, the father's false memory, as a result of memory reconstruction, will be the main object of analysis. The first section will introduce the background and details of one specific argument the father had with his daughter Nicole that lingers in his mind and how *Remem* "overturned" his memory of that argument. To analyze how *Remem* stipulated the father's attention to reconstructive memory, this section will introduce the father's background narrated in the story. The father's argument with Nicole, which is probably kindled by the wife's departure, plays a deterministic role in the father's relationship with Nicole. This argument kindled the father's realization of Nicole's predicament, and *Remem* made the father further appalled by how inaccurate his memories were. He realizes and acknowledges that people's natural memory is reconstructive and using *Remem* mindlessly might lead to a fatal loss of memory's reconstructive nature, thus a heavy loss of more nuanced and precious emotions in life. To analyze the father's cognitive transformations caused by *Remem*, this section refers to the cognitive and cultural factors that are accountable for one's reconstructive memory and Bartlett's five factors resulting in memory reconstruction. The first part of this chapter starts with analyzing what dramatically led to the father's false memory. Specifically, what Bartlett

concluded as “the persistence of the trivial”, “the increased visualization” and “efforts to rationalize” will be applied to expound the father’s false memory. The second section provides a comprehensive exploration of the father’s false memory and his cognitive transformations induced by *Remem*. This segment is further delineated into a few key aspects: 1) explaining the father’s false memory while applying Bartlett’s theory of reconstructive memory, 2) analyzing the processes of the father’s acknowledgement of his false memory, and 3) examining the father’s cognitive transformations having interacted with *Remem*. This section, in alignment with the theory of reading fiction as thought experiments, delves into the father’s character development and the father’s cognitive transformations concerning reconstructive memory, his past and his relationship with Nicole, as shaped by interactions with *Remem*.

2.2.1 Reasons for the Father’s False Memory

Throughout the journey with *Remem*, there is one event that turns the father’s world upside-down, which is the moment he revisits a harrowing argument he had with his daughter Nicole through *Remem* and discovered some wounding words full of blame and maliciousness out of distress are from him to his daughter rather than the other way around:

“You’re the reason she left. You drove her away! You can leave, too, for all I care. I sure as hell would be better off without you.”

The words were just as I remembered them, but it wasn’t Nicole saying them.

It was me. (Chiang 186)

The father remember the exact conversation but misremembered from whom and to whom these words are. This corresponds to what Bartlett concluded as the persistence

of the trivial: the subject will preserve some peculiar turn of phrase intact, even when incidents much more intrinsically important in the story are distorted (32). Noticeably, the father preserved the specific expression in their conversation but distorted the more important fact that he was the harsh speaker rather than his daughter. Before revisiting the clip of that argument with Nicole, the father used to believe those hurtful words were Nicole's "unpremeditated malice" that spurred him to become a better father (Chiang 172). Besides the persistence of the trivial, the father's misremembering aligns with another observation Bartlett concluded as one of the most important general factors inducing memory transformation: the effort to rationalize (33). It denotes people's tendency to make sense of the story to themselves during their recalling process. Bartlett claims that when the rationalising factor is inserted in the recalling process, all the rest is satisfactory (37)**.** Accordingly, the rationalising factor in the argument for the father is "Nicole said hurtful things to me because she was young, naive and harmless". The father subconsciously and imaginatively rationalized his misconduct by filling in the gaps. He recreated a new scenario that aligns with his cognition and beliefs. He believed that Nicole's accusation truly gave him a heavy punch in his heart, which aggravated his devastation as a father being unjustly treated. How he perceived himself as the biggest victim of this collapsed family tree rationalizes why he remembered his daughter was the one that says: "You are the reason she left, I sure as hell would be better off without you" (Chiang 172). Therefore, the father's memory was reconstructed into a version that matches his guiltless and aggrieved single father image. Just as what Michael Ross and Anne Wilson said: "an equally distant event feels close or remote, depending on whether it has favorable or damaging implications for evaluations of the

current self" (69). The father's memory was reconstructed to a version that improves his autobiographical memory as a good father. His brain made him believe so presumably to lessen his guilt and acknowledge him as a self-perceived decent and responsible father. The father was confused at the accurate memory presented by *Remem* because his reconstructed memory was programmed to a version that aligns with his common sense: those words are indeed too harsh from a parent to a kid so it should be the other way around. It is more pardonable to hear harsh words from kids since kids still lack expertise in using the language.

The father's false memory and his subconscious rationalizing of the argument unveil one discussion that is also hinted at by Chiang in the title of the story: the relation between the truth and feeling. To what extent is the tendency to rationalize affected by how we feel rather than what the truth is. In a simple term, to rationalize is choosing to believe in what feels right. Dietrich claims that feeling truth is the real way to judge the truth, which leads to the speculation of how much feelings and experiences are accountable for the truth and how much is the truth affected by something that feels right. Dietrich says that the truth could be meaningless if you don't feel the truth, a great part of which justifies people's tendency to rationalize their reconstructed memory. Feeling truth by instinct somehow shares an enigmatic connection with being truth; the interpretation of the truth from a wrong perspective might reflect certain perspectives that matter to the truth. To be specific, the father's misremembering of the argument indicates his concealed guilt for not being able to give his daughter a formal apology and not being expressive enough for his love. Moreover, the father's misremembering and tendency to rationalize is also deeply affected and explained by the malleable nature

of episodic memory. The psychologist Endel Tulving introduces the concept of episodic memory as a neurocognitive system that enables humans to remember past happenings (1). Tulving explains: "When one thinks today about what one did yesterday, time's arrow is bent into a loop. The rememberer has mentally travelled back into her past and thus violated the law of the irreversibility of the flow of time" (2). Episodic memory is the memory system that recalls, recollects and reconstructs one's previous events in life. Patihi and others suggest that episodic memory usually involves a flawed reconstructive process that rationalizes memory distortions and basically nobody is immune to the malleable nature of episodic memory (20947). In "The Truth", *Remem* is devoted to the repairment of episodic memory through laying aside natural recalling. If *Remem* succeeds, episodic memory can no longer reconstructively render people blurry and false memories. People risk losing the euphoria of a hard-won recollection from memory lane. More importantly, Bartlett confesses that the presentation of the story is from a certain point of view or under the influence of a certain attitude. This attitude not only persists but usually plays a greater part with the lapse of time (33). Bartlett's view is concluded as "the tenacity of the attitude". The father's rock-solid attitude is to be a responsible and decent father. Even though the father was heading forward with a gloomy memory about certain past events and also mistreated his daughter to a certain point, his destination remains the same: being a good father. However, what he said to his daughter in the argument tingles him with guilt, which is not in conformity with his attitude of being a good father. Therefore, the attitude prevails in the incident and drives the father to omit his fault and modify the argument to match his attitude.

2.2.2 Processes to the Father's Acknowledgement of False Memory

Having analyzed the reasons for the father's false memory, this section examines the processes that the father went through in accepting his false memory to better understand *Remem*'s role in mediating the father's perceptions about reconstructive memory. Moreover, this section's analysis also provides insights into the extra-literary world of memory-modulating technology's cognitive impacts on people.

The father's reaction to his discovery of truth is divided into three stages: the first stage is denying what *Remem* displays and deeming it a fake clip falsified by Nicole to purposely impose her ideas on him (Chiang 186). The father's reaction could be explained by a psychological phenomenon: cognitive dissonance, a term that describes some exceptions of people's tendency to seek self-consistency about what they believe and what they do (Festinger 2). When there is inconsistency, people tend to rationalize the inconsistency until they become consistent because the presence of inconsistency incurs psychological discomfort. Festinger prefers to replace the words consistency and inconsistency with consonance and dissonance to be more neutral and avoid confusion (2-3). The father's eager attempts to reduce the dissonance by assuming possible explanations of what he witnessed demonstrates the psychological rule of "de-dissonance" as well as Bartlett's rule of "efforts to rationalize". Bartlett explains that rationalization is the result of a common tendency to change all presented material into such a form that it may be accepted without uneasiness and question (37). To alleviate his discomfort and face the video clip without uneasiness, the father has attempted to subjectively postulate the situation into something that fits his personality in his mind and generally matches his cognition: passing the buck to his daughter.

Therefore, the father said: “She must have noticed my request for access to her lifelog footage and concocted this to teach me a lesson. Or perhaps it was a film she had created to show her friends, to reinforce the stories she told about me” (Chiang 186).

Moreover, what Bartlett narrated as “efforts to rationalize” corresponds to an example about “dissonance” that Festinger listed: people who smoke might hear from the news that smoking is harmful to one’s health, which leads to the dissonance with their beliefs. The momentum to restore the consonance prompts them to either stop smoking or believe smoking does no harm, even though both of which could bring difficulties to practise (6). Failing to rectify the dissonance between what truly happened and what he consistently believed happened, the father was strangled by desperation: “I shut down *Remem* in disgust, furious at the product” (Chiang 187). When “editing the video clip” could be in no way feasible, the desperate single man has to change what he believes by acknowledging he indeed threw those harsh words at his daughter. However, the processes to his acknowledgement is not all plain sailing. The initial denial of the truth transits to another stage of self-doubt. When the external structure is unscathed and authentic, the internal structure of belief starts to shatter with denial: “it was also my knowledge that—whatever my faults or imperfections—I was never the kind of father who could say such a thing to his child” (Chiang 187).

In the second stage following denying the “truth”, the father’s reaction is saturated with self-doubts and a partial crumble of his identity surrounding his fatherhood. It appears that *Remem* did not change anything but only reminded the father of memory’s fallible nature. In fact, *Remem* unobtrusively restructures the father’s thinking pattern, which is reflected in his attempts to rewatch old life logs about Nicole and keep a strict

record of his entire life. The overflowing skepticism of human's fallible memories makes him acknowledge that he was a failure as a father. Festinger pinpoints that there is an inclination among humans to establish consonant relations among cognitions and to evade dissonance (9), which accounts for the father's repentance and willingness to repair what he did. It is contradictory that the father is growing more attached to *Remem* but he is also being more mindful in the usage of *Remem*. On one hand, he completely relies on *Remem* for self-evaluation: "I'm going to use *Remem* to get an honest picture of myself, take a kind of personal inventory" (Chiang 192). On another hand, he is very certain about one fact: digital memory can never roll in as a replacement for natural memory or stop people from telling stories, but only make people more pardonable of others' mistakes (Chiang 198). A new structure will only be established when the old structure begins to crumble. *Remem* crushes the father's comfort zone where he used to allow his experiences and ideologies to willingly reshape his memory. It comes at the cost of his temporary crumble of identity and cognition. The father firmly believed there was a hiatus between his memory and the truth and he was deeply worried by this.

The third stage following the father's self-doubt and identity crisis is a cognitive restructuring (CR) of who he is. At this stage, *Remem*'s imapct infiltrates the father to an introspective re-establishment of his self-cognition. Together with the second stage, the father diverts his attention from blaming others to reflecting himself. The negative feeling about himself as a father has been mindfully restructured to a compromised mindset that is more congruent with a less disorienting perspective of himself: "With *Remem* providing only the unvarnished facts, my image of myself will never stray too far from the truth in the first place" (Chiang 198). The father fumbles for a fixed point

to relieve himself from the depression caused by the gap between the "true-self" and "self-perceived self". It seems the lost man has admitted he was a terrible father, or maybe he still is. But instead of immersing himself in the endless loop of self-denial and self-degradation, he chooses to search for a balance between technology and life that at least re-establishes his balance of life and renders a lesson about *Remem*'s intrusion and the ripples *Remem* generated to his relationships.

The connection between cognitive restructuring and the theoretical framework of Bartlett's theory is: schemas are the basic mental structures that explain why memory is reconstructive, while cognitive restructuring is defined in terms of schematic changes (Clark 2). The psychological term "cognitive restructuring" initiated by A. T. Beck has been extensively applied in cognitive behavioral therapy to address psychiatric disorders such as depression, anxiety and personality disorders (Clark 1). Clark teases out a more understandable definition of Beck's cognitive restructuring in the chapter "Cognitive Restructuring": cognitive restructuring is structured, goal-directed, and collaborative intervention strategies that focus on the exploration, evaluation, and substitution of the maladaptive thoughts, appraisals, and beliefs that maintain psychological disturbance (2). Usually, cognitive restructuring is a therapeutic session carried out by the therapist to the patient, but the father has proactively completed it without others' assistance under the influence of *Remem*. Therefore, being a user of *Remem* mentally restructures the father's cognition of his own fatherhood by making him appalled by the huge gap between his memory and the reality. But how specifically does the father's encounter with *Remem* restructure the father's cognition? Clark quotes Beck and himself that cognitive restructuring is defined in terms of schematic change (2). While schema by

Bartlett refers to the way information is organized in the human brain as mentioned in the previous chapter, the process of cognitive restructuring could be visualized as a directional and purposeful re-prioritization of the information in the human brain: replacing or subordinating the schemata that are dissonant with a positive mindset and prioritizing the schemata that are consonant with the positive mindset. This explanation above simplifies what Clark mentioned as a key goal of CR: reverse the maladaptive schema-congruent processing bias by questioning the automatic acceptance of negative schema-congruent information and encouraging the assimilation of more adaptive schema-incongruent data (Clark 2). Taking the father's reaction as an example: his maladaptive thoughts that are dissonant with positive schemas were identified when he just found out the truth: "I couldn't trust my perceptions anymore" (Chiang 187-188). While his adaptive thoughts restructured by his rumination over *Remem*'s functionality should be a self-evaluation of his fatherhood rather than a comment on what could the thriving digital age render us and how *Remem* signals a new era. There are a few lines that demonstrate the father's evolving perceptions of his false memory which also serve as the proof of the father's adaption to schemas that are consonant with positive mindsets: 1) I think I've found the real benefit of digital memory. The point is not to prove you were right; the point is to admit you were wrong (Chiang 187). Though the confession sounds like a neutral and even desolate narrative, it reflects the father's pursuit of forgiveness and amendments from his mistakes. To the father, record-keeping goes off-track from the proper use of *Remem* so it's nonsensical to argue who was right. The proper use of *Remem* is to avoid indulgence in a confident but ignorant self-narration regardless of the truth. 2) Regarding the downsides of digital memory, the

father said:“ I just don’t think I can argue the case with any sort of objectivity anymore” (Chiang 198). If the father has always trusted his intuition and presumed himself an objective person, the emergence of *Remem* made him more attentive to the subjectivity in his personality even just subconsciously.

Analyzing the father’s acknowledgement of his false memory provides extra-literary implications in a few aspects. Firstly, it enlightens the readers to be aware of the consequences of false memories in real life relationship-wise. Stepping back from intense arguments and re-examining our own behaviors are practical advice for people who rarely realize their memories are products of experiences, personal backgrounds and customary practices. Psychologically, it is essential to be aware that cognitive structuring is an approach to overcome self-sabotage, but the logic behind it is to construct consonance between your cognition and behaviors. Lastly, technology’s intrusion could be less intrusive once people gain a sufficient understanding of the way our memory functions, especially the schemata system that organizes what we remember. More acceptance of reconstructive memories’ features could efficiently rectify the dissonance between technical accuracy and natural fallibility because people’s ardour for digital perfection would be eased once the consequences are exposed.

2.2.3 The Father’s Encounter with *Remem*: His Cognitive Transformations

This section targets and addresses two research questions by analyzing the father’s cognitive transformations of *Remem* and reconstructive memory: firstly, how do the father’s engagement with *Remem* reflects the father’s views of technology, thus inferring Chiang’s techno-realistic perspective in his thought experiments; secondly,

how does *Remem* reinterprets the father's past and refines his comprehension of reconstructive memory and his relationship with his daughter. The theory applied to analyze the father's changing views is Bartlett's schema theory as a memory structure that functions as the basis of reconstructive memory. As elaborated in the theoretical framework, schema is an actively developing pattern and an active organization of past events and experiences (Bartlett 201). The significance of this section is mainly garnering awareness of technology's impacts on the nature of reconstructive memory.

(a) The Father's Cognitive Transformations about *Remem*

This section will elaborate on the father's cognitive transformations of *Remem* from being an outsider to an observer and a thinker. Even though the father's views didn't experience a considerable change throughout time, the reasons why he has been cautious and suspicious of technology are getting clearer bit by bit. The father's attitude and perception of *Remem* were gradually evolving from feeling nameless ominousness to having a solid and rational understanding of its clash with and impacts on reconstructive memory and relationships. These transformations are truly harvested from his first-hand experiences. Besides, this section will also apply Bartlett's theory of reconstructive memory, particularly the schema theory, to address the father's conceptual changes. The father's changing attitude towards *Remem* brings more clarity to *Remem*'s cognitive impacts on the father, thus alluding to technology's influences on human reconstructive memory. Moreover, the father's gradual and distinct changes of attitude on *Remem* represent the processes of schematic changes, which serve as the basis of Bartlett's theory of reconstructive memory.

"In its schematic form the past operates en masse, or strictly not quite en masse,

because the latest incoming constituents which go to build up a 'schema' have a predominant influence" (Bartlett 202). Analyzing the character's schematic changes while observing Bartlett's theory of reconstructive memory requires two steps: identifying the schemas and comparing the character's different interpretations of the same event. To analyze the father's schematic changes in his memory structure, it is necessary to examine his changes in interpretation, attitude, thinking and beliefs about *Remem*. The father's initial impression of *Remem* is his original schema before his deep interaction with *Remem*. Initially, the father's internal monologue reveals his defensiveness about the release of *Remem* since he realized it might be an epoch-changing device that shatters traditional literacy. Seemingly, he was falling into the category of techno-conservatives even though he tried to spare himself from doomsaying (Chiang 161). The story starts with the father's narration laden with anxiety about how technology might someday make reading and writing abilities unnecessary for newborns, Regarding this, he asserted that his daughter would always rest on the bedrock of traditional literacy (Chiang 160). While piercing into the father's wording and phrasing, it could be sensed that his selection of words in expression, though displaying gloomy vibes, are saturated with his persistence to be utterly objective. The father chose to say "it raised concern for me", "I've been much more skeptical about..." and "I couldn't share the same optimism...technology doesn't always bring out the best in people" (Chiang 161, 165, 167), which implies his critical views of technology indirectly. Even though the father's negativity is all over the place, he was still holding back from giving people the illusion that he is techno-pessimistic. His rationality is still pulling him back from choosing a side in this technology-mediated life. But these are

purely the father's assumptions about technology-mediated life for modern people without his first-hand experience, and these words do not seem to be considered persuasive enough because the father did not elaborate on why and how *Remem* is ground-breaking with his own examples. But it is not difficult to detect the father's cautious, mindful, slightly cynical and even negative attitude about *Remem* and prosthetic memory before he became a loyal user of it.

Later on, the father was not only giving some empirical talks while standing high above the masses. In order to write articles required by the editing manager, he carried out interviews with a couple and a salesman from *Whetstone* to be more educated about users' experiences with *Remem*. The first heartful insight originates from one couple who taught the father that *Remem* might generate more opportunities for arguments to arise even in solid marriages (Chiang 167). This change in mentality concerns how *Remem* brings the father enlightenment about schema change which affects one's cognition and behavior. Chung Min and Woodman claim that although a change schema may not be the only cognitive variable that affects attitudinal and behavioral responses towards change, it is nevertheless an important guide for actions (537). The father's insight in regards to cognitive science mirrors how new schemas are acquired, stored and retrieved to support the cognitive processes as a result of new learning and experiences (Gilboa and Marlatte 619). The father's main concern is that always having a digital database to augment the argument might devastate a relationship more speedily. Asaf Gilboa and Marlatte Hannah assert the absorption of new knowledge, also called schematic encoding, will supposedly reduce memory accuracy and enhance memory formation (625). They further explained by saying: a new encoding of knowledge in a

schema-congruent context will boost the overall memory but undermines the perceptual encoding of fine details (625). In "The Truth", Deirdre and Joel are a couple who's passionately involved in fact-checking with *Remem* in domestic squabbles. When Deirdre indirectly forced Joel to admit something he said by replaying the video clip via *Remem*, Deirdre realizes what *Remem* showed is congruent with Joel's obstinate and unreasonable personality. Therefore, if *Remem* proves Joel wrong over and over again, Deirdre will heed even less about what Joel actually meant and more about what he said. The persistence in finding Joel's wording submerges the Deirdre's curiosity of Joel's intentions and implications of words. Finger-pointing becomes more urgent than problem-solving than Deirdre. Just like the father confessed there was a certain moment when seeking for justice ceases to be the intrinsic good, a blind pursuit of accuracy might overwhelm the intricacy of the mind (Chiang 166).

The father's rumination over *Remem* is elevated to another level when this digital camera guides him to ponder on more philosophical questions. Having recollected a few clips of his childhood memories, the father ascertains that *Remem* could taint a unique narrative tone preserved in everyone's autobiographical memories loaded with emotions (Chiang 179). Memories are supposed to be the most confidential, idiosyncratic and self-representative existence, but *Remem* makes the narrative monotonous and syphons all the emotional value from it: "the criteria used for selecting moments were different for each of us, and a reflection of our personalities" (Chiang 180). The father says: "It seemed to me that a perfect memory couldn't be a narrative any more than unedited security-cam footage could be a feature film" (Chiang 180). If our memory is no longer narrative, *Remem* deprives all the sentimental value from a subject and devalues it into

an object. In this case, *Remem* has no difference from the surveillance camera everywhere in public areas. When memories are no longer flexible and fluid but are neatly lined up with solid facts, there is no leeway to feel, to love and to forgive. This stage is remarkable since the father's confrontation to *Remem* is more well-grounded and the negligible reconstructive memory also rises to its significance.

(b) The Impact of *Remem* on the Father's Reconstructive Memory

The section will analyze the processes in which the father's reconstructive memory was impacted before, during and after his encounter with *Remem* through a textual analysis of the father's narration. The main concepts applied are Bartlett's schema theory and theory of remembering, both of which belong to Bartlett's theory of reconstructive memory. There might not be a drastic change in the father's understanding of reconstructive memory due to his prior comprehension of memory's resilience, but his understanding of reconstructive memory grows ever more solid and compatible with his life practices ever since his interaction with *Remem*. Lastly, this section will clarify what the arrangement of the plot and conflicts speak about reconstructive memories and techno-realism. This section more pertinently displays the possible influences of technology on the nature of reconstructive memory through the father's example. The extra-literary implications of the study between science fiction devices and reconstructive memory will be enumerated at the end of this chapter.

It could be detected from an early stage that the father was never a strong supporter of digital memory in any shape or form. At the beginning of the story when he was only a stander-by of other couples' dramatic arguments saturated with fact-checking, the father already displayed a propensity towards a fallible memory over an accurate

memory and leans towards an inclusive view of the mistakes caused by fallible memories: “forgive and forget” goes the expression, and for our idealized magnanimous selves, that is all you needed (Chiang 171). That explains why he is reserved to share the optimism when the salesperson from *Whetstone* talks about the revolutionary role of *Remem*. When the father said: “But having a perfect memory wasn’t the blessing one might imagine it to be” (Chiang 171), he’s embracing the fact that we are humans who forget. The father is also sensitive and cautious about the idea that technology jeopardizes people’s unadulterated pleasure. The father’s attitude sets the tone of rationality toward technology in the story and spreads looming alertness to readers about *Remem*’s role. His critical attitude echoes techno-realism in that the father demonstrates his remarkable prudence in giving up on prejudgment and starting by observation and contemplation. A close-up examination of the father’s selection of vocabularies pertinent to the natural memory exposes the father’s adoration for reconstructive memory: “a lovely, idyllic memory, romanticization of childhood memories, one that captures the emotional dimension of events and one that is full of feelings” (Chiang 179). Here is a line that is laconically expressive of the father’s perception of reconstructive memory and what makes forgetfulness important and valuable for humans: “What’s important to me about that memory is the happiness I associate with it, and I wouldn’t want that jeopardized” (Chiang 179). From the father’s standpoint, the footage with perfectly accurate details ruins a subjective, sensational and even emotional recall. The inability to misremember risks spoiling the ability to feel and the artificial memory erases all the emotional weight of a unique memory. Logical reflection over the impact of technology on humans is itself techno-realistic, and the

father's realization of the demise of emotional involvement in memory is sufficient to be a result of his continuous critical examination of *Remem*'s major role in eliminating emotions. The interaction between the father and *Remem* is rife with a major misremembering about him and his daughter. The father's major misremembering deeply influenced his self-confidence and perceptions of reconstructive memory. If it was in the past, he had no obstacle admitting and even prioritizing human reconstructive memory, now he is baffled by the skepticism that humans never keep an accurate memory of what happened, not even a tiny bit. His insights into reconstructive memory go a little off-track and extreme: You may say, "I know I'm not perfect. I've made mistakes." I am here to tell you that you have made more than you think, that some of the core assumptions on which your self-image is built are actually lies. Spend some time using *Remem*, and you'll find out (Chiang 197-198). The "lies" here do not refer to fabricating lies on purpose while one is totally aware of them; instead, what the father implies is that our perceptions, intertwined with experiences and beliefs, affect our recalling process and automatically construct a memory that is suitable for the situation. Bartlett ascertains that people either fill in the gaps with similar experiences in the past or choose what's suitable in that situation in a recalling process that is affected by perceptions (14). Presumably, the daughter had said too many hurtful things in the previous arguments so the father naturally presumes that Nicole is undoubtedly the toxic speaker. Another possible scenario is the father perceives what ostensibly is suitable for that situation without being the least aware that he is supplementing or falsifying the data of perception (Bartlett 14**)**. In another word, the father filled in the voids in his memory conforming to his self-perceived image of an unfairly treated father

struggling with a rebellious daughter. The scenarios above are purely conjectures of what presumably led to the father's misremembering in alignment with Bartlett's theories. Because the father did not spend half of his efforts on questioning reconstructive memories to examine why he misremembered the argument that sent him and Nicole on parted ways, which is crumbled by their reckless miscommunication. It seems that having crumbled trust in his own memory is just the entrance of the father's journey to negative self-identification. Even though how we perceive ourselves is not only defined by memories, the father possesses an agnostic perception that clashes with Greek philosopher Socrates' famous quote "Know yourself": we don't really know ourselves. The vulnerable man's skepticism was uttered in the plainest words: "... that means we don't really know ourselves. How much personal insight can I claim if I can't trust my memory" (Chiang 197).

In summary, *Remem* has exerted humanistic impacts on the father's reconstructive memory which is not merely defined as positive or negative. Firstly, the father's skepticism over memory and attachment to digital retrieval threatens to make reconstructive memory less reconstructive. Digital amnesia, a concept referring to people's breakdown of cognitive abilities due to their reliance on methods of digital retrieval, captures one of the consequences of the father's continuous usage of *Remem* (Lodha 18). The father's digital amnesia, different from most addicts of digital memories, is a deed of willingness to consciously alleviate the dissonance between his perceptions and the truth. When reconstructive memory is less reconstructive, a series of changes presumably happen to the father, including a changing standard in evaluating the value of memories and more pursuit of cognitive consistency. For instance, the

remembering and recalling mechanisms function for the father in alignment with the father's intention to recollect an event, to re-relish the joy of the past or to consolidate the knowledge of something. Having encountered *Remem*, the canon for the father to evaluate the memory mechanism becomes the discrepancy of it with reality. The accuracy of memory outweighs its emotional value. The father and other users alike seem to prefer the ever more nuanced versions of memories because memories will always be used to validate something or vindicate someone.

It is worth considering why the author schemes for a major plot of misremembering by the father and how this plot help convey the theme regarding reconstructive memories. The first answer is that misremembering is wrapped with layers of conflict in the story and acts as a key point that pushes the development of the plot. The first layer of conflict in the story is the typical type of single-parent dispute that happened between the father and the daughter, which appears to be quite ordinary for a story. While the second layer of the conflict is between the father and technology, which somehow provokes the first conflict and accentuates the external conflict to another level. Specifically, this conflict summons up how the father grapples with the issue of gain and loss brought by *Remem* and endeavors to retain people's primitive pleasure while not falling into revisionism. The next conflict detectable is the father's inner turmoil wrestling and hesitating between a responsible father and an irresponsible father. The three conflicts above are principal to analyzing the plot since the misremembering might never rise to its current prominence had the father not used *Remem* and had the father not worried much about his fatherhood. Besides inventing a new technological device, what makes the plot more intriguing is Chiang maps some psychological truth about

reconstructive memory into the characters' conflicts.

What the father remembered is impactful to how he perceives memory, but how he perceives is similarly influential to how he remembers. Bartlett suggests that a distinction should be made between perceiving and remembering: perceiving is the direct response to sensory stimuli while remembering is a way of making use of such stimulus (14). To perceive anything is one of the simplest and most immediate, as it is one of the most fundamental, of all human cognitive reactions (31). It is more understandable that the father's affirmation of reconstructive memory has been accentuated under the influence of *Remem*.

The father's evolving perceptions of reconstructive memory also mirror Chiang's techno-realistic and humanistic approach towards technology: what appears to transform who we are turning out to help us know ourselves better. But this "knowing" comes with a cost in life, which might be the inability to enjoy the simplest pleasure due to an overanalysis of everything and might also be a sacrifice of personal privacy or peacefulness. Just like what Chiang said in an interview: "Technology is not sort of cure or panacea. I would like to take as a more measured view of it" (Chiang). Chiang demonstrated what "a measured view" is by his thought experiments about reconstructive memory, technology and cognitive changes, especially by his narration of the science fiction device *Remem* and its' interaction with and impact on the father's cognition. As Chiang narrated, the father endlessly ponders on what could *Remem* bring and never lets his guard down, echoing with a techno-realistic spirit which, as Lessig suggests, is non-extreme and nuanced to the changes that are occurring in our life. The father's gradually evolving perceptions symbolize his ever-deeper understanding of

technology's role with close integration and scrutinization of his personal experiences. The ending of the story discloses the father is not satisfied with his current discovery and even aims to elevate the interflow between him and *Remem*. Holmes confesses the gist of techno-realism is attempting to apply technology in a manner that is consistent with basic human values, and Chiang manifests in "The Truth" that there is still a long way to go to realize a harmonious and sane coexistence between technology and human beings without ditching the natural gifts: emotion and cognitive processes. Chiang's narration of the father's consistent experiments, observation and contemplation tremendously contribute to a techno-realistic view in science fiction stories.

Beyond the literary narratives, this research demonstrates its contributions to multiple aspects. First of all, the father's case exemplified and explicated the psychological reasons for people's series of reactions to their false memories. It also invites more lenient perceptions of people's initial rejection of their false memories. Being exposed to the precise differences between reconstructive memory and digital memory, optimistically, blunts the overly positive or negative opinions on either side. Therefore, the polarization trend towards a either digitalized society or a primitive society is effectively soothed. The more people learn about the consequences of each option, the more rational people become, which announces the demise of the fetishism of leaning towards an extreme side. Moreover, this research contributes to an emerging trend of taking humanistic factors into consideration while devising technological devices. Accuracy, perfection, and high pixel were the goals when technological development was at its initial stage. In recent decades, freeing human labour and bringing more convenience to users become the mission of technological devices.

Unmanned devices maintain their own inner orders, but disrupt users' original orders. The seemingly humanistic considerations could do exactly the opposite to humans. This research increases awareness of the real humanistic needs of users while interacting with technology: to let voices be heard, to appreciate emotions and natural mechanisms of human bodies and to embrace the dynamic in imperfections.

CHATPER 3: *PRISM* AND DANA'S DISTORTED MEMORY: MEMORY RECONSTRUCTION IN *ANXIETY IS THE DIZZINESS OF FREEDOM*

Chapter three focuses on Ted Chiang's *Anxiety is the Dizziness of Freedom* ("Anxiety") which is the last story collected in his book *Exhalation*. This chapter coheres with chapter two on defining the science fiction device *Prism* and clarifying *Prism* as a tool of Chiang's thought experiments that scrutinizes technology's potential impacts on people's reconstructive nature of memory and perspectives of their past. "Anxiety" frames wildly the Many-World Interpretations' marriage with civilians' lives and performs its role as a meditation of the roaming fear over identity crisis at the discovery of multiverses. However, the more important but less frequently examined angle is the story's humanistic gaze into the science fiction device *Prism*'s potential impacts on the biological reconstructive memory.

This chapter delves into the science fiction device *Prism* as both a technological and literary device in this research, reflecting Chiang's techno-realistic view and carrying symbolic meanings. Additionally, it explores the significance of narratives about *Prism* in composing and propelling Chiang's thought experiments. The second section focuses on the psychologist Dana's psychic trauma and the story behind her distorted memory, serving as an opening introduction. Guilt, as an emotion, relentlessly haunts Dana's memories of the past, burdening her with weight and duty that aren't truly hers. Subsequently, Dana's surprising contact with a few clips about her para-selves generated by *Prism* is thoroughly introduced. The last part addresses changes brought by *Prism* to Dana's interpretation of her past and a changing attitude towards her guilt. *Prism* enlightens Dana that Vinessa in other parallel worlds will

always blame others for her own mistakes. She does not need to sacrifice herself to amend for others' mistakes. Science fiction device *Prism* helps Dana realize that our memory could be distorted by our emotions, beliefs and experiences, hence enhancing our tendency for excessive remedial actions.

3.1 An Introduction to the Science Fiction Device *Prism*

3.1.1 *Prism* as a Technological Device and Chiang's Techno-realistic View

Unlike *Remem*, the word "Prism" has geometrical and optical meanings even out of the context of a science fiction device in the story. In this part, *Prism*'s naming, appearance, performance and operating principles are discussed as a guide to its technical functionality. According to *Dictionary.com*, the word "prism" geometrically means: "a solid having bases or ends that are parallel, congruent polygons and sides that are parallelograms." A prism has multiple shapes such as triangular, rectangular, hexagonal etc. A very famous experiment about the geometrical object prism was conducted by Newton in 1666 to study the dispersion of light: how white light goes through a prism and comes out in different visible colors of the rainbow. In "Anxiety", *Prism*'s geometrical feature was not given special attention. It is depicted as a machine that resembles a notepad with one blue and one red LED light, the size of which decides its storage and life span (Chiang 239). It could be deduced the geometrical shape has not much reference to the notepad-like *Prism in* "Anxiety". Presumably, Chiang names the device "Prism" since its parallel lines and planes in structure bear resemblance to the parallel universes activated by the device in "Anxiety". Another reason stated in the story is that PRSIM is the acronym for "Plaga interworld signaling mechanism" (Chiang 238), echoing its capability of activating and approaching multiverses.

Interworld implies *Prism*'s operating principles, the Many-Worlds Interpretation, stated in the literature review in chapter one: the activation of the *Prism* powers up a quantum measurement inside the device that allows the main timeline to branch off into another timeline. Communication in the form of texts, images and videos between two branches is available to public users (Chiang 238).

A few notable features of *Prism* in "Anxiety" as a technological device are its: longevity, commercial and recreational value and finiteness. *Prism*, like scarce resources, could be burnt out, thus causing an incommunicado among branches (Chiang 239). The narrator confesses the temporality of the connection with other branches: no matter how interesting any particular divergence might be, the connection between branches was always temporary (Chiang 258). This prompts scientists in the story to invent *Prisms* of bigger gigabytes that could last for a lifetime via textual communication. Despite Chiang's nonchalance towards embodying capitalist facts in his story, there is a broader exposure to *Prism*'s commercial value in "Anxiety" than *Remem* in "The Truth". Secondly, *Prism*'s commercial value is widely reflected in its exchange value among vendors, such as *SellTalk* who purchases and Orange Sweater who peddles the *Prism* (Chiang 236). There are also some under-the-counter transactions enabled by *Prism* that might be omnipresent in the story, which target seniors who are unsophisticated about technology and consider talking to your para-selves a novelty (Chiang 253). For example, the customer Jessicah Oehlsen who was diagnosed with pneumonia is swindled by Morrow and Nat to transfer her legacy to her most trustworthy one: para-self. Morrow cantankerously persuades Jessicah: "Money is just another form of information. We can transmit it through a prism the

same way that we transmit audio or video information" (Chiang 254). Such transactions differ from the commodification of science since the bargaining chip is not knowledge but a better mastery of life by means of a new technological device. It resembles technology commercialization which defines the process of technology transitioning from the research lab to the marketplace. *Prism* has already gone through this transition and successfully made it to the mass market. *Prism*'s availability, as narrated in the story, enables users to purchase multiple *Prisms* for a cross-universal collaboration (Chiang 270). The "para-self fraud" is a novel type of fraud that ensnares citizens with basic skills about devices into low-cost and unethical crimes. Thirdly, *Prism*'s commercial value is also significantly bundled with its recreational value. All the possible values that are valid in the real world such as the flying rumours from tabloids, the secrets of late celebrity's private affairs and so on are also attached to recreational values in the world intruded in by *Prism*. Even though *Prism* possesses the ability to befuddle a placid psyche or seemingly pacify all the quests for life, it is certainly not almighty. Besides its limited lifespan, its availability might also disappoint some greedy seekers since users can only pry into the life of one branch after *Prism*'s activation in that branch. It is clearly stated in the story that: "No prism would ever allow communication to a branch that had split off prior to its moment of activation" (Chiang 256).

Chiang's techno-realistic view permeates the narration of the science fiction device *Prism* and its abundant interactions with various characters, especially with Dana. Chiang's dialectical and nuanced portrayal of a gloomy world of mazes initially casts a negative light on technology. However, as Hughes and Eisikovits pointed out, this

darkness will be enlightened as the story unfolds (8). *Prism* has multifaceted roles to play depending on the users' intentions. *Prism,* like the Crystal Ball to Morrow, represents profits to capitalists but also entails engagements in unethical transactions. For countless users of *Prism*, their interactions spark diverse reactions to the hypothesis of a multiverse but most people merely find *Prism* ameliorates their conditions, such as Lyle who pursues a stranger who is his girlfriend in a parallel universe. Moreover, Teresa also lost her peaceful mind as she was keen to know whether breaking up with her ex-boyfriend was the right choice. Instead of judging the drawbacks and merits of *Prism* to characters, Chiang is more inclined to guide readers to be more aware of the dizzying effect brought by technology along with satisfied curiosity and a sense of assurance. Dana's story brightens the predictable pernicious impression of *Prism* by displaying *Prism*'s effect of bringing psychological relief to Dana and unriddling her guilt and pain, proving the degree of complication *Prism* could bring to people's mindsets. In this case, Chiang's techno-realism is to acknowledge technology's capacity to intervene in multiple dimensions of humanistic behaviors out of the context of capitalism.

3.1.2 *Prism*'s Symbolic Meanings as a Literary Device

In an article titled "Social Science Fiction" by Issac Asimov, he classified all science fiction plots into three categories, which are 1) gadget: the story itself is the invention; 2) adventure: the invention is a medium and 3) social: the presence of the invention affects people's routines (272). Asimov explains that social science fiction depicts: how new technology such as the automobile exists in a society in which it is already a problem and calls on people to figure out solutions (273). Chiang's "Anxiety"

falls into the category of "Social" by Asimov's yard since *Prism* represents not only the modernization, advancement and futurity of the society itself but also the impact of *Prism* on people and the reflections *Prism* triggered. Asimov's classification justifies *Prism*'s role as more than a new invention, but a symbol of Chiang's ideologies to bring readers and the world fresh insights, such as how would the discovery, application and popularization of *Multiverse* bring problems to the current society and what could be done to maintain the balance.

First and foremost, *Prism*'s merit is expressed by how it helps people meet their deceased family members who passed away in an accident by connecting to another branch where this person survived. Though Nat, as appointed by Morrow, peddles one *Prism* to Scott out of business intent, what she did indeed helps the pop singer Scott talk to her deceased husband Roderick who survived in another branch (Chiang 280). It could be perceived that ***Prism*** symbolizes the rising but debatable "grief tech", a term describing the use of technology as a tool to deal with loss (Gilbert and Gloria). Grief technology is more than the pattern of assistance by gathering the bereaved for recovery-oriented communication. It even helps people to deal with loss via virtually "bringing the dead back to life" by artificial intelligence-generated emulation of images, videos and sounds that aim to render users an interactive experience with the beloved late family or friend. This technology is debatable mainly because society wonders whether "an artificial reunion" truly brings comfort to the person in grief or will only exacerbate the person's pain of loss knowing everything is fake. In "Anxiety", Roderick's video meeting with Scott via *Prism* reflects Chiang's concern over the grief technology: Ornella is concerned about the hidden peril of this reunion: "For a moment

Ornella had an impulse to call the whole thing off, afraid that Scott would only be hurt more" (Chiang 287). Even though meeting with characters' para-selves is not a reunion completely artificial, Ornella's instincts about the negative effects of this reunion share similarities with people's hesitation towards an artificial reunion with late family members. This hesitation is a type of vigilance and prudence towards technology that adheres to Chiang's techno-realism. Besides, since *Prism*'s pad can not last for the rest of their lives, Ornella is also worried that another separation would come more devastating to Scott once the pad eventually runs out (Chiang 288). But Scott believes this meeting will bring more good than harm and endorses this meeting's credit: "Scott had been willing to go ahead with it; any extra time they had together was worth it, as far as he was concerned, and when the end came, at least it wouldn't come as a surprise" (Chiang 288).

Compared with the merits, *Prism*'s potential downsides are more underlined in the story, one of which is fostering a hotbed for addictive *Prism* users. Therefore, ***Prism*** symbolizes a narcotic substance that causes dysfunctions to users' lives. Dana's support group targets users of *Prism* with socially dysfunctional symptoms. A person who is no longer attached to *Prism* would show up in the support group as a successful case and share insights with other group members. *Prism* here symbolizes drugs and Dana's support group symbolizes *Alcoholics Anonymous* which provides fellowship helps to alcohol addicts. Even though *Prism* bears some resemblances with drugs in the context of this story, Chiang implies that the toxicity of *Prism* could never reach that of drugs. When Nat quit *Prism* Support Group and joined a new NA support group, the narration was frank about *Prism*'s actual impact: "It was bigger than the prism support

group—prisms would never be able to match drugs in terms of appeal" (Chiang 291). This detail shows that Chiang did not equalize *Prism* with drugs, thus sparing the narration of *Prism* from a purely pessimistic tone. It implies that overuse of *Prism* might cause hindrance to the user's life, but *Prism* does not behold any poisonous nature until the user uses it improperly. The tendency to emphasize human initiative and intentions in applying technology rather than the inherent nature bundled with technology is also what technorealists aim to achieve, as inspired by Holmes's definition (128).

The function of *Prism* evokes a philosophical question: do your daily activities define your personality; if so, how? "Anxiety" manifests a confirmative answer to this query: "Each time you do something generous, you're shaping yourself into someone who's more likely to be generous next time, and that matters" (Chiang 286). It's easy to unpack in the scenario of One-World Interpretation since the personality remains consistent with one's linear actions in the past, present and future. But the Many-Worlds Interpretation narrated in "Anxiety" broadens the dimension of this question by associating a personal activity not only with linear consequences but also with non-linear repercussions on their para-selves**.** Dana explains to Nat: "And it's not just your behavior in this branch that you're changing: you're inoculating all the versions of you that split off in the future" (Chiang 286). *The Butterfly Effect*, as defined by the *Cambridge Dictionary*, describes a situation in which an action or change that does not seem important has a very large effect, especially in other places or around the world. Close to but different from the *Butterfly Effect*, *Prism* symbolizes a concretization of the multiverse-version of the *Butterfly Effect* which, by Dana's words, is marked as the inoculating effect: your actions can not affect the past anymore, but every single act

affects what type of person you'll be in the future. Here, *Prism* symbolizes the type of technology as a morality and immorality recorder which is synonymous with the religious concept of *karma* in Buddhism and Hinduism: what you did will be manifested in the future happenings and every deed has its moral consequences. Technology like *Prism* goes beyond the practical purposes of bringing convenience to modern life but dives into the feature of bringing users to the spiritual zone of meditation.

3.1.3 *Prism* and Narratives in Chiang's Thought Experiments

This section also asserts that the quiddity of Chiang's thought experiments is an invention and application of the science fiction device *Prism* in the narratives of the "Anxiety" to examine hypotheses about multiverses' impacts on people's self-knowledge and interpretation of the past. Chiang's narratives thought experiments provide epistemic enlightenment about technology's influence on the way we deal with defective relationships and guilt. Elgin claims that thought experiments are performed by imaging a scenario in which a sequence of events happens with a beginning, middle and end (230). The narratives of "Anxiety" following the same logical pattern present a complete series of sequential events revolving around *Prism*. *Prism*, as a stimulator of characters' anxiety and guilt, does not give rise to problems but only stirs up the long-embedded turbulence in people's minds. Chiang's thought experiments reveal that instead of technology, reconstructive memory is accountable for people's aggravating guilt and tainted self-image in relationships.

This research claims that Chiang created narratives about the science fiction device *Prism* to examine technology's impacts on the nature of thought experiments. There are a few reasons why constructing narratives about *Prism* could reveal the nature of

reconstructive memory. Firstly, narratives about *Prism* present scenarios between the device and characters which juxtapose features of digital memory and reconstructive memory. Comparison emerges from this juxtaposition and makes features of human reconstructive memory more salient than usual. In the shadow of technology, the advantages and disadvantages of reconstructive memory become more transparent to people. Similarly, a temporary absence of reconstructive memory enables people to realize the value of reconstructive memory and the consequences of losing it. Moreover, the science fiction device *Prism* externalizes human memory from being intangible to tangible, thus making it more feasible to analyze relevant features of reconstructive memory.

Chiang's narrative thought experiment revolves around the science fiction device *Prism*. First and foremost, Chiang's hypothetical scenarios are built upon the existence of *Prism*, as it enables the actualization and concretization of a world with parallel universes—an essential prerequisite for the unfolding of the stories. Furthermore, *Prism* does not resemble other science fiction devices such as the *Voight-Kampff Test* in "Do Androids Dream of Electric Sheep," which is confined to specific social classes and missions. *Prism* exhibits a pervasive influence across a broader community. *Prism* is customized to each individual's situation to cater to their convenience and curiosity. *Prism* appears to be the source of attention starting from the opening of the story when Nat dropped her own matter to see the new model: "Let's take a look at it" (Chiang 235). Thirdly, *Prism* helps discover the common threads that bind humanity together: as humans, we share similar pain, guilt and struggle, just like how Dana and Zareenah went through a very similar journey of pain and discovery over mistakes and guilty

feelings.

Narratives about the characters' encounters with *Prism* in "Anxiety" also demonstrate the impact of technology on people's self-discovery. The narratives of Zareenah in "Anxiety" resembles Dana's story about guilt and reconstructive memory, echoing with the keynote of the story: the reality generated and upheld by technology is capable of disrupting some people's peace but is also a chance to face up to and re-examine their problematic past. Zareenah is one member of Dana's support group who painstakingly compensates for her past due to one understandable but unethical behavior she once did to her sister. What possibly brought Zareenah to Dana's support group for consultancy and discussion is that she was informed that her niece was accepted by the first-choice school in another parallel universe but was rejected by that school in this universe (Chiang 259). Zareenah indulges herself in endless self-blaming in that she took part in her niece's application which failed. Other members from the support group including Dana consoled Zareenah that the college's decision in another branch is an unforeseeable consequence just as capricious as the climate, and she does not need to be too harsh to herself for something uncontrollable. But Zareenah disclosed the real reason for her inannihilable regret: "I think I'm prone to feeling guilty about my sister..." (Chiang 261). In their teenage years, Zareenah, being carried away by jealousy over her sister, put caffeine in her sister's bottle on purpose to throw her off the mood for an interview. As expected, her sister failed the interview. Knowing that there is no way to change the past, Zareenah tried to remedy her misdeed by treating her sister's daughter with excessive responsibility and care. Dana tried to help Zareenah out from this misconception: "There's a difference between accepting responsibility for our

actions and taking the blame for random misfortunes" (Chiang 261).

If it was not for *Prism*, Zareenah might rationalize her guilt and sink herself into the endless loop of guilty feelings, shouldering more accountability and having more chances to feel guilty. But with *Prism*, she discovered that maybe she was not as terribly wrong as she presumed to be and maybe the feeling of guilt and remediation is not too much until it blurs the boundary between responsibility and self-sabotage. *Prism* becomes the turning point and opportunity for Zareenah to realize that we are not entitled to our para-selves' advantages (Chiang 246), and are not to blame for unforseeable events in the parallel universe. Chiang's imaginative scenario, performed by *Prism* and achieved through narratives, vividly postulates technology's impact via Zareenah's story. Zareenah's story reflects a techno-realistic view held by Chiang that is articulately sober while equally embodying technology's potential downsides and merits (Hughes and Eisikovits 2). On this note, technology is capable of empowering and liberating human beings by creating transformative chances to disorganize their inherent and stubborn thinking patterns. Therefore, the techno-realistic view by Chiang emphasizes perspective-changing experiences that are unique to the interactions between technology and human beings.

3.2 Dana's Distorted Memory and Her Encounter with *Prism*

This sub-chapter aims to investigate how Dana's encounter with *Prism* generates an impact on her understanding of reconstructive memory and re-interpretation of her past. The analysis will follow the chronological and logical sequences to introduce Dana's distorted memory and solutions to deal with guilt before and after encountering *Prism*. The first section introduces the context of Dana's distorted memory about an incident

between Dana and her schoolmate Vinessa and applies Bartlett's five factors resulting in transformations in repeated reproduction to analyze the reasons for Dana's distorted memory. The second section zooms in on the emotion of guilt and elaborates on how reconstructive memory played a role in Dana's guilt. Dana's guilt is unwound in a quick and more direct manner, but her guilt is inflicted step by step under the shadow of reconstructive memory. The third part explains and emphasizes how *Prism* bring an awareness of reconstructive memory to Dana that enables her to unriddle her lingering guilt. It emphasizes changes brought by *Prism t*o Dana including opening up another interpretation of her past and relieving her from her guilt. Even though this chapter throws the limelight on psychologist Dana's story, reconstructive memory permeates the whole story and has its encounter with the majority of characters. Therefore, a few other characters' stories such as Teresa will be briefly mentioned to further expose *Prism*'s influences on characters.

3. 2. 1 Dana's Distorted Memory and Its Reasons

This part will first introduce the main character Dana's characteristics and the story about her distorted memory. Moreover, this part will apply Bartlett's five reasons resulting in transformations in repeated reproduction, mainly 1) the tenacity of the attitude, 2) the intensified opposition and 3) efforts to rationalize, to analyze Dana's distorted memory. Dana, one of the main characters in the story, is a therapist and a facilitator of one support group attending to people having life obstacles having grown a toxic attachment to *Prism* (Chiang 244). She is dedicated to offering one-to-one private therapy but has also devoted to group therapies for problematic members such as Nat, Lyle, Teresa, Zareenah etc. Dana seems to be a nonchalant beholder with an objective

attitude throughout her therapies like all the therapists do. She listens attentively and talks discreetly. For instance, in a session with her patient Teresa, Dana patiently guides Teresa to re-examine all her looming obfuscations about turning down her ex-boyfriend's proposal while drawing sharp lines between her roles as a therapist and as a decision-maker. Facing Teresa's earnest request for a justified action, Dana rationally replied: "You know that's not my role" (Chiang 242). Even though Dana's objectivity at the beginning of the story pictures herself as a "clean" character away from worldly disturbances, Dana is probably the biggest victim submissive to memory distortion's long-lasting consequences. Dana could have been the mysterious therapist in this story without much exposure to her point of view, but the story does not elide Dana from reconstructive memory and *Prism*'s prowess. She also has her share of stories which continuously unsettles her "peace of mind". As mirrored from Bartlett's experiment, memory reconstruction is subject to memory distortion which means there might be errors in the subject's recalling process; for example, a subject might remember certain details correctly at the cost of distorting more important facts or plots at a story, which is named as the "persistence of the trivial" (Bartlett 32-33). Memory distortion has long been a fundamental theoretical and empirical problem for cognitive psychologists such as Bartlett who are interested in understanding how memories are encoded, stored, and retrieved (Schacter 2). Daniel L. Schacter also suggests that memory distortion indicates the imperfection and inaccuracy of memory (2) and confirmed Bartlett's monograph *Remembering* (1932) as the most important development concerning memory distortion (8). Though memory distortion also highlights the fallibility of memory, it's a broader concept not only includes major

fabrication of fact, the so-called false memory but also embodies minor inaccuracies which is claimed by Bartlett as having no major drawback and is a common matter of small importance (52). The relation between false memory and memory distortion is hinted from Schacter's article "The Cognitive Neuroscience of Constructive Memory", in which he classified memory distortion into two types: 1) false recognition and 2) intrusions and confabulations (289). Accordingly, it is more proper to describe Dana's condition as memory distortion rather than false memory since her recapitulation of the past is never off the mark and is mostly consistent with what happened. In Dana's case, her memory distortion is extremely unobtrusive since it is not a major misremembering of vital facts but it is her insensitivity to the emotional weight of guilt in reconstructing her past and overloading her with guilt more than she should shoulder.

The story happens between Dana and her schoolmate Vinessa who has a huge presence in disrupting Dana's peaceful mind due to Dana's one irresponsible act in high school. Dana and Vinessa were caught carrying and potentially using drugs by the school teacher one day in a hotel room. When being interrogated, Dana passed the buck to Vinessa although the two of them conspired this together, which directly led to Vinessa's suspension from school. Dana tips the scale in her own favor knowing that the teacher is partial to "good students" with more decent behaviors. The seed of guilt was planted in Dana's heart ever since then (Chiang 267). Both Dana and Vinessa believed that is a doomed day for Vinessa's Waterloo, prompting her to act out, drop out of school and live a degraded life. Vinessa revels in taking advantage of Dana's guilt and willingness to remediate her faults, relying on Dana for financial support to "pull herself up" but always giving up halfway on whatever she pursues and never

showing any persistence. There are a few parts in the story that demonstrate Vinessa is Dana's biggest pain point and even the mentioning of Vinessa's name descends her to despair. The narration of the first part exposes how Dana's heart sink when she bumps into Vinessa: "She was feeling pretty pleased about both the group and herself afterwards, but her good mood didn't last long" (Chiang 265). The second part displays Dana's inner complexion about knowing that she's haunted by an unhealthy relationship: "As Dana watched her walk away, she wondered what was the right word to describe their relationship" (Chiang 266). Dana is clear they are neither friends nor enemies. If this link has to be defined, it was like the ex-scapegoat and a "good student" and it resembles a guilty woman and another woman who's taking advantage of her guilt. What appears to be complementary is in essence unnerving to the two parties' well-being.

But why Dana's experience is more than a case that could be explained and interpreted simply by guilt? What indicates her distorted memory is her voluntary but helpless tendency to engrave her guilt deeper and deeper in her heart and give up on any other explanation for the old incident. This distortion is Dana's actions to tolerate Vinessa's exploitation, rationalize her endless remediation, and interpret the past incident to be more intense and devastating than it actually was. These endless loops of rationalizing Vinessa's exploitation and her own remediation are the result of reconstructive memory. Reconstructive memory shadows the way Dana recalls and interprets her mistakes, aggravates Dana's self-blaming and worsens her self-perception in friendships. Bartlett asserts that: "the ingenious rationalization of the 'Ghosts' was a clear instance of how potent may be a special interest in producing an unrealized

distortion in remembered material (69). It is difficult for Dana to realize her memory distortion since she did it both voluntarily and involuntarily. Dana immerses herself in repetitive brainwashing of what feels true rather than what is true. Dana keeps her sanity intact to her patients but she can hardly retain objectivity and justice while judging herself.

But what are the reasons that presumably led to Dana's distorted memory, hence her aggravating guilty feelings toward Vinessa? How specifically has reconstructive memory aggravated Dana's guilt? 1) Firstly, what Bartlett describes as the tenacity of the attitude is accountable for Dana's lingering guilt. Bartlett declares: "In repeated reproduction, a subject's own earlier versions gain an increasingly important influence as time elapses" (33). Dana's earlier recall of the event is not open for examination since her predictable and understandable proneness to conceal this disgraceful incident. Moreover, there is no narration from her first-person point of view until the end of the story. But Dana's tenacity of attitude tricked her into believing that she pushed Vinessa off the edge to go overboard as a bad girl. Dana is accustomed to taking the blame for Vinessa's backslide in life, which composes an attitude that shows tenacity and is hard to waver. Dana's guilt in her early recalls can not fade away in her later recalls as well. Another reason accountable is what Bartlett called the "intensified opposition": "Relations of opposition and the like, occurring in the original, are very commonly intensified". This forms one illustration of a deep-rooted and widespread tendency to dramatization (33). The intensified opposition further explains why Dana was caged by her excessive guilty feelings and started to lose her boundaries. What Dana did to Vinessa was indeed unethical, but it was not the dominating reason that turned

Vinessa's life into a tragedy. Dana was too ignorant to let others take advantage of her guilt, and she can hardly realize that having her empathy deprived is never the best remediation. Lastly, what is portrayed by Bartlett as "efforts to rationalize" explains why Dana's guilt has been solidified. In summary, Dana's efforts to rationalize play a role in solidifying Dana's guilt towards Vinessa in three primary ways: 1) filling in the gaps of Dana's wrongdoing always in a negative light; 2) activating Dana's negative self-assessment in friendship; 3) Dana tends to overlook the mitigating factors and alternative explanations for her wrongdoing.

3. 2. 2 Dana's Guilt and Remedial Actions

Before analyzing how Dana's encounter with *Prism* magically unriddled her guilt, it is necessary to analyze the role of guilt in Dana's memory reconstruction and how reconstructive memory unobtrusively worked on her guilt. Analyzing Dana's guilt is essential to this chapter since guilt is one of the emotions that affect memory to be reconstructive and could lead to memory distortion. On one hand, memory is reconstructive due to a range of factors including emotions, which are referred to by Bartlett as clustered feelings that are readily exaggerated or emphasized (33). When memory is vividly shadowed by emotions such as guilt, memory distortions are very likely to appear. Bartlett ascertains that in the situation of repeated reproduction, the general setting is expressed mainly through the subject's attitude, which does outstanding detail (93). Since attitude is influenced by emotions, it denotes that emotions and feelings do shadow and dwarf the details of an incident and lead to inaccuracies and distortions in recalling. Levine Linda J. suggests that: "systematic distortions in emotion recall were found in the direction of consistency with current

appraisals" (165). Levine's statement clarifies that while recalling our emotional experiences in the past, there is a tendency for our current appraisal of the event will distort the accuracy of our recall. On another hand, emotions are highly susceptible to the sway of reconstructive memory: a re-calling of old events with inaccuracies in details might elicit more similar emotions due to a re-experiencing of old incidents. The connexion between emotion and reconstructive memory is certified by Bartlett in the book *Remembering* (1932). Bartlett renders another point, as mentioned in the previous section, which demonstrates the impact of emotion: "The influence of affective attitude may be intensified with the lapse of time" (93). This further strengthens that reconstructive memory might cement the emotion while recalling, which further elaborates how Dana's guilt was propelled to the extreme. Therefore, this intensified guilt simultaneously makes Dana rationalize her remediations. An analysis of how reconstructive memory works on Dana's guilt and remedial actions will pave the way for analyzing the impact of Dana's encounter with *Prism* in the next section. Meanwhile, this section is also an extension and amplification of one major factor that led to Dana's memory distortion: the tenacity of the attitude.

What is guilt? Ekman explains that guilt is a self-conscious emotion in contrast to basic emotions such as fear, anger and happiness (qtd. in Cryder, et al. 608). Guilt occurs when a person feels responsible for a bad outcome that typically affected others (Zeelenberg and Breugelmans**)**. Cryder, et al. conclude that guilt prompts focused reparative behavior toward the person who's been wronged by the guilty party under the condition that the wronged party recognizes these reparative actions (Chiang 615). This research authorizes Dana's guilty feelings and remedial actions as a chain effect. Dana's

remedial actions are consistent since the receiving party was taking everything for granted. Dana's most noticeable remedial action is bailing Vinessa out whenever Vinessa is in need of. Besides being generous and empathetic to Vinessa, Dana continues her remedial actions by aiming at the public good: organizing a support group for people whose lives are disrupted by *Prism*. According to Tangney, guilt-proneness is associated with increased empathetic responses to the suffering of others (qtd. in Cryder et al. 608), not specifically to the party being wronged. It is postulated that Dana might choose to be a therapist to restore her image and virtue by healing others and nourishing compassion. More importantly, it could supposedly take the edge off her guilt. However, it seems that Dana's reparative actions are only pushing both her and Vinessa off the abyss. It was not until Dana opened a dozen of mysterious files that she finally helped herself out.

Reconstructive memory as a literary theory underlines the textual analysis of characters' past, experiences, beliefs, emotions etc. to turn characters from flat to round and further unpack an individual story and momentum. Guilt is the primary emotional load that drives Dana to a path of self-reproach and reconstructs her high-school memory and self-cognition in adulthood. Most importantly, guilt plays an effect on and even alters Dana's memory, corresponding to the core features of memory distortion in reconstructive memory. Besides the guilt she exerted on herself, Dana's feeling of guilt and sense of guilt that long existed have been aggravated by an external factor: Vinessa's constant appearance in her life. These two main factors help form Dana's little internal compensation mechanism, especially in her relationship with Vinessa. Since there is no trace in the story that Dana has ever openly talked about her past to

someone else, Dana's attitude toward dealing with guilt in a relationship is mirrored by her conversation with her patients during the consultancy. In a private therapy with Jorge, Dana implies that the right attitude towards misconduct in the past is to acknowledge the dark side in your personality, take responsibility for your actions and focus more on reasons and solutions in this branch rather than exempting yourself from the responsibility just because your para-selves are innocent. Dana gave Jorge some objective and genuine suggestions: "Maybe it's worth thinking about what happened here in this branch" (Chiang 290). If we project what she said to Jorge about her relationship with Vinessa, it is apparent to see Dana is practising what she said by taking responsibility in this branch, maybe even more than she should. Furthermore, how Dana's mind is structured to respond to Vinessa's request and how she perceives the past is a reflection of her negative autobiographical recall affected by guilt. According to Burke and Mathews, autobiographical recall showed a negative bias when the memories were rated for emotional meaning by the anxious participants themselves but not when they were rated by independent judges (qtd. in Hertel and Brozovich 155). Dana's anxiety is not a result of choice paralysis nor jealousy over her para-selves, but the anxiety of always having to engage in a series of accumulative remedial acts to atone for her sin. Although there is seldom a part of Dana's autobiographical recall in the narratives, the member Zareenah in Dana's support group has a similar experience with Dana. Dana's reaction to Zareenah's statement is another projection of Dana's degree of negative autobiographical recall caused by guilt. One day in a group session, when Zareenah was sharing how she ruined her sister's interview, Dana is spotted to have an emotional resonance with a patient: "A pained look crossed Dana's face, but

she quickly rearranged her expression" (Chiang 261), a moment that Dana resonates with Zareenah in this conundrum. Nat also became suspicious when she captured Dana's irregular loss of composure during a help session (Chiang 262).

A chain effect of guilt, remediate and feeling more guilty creates a closed loop awaiting a resolution, and *Prism* is the turning point that unriddles Dana's guilt by presenting an alternative explanation of the past that finally eased Dana's mind.

3. 2. 3 Dana's Encounter with *Prism* and *Prism*'s Impacts on Dana

Having teased out Dana's guilty feelings and remediations as well as how reconstructive memory tied her up with guilt in the previous section, this section aims to elucidate the profound impacts and transformative effects that *Prism* has exerted on Dana. Firstly, *Prism* makes Dana conscious of her distorted memory, enabling her to re-interpret her past incident and discard her guilt. Moreover, it delves into Dana's revised perceptions of her personal history and her enhanced understanding of the role reconstructive memory plays in shaping her experiences. Lastly, this section also addresses Chiang's techno-realistic perspective based on *Prism*'s interactions with and impact on Dana.

(a) Dana's Realization of the Distorted Memory and Her Re-interpreted Past

Dana's encounter with *Prism* comes as a concluding part of the novella in haste. This encounter is incidental rather than voluntary since Dana is cautious about using *Prism* having seen manifold inexplainable and intertwined relationships of her patients with their para-selves. A mysterious package was sent to Dana's door one day she was off from work. The package contains a note and a tablet with a dozen video files displaying other possibilities between her and Dana in several parallel universes

(Chiang 293). It presents multiple scenarios of that "life-changing night" which aroused Dana's curiosity about her "what-if" questions. In all the other branches, Dana's para-selves tried covering up for Vinessa's para-selves, shouldering the responsibility together with Vinessa. But none of these branches presents a widely divergent life of Vinessa's compared with Vinessa's current life in this branch. Vinessa's life in all branches follows a similar pattern of self-destructive behaviors no matter what Dana does to remediate (Chiang 294).

The ending of the novella signals Dana's realization of her distorted memory with the crumbling of her previous beliefs and obsessiveness. The information stored in the anonymous tablet suddenly hits Dana that all those contemplations of "if I hadn't" or "If I had" scenarios that she had anticipated a number of times were now futile. The impact of these newfound clips triggers Dana's deep rumination which is manifested from her recurring thoughts of conditional statements. She confesses: "And I keep thinking, if I hadn't said the pills were mine, everything would be different. If I had let Vinessa take her share of the blame, there wouldn't have been that wedge to drive us apart" (Chiang 294). Similar to the reflection above, another similar self-interrogation of Dana appears shortly after the previous lines: "And I keep thinking, if only I hadn't confessed, everything would be different. That close call would have been enough to warn Vinessa away from getting into real trouble" (Chiang 294). This negative self-talk is also a part of Dana's rationalization of the past to find meanings from her remediations. Ever since the event of that day, multiple possible storylines emerged and instantly demised: when things happened in the main universe become the only storyline that Dana is experiencing, her "If I hadn't" presumptions become fragile unpredictability. These

thoughts were never mentioned by Dana until her interaction with *Prism* in the end, as she has developed a defensive mechanism of being persistent with her guilt and finding satisfaction in her remedial actions. Dana's infrequency in recalling this event and her tendency to evade replaying the past might make her resort to over-simplification of the situation and imprison herself in her defensive mechanism. Bartlett says that: "with infrequent reproduction, omission of detail, simplification of events and structure, and transformation of items into more familiar detail, may go on almost indefinitely, or so long as unaided recall is possible" (94). When Dana is haunted by the past, her reconstructive memory will simplify the event into one monotonous explanation which wreaks havoc on her mentality by denying other alternative explanations. If recalling an old event evokes vivid images, feelings and multiple other details, recalling for Dana has simplified into an acknowledgement of her faults and self-accusation. Reconstructive memory aggravated the tendency to weaken the already omitted part and strengthen the already emphasized part, pushing Dana to believe in one single narrative and omit any other possible explanations of the old event. Maybe she should not be blamed for Vinessa's faults, and maybe Vinessa triggers problems no matter what Dana does. But these chances of reinterpretation of an old event didn't surface in the shadow of Dana's magnified guilt.

The multiple occurrences of Dana's "If I hadn't" sentences reflect Dana's transition from being repressed to being able to realize. Having realized her distorted memory, Dana manoeuvres her new knowledge to re-interpret her past. However, re-interpretation is not groundless fabrication or re-writing. Dana's story in this main universe with Vinessa was not rewritten in any shape or form but was greatly

re-structured and endowed with a different meaning because of *Prism*'s interference. Dana's initiative in re-interpreting her past could be manifested from two lines of her monologue: when she annuls her guilt in this universe having seen her desperate para-selves and when she decided to change her actions in this universe. Firstly, after much hesitation and hard-to-let-go moments, Dana finally gathered some new insights with the assertion: "If the same thing happens in branches where you acted differently, then you aren't the cause" (Chiang 295). Dana's assertion is closely related to the visual effects and stimulation of the video clips *Prism* presents. Among Bartlett's five factors inducing transformation in repeated reproductions, one factor suggests that increased visualization provides conditions which favor transformation (33), a point that Bartlett also brought up in *Remembering*: "Perceiving is simpler than thinking" (5). The video clips presented by *Prism* are more persuasive than words and narrations, and Dana's memory about Vinessa is also reconstructed the moment she sees, perceives and decides. In this context, the video clips provided by *Prism* became the "truth" in a different dimension, which instantly reverses Dana's unswerving beliefs in her original memory. Seeing becomes Dana's belief and the visual stimulation overpowers the "fact" she used to hold.

(b) Dana's Unriddled Guilt and *Prism*'s Confrontation with Reconstructive Memory

After all the brainstorming of what she believed and what she saw, Dana determinedly made a decision to announce her abandonment of the guilty feeling: "And Dana had spent years and thousands of dollars trying to make amends for what she'd done, trying to fix Vinessa's life. Maybe she didn't need to do that anymore" (Chiang

295). It seems Dana ultimately made peace with her past. Having replayed all these years of remediation and guilty feeling, she decided to let it go. But there is another implication behind the phenomenon of letting go of the past: Dana's reinterpretation of her past caused by the encounter with *Prism* signals an invisible confrontation with her reconstructive memory. This confrontation is manifested in how Dana instantly chose to believe in the mysterious package upheld by *Prism* and relinquished what she naturally perceived. However, Dana has been able to unriddle her guilt right now does not mean she will encompass the capability of dealing with guilt properly in the future and also does not pardon her from making the same mistakes again. If someday Dana unintentionally let the same thing happen, she might only turn to *Prism* to save her rather than truly reflect this event from a multitude of perspectives and gain valuable and solid insights from her own rumination. It is a sample case to elaborate on Chiang's humanist, techno-realistic view in this story. *Prism* appears to possess the potential to manipulate characters' cognition and determine Dana's life, but the ending is far from portraying technology as a panacea to people's puzzles since *Prism*'s effect on everyone is divergent depending on how they perceive and absorb this encounter in their own manner. Some people have been grappling with *Prism* ever since their encounter with it and consistently find it problematic; other people like Dana tasted blood from their early encounter with *Prism* and might ditch their natural ability and initiative to fail, learn and change. But it indeed provided Dana with temporary relief and reversed her way to see her past. Bartlett said that minor memory distortion has no major drawback (52); Chiang also said in the story note of "The Truth": "Intellectually we are aware that our memories are fallible, but rarely do we have to confront it" (300). But *Prism*'s release

and popularization may start to evoke people's confrontation with reconstructive memory when they realize reconstructive memory is capable of amplifying their negative feelings. *Prism* appears to be a repairment of reconstructive memory for people like Dana, who has been consciously resisting using *Prism* but find it impressive one day they use it. But in the long run, if *Prism* turns into the end rather than the mean in their life, users of *Prism* perhaps will be at ease with discarding their reconstructive memory, and even their ability to listen, to think and to make changes. Then how much resilience could one forge in the personality to handle emotional intricacies and social occurrences and how much could one truly live. In this perspective, *Prism* does not keenly promote technology as either a utopia or dystopia. Technology itself can hardly encompass any harm or merit, but human interaction and intention to approach and employ technology endow technology with certain attributes as well as foreseeable or unforeseeable consequences. *Prism* in "Anxiety" is illustrated by Chiang as a device that is equipped with a plurality of aspects diversely integrated with each character's story. Chiang's techno-realism is expressed from his compelling statement of the complexity of technology's role on users which can hardly be concluded by a techno-pessimistic or techno-optimistic view.

Moreover, the confrontation kindled by *Prism* between characters and their reconstructive memory also mirrors technology's impacts on reconstructive memory. When technology presents a more neutral and digitalized version of memory, people start to confront the negative feelings that reconstructive memory tends to amplify. Cognitive restructuring is triggered when people are hyper-alert to the negative recalling and consciously switch their attention to neutral or positive recalling. Technology is

able to detect and rectify the deviation caused by reconstructive memory by constantly presenting the comparison between digital and natural memory. In a sense, technology and human reconstructive memory are mutually supervisory of each other's deviation from the track and are acting as each other's counterparts.

(c) Dana's Refined Comprehension of Reconstructive Memory

More than a confrontation of reconstructive memory as stated in the previous part, *Prism* also helps Dana garner more understanding about her distorted memory, thus being more aware of the reconstructive nature of memory. This part, as a concluding part for chapter three, analyzes how has *Prism* refined Dana's understanding of reconstructive memory, briefly summarizes the association between Dana's cognitive changes and Chiang's techno-realism and elaborates on the significance of this research. It is unreasonable to say Dana herself has grasped all the terminologies of reconstructive memory at the end since her thoughts and reflections are reserved, recessive and countable. But to what extent do her transformations in words and actions reflect her adeptness in analyzing and reacting to the past? The significance of this section is to discover *Prism*'s role in assisting Dana to learn more about her past and examine the implication of Chiang's techno-realistic view which portrays technology in a measured and balanced view. Since the story ends in an abrupt way with no further indications of Dana's digestion and settlement of similar events in the future, the analysis will only refer to Dana's instant thoughts and reflections the moment she witnessed her para-selves' stories with Vinessa. A few essential points about reconstructive memory as categorized in the theoretical framework serve as the canons to analyze Dana's enhanced understanding of reconstructive memory, which includes Bartlett's definition

of schema and other factors such as the subject's habits of life, thoughts, customs and beliefs that affect Dana's memory.

Firstly, Bartlett suggests that schema is an active organization of past reactions or past experiences that serve as the basis for memory reconstruction (201, 296). Upon recognizing her distorted memory, Dana took the initiative to re-evaluate her perception of the complicated relationship with Dana through affirmative self-talk. This approach encoded new insights in her memory that will potentially alter her schema regarding that specific incident. Unlike her usual practice of escaping any recollection or discussion about Vinessa, Dana actively engages in incorporating her new input on her distressing past. This perhaps will induce changes in her existing schema and diminish the sense of guilt she carries. For instance, the narration about Dana's thoughts could demonstrate her initiative in altering the current schema: "She had lied about the pills being Vinessa's, but her lie wasn't what pushed Vinessa off the edge, what turned her into a delinquent. That was the direction Vinessa was always going to move in, no matter what anyone else did" (Chiang 295). By believing in her innocence in pushing Vinessa's life off the track, Dana diverts herself away from the endless loop of self-blaming and turns to a mindset that exempts herself from the responsibility. Regardless of the necessity to judge whether Dana's new interpretation is right or wrong, Dana is more aware that positive affirmation and response change the way she interprets the past and enables a schematic change and re-organization of her memory in a positive light.

The second point that displays her refined understanding of reconstructive memory is: instead of purely relying on distant events to solve some immediate problem, Dana

applies both new experiences and old knowledge to solve this ongoing occurrence that never happened before. In the chapter "The Basis of Social Recall", Bartlett claims that: "when an agent acts as if it were being predominantly determined by some distant event in its history, using this directly to help it to solve some immediate problem, it may be said to 'remember' (297). Bartlett also explained that: "mere serial recapitulation is different from 'schematic' reconstruction since the latter demands that items should be picked out of schemes, reshuffled and used to aid adaptation towards conditions which have perhaps never occurred before" (297). Even though Bartlett's description of "schematic reconstruction" is more or less sketchy (Wagoner 553), his statement pinpoints that the recalling process merely follows a chronological order and prioritizes neither old items nor new items. Instead, it is unequivocally affected by both old and new items. It is a process of cherry-picking and reorganizing. Dana's reaction to this accidental event is hardly an act of experience nor a momentary decision spurred by an urge for detachment. Firstly, Dana's experience in the support group and the fellows' insights are all factors potentially adduced to persuade her to get over the guilt. Zareenah's story goes into Dana's heart due to the similarities between their experiences. Zareenah shares the same guilt and is also tethered by ceaseless and random remedial actions; Dana has a hazy idea about how to comfort Zareenah since her activated pain is very discernable (Chiang 261). Would Dana feel similarly comforted when group members comfort Zareenah? Are Dana's words in concert with her mind when she told Zareenah: "But there's a difference between accepting responsibility for our actions and taking the blame for random misfortunes" (Chiang 261). Dana's answer offers ample evidence to claim that there is an underlying self inside her mind that already forgave

her mistakes and wishes for a change. But there is no perfect chance for Dana to face her pain when she is dedicated to addressing others' pain. *Prism* prompts Dana to face the past with optimized perceptions and embrace a new inception of her cognition. Referring to Bartlett's definition of schematic reconstruction, Dana also reshuffled all her distant and ongoing events to address the new condition. In this perspective, Dana's reaction shows that she diverts her attention from "here and now" to focus on "elsewhere" when the main universe can not fill in her void. In all the private and public sessions, she excels in encouraging patients to come back to "this world" when the multiple worlds are disorienting them from facts to illusions. It is commonly opined by Dana that a better para-self in another universe can not exempt one from a mistake in this universe (Chiang 290), but she never expects that she could find peace in her para-selves when the main-self only brings her pain and drags her down.

Even though *Prism* has been a source of pain and tragedy for many characters in "Anxiety", it renders Dana a rare chance to reappraise her past in a new perspective. Chiang devised *Prism* to be not only a device that provides estrangement but also a device that illuminates an unconventional path to a new level of cognition. In Dana's case, she needs a motive and more courage to simply look back at her imprisoned mindset about making mistakes and making remediations. What Dana demands more is independence and decisiveness to deal with her defective past responsibly and appropriately. It resonates with Chiang's techno-realistic view: technology can kick off a good start of a reappraisal of a guilty past, but it can hardly warrant remedies for anything.

This chapter renders insights about the significance of this research: technological

devices could expect humanistic transformations and natural reconstructive memory's demerits will be more thoroughly considered, embraced and controlled. Neither digital memory nor natural memory is flawless, and the relationship between two parties should be complementary rather than oppositional. Chapter two illuminates that an attachment to memory-modulating devices leads to humanistic consequences, particularly the loss of subjectivity and emotions in individual memory. Chapter three contributes insights into technology-mediated memory's constructive effects, including helping people realize their natural inclination to amplify negative recalls and ignore alternative explanations for self-perceived mistakes. It is noticed that more attention has been given to the unidirectional impacts of technology on reconstructive memory, but this research also ascertains that a refined understanding of reconstructive memory offers a glimpse into the humanistic considerations of technological development in the future. For instance, how could memory-modulating devices preserve human subjectivity while ensuring its efficiency? In a broader sense, how could technological development achieve optimization by attending to users' personalized feedback, not simply through overcoming technical difficulties? The interdisciplinary nature of this research, with an embodiment of the theory of *Reading Fiction as Thought Experiments*, expands the discussion about closing the gap between hard science and soft science. Chiang theorizes that thought experiments in science fiction stories embody speculations, narratives scenarios, variables, character development and interactions with science fiction devices.

CHAPTER 4: CONCLUSION

This chapter summarizes the key findings of this research in alignment with the research aims and questions. Furthermore, a summary of the significance of this research will be enumerated, particularly its contribution to the study of technology-mediated memory (TMM) in the field of science fiction and beyond the literary world. Lastly, this chapter critically examines the limitations of this dissertation and presents a direction for future research.

The concept of reconstructive memory has been widely employed and explored in various science fiction stories and studies primarily through concepts of memory editing, enhancement and manipulation. The term Technology-Mediated Memory (TMM) describes digitalized memory allowing manual revisiting and editing, and draws awareness to the intersection of human reconstructive memory and technology. Multiple science fiction works addressing TMM highlight the vulnerabilities of reconstructive memory and technology's manipulation of reconstructive memory in a capitalist context. Aside from gazes at technology's capitalist influences, some scholars expanded the discourse into technology's nuanced and humanistic impacts on memory and cognition, providing an extensive analysis of TMM's futuristic implications. American science fiction writer Ted Chiang's two novellas, "The Truth" and "Anxiety", stand out with his sharp-witted insights about reconstructive memory's unobtrusive importance as well as technology's humanistic impacts on people's cognition, relationships and the way they deal with emotions.

Based on a qualitative analysis of two main novellas "The Truth" and "Anxiety", this research aims to define and explore the impact of two science fiction devices on

characters' introspection of their past mistakes and feelings of guilt. Additionally, being inspired by Hughes and Eisikovits, this study also elaborates on Chiang's measured and balanced view of technology which is termed techno-realism. Meanwhile, this study aims to raise concerns over the humanistic impacts of technology-mediated memory: realistic implications of the intersection between digitalized memory and reconstructive memory.

Addressing the research questions about science fiction devices' roles and Chiang's techno-realistic view, chapters two and three respectively analyze *Remem* and *Prism*'s functions as technological devices, literary devices symbolism and tools of Chiang's thought experiments. In chapter two, it is found that *Remem* as a technological device digitally recording and displaying the entire story of one's life threatens to replace natural memory, change people's cognitive patterns and jeopardize their autonomous learning ability by abridging the recalling process. As reflected from the narratives of *Remem*, Chiang's perspective neither overly celebrates nor condemns technology but rather presents a sober assessment of its impacts. *Remem* is shown to promote self-awareness, offer a balanced view of the past, and guide users toward deeper self-exploration. Chiang's techno-realistic approach to technology is humanistic, prioritizing individual experiences and mentalities over society-wide effects and moving beyond simplistic debates of its benefits or detriments. As a literary device, *Remem* symbolizes society's relentless pursuit of a digitalized society where technology could be merely entertaining or could be abused for other purposes, while the precious emotion residing in natural memory is overlooked. In chapter three, *Prism* as a technological device embodies features such as limited longevity and rich commercial

values. Chiang's techno-realistic view is disclosed from *Prism*'s capacity to intervene in multiple dimensions of humanistic behaviors depending on users' intentions. It could uplift Dana's life by bringing ease to her guilty past with Vinessa, but it could also bring multiple characters' predicaments by providing them with unreachable parallel truths. On the literary level, chapter three also reveals that *Prism* symbolizes the gradually rising but controversial "grief tech", the addictive substance that disrupts addicts' lives and meditative technology that brings people spiritual illuminations.

Chapters two and three also reveal the strong connection between science fiction devices, narratives and Chiang's thought experiments. The quiddity of Chiang's thought experiments is constructing narratives about science fiction devices that are essential to characters' development to reveal the relationship between technology and reconstructive memory. Science fiction devices and characters act as variables in Chiang's thought experiments that share rich and dynamic interactions that contribute to the research questions.

The second section of both chapters two and three delves into the details and consequences of the encounter between devices and characters. The discovery in chapter two is that the father's false memory is explained by Bartlett's principles of "persistence of the trivial" and "efforts to rationalise", representing the father's tendency to compose a past that conforms to his good-father image and coheres with experiences with his daughter and beliefs in parenting. The father went through gradual processes to the acknowledgement of his false memory: from denying his false memory due to cognitive dissonance to having self-doubt and identity crisis, then to a gradual reconciliation with the dissonance. Lastly, the father admitted the fallibility of his

reconstructive memory, a result of his cognitive restructuring and as well as schematic changes. The last section in chapter two answers the research question of the impact of technology on characters' cognitive transformations as well as reflections on Chiang's techno-realistic view. The analysis shows that *Remem* monotonizes the narratives of memory by erasing all subjective emotional values from it. But *Remem* also offers the father a coherent understanding of the cost of a digitalized memory: a sacrifice of the simplest pleasure and an overanalysis of everything.

Chapter three zooms in on Dana's memory distortion, revealing her endless feeling of guilt and remedial actions as a result of reconstructive memory. The findings verify that memory distortion is likely to occur when memory is shadowed by emotions such as guilt; while reconstructive memory also aggravates emotions by allowing a re-experiencing of old incidents. Dana's negative autobiographical recall, influenced by guilt, perpetuates a cycle of remediation while *Prism* becomes the turning point that provides an alternative explanation of her past, easing Dana's mind and resolving the closed loop of guilt. This research discovered that what Bartlett concluded as the "increased visualization", facilitated by *Prism*'s visual presentation, explains Dana's cognitive transformations. Chapter three asserts that *Prism* possesses a plurality of features that could be manoeuvred to disrupt people's peaceful lives as well as to bring psychological relief, responding to a critical and nuanced scrutinization of technology's humanistic impacts. Besides the unriddled guilt, this study also claims that Dana had a refined understanding of her reconstructive memory because she actively and speedily absorbed schema-congruent thoughts about her past and understood how reconstructive memory amplified her negative self-recalling. Additionally, Dana grows the awareness

that what reconstructive memory made her accustomed to is relying purely on distant knowledge to solve current problems. However, she grappled with her inertia and learned to employ both old and ongoing knowledge to address the new problem. The major concern discovered is whether Dana's instant enlightenment guarantees her proper dealings with similar issues in the future without the help of *Prism*.

These findings in this research have several contributions to the field of science fiction as well as illuminating significance beyond the literary world. Firstly, this research contributes to a humanistic perspective on memory-modulating technology's role in the field of science fiction studies, emphasizing the importance of the natural capacity to deal with defective relationships and overcome guilty feelings. This research stimulates deeper reflection on technology-mediated memory's impacts on people's cognition, mainly the way people remember and recall. Secondly, this research engages in a balanced and non-capitalist view of technology in science fiction, which contributed to the discourse of technology's non-capitalist impacts on people. Beyond the fictional world, this research discovered the mutually supervisory roles of technology and human reconstructive memory that expand the discussion simply about their oppositional relationship. Furthermore, this research offers practical insights into futuristic technological developments to be more attentive to users' personalized and humanistic feedback. Lastly, this research calls for people's comprehension of their reconstructive memory with the aim of fostering tolerance to human imperfections and disenchantment with digital perfection.

While the non-capitalist side is prone to be neglected in science fiction stories, an application of Bartlett's theory of reconstructive memory and schema theory in this

research provides the cornerstone for a nuanced absorption of cognitive terminologies. To better understand the implications of technology on the natural cognitive processes narrated in Chiang's stories, future studies could conduct more analysis of characters' cognitive changes in the form of case studies. Besides, further research is needed to compare and contrast narratives in scientific or philosophical thought experiments and narratives in speculative fiction.

WORKS CITED

Ahn, Sunyoung. "The Everyday Life of Artificial Intelligence." *Science Fiction Studies*, vol. 47, 2020, pp. 73-92.

Albert, David and Barry Loewer. "Interpreting the Many Worlds Interpretation." *Synthese*, vol. 77, no. 2, 1988, pp. 195-213. *JSTOR*, www.jstor.org/stable/20116589.

Arcangeli, Margherita. "Narratives and Thought Experiments: Restoring the Role of Imagination." *Routledge*, 2021, pp. 1-24.

Asimov, Issac. "Social Science Fiction." *Science Fiction: The Future*, edited by Allen Dick, Harcourt Brace Jovanovich, 1971, pp. 263-290.

Avădanei, Dragoş. "Narrating the Undefined: A Math Melodrama (Thought) Experiment." *Journal of Romanian Literary Studies*, no. 22, 2022, pp. 146-153.

BALÉE, Susan. "When the World Gets Weird, We Cry for Sci-Fi (and Fantasy)." *The Hudson Review*, vol. 72, no. 2, 2019, pp. 321-337. *JSTOR*, doi: 10.2307/26801516.

Baccolini, Raffaella. "The Persistence of Hope in Dystopian Science Fiction." Special Topic: Science Fiction and Literary Studies: The Next Millennium, vol. 119, no. 3, 2004, pp. 518-521.

Bartlett, Frederic C. *Remembering*, Cambridge UP, 1932.

Bartlett, Frederic C."Some Experiments on the Reproduction of Folk-stories." *Folklore,* vol. 31, no. 1, 1920, pp. 30-47. *JSTOR*, www.jstor.org/stable/1255009.

Bellamy, Brent R. "Science Fiction and the Climate Crisis Author(s)." *Science Fiction Studies*, vol. 45, no. 3, 2018, pp. 417-419. *JSTOR*, 10.15621/sciefictstud. 45.3.0417.

Biel, Joan-Issac, et al. “You Are Known by How You Vlog: Personality Impressions and Nonverbal Behavior in YouTube.” *Association for the Advancement of Artificial Intelligence*, 2011, pp.446-449.

Broderick, Damien. “Novum.” *The Encyclopedia of Science Fiction*, edited by John Clute and David Langford, *Science Fiction Encyclopedia*, 2022, sf-encyclopedia.com/entry/novum. Accessed 14 June 2023.

Brown, J. Robert and Yiftach Fehige. “Thought Experiment,” *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta and Yiftach Fehige, *Stanford University*, 2016, plato.stanford.edu/entries/race/. Accessed 14 June 2023.

Camp, Elisabeth. “Two Varieties of Literary Imagination: Metaphor, Fiction, and Thought Experiments.” *MidWest Studies in Philosophy*, 2009, pp.107-130.

Chiang, Ted. *Arthur C Clarke Awards 2020 Imagination in Service to Society Award Ted Chiang*. *YouTube*, uploaded by SirArthurClarke, 29 Oct. 2020, www.youtube.com/watch?v=PmZjaYdS3fA.

Chiang, Ted. *Exhalation*, Knopf, 2019.

Clark, David A. “Cognitive Restructuring.” *The Wiley Handbook of Cognitive Behavioral Therapy*, 2014. *John Wiley & Sons, Ltd.,* doi: 10.1002/9781118528563.wbcbt02.

Cryder, Cynthia E, et al. “Guilty Feelings, Targeted Actions.” *Personality and Social Psychology Bullet*, vol. 38, no. 5, pp. 607–618. *SAGE*, doi:10.1177/0146167211435796.

Davenport, A. Edward, “Literature as Thought Experiment (On Aiding and Abetting the Muse).” *Phil. Soc. Sci.*, vol. 13, 1983, pp. 279-306.

Davies, David. “Thought Experiments and Fictional Narratives.” *Croatian Journal of Philosophy*, vol. 7, no. 1, 2007, pp. 29-45.

Dodsworth, Alexey. “Hugh Everett’s Many-Worlds Interpretation of Quantum Mechanics in Science Fiction.” *Passages through Enclosures and the Spacetime Continuum in English and American Science Fiction*, Cambridge Scholars Publishing, 2022. pp. 20-46.

Dohke, Rumiko and Murata, Koji. “Ease of Retrieval of Regrettable Actions/Inactions and the Evaluation of the Past.” vol. 41, no.3, 2008, pp. 73-79, hdl.handle.net/10086/15889. Accessed 14 June 2023.

Eagleton, Terry. *An Introduction to Literary Theory*, 2nd ed., *Blackwell*, 1996.

Egan, David. “Literature and Thought Experiments.” *The Journal of Aesthetics and Art Criticism*, vol. 74, no. 2, 2016, pp. 139-150.

Elgin, Catherine Z. “Fiction as Thought Experiment.” *Perspectives on Science*, vol. 22, no. 2, 2014, pp. 221-241.

Festinger, Leon. *A Theory of Cognitive Dissonance.* Stanford UP, 1957.

Ghosh, Vanessa E. and Asaf Gilboa. “What Is a Memory Schema? A Historical Perspective on Current Neuroscience Literature.” *Neuropsychologia*, vol. 53, 2014, pp. 104-114. *ELSEVIER*, doi: 10.1016/j.neuropsychologia.2013.11.010.

Gilboa, Asaf and Hannah Marlatte. “Neurobiology of Schemas and Schema-Mediated Memory.” *Trends in Cognitive Sciences*, vol. 21, no. 8, 2017, pp. 618-631. *CELLPRESS*, doi:10.1016/j.tics.2017.04.013.

Gribbin, John. *Impossible, Possible, and Improbable: Science Stranger Than Fiction*, Icon Books, 2022.

Goodman, Steve and Luciana Parisi. "Machines of Memory." *Memory: Histories, Theories, Debates*, edited by Susannah Radstone and Bill Schwarz, *Fordham UP*, pp. 343-359. *JSTOR*, www.jstor.org/stable/j.ctt1c999bq.27.

Hansen, Johannes Witt. "H.C. Ørsted: Immanuel Kant and the Thought Experiment." *Kierkegaard and His Contemporaries*, edited by Jon Stewart, 2003, Die Deutsche Bibliothekpp, pp. 62-77.

Hayden, Craig. *Entertainment Technologies*, Oxford Research Encyclopedia of International Studies, 2010.

Head, Henry and Gordon Holmes. "Sensory Disturbances from Cerebral." *Brain*, vol. 34, no. 2-3, 1911, pp. 102-254. DOI:10.1093/brain/34.2-3.102.

Hemmer and Steyvers. "A Bayesian Account of Reconstructive Memory." *Topics in Cognitive Science*, no. 1, 2009, pp. 189-202.

Hughes, J. James and Nir Eisikovits. "The Post-Dystopian Technorealism of Ted Chiang." *Ethics and Emerging Technologies*, vol. 31, no. 1, 2022, pp. 1-14. *IEET*, doi: 10.55613/jeet.v32i1.97.

Karpicke, Jeffrey D. "Retrieval-Based Learning: Active Retrieval Promotes Meaningful Learning." *Current Directions in Psychological Science*, vol. 2, no.3, 2012, pp. 57-63. *SAGE*, doi:10.1177/0963721412443552**.**

Kierkegaard, Soren. *The Concept of Anxiety*, edited and translated by Reidar Thomte and Albert B. Anderson, Princeton UP, 1980.

Konrad, Artie, et al. "Technology-Mediated Memory: Is Technology Altering Our Memories And Interfering With Well-Being?" *ACM Transactions on Computer-Human Interaction*, vol. 23, no. 4, 2016, pp. 1-23. DOI:

10.1145/2934667.

Irvine, Andrew D. “Thought Experiments in Scientific Reasoning.” 1991, pp. 149-165.

Langford, David. “Thought Experiment.” The Encyclopedia of Science Fiction. Eds. John Clute and David Langford. SFE Ltd/Ansible Editions, 2019. sf-encyclopedia.com/entry/thought_experiment.

Lasbury, *Mark E. The Realization of Star Trek Technologies: The Science, Not Fiction, Behind Brain Implants, Plasma Shields, Quantum Computing, and More*, Springer, 2017.

Lessig, Lawrence. “Introducing Technorealism: A New Way to Think about Technology, Politics, and Culture.” Presented at Harvard Law School campus, *Berkman Center for Internet&Society*, 1998.

Levine, Linda J. “Reconstructing Memory for Emotions.” *Journal of Experimental Psychology*, vol. 126, no. 2, 1997, pp. 165-177. DOI: 0096-3445/97/S3.00.

Lodha, Pragya. “Digital Amnesia: are we headed towards another amnesia.” *Indian Journal of Mental Health*, vol. 6, no.1, 2019, pp. 18-22.

Lohier, Patrick. “A Review of Exhalation by Patrick Lohier.” *Harvard Review Online*, 2019, harvardreview.org/book-review/exhalation/. Accessed 19 Oct. 2022.

Mach, Ernst. “On Thought Experiments.” *Philosophical Forum*, vol. 4, no. 3, 1973, pp. 446.

Marcus, Halimah. “Ted Chiang Explains the Disaster Novel We All Suddenly Live In.” *ELECTRIC LIT*, 2020,electricliterature.com/ted-chiang-explains-the-disaster-novel-we-all-suddenly-live-in/. Accessed 11 Sep. 2022.

McConnell, Anne. “Listening to Terrestrial Voices in Ted Chiang’s ‘The Great

Silence'." Literature, vol.2, 2022, pp. 77-89. DOI: 10.3390/literature2020007.

Michael, Rose. "Out of Time: Time-Travel Tropes Write (through) Climate Change." *M/C Journal*, vol. 26, no.1, 2019. *Literature*, doi: 10.5204/mcj.1603.

Nyholm, Sven, et al. "The Technological Future of Love." *Love: Past, Present, and Future*, Routledge, 2021, pp. 1-18.

Oates, Joyce C. "Science Fiction Doesn't Have to Be Dystopian." *The New Yorker*, 2019,www.newyorker.com/magazine/2019/05/13/science-fiction-doesnt-have-to-be-dystopian. Accessed 29 Sep. 2022.

Parker, Jo A. "Ted Chiang's Braided Stories of Memory, Narrative, and Technology: 'The Truth of Fact, the Truth of Feeling.'" *Performing Memories: Media, Creation, Anthropology, and Remembrance*, edited by Gabriele Biotti, Cambridge Scholars Publishing, 2021, pp. 184-198.

Parker, Jo A. "Ted Chiang's Time Travel Narratives: Predetermination, Predictability, and Free Will." *Science Fiction Studies*, vol. 9, no. 1, 2022, pp. 138-159. *Project Muse*, doi: 10.1353/sfs.2022. 0009.

Phelps, A. Elizabeth and Stefan G. Hofmann. "Memory Editing from Science Fiction to Clinical Practice", *Nature*, vol. 572, 2019, pp. 43-50. DOI:10.1038/s41586-019-1433-7.

Phipps, Gregory Alan. "Following Schrödinger's Cat into Many Worlds: Quantum Physics and William Sleator's The Last Universe." *Science Fiction Studies*, vol. 48, no. 3, 2021, pp. 483-499. *Project Muse*, doi:10.1353/sfs. 2021.0068.

Poole, Ross. "Memory, Responsibility, and Identity." *Social Research*, vol. 75, no. 1, 2008, pp. 263-286. *JSTOR*, www.jstor.org/stable/40972060.

Ramoğlu, Muhammet. "Cyborg-Computer Interaction: Designing New Senses." *The Design Journal*, vol. 22, no. *Routledge*, doi:10.1080/14606925.2019.1594986.

Rothman, Joshua. "Ted Chiang's Soulful Science Fiction." *The New Yorker*, 2017, www.newyorker.com/culture/persons-of-interest/ted-chiangs-soulful-science-fiction. Accessed 11 Sep. 2022.

Ross, Michael and Anne E. Wilson. "Autobiographical Memory and Conceptions of Self: Getting BetterAll the Time." *Current Directions in Psychological Science*, vol. 12, no. 2, 2003, pp. 66-69.

Schacter, Daniel L, et al. "The Cognitive Neuroscience of Constructive Memory." *Annual Review of Psychology*, vol. 49, 1998, pp. 289-318. *Research Gate*, doi: 10.1146/annurev.psych.49.1.289.

Schneider, Susan. *Science Fiction and Philosophy: From Time Travel to Superintelligence*, Wiley Blackwell, 2016.

Shephard, W. Andrew. "Chiang, Ted." *The Encyclopedia of Contemporary American Fiction*, edited by Patrick O'Donnell, et al., John Wiley & Sons Ltd., 2022, pp. 1-6.

Smelik, Anneke. "The Virtuality of Time: Memory in Science Fiction Films." *Technologies of Memory in the Arts*, edited by Liedeke Plate and Anneke Smelik, Palgrave Macmillan, pp. 52-68, 2009. DOI: 10.1057/9780230239562_4.

Snow, C. P. *The Two Cultures and The Scientific Revolution*, Cambridge UP, 1961.

Sparrow, Betsy. "Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips." *Science*, vol. 333, 2011, pp. 776-778.

Schneider, Susan. *Science Fiction and Philosophy: From Time Travel to Superintelligence*, Wiley Blackwell, 2016.

Swanstrom, Elizabeth. "Wax Blocks, Data Banks, and File: The Archive of Memory in William Gibson's Science Fiction." *InterActions: UCLA Journal of Education and Information Studies*, vol. 1, no. 2, 2005. DOI: 10.5070/D412000541.

Swirski, Peter. *Of Literature and Knowledge*, Routledge, 2007.

Tulving, Endel. "Episodic Memory: From Mind to Brain." *Annu. Rev. Psychol*, vol. 53, no. 1, 2002, pp. 1-25.

Vatilo, Essi. "Climate Change in a Chromium World: Estrangement and Denial in Ted Chiang's "Exhalation." *Fafnir*, vol. 6, no. 2, 2019, pp. 38-50.

Wagoner, Brady. "Bartlett's Concept of Schema in Reconstruction." Theory&Psycholo-gy, vol. 23, no. 5, 2013, pp. 553-575, *SAGE*, doi:10.1177/0959354313500166.

Whitehead, A. N. "Uses of Symbolism." Daedalus, vol. 87, no. 3, 1958, pp. 109-123. *JSTOR*, www.jstor.org/stable/20026455.

Wolfe, Gary K. "Alternate Cosmologies in American Science Fiction." *Hungarian Journal of English and American Studies*, vol. 18, no. 1/2, 2012, pp. 161-176. *JSTOR*, www.jstor.org/stable/43488467.

Zheng, Shawn and Lee Wei Lim. "A Practical Approach to the Ethical Use of Memory Modulating Technologies." *BMC Medical Ethics*, vol. 21, no. 89, 2020, pp. 1-14.