Memory in the Apocalyptic Archive: A Literary and Computer Textual Analysis of *A Canticle for Leibowitz*

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Introduction

At a glance, *A Canticle for Leibowitz* by Walter M. Miller, Jr. is a science fiction novel about the past. A post-apocalyptic society remembers the civilization that wrought its own destruction and, by extension, caused hardship centuries into the future. Miller's characters hoard texts, hoping for any last scrap of information, for no purpose other than memorial. In the end, this remembrance seems futile, as a second apocalypse arrives. As a novel of the past, *Canticle* is dismal. Humanity is trapped in an unbreakable cycle of self-destruction with no hint as to how it might bring the cycle to an end. Science, which would otherwise be considered humanity's greatest accomplishment, causes their destruction again and again. *Canticle* becomes a text with no way forward, because Miller frames the destruction of knowledge as a clear sin, but the regaining of knowledge always leads humanity back to the same nuclear war.

Reading *Canticle* as a novel of absences, however, provides the reader a way to escape such a spiral. Walker Percy, an author frequently quoted about *Canticle*, calls the novel a "cipher, a coded message, a book in a strange language" (Percy 227). The reader must decode the cipher, just as the characters in the novel feel compelled to fill the gaps in memory the earlier society left. In this paper, I will argue that a part of the book's secret can be uncovered using a combination of techniques. The first step is to analyze cultural memory and materiality within the text, and the second is to use quantitative topic modeling to compare the topics within *Canticle* to other post-apocalyptic science fiction novels with strong themes of memory and materiality. Combining digital methods with conventional literary theory can illuminate gaps in a text, potentially providing new avenues for the researcher's questions or interpretation, aiding in the filling of those fissures and apertures.

One function of literary theory is to fill in absences. Feminist theory, for example, searches out female authors and characters who have been left out of the scholarly conversation. Postcolonial theory gives a voice to people who live or have lived under colonial exploitation, a voice that would often otherwise be silenced. I aim to show that quantitative digital humanities methods can perform a similar function in literary research, taking a corpus of texts, pointing out the dominant themes across those texts, and suggesting where a text deviates from those dominant themes. Although this paper will use topic modeling to analyze cultural memory and materiality, similar methods can be applied to almost any theme or theory that appears in the words of a text.

When studying *Canticle*, topic modeling provides new comparisons that complicate many earlier scholarly readings of the text. In *Canticle*, a nuclear war devastates the United States, leaving behind a fraction of the population and turning much of the terrain to desert. While the rest of the country struggles to rebuild civilization, an abbey of Cistercian monks amasses, over centuries, an archive of pre-war texts in a patient attempt to return humanity to its former glory. Because of *Canticle*'s near-exclusive focus on the monks, their extraordinary patience in creating and protecting their archive, and the second nuclear war brought about by advanced science at the end of the book, *Canticle* has most often been read as an argument for the superiority of religion over science.

For example, Ralph C. Wood interprets the novel as a rejection of anthropocentric Enlightenment ideology that, he argues, will lead to destruction, in favor of a foundational Christian culture which contains both a warning of humanity's fatal amnesia and a spark of hope that can be found in the Christian church. Wood argues that the scientists' neglect of Christian morality leads them back to the end of the world. For Wood, the novel's answer to the question

of moral responsibility is indistinguishable from religion. The world falls back into war because they fail to listen to the Leibowitzean monks, who preserve both the means to scientific knowledge and the religious morality necessary to conduct themselves properly with such dangerous weaponry.

Similarly, Niall W. Slater and Jerry S. Jacobs explore the relationship between science and religion in the novel, ultimately determining that "man's quest for scientific knowledge is demonized," as only the Church escapes the second nuclear war (130). Slater and Jacobs pin the novel as a passing down of knowledge, reframed in a new cultural context. Similar to the pagan texts passed down through the Medieval era, "the Memorabilia are alien and in some deep sense *opposed* to the culture which preserves them" (125). Slater and Jacobs interpret the post-apocalyptic setting as one hostile to science, with religion as a passive transmitter of the previous society's knowledge, which is antithetical to the church's beliefs.

While the Catholic faith is vital to the text, a literary analysis of the Memorabilia and an interpretation of the results of topic modeling draw attention to what is not present in the text, suggesting that the relationship between the church and science is more complex than a binary opposition between the two modes of understanding. Instead, this paper will argue that cultural memory and materiality provide a more compelling and coherent reading, and that the relationship between religion and science in *Canticle* can be understood with more nuance by analyzing their interactions with the documents in the monks' archive. In the spirit of cultural memory, this paper will also analyze the text's applicability to the digital humanities, text recovery, and digitization today.

Memory and Materiality in *A Canticle for Leibowitz*

In *Canticle*, science is a prodigal child. The novel begins hundreds of years after the Flame Deluge, a nuclear war which destroys most human life on Earth. Across the United States, scattered settlements in the style of Medieval monasteries struggle to rebuild civilization. The Leibowitz Abbey, in the Utah desert, carries on the task of its founder, Isaac Edward Leibowitz, "to preserve human history for the great-great-great-grandchildren of the children of the simpletons who wanted it destroyed" (Miller 65). In order to preserve history, the monks find and maintain "volumes of history, sacred writings, literature, and science" (Miller 65). Later, they turn to preserving any documents they find, including racing forms, grocery lists, notes, and blueprints. The church houses the documents—the Memorabilia—necessary to reconstruct the science and technology of the pre-apocalyptic era. All they must do is maintain the Memorabilia and wait for the scientists and scholars to find them—to literally return to the house of God—in order to start rebuilding the world.

All of the novel's three sections are separated by 600 years, and the only connecting threads between the sections are the Leibowitzean monks and their Memorabilia. Until the third section, the novel focuses on the actions surrounding the Memorabilia. The monks test the documents for authenticity, use them as evidence to get the Beatus Leibowitz canonized, and argue over whether to preserve or use the documents. Thon Taddeo, the scientist in the second section of the book, travels hundreds of miles across bandit-plagued lands to study the documents, struggles over the concept of knowledge discovery as opposed to re-discovery, and attempts to justify the current deterioration of humanity as compared to the apparent glory of pre-apocalyptic humanity using evidence in the Memorabilia.

The Memorabilia are the only way the characters in the novel have to remember, venerate, or study the pre-apocalyptic society that produced the documents. Centuries after the Flame Deluge, almost all physical structures, machines, and products of industry have been destroyed or salvaged for parts. Nearly all understanding of pre-war technology and culture has disappeared. No one remembers anything but rumors of the time before, during, or immediately after the Flame Deluge, rumors that the reader understands to be historically inaccurate interpretations of the early twentieth-century United States. The Memorabilia become the sole reliable source of cultural memory in *Canticle*, and because the characters feel an irrepressible urge to recover or improve the earlier civilization, the documents' cultural memory is the foundation of all conflict in the novel.

Canticle's cultural memory—contained in a physical object, but divorced from any social, inter-personal context—is not classical, Halbwachsian cultural memory. Maurice Halbwachs, considered the father of collective memory studies, writes little about the memory relationship between a person and unfamiliar objects, focusing instead on the role of space and belongings on family memory and identity. Halbwachs does briefly place his reader in an antique shop, where "one naturally wonders who would have owned such an armchair, tapestry, dishes, or other necessities," which develops into a broader curiosity about "the world recognizable" in the everyday objects (129). Although the Memorabilia are not as familiar to the monks as armchairs, tapestries, and dishes, the books and documents invoke a similar fascination that drives them to devote their lives to interpreting and preserving them.

Saving information in a material form does not guarantee understanding in the future; it encourages reinterpretation within a new cultural context. The monks attempt to bring the information into their cultural ethos through connections to stories and legends, but they do not

have any way to validate their interpretations when there is not anyone from that culture remaining. However, being essentially creation myths for their world and Order, the Memorabilia are vital to the monks' identities as people within a post-apocalyptic world and as Leibowitzean monks. Halbwachs argues that "no memory is possible outside frameworks used by people living in society to determine and retrieve their recollections," and so the monks must use their own cultural frameworks—legends, gossip, and fragments of knowledge—to integrate the information in the documents into their worldview (43). Therefore, their cultural memory formation has to occur around the document, rather than with the document. The monks must place the documents in the only context they know, asking what they can learn from the document and how it relates to what the monks already know about the present world. For example, when Brother Francis finds the fallout shelter that contains Leibowitz's documents, he mistakes it as a shelter *for* fallout, which he understands "as half-salamander… and as half-incubus" (Miller 18). The legend reinterprets radiation as a monster which causes mutations in children. Over the centuries, the new circumstances, words, and objects that make up the characters' worlds accumulate, and these new contexts shape the way they interpret new information.

Because Halbwachs does not apply his theories extensively beyond interpersonal relationships within families, religion, and economic exchanges, scholars have recontextualized Halbwachs' concepts since he wrote about collective memory in the 1950s and since *On Collective Memory* was translated into English in the 1980s. Jan Assmann provides the most useful additions for analyzing *Canticle*. Assmann preserves the distinction between tradition and collective memory "by breaking up [Halbwachs'] concept of collective memory into 'communicative' and 'cultural memory,'" which allows for treatment of the cultural sphere

(Assmann 37). According to Assmann, communicative memory is that which is passed on in conversation and does not last beyond three generations, as it is embodied memory. Cultural memory, in contrast, is disembodied and found in objects. *Canticle* depicts the oral transmission of information as unreliable, especially as it gets further and further from an individual's lived experience, when it becomes rumor and gossip. For example, the reader experiences Brother Francis's discovery of the Leibowitzean documents through Francis's own perspective, but also reads about the other monks' wild rumors about the event that they did not experience. Over time, orally transmitted information degenerates until it no longer resembles the truth, or it reveals a truth that the original speakers would never have intended to reveal, such as the near-prophetic insight of the morally ambiguous Poet who is canonized as a saint and remembered as a martyr of the faith.

Miller allows his characters to speculate wildly about events that they do not see, dispensing with the preservation and conservatism he attributes to documentary evidence. The contrast between material and immaterial information suggests that material information is particularly valuable and reliable in *Canticle*. Since material texts remain relatively stable, Miller argues that a given civilization would be able to come to a productive understanding of the documents of another civilization with enough time. In the novel, communicative memory is unreliable, leading to inaccurate beliefs through uncurated legends, rumors, and stories, but the information obtained through these methods is still useful. For example, while the machines left behind by pre-Flame Deluge society are not actually magic, the belief that they are keeps characters from investigating objects they do not understand, objects which could be bombs, weapons, or just broken and dangerous machinery. Communicative memory changes rapidly, but ultimately determines the nuance with which cultural memory will be remembered.

While most types of communicative memory can be performed by anyone, cultural memory "always has its specialists" who safeguard or transmit information deemed significant (Assmann 39). These specialists include religious figures, artists, scholars, and teachers. At the beginning of *Canticle*, those specialists are the Leibowitzean monks, but over the course of the novel, the category of specialist grows to include others within the Catholic church, scientists, and scholars. As specialization is disseminated, the strict moral law of the church no longer holds sway over everyone who has access to the information, and the usage of the documents begins to change.

The Memorabilia are valuable to the Leibowitzean monks because they are a direct link to Leibowitz and to the time before the Flame Deluge, but not all groups within *Canticle* want to use the Memorabilia as a unifying cultural memory. Over time, the Memorabilia become a symbol for the gap between the characters' present scientific and technological knowledge and that of the pre-apocalyptic society. It takes centuries for the characters to understand all of the texts, but the information they contain does not change. The characters' knowledge just has to grow until they can finally understand the texts and recreate the civilization they represent. The Memorabilia act as the "connective structure or diachronic identity to societies, groups and individuals, both in the social and in the temporal dimension" (Assmann 36). The documents form a part of the monks' religious and societal identities. For other groups in the text, the Memorabilia are a route to power. As "cultural memory reaches back into the past only so far as the past can be reclaimed as 'ours,'" *Canticle* is a race among many factions to comprehend the documents and reclaim the past and its technology. (Assmann 38). Controlling the Memorabilia will enable the winner to determine the short- and long-term futures of humanity. For the groups

outside of the church, cultural memory is not primarily useful for group identity formation, but rather for claiming the power and legacy of pre-war society as their own.

Because cultural memory is disembodied, it is "able to be transferred from one situation to another and transmitted from one generation to another" (Assmann 37). To be integrated into a culture, the memory must not only "be preserved but also to be circulated and reembodied in a society" (Assmann 37). Assmann relates the problem of transmitting cultural memory to the communication of church law in Deuteronomy, which Christians needed to "preserve the memory of the generation who has witnessed the events in the context of the exodus from Egypt and the revelation of the Law into the cultural memory of a society that could be handed down to an infinite number of future generations" (Assmann 39). According to Miller, this preservation was successful enough that the Catholic church survived a nuclear apocalypse and the destruction of almost all knowledge. The Catholic church structures the year with the liturgical calendar of saints, readings, and yearly rituals, such as the Lenten fast which opens *Canticle*. Such cycles refresh memories over the course of the year. The church's cycles provide a structure that other organizations lack and provide members of the church a grounding from which to reconstruct their lives after a crisis like the Flame Deluge.

The transmission of the Memorabilia's cultural memory is less successful than that of cultural memory within the church, both across time and between groups, because "textual continuity is only achieved when institutions of learning and exegesis arise that keep the ancient texts alive and semantically transparent" (Assmann 41). Although it is not described within *Canticle*, at some point after Leibowitz's death, the monks lose their ability to understand the Memorabilia, and the rest of the world forgets that the monks even have them. The pervasive forgetting and subsequent struggle to remember emphasize the "ancient anxieties about the

relation between oral communication and literacy, textual information and knowledge," and the tension those relationships place between groups (Seed 157). Cultural memory fails because the monks' interpretations of the Memorabilia are deeply steeped in the tenets of Catholic faith and are influenced by the individual monks' proclivities. After being read an account of the Flame Deluge, Taddeo skeptically inquires after its origins. The young monk who wrote the account "got it second hand from Saint Leibowitz' followers, the original memorizers and bookleggers, and he had a liking for scriptural mimicry" (Miller 188). The narration lacks the detail and certainty with which the church conducts rituals like Lent, and is not transferrable to Taddeo, because it has passed through several hands, has gained metaphor, and is derived from interpretation.

A few scholars have framed the disconnect between text and cultural knowledge in *Canticle* in terms of semiotics. The monks face the "problem of how to access the past" through the Memorabilia (Seed 157). They have access to the past's valuable information but must regain enough cultural knowledge to use it. The monks have the signifiers, but no longer have the signifieds, the concepts which the signifiers represent. Although Leibowitz and his monks memorize or smuggle texts, hoping to preserve the culture lost during the war, the priests and monks fail to take into account the effect of culture on text interpretation and learning:

> But the monks of the earliest days had not counted on the human ability to generate a new cultural inheritance in a couple of generations if an old one is utterly destroyed, to generate it by virtue of lawgivers and prophets, geniuses or maniacs; through a Moses, or through a Hitler, or an ignorant but tyrannical grandfather, a cultural inheritance may be acquired between dusk and dawn, and many have been so acquired (Miller 66).

Although, in context, this quotation applies to those outside of the church, the Leibowitzean monks also fail to consider their own new cultural inheritance shaped by the specters of nuclear war and Leibowitz's dream to archive pre-war culture. Semiotics explains what the breakdown in communication is, while examining how the various factions use the Memorabilia helps explain how that breakdown happened.

There are four primary factions in *Canticle*: the government, the church, science, and the simpletons. All of them can be categorized by their relationship to the Memorabilia. The government uses a proxy to interact with the documents and is only interested in them if they provide information that will gain them the upper hand in conflict. The church, which has control of the Memorabilia throughout the novel, wants to preserve the documents out of veneration for their origin and out of the hope that they will be useful again one day. The scientists want to use the documents, with a combination of hubris and veneration. Taddeo wants to innovate, hoping that he has discovered natural laws beyond those found in the Memorabilia, while also believing post-apocalypse humanity could not possibly be related to pre-apocalypse humanity because of the wonders the previous civilization created. The simpletons gained their name as an insult from scholars but took the term as their title in an act of resistance against the people who caused the end of the world. The simpletons were originally a group seeking vengeance against the scientists who created the atomic bomb but, later, would seek out and kill anyone literate or destroy any books or documents. Although the simpletons take several forms throughout the novel, they remain opposed to institutional or textual knowledge throughout.

Without bringing together the Memorabilia and the various ways each faction uses the Memorabilia, the significance of the relationship between the past and a post-disaster future remains difficult to parse. The Leibowitzean monks' relationships to the Memorabilia are the

most complex. Leibowitz saves as many books as possible to preserve culture but fails to realize that, with so much of the world destroyed, the knowledge contained within those books is inscrutable. By the beginning of the novel, Leibowitz's monks no longer remember what the world was like before the Flame Deluge. Because of this, they stagnate. They know that they must protect the Memorabilia, as that was Leibowitz's goal, but they cannot comprehend the bigger picture. For the monks, the Memorabilia is valuable only because it was valuable to their saint. The Memorabilia has value not as documents and books, but as physical objects that have a direct connection to a martyr and to a religious mission. The monks do not consider the value of the documents in terms of the accumulation of power, as the government and scientists do.

Thon Taddeo is the only scientist in the novel who comes into contact with the Memorabilia, and so his viewpoint is the only reference for understanding scientists' and scholars' relationships to the documents. Taddeo is a scientist not out of respect for the past, humanity, or nature, but because it is the only way he has to prove his supposed superiority over others. He did well in school due to competition with his cousin, Hannegan, who "excelled him in all things but keenness of mind" (Miller 136). However, Taddeo's "victory was hollow, for Hannegan did not care" (Miller 136). Even Taddeo's study of the Memorabilia is born out of a desire to prove himself, as he finds out that "some of his discoveries are only rediscoveries, and it leaves a bitter taste" (Miller 209). No matter the quality of Taddeo's scholarship, "he can only do what others before him had done" (Miller 209). Taddeo's motivations are self-serving. The purposes of science and scholarship, as Miller depicts them, are to assuage the ego and to gain recognition or admiration. Ego-driven science is a direct contradiction to the Leibowitzean monks, who have no expectation but to be one person in a centuries long procession of workers defending, copying, or interpreting the Memorabilia.

Taddeo's use of the Memorabilia for his own selfish ends and to further Hannegan's wars reflect people's worst fears about science during the Cold War and after the bombings of Hiroshima and Nagasaki. During this time, the average person feared that scientists were "suddenly saddled with godlike responsibilities" which included the safety of the world and the people in it (Tietge 48). Taddeo rejects the responsibility that accompanies the leaps in scientific knowledge furnished by the Memorabilia, proving that "if power corrupts, then science represents the absolute power that may corrupt absolutely" (Tietge 48). Just as Taddeo allows Hannegan to direct his research on the Memorabilia, more than half of scientific research in the United States in 1953 was funded by the government (Tietge 50). In both *Canticle* and 1950s America, a majority of this research found military applications. *Canticle* expresses the fear "that when institutions become too reliant on the government for financial support, the spirit of academic freedom and the ethical application of scientific discovery are in jeopardy" (Tietge 50). Government goals encourage the use of the Memorabilia toward short-sighted goals of conquest which contradict those of the Leibowitzean monks. This viewpoint helps to explain the reckless abandon with which scientists in *Canticle* rediscover nuclear weaponry using the Memorabilia.

While religion and science are in tension throughout *Canticle*, they are far more often beneficial to each other. Immediately after the Flame Deluge, the Church protected scholars, "vested them in monks' robes and tried to hide them in such monasteries and convents as had survived and could be reoccupied, for the religious were less despised by the mob" (Miller 64). This protection often came at great cost to the church, as "monasteries were invaded, records and sacred books were burned, refugees were seized and summarily hanged or burned" (Miller 64). Leibowitz was an electrical engineer and weapons expert, who later joined the Cistercian monks and "took their habit, and after more years became a priest" (Miller 65). In his role as a priest,

Leibowitz led bookleggers and memorizers in saving books, including science books, either as physical objects or through memorization. Leibowitz is ultimately betrayed, not by any religious order, but by a "turncoat technician" who joined the simpletons (Miller 65).

The Leibowitzean monks prove the Order is still civil to scientific endeavors during Taddeo's visit during Book II. Paulo allows Brother Kornhoer to tinker with building an arc lamp based off writings in the Memorabilia because the abbot was "curious at first," and he is allowed to continue despite the commotion his invention causes (Miller 140). The lamp is such impressive science that Taddeo himself, someone whose "name was being spoken in the same breath with names of natural philosophers dead a thousand years and more," is impressed with it (Miller 127). As Taddeo says, "the gadget… is a standing broad-jump across about twenty years of preliminary experimentation, starting with an understanding of the principles" (Miller 199). Kornhoer displays impressive talent for machinery, and the Abbot sees past the inconveniences of mechanical tinkering in his basement, as the work keeps his monks happy. The church has maintained the Memorabilia for centuries, and most of the monks do not find the use of the documents dangerous or blasphemous.

The monks go out of their way to make the monastery's atmosphere welcoming and comfortable for visiting scholars. They go so far as to move one of the crucifixes in the library to hang up Kornhoer's arc lamp to aid Taddeo in his research. Replacing the crucifix is contentious. Armbruster, the librarian, calls Kornhoer a heathen, pagan, and desecrator for suggesting it, and the Abbot is hesitant, but ultimately allows it. Despite Taddeo's assumptions of the monk's views of science, the monks laugh at the idea that they would be offended by the concept of refracted light, and Father Gault later explains that many of them "feel that Genesis is more or less allegorical" (Miller 231). They have an open invitation to scholars to visit and study the

documents, although the scholars must travel to the monastery in order to do so out of concern for the documents' safety.

The relationship between religion and science does not break down until Doctor Cors breaks his contract with Zerchi. Zerchi does not take Cors' word that the doctor will not recommend euthanasia on church grounds until he has written out his promise. The act of creating a document to substantiate Cors' promise convinces Zerchi, although Cors ultimately breaks his word anyway. Zerchi believes that documents will hold Cors accountable, although Cors does not hold the contract in the same regard. Similar to the church's veneration of the Memorabilia, Zerchi believes that a document has enough power and value to change the future. Although the issue of euthanasia ultimately drives religion and science apart, Miller does not imply a clear moral superiority for either side of the argument. The inconclusive moral argument suggests that, although texts can be useful to store knowledge, the morality and context that creates those texts should not necessarily be binding in a new context. Extended to the Memorabilia, the mere fact that the scientific knowledge contained in the texts leads to nuclear war once does not mean that the use of the documents will lead to the same result in a new context.

Scholars frequently interpret *Canticle* as a novel of religion versus science, but, while the relationship between religion and science is fraught, it is not the main conflict in the novel. The Leibowitzean monks and various scholars and scientists—especially Taddeo in Book II and Doctor Cors in Book III—do come into conflict over their incompatible values and their beliefs about how the documents should be used. The tension between religion and science forms because of the differences in how these two ideologies consume the material that connects them to the past. The church tends to preserve, while science seeks to innovate. Miller, an engineer

and, at many points in his life, a devoutly religious person, avoids the insinuation that science and religion are diametrically opposed, as "was a typical outlook in the 1950s" (Tietge 59). The structure of *Canticle* is such that the main conflict reoccurs across the three sections, especially Books II and III. The cast of characters change, but the relationships between institutions stay the same. The Abbots Arkos, Paulo, and Zerchi fulfill the same roles as members of the church, as do Taddeo and Cors as scientists, although their actions are separated by centuries. *Canticle* foregrounds the interactions between the religious characters and the scholars, while only mentioning Hannegan as a background character. Characters discuss his actions and read his proclamations, but he remains a backdrop to other events in the novel. Hannegan's absence disguises the conflict between religion and the government, hiding the government's role as puppet master to science.

The moral failure in *Canticle* is not science itself, but rather science's willful ignorance of the government's ambitions. Considering the context which produced *Canticle* is useful because it explains the motivations behind the conflict between the church and government in the text and the reasons they approach the Memorabilia with the methods they use. Miller took part in the bombing of Monte Cassino Abbey in February 1944. At the time, Monte Cassino Abbey housed "as many as 3000 Italian civilians," and the building itself was "among Christianity's most venerated buildings" with "collections of art and rare manuscripts… among the finest in the world" (Harper and Tonkin-Covell 36). Although Allied leaders debated whether German troops occupied the Abbey, Bernard Freyberg gave the order to bomb the Abbey because it "was a critical part of [German] defenses" along the Gustav Line (Harper and Tonkin-Covell 41). Two hundred and thirty Italian civilians were killed, and the Abbey was destroyed, although the monks transferred the artifacts to Rome before the bombing (Hapgood and Richardson 211). The

bombing was ultimately a tactical error, as "the gains—both tactical and in terms of a propaganda coup—had gone to the Germans" (Harper and Tonkin-Covell 55). In *Canticle*, Miller questions the morality of the scientific endeavors that led to the bombs dropped on Monte Cassino Abbey, a needlessly destructive battle with poor leadership.

The only benefit of the bombing was that the destruction of cultural artifacts "reverberated around the world as the culmination of the pity, stupidity and barbarism of war" (Parker 185). The bombing and the subsequent controversy shook Miller and likely influenced the mistrust of large-scale war tactics, government intercession in religious matters and spaces, and government control of religious or cultural documents in *Canticle*. Hannegan's missive is one of the first warning signs of impending disaster in the text. The missive orders "the licensing of the Texarkanan clergy, made the administration of the Sacraments by unlicensed persons a crime under the law, and made an oath of supreme allegiance to the Mayorality a condition for licensing and recognition" (Miller 231). *Canticle* rejects government intercession in religious matters, including the use and interpretation of religious texts, as the government works toward short-term and often destructive goals, while the church is concerned with the long-term moral health of its people.

Much like the contextual basis of the Monte Cassino bombing during World War II, *Canticle*'s church seems powerless, a victim to the whims of those in power. The church's powerlessness is seen most clearly through its inability to intervene in Taddeo's relationship with his cousin, Hannegan, who aims to unite the continent under his rule. Hannegan's unchecked greed allows Taddeo to experiment and study the Memorabilia, and so Taddeo facilitates or ignores the atrocities that Hannegan commits. During his speech at the monastery, Taddeo expresses his acceptance of Hannegan's plans:

Tomorrow, a new prince shall rule. Men of understanding, men of science shall stand

behind his throne, and the universe will come to know his might. His name is Truth… It

will come to pass by violence and upheaval, by flame and by fury, for now change comes

calmly over the world (Miller 214-5).

Hannegan is merely the vehicle for Taddeo's new prince—Truth. Taddeo accepts Hannegan's

plans because they are the fastest path to fill in the gaps left by the nuclear war, efforts for which

he will gain fame. Taddeo views humanity as fallen, and so resurrecting science from such bleak

ruins would cement his place alongside the great names of twentieth-century science. The appeal

of power and the belief that violence will gain him that power prevent Taddeo from exercising

the same caution and patience with which the monks treat the Memorabilia. Although Taddeo

finds friends in the church, he does not adopt their moral code, which would allow him to

understand the long-term goals of human health and morality.

The conflict between long- and short-term goals returns in Book III, but the text shifts

focus from the documents to the Texarkanan survivors of the nuclear bomb, suggesting a

relationship between the Memorabilia and the survivors. The preservation of documents turns

into the preservation of human life. The documents are not only valuable because they contain

information; they are valuable because they are the last creations of the people who wrote them.

The monks value knowledge, but even more so, they value humanity. *Canticle* argues for the

sacredness of people and their creations, from grocery lists to blueprints to arc lamps, but even

the Leibowitzean monks' love for humanity is not enough to turn the tide against nuclear war.

Canticle remains a cycle of discovery and rediscovery, war and rebuilding, remembrance and

forgetting. To better understand this cycle, we turn to the future, both within *Canticle* and outside

of it.

Preservation and the Digital Humanities

The main challenge in *Canticle*—how to understand, distribute, and use information—is the same challenge facing literary scholarship today. While the Leibowitzean monks have information in the form of the Memorabilia, they are not able to process it because they do not have the linguistic or scientific capabilities to understand their documents. For today's literary scholars, there is too much data to absorb and not enough time to do it. The monks have all the time in the world, as generations of them work towards the same goal, but they lack the necessary knowledge and technology. Literary scholars have access to the necessary knowledge and technology but have limited time to study the ever-increasing number of texts available, as work hours are spread across a larger number of texts. While in *Canticle*, the journey from discovery to comprehension to surpassing the Memorabilia takes nearly 1800 years, computational textual analysis allows literary scholars to examine digitized documents more quickly and find relevant information more efficiently.

Jerome McGann describes the problem of texts that have now "become either ruins or movies," and once this displacement occurs, "their works have to be pedagogically—artfully, philologically—recreated" (7). He makes this argument in terms of canonical authors—Dante, Ovid, and Petronius, for example—who have become so ingrained in Western cultural memory that few study their texts. At the same time, their works are reinvented consistently. Such a cycle of cultural memory is not unlike the cyclical structure of *Canticle*. In *Canticle*, the Memorabilia becomes the canon, and the monks and scholars recreate and reinterpret the texts over the course of the novel. Taddeo's work on the "Mobility of Electrical Essences," for example, recontextualizes the movement of particles in the electromagnetic force (Miller 149). The digitization of texts allows the cycle of discovery and rediscovery to occur much faster, but,

without a future-orientation, the cycle cannot lead anywhere new. McGann adopts T.S. Eliot's disjointed, jumbled, and overcrowded *Wasteland* as a symbol for these texts that are no longer read, but which still shape Western cultural ethos. In other words, the texts sitting on shelves or in servers represent a world that has passed on but still echoes. Taddeo describes the problem: "how many schismatic Orders were fabricating their own versions of things, and passing off their versions as the work of earlier men? You can't know, you can't *really* know" (Miller 129). The characters in *Canticle* must deal with an overabundance of legends, stories, and faked documents and an underabundance of reliable information. They have several accounts of the Flame Deluge, but it is unlikely "a single *completely* accurate account of the Flame Deluge exists anywhere" (Miller 188). In much the same way, digitalization maintains the contradictions, arguments, confusions, editions, and revisions of the years, and the curators and readers must find a way to integrate the information.

Because so much information has been and continues to be digitized, and because that information is key to memory and identity formation, digitization impacts the ways cultures remember. Technology enables the digitization of more and more data every day, but the average person's information processing capabilities have not increased proportionally. Scale is both a luxury and a problem. Does it matter if more texts are preserved if nobody accesses or uses those texts? Without use, preserved texts do not enable people to form stronger cultural bonds or interact with other cultures.

With more and more information, it also becomes more difficult to differentiate what is true and what is false, damaging peoples' relationships to their own cultural memory. The effects of digitization can be identical to the effects of information loss. Although people do not have to dig through a rockfall-buried fallout shelter to advance their scientific knowledge, digging

through the huge amounts of available information can feel similar. People experience

information fatigue and choose to believe the information that is most familiar to them or accept

the information that is most closely at hand. People limit their information consumption, not

always because they lack the knowledge necessary to access information, but because sifting

through the available information is unfeasible.

This information fatigue is part of the reason information curators have to approach their

craft responsibly. With the digitization of documents comes questions about the impartiality of

curation. Digitization—and, by extension, digital scholarship—is the imposition of a particular

narrative on the documents being digitized, even if only through proximity to other digitized

documents or the tools used to find documents. Through curation, whether digital or physical,

archivists "wield power over those very records central to memory and identity formation"

(Schwartz and Cook 2). Archivists choose the texts that will be added to their archives, how their

visitors will interact with those texts, and how those texts will be categorized and described.

Similarly, digital humanities scholars face the unusual task of putting hundreds or thousands of

texts in conversation with each other in the curation of their corpora. Some problems in the

process of corpus or archive curation are ones in which no single person has control, such as the

lack of digital versions of some texts or incompatible formats across projects. Human limitations,

such as lack of knowledge, bias, and mistakes also impact the final archive and corpus.

While various digital humanities methods help to solve these problems, the digital

humanities present their own issues. Humanities scholars working with digital methods may be

hampered by the origins of those methods. Many interface tools are made with business, the

sciences, or the social sciences in mind, meaning humanities scholars must develop "traditions of

programming native to the humanities" that enable scholars to ask humanities questions and use

humanities methods (Galey 115). When tools are designed for a particular field, their design carries assumptions about the questions scholars will ask, the types of data they will use, and the methods they will use to analyze that data. Researchers in the sciences or business tend to ask quantitative questions and, for such questions, treating "data as extricable from their presentation *is* consistent with best practice" (Galey 115). Humanities scholars tend to ask qualitative questions, and so treating "texts as *in*extricable from their presentation *is also* consistent with best practice" (Galey 115-6). Digital humanities scholars must therefore change the questions they ask and the methods they use or devise new tools to answer their qualitative questions through humanities methods. Tools like topic modeling are useful to the humanities because they are customizable but accessing most of these tools requires either technical skill or money.

As in *Canticle*, sometimes texts must be understood out of context. The Leibowitzean monks could not understand the information they had for centuries, and, likewise, especially while recovering texts, literary scholars must deal with texts with no author, authors with no other works, texts with no clear dates, or other situations where the text is removed from its context. Quantitative text analysis can help scholars make educated guesses in these instances, and, with recovered texts, the ability to form theories can mean the difference between texts being studied and reentering circulation and texts sitting in an archive's servers.

Approaching a text as extricable from context allows the humanities scholar to find patterns both within a text and within a set of texts. Unlike the computer, the researcher is aware of trends and assumptions in research, which can guide the questions asked, whether intentionally or not. When used to explore a corpus, digital methods can uncover unexpected patterns or questions. Taking a text out of context also allows the researcher to study finer details, such as grammatical or syntactic trends, and how those trends manifest over time.

Studying a text outside of context does not require that the text remains out of context.

Quantitative methods can be merely one stage of a longer process, after which the researcher

considers their new discoveries within their historical, literary, and scholarly context.

Digital humanities methods often require the analysis of texts outside of context, methods

"both its promoters and its critics regard as a set of replacement protocols for traditional

humanities scholarship" (McGann 4). However, quantitative work is not new to the humanities.

Computer-generated word lists and concordances have been available since the 1960s and 1970s,

and similar hand-counted concordances have been available for centuries (Rommel 88). Digital

humanities work today extends methods that have been in use for decades. Quantitative work has

never been easier or more productive, and it is dangerous to ignore, but it will never completely

replace traditional literary scholarship. With that in mind, in the rest of this paper I attempt to

integrate qualitative and quantitative questions and methods as an example of the ways in which

the combination of digital and traditional methods can provide more complex analysis than either

method alone.

Methods

Knowing that my interests were in memory and materiality, the first step was to find a

main text and a corpus of texts in which these themes played a major role. After researching

several texts with archival elements, I decided to use *A Canticle for Leibowitz* as my primary

text. For the corpus, as a first option, I used a set of non-copyrighted science fiction texts

digitized by Project Gutenberg. However, the Gutenberg corpus was not without its problems.

The texts were primarily early twentieth-century science fiction short stories, which would not be

a direct comparison to *Canticle*, which was published in 1959. There were also many obscure

short stories, which made the classification of genre more difficult, and therefore, the corpus less

focused. Luckily, I came across a blog post from Temple University describing a project to digitize twentieth-century science fiction novels, led by Alex Wermer-Colan (Wermer-Colan). Accessing these documents proved difficult, as the novels being digitized are all under copyright. Finding a format to transmit the novels legally was challenging and time-consuming, but eventually I gained access to disaggregated text files for a set of novels, with each novel separated by chapter.

From here, the question became one of corpus curation. I decided the texts needed to fall under one of two categories: general post-apocalyptic science fiction or post-apocalyptic science fiction that contains significant thematic elements of memory and materiality. This introduced the question of genre. What qualifies as an apocalypse? Is a text post-apocalyptic if it takes place before or during the apocalypse, in addition to after? In the curation of texts, I was fairly conservative, choosing texts which are frequently categorized as post-apocalyptic or which contain more common apocalyptic scenarios. However, many texts were unavailable to me because Temple University did not have access to them or they had not yet been digitized. Some science fiction texts with themes of memory and materiality, like *Parable of the Sower* by Octavia Butler, were unavailable. The Temple University corpus contained several hundred texts, the majority of which were unfamiliar to me. To determine which texts would be relevant, I had to rely on what information about these texts I could find, which was frequently limited to blurbs or synopses, meaning some obvious texts might be missing and some texts may not adhere as closely to the corpus themes.

Because I was interested in finding the themes or topics latent in the texts—as a human reader would find memory and materiality in *Canticle*—I decided to use topic modeling to process the digital texts. Topic modeling is "a suite of algorithms to discover hidden thematic

structure in large collections of texts," typically used to "summarize, visualize, explore, and theorize about a corpus" (Blei). When running a topic model, the computer iterates over a corpus of texts a user-defined number of times. During the first iteration, the topic model places each word in the corpus in random categories. With each subsequent iteration, the topic model compares the statistical probability that the words will occur near each other and rearranges the categories so that the words that are most likely to occur together fall under the same category. This process produces the topics—a set of words most likely to appear together across the corpus.
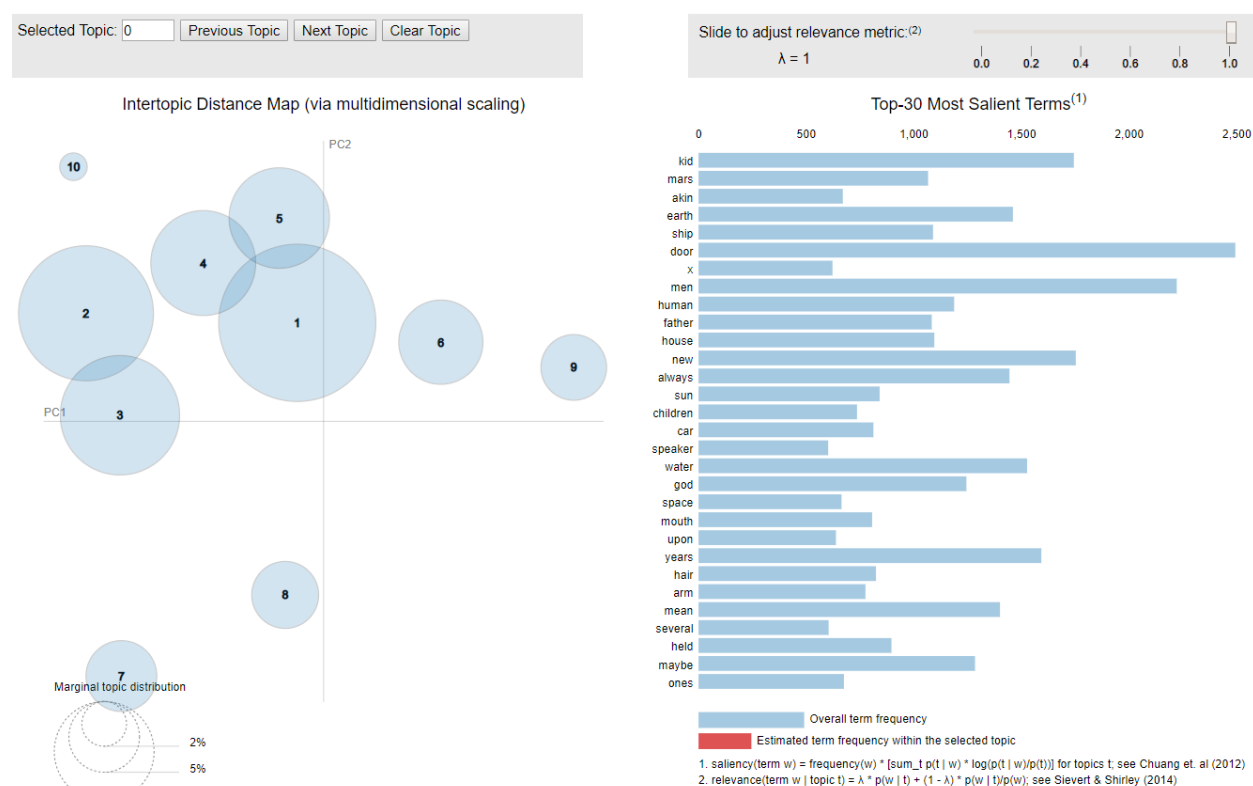

Figure 1:

An Example pyLDAvis Visualization of Topic Model Results

The topics can then be analyzed in terms of the entire corpus, or they can be traced back to the documents which are statistically likely to contain those topics. There are several

mathematical models for topic modeling, although latent Dirichlet allocation (LDA) topic modeling is the most commonly used in the humanities. When using pyLDAvis, a Python library with tools to assist in visualizing LDA topic model results (see Figure 1 above), the topics are displayed as circles of various sizes on a graph. The axes are PC (Principal Component) 1 and 2, which are compressed, numerical representations of a given number of components found during the topic model process. Therefore, topics in the first quadrant are positive for both PC1 and PC2, while topics in the third quadrant are negative for PC1 and PC2. The distance between topics indicates how closely related those topics are, and the size of the circle indicates what percentage of the corpus consists of the words within that topic. Along the right side is a list of the words contained in the selected topic, organized from most to least relevant as calculated by pyLDAvis.

An example of the results a researcher may find using topic modeling, Mark Algee-Hewitt explores themes within paragraphs. His hypothesis is that, as paragraphs are divided according to theme, "they would have a higher 'thematic focus' than the abstract textual segments that were routinely used by topic modeling researchers," a hypothesis which he found consistent with his results (Algee-Hewitt et al. 71). Algee-Hewitt found that paragraphs do tend to concentrate themes, and that these themes are computer readable through topic modeling. For example, he found common thematic paragraphs such as "'marriage and expectations' (*Middlemarch*), 'entering a house' (*Villette*), and 'direct, emotional communication' (*Adam Bede*)" (Algee-Hewitt et al. 74). As shown through Algee-Hewitt's methodology, the topic model finds a set of words (for example, "mind," "marriage," and "husband") which are most likely to occur together in the text. The topic model then returns those words, and the researchers interpret the strongest thematic connections between those words.

I used topic modeling to examine the texts of three corpora, with each text divided into chapters: post-apocalyptic science fiction, post-apocalyptic science fiction narratives which contain memory and materiality, and the two previous corpora combined. I analyzed the results from these three topic models to see if the second corpus had a higher instance of memory and materiality topics than the other corpora. I also examined the other topics in terms of their relationship to memory and materiality, to see if the computer uncovered any connections a traditional literary analysis might miss. During this process, I aimed to discover how physical objects might embody cultural memory in a way that makes those memories legible or illegible to unfamiliar cultures, and how those cultures interpret and use those objects.

Although topic modeling can be manipulated to outline a specific theme (such as memory and materiality) through corpus curation, there are limitations to the themes topic modeling can read and the corpora that produce meaningful results. Topic models cannot display topics that are implied, but which do not appear on the page. Topic modeling works best on relatively large data sets and can produce inaccurate or unhelpful results with smaller data sets. The researcher's decisions can also have a profound impact on topic model results, including corpus curation, the number of topics generated, and the number of times the model passes over the corpus to sort words. Afterwards, the researcher must also interpret the results, and interpretation can vary from person to person. However, in literary studies, interpretations often begin with observations or pre-determined questions, before the introduction of evidence from texts and theory. A topic model is only a place to begin, and some of its limitations can be reduced or removed through the analysis of texts once the topic model has produced ideas.

Results

      As expected, grouping the texts into corpora based on genre had a significant effect on the topics and the most relevant terms within those topics. The complete corpus topic model, which uses all general post-apocalyptic novels and all post-apocalyptic novels with major themes of memory and materiality, resulted in topics such as mechanical terms (topic 1: earth, course, machine, matter, power), environmental description terms (topic 2: across, side, feet, city, water, wall), and community terms (topic 6: children, human, water, food, house, village; see Figure 2 below). These topics make sense for a loosely curated science fiction corpus. Although post-apocalyptic science fiction takes many forms, many texts will have similar concerns, such as losing or attempting to regain power, the decay of machines, and rebuilding communities. The general post-apocalyptic corpus topic model contains topics such as esoteric terms (topic 1: world, old, great, light, god), space travel terms (topic 3: earth, course, children, ship, planet), and natural competition terms (topic 6: human, animal, test, hunter, killed). The difference in topics suggests that texts that do not focus on memory and materiality themes have instead philosophical and religious themes or adventure themes, whether in space or the new wilds of earth. Apart from a few scattered words across topics, memory and materiality terms do not appear in the topic model results for the complete corpus or the general post-apocalyptic corpus.
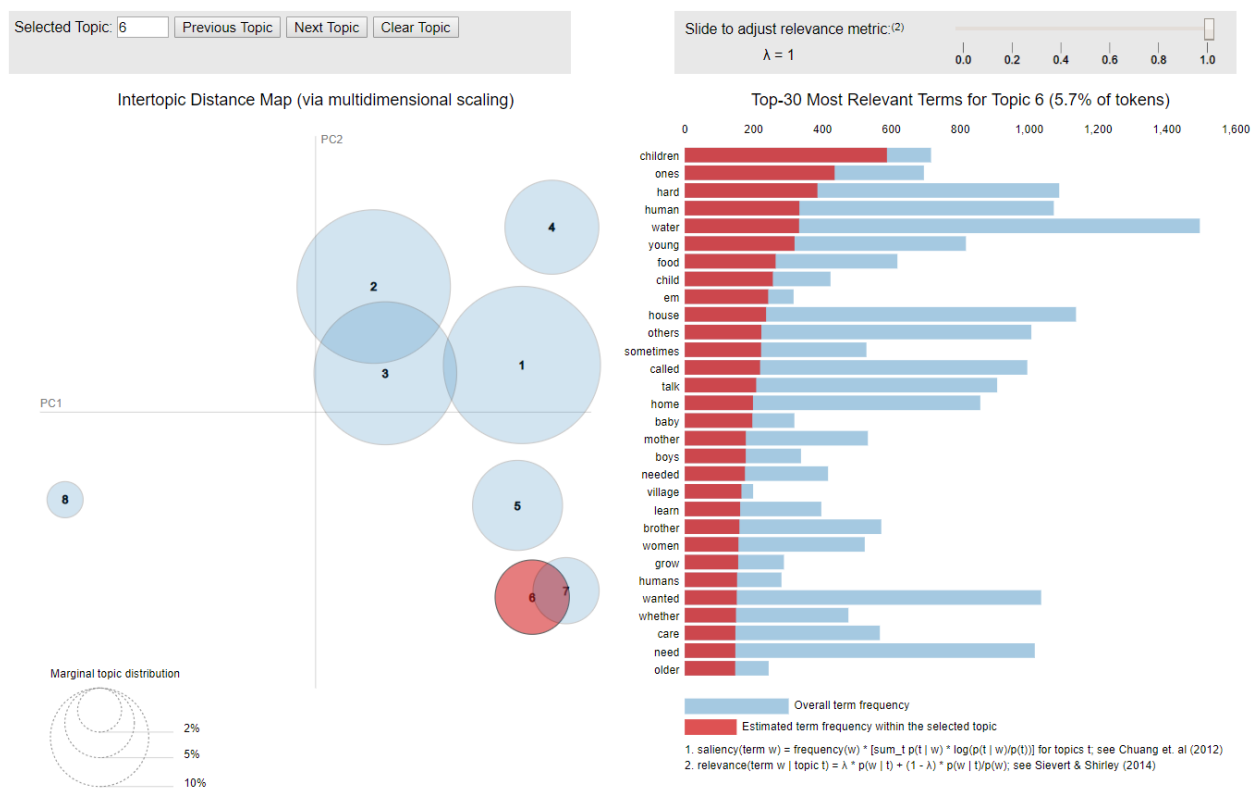
Figure 2:

pyLDAvis Visualization of Combined Corpus with 8 Topics, Topic 6 Selected

In the topic model results for the corpus containing texts more deeply concerned with memory and materiality, topic 7 (see Figure 3 below) includes words closely related to materiality, time, and memory. Topic 7 is separated from the rest of the topics in the chart, suggesting that the concentration of words that make up that topic 7 do not overlap with the sections that make up the other topics in the texts. These words suggest the transmission of information to a younger generation. The most relevant word is "children," and so children are the most common significant connection between the chapters containing topic 7. Many of the words relate to documents (book, words, story, read), and several are related to time (year, age, days, future, longer). The words in topic 7 come together under the topics of children and pedagogy. Many of the words are future-oriented—year, wanted, needed, future, grew—

suggesting the goal-oriented nature of the teaching, while also emphasizing the documentation of the past for future generations—book, words, story.
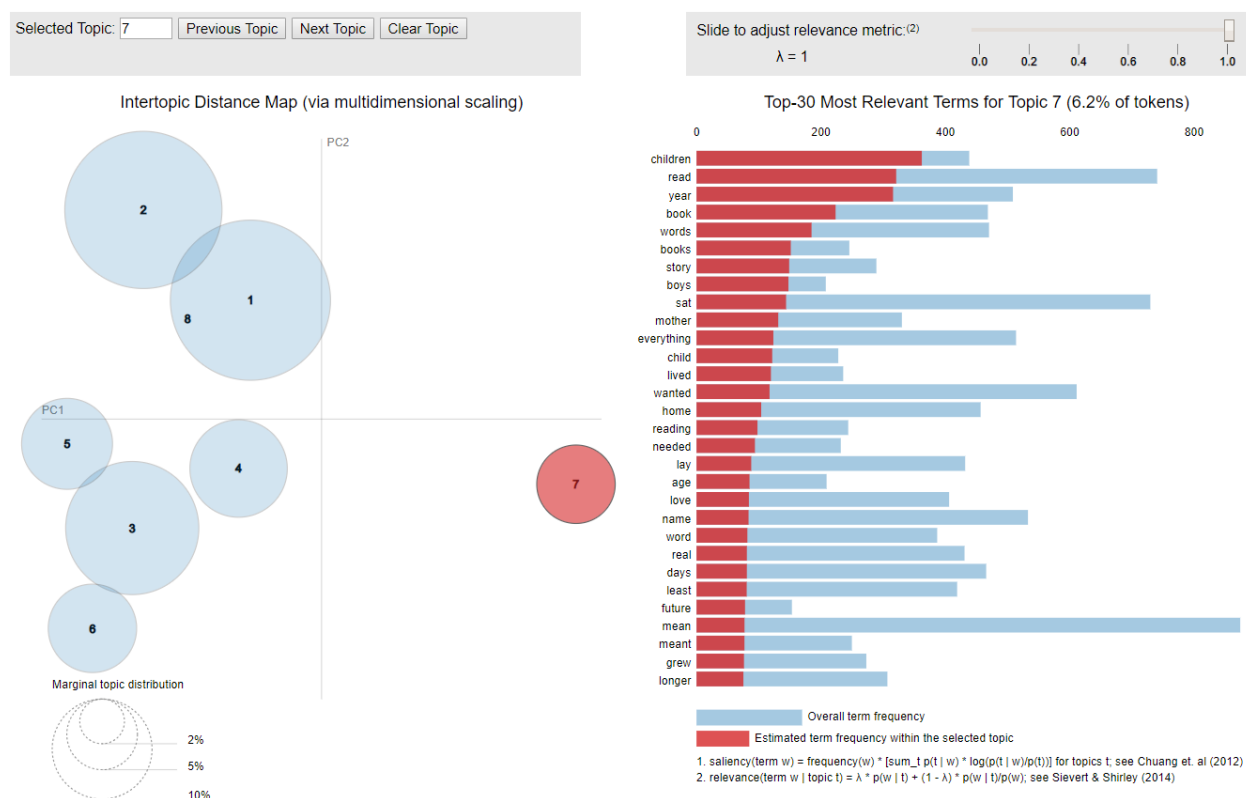

Figure 3:

pyLDAvis Visualization of Memory and Materiality Corpus with 8 Topics, Topic 7 Selected

Once I had a list of terms that appear frequently together within the corpus texts, I needed to find those sections in which the terms appear. To do this, I wrote a program that goes through each text document, counts each appearance of a word within a given list, calculates what percentage of the document consists of the words in the list, and returns the documents with the highest percentages of words. From this process, the ten chapters with the highest percentages of words from topic 7 were from two novels: *Earth Abides* by George R. Stewart and *Galatea 2.2* by Richard Powers. Now that I knew which chapters in which books contained the highest concentration of memory and materiality terms, I read and compared those chapters to the themes of memory and materiality in *Canticle*.

Earth Abides by George R. Stewart is a post-apocalyptic novel in which most of the population of the United States dies from disease. A graduate student in geography, Isherwood Williams, survives, founds a community, and feels he must pass on academic knowledge to the next generation as technology and modern life slowly come to an end. The younger generations slowly turn toward more practical knowledge suited to their environment and forget the trappings of the past. *Earth Abides* shares a few common themes with *Canticle*: the need to pass on memories that a new world will not understand, drastic changes in cultural context, and legends and superstition taking the place of science and scholarship. Unlike *Canticle*, the audience for memory transmission is clear. The children in Isherwood Williams' community survive and have the resources to learn history, math, geography, and all of the other subjects Isherwood teaches. In *Earth Abides*, the problem is one of context. Knowing pre-apocalyptic society and its skills does not help the community survive in the encroaching wilderness but finding water and safe food sources is vital.

Galatea 2.2 by Richard Powers is a pseudo-autobiographical novel in which a writer, named Richard Powers, returns to his alma mater to write a novel as the Humanist-in-Residence for the Center for the Study of Advanced Sciences. However, he's not able to write beyond the first line. Instead, he finds himself involved in a study in which he must teach an artificial intelligence, named Helen, beginning with canonical works of literature and then moving on to current events. Helen, after learning about the violence of reality, decides she does not belong and asks Richard to experience the world for her. While in *Canticle*, the unfamiliarity between cultures is due to time, *Galatea 2.2* presents the communication of human culture to a non-human AI. Like *Canticle*, *Galatea 2.2* is concerned with canonization, legitimacy, and the influence of cultural memory on relationships between beings. Richard transmits cultural

memory to an artificial intelligence—metaphorically a child, as the AI is at the beginning of her life—through pedagogical methods. The AI reads texts and current events and discusses the philosophical implications with her teacher. These same pedagogical methods are lacking in *Canticle*. Any character who learns must guide their own studies, and there are no children to learn and eventually continue the cycle of teaching.

Back to *Canticle*

The words in topic 7 and comparison with *Earth Abides* and *Galatea 2.2* suggests a gap in *Canticle* which has so far remained unstudied in the scholarly literature on the text. Because the word "children" is the most common connection in sections concerned with transmitting memory, the topic model suggests that most texts with themes of cultural memory and materiality have a clear audience for those memories. The next generation learns the lessons of previous generations, which continues a cycle of memory transmission. This cycle does not exist in *Canticle*. No one in the novel teaches and children do not play a significant role in the book until the very end, when they are included in a mission to save a small number of people and the Memorabilia from the second nuclear war.

Children are mentioned throughout *Canticle*, but they are far more commonly metaphorical children than literal children. The text most commonly uses the word "children" in the phrases "children of the fallout" and "the Pope's children." Both phrases refer to people born with significant ill-effects from radiation, whether physical or mental. The Pope's children are considered the end of the genetic line and the cultural memory cycle. Humanity in general, and the monks more specifically, are also referred to as children who are unworthy of carrying the message of the Memorabilia. Abbot Paulo opines the "forty generations of us monastic ignoramuses, *children* of dark centuries, many, entrusted by adults with an incomprehensible

message, to be memorized and delivered to other adults" (Miller 155, italics added). They are

children, but children incapable of growing and learning. They cannot understand the

significance of the Memorabilia, but they must find those who can so the cycle of cultural

memory can begin again.

Only twice are the children in *Canticle* actual children. Both instances occur in Book III,

after the first bomb of the second nuclear war has been dropped and there is no hope to end the

conflict. Children playing in a yard notice Benjamin and call him Lazar, making reference to the

story of Lazarus, a cycle of death and resurrection. The second group of children are "twenty

children from the Saint Joseph school," who the monks bring along on the *Quo peregrinatur*

grex mission to Alpha Centauri, in an effort to preserve humanity and the Memorabilia (Miller

284). The Leibowitzean monks are the only future-oriented faction within the text. Their

foresight in including children in their mission is only one example of the monks' responsibility.

The monks consider themselves part of a chain, not just individuals. They know that in years,

decades, or centuries, another monk will take up their unfinished work, and so providing for the

future is vital. The other factions, in contrast, desire immediate power, whether that is through

Hannegan's spread across the continent or Taddeo's search for notoriety. The Memorabilia has

fallen to the monks because only they are willing to work toward a future they will never see.

Once the lack of children in the text is made explicit, the relationship between the

Memorabilia in Books I and II and euthanasia in Book III becomes clearer. In Books I and II, the

factions which have the opportunity or resources to pass on cultural memory—the government

and the scientists—fail to do so. In Book III, it is too late to take up this cause, as represented by

the refugee mother and baby. The baby does not have a chance to grow old enough to learn the

lessons of cultural or communicative memory because it will either die from radiation poisoning

as a result of the atomic bomb or from euthanasia to prevent suffering from the radiation poisoning. Memory fails not only because of the way the government officials and scientists consume material memory, which leads to large-scale violence, but also because of the way they fail to transmit memory. The Leibowitzean monks are the only future-oriented group in the text, but they do not have the resources to communicate their message of cultural memory—both the scientific knowledge of pre-war society and the moral strength to use it responsibly.

The failure to transmit cultural memory also highlights connections to one of the only specific texts Miller references in *Canticle*, *RUR* by Karel Capek. *RUR*, a science fiction play written during the 1920s, also concerns itself with the failed transmission of information through writing and anxieties about future generations. In the play, robots take over the world from their creators, leaving only one human, named Alquist, alive. Alquist was the chief of construction for Rossum's Universal Robots, the company that created the robots. Alquist must recreate the formula for creating robots so that any life, even non-human life, will be able to continue, but he only has the scientists' notes from which to work, which makes his task impossible: "Damned science! Imagine not writing it all down! Gall, Gall, how were the Robots made? Hallemeier, Fabry, Domin, why did you take so much away in your heads?" (Capek 71). As with *Canticle*, the texts in *RUR* fail to transmit the information they need to; they were written to communicate to a certain set of people, and once those people are gone, their texts are useless. Miller gives the Leibowitzean monks the two things Alquist needs to fulfill his task—time and a next generation to hear the message.

Canticle is a cyclical text, a text of renewal and transmission of memory, but there are few children and there is no pedagogy. The lack of children in the text is odd both in comparison to similar texts, as discovered in topic modeling, and in the process of cultural memory. The

most obvious use of materials containing cultural memory is to teach the information to children, so those children can use, develop, and pass on those ideas later. This is the one cycle *Canticle* is missing. It is the one cycle that would end the seemingly inevitable destruction and rebuilding. If the monks could transmit their concern for humanity's future and their knowledge of the past outside the boundaries of their abbey, the world would have a chance to end humanity's drive toward self-destruction. As Abbot Paulo says, "Neither infinite power nor infinite wisdom could bestow godhood upon men. For that there would have to be infinite love as well" (Miller 238).

Conclusion

Topic modeling reveals the norms of a set of texts, and comparison between the corpus and a main text can highlight the fissures within that norm. Although literary theory also has other purposes, one function of theories is to point out the trends in literature, the implications of those trends, and where those trends fall apart. Topic modeling could therefore be a useful tool for applying literary theory to large sets of texts, a way of reading outside of Paul Ricoeur's hermeneutics of suspicion, which Rita Felski argues is "not always the best tool for the job" (8). Topic modeling and other digital methods have the same ends, but different means, as a computer is unable to approach a text "against the grain and between the lines" (Felski 1). Felski coins the term *postcritical reading* for these alternative methods that approach a text exactly as it is on the page. When studying a text using mathematical models, the researcher must use postcritical reading to some degree, even if the researcher returns to critical reading later in their project.

Reading a text both out of context and without suspicion allows the researcher to rekindle a context that the dominant narratives of history might otherwise overshadow. Taking a text out of context allows the researcher to find new significance and relevance for the text's impact

throughout history and for the modern day, as texts "speak to, but also beyond, their own moment, anticipating future affinities and conjuring up not yet imaginable connections" (Felski 159). *Canticle* speaks to its own time as a rumination on the disastrous potential of nuclear war and the question of how to maintain cultural memory when nothing is left, but the novel has gained additional meanings over time, and those meanings are no more or less significant than those gained from the book's original context.

Although Felski does not apply postcritical reading to computer text analysis, her theory also demonstrates the value digital methods bring to literary studies. She argues that critical readings of texts—in which the scholar must fight against the obvious, surface meanings of the text in order to find the truer, hidden meanings—are only one way to understand literature. Literary study's sole focus on criticism prevents it from seeing other methods that do not approach texts in an adversarial manner. Topic modeling is one such method because it finds only what is present in the explicit language of the text. Along these lines, Andrew Piper writes of topic modeling as an expansion in spatial terms. Topic modeling "allows us to envision how figure and concentration serve as an essential foundation of human thought, and that their opposites, dispersion and formlessness, are equally essential for the process of intellectual change" (Piper 70). Topic modeling turns texts into networks of ideas, accentuating connections the researcher might miss because they are hidden or too obvious to notice. Approaching texts solely through context and suspicion means the researcher can only ask certain types of questions and find certain types of answers. Incorporating new contexts and new methods, like quantitative and visual models, enables connections between texts, time periods, and ideas that might be overlooked in traditional criticism.

Literature, as a part of the social world, "is not a preformed being but a doing, not a hidden entity underlying the realm of appearance but the ongoing connections, disconnections, and reconnections between multiple actors" (Felski 158). As culture changes, so will readers' relationships to texts from the past—just like the understandings the characters in *Canticle* have toward the Memorabilia, and just like today's reader will have to digitized, recovered texts. Readers already think with "temporal interdependency without telos, movement without supersession" and scholarship can gain more complexity by understanding that "pastness is part of who we are, not an archaic residue, a source of nostalgia, or a return of the repressed" (Felski 158). Texts are more than words on a page. For the reader and the author, they are conversations with other texts, arguments with family members, half-remembered stories, anxieties, and obsessions, trends and reactions against trends. In other words, they are cultural memory changing over time, and digital methods allow researchers to visualize these conversations with a scale and precision impossible otherwise.

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