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2019

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Geneseo Recognizing Excellence, Achievement, & Talent is a college-wide symposium celebrating the creative and scholarly endeavors of our students. In addition to recognizing the achievements of our students, the purpose of GREAT Day is to help foster academic excellence, encourage professional development, and build connections within the community.

Established in 2009, *The Proceedings of GREAT Day* compiles and publishes promising student work presented at SUNY Geneseo's GREAT Day symposium. The projects, presentations, and research included here represent the academic rigor, multidisciplinary study, and creativity of the students taking part in the SUNY Geneseo GREAT Day symposium.

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2019

Interview with Stephanie Singer

Nicole Callahan

Stephanie Singer, PhD, an elections and government data expert, delivered the keynote lecture, "Democracy: Your Path to Power," at GREAT Day 2019.

Why did you agree to be keynote speaker?

Well, it's quite prestigious and it pays well, [laughs]. When it's not too mercenary, I have a lot of things to say, and I love to have an audience that wants to hear them. I was very excited to talk, especially to a college audience, because I used to be a college professor myself and I really miss the energy.

You've done a lot of things in your life, and you spoke about them in your keynote. Why did you decide to discuss democracy and power at GREAT Day?

Democracy and power has been the theme of my work for over a decade. My actual paid work is a small corner of that, because that's where my skills are most valuable. I have technical skills so I work on the technical part of it, but it's a theme that is in everyone's life. I tried to say what might be most useful for people to learn.

You spoke from the heart and were clearly passionate about the subject. Do you think that personal drive is important in everything you do?

There are a lot of different ways to live, right? Almost everyone has passion. For some people it's quiet, for some people it's about personal things like friendships, family, and it stops in the home. There's nothing wrong with that, but when you can find work and ways to spend your days doing something you're passionate about, it's a great way to live.

I think that's a big part of what makes GREAT Day what it is. So what was your experience like at GREAT Day?

It's amazing! It was so fun, and it was more than that. It was really lovely to feel recognized for what I've done, because I don't always feel that way. It was an honor. I was quite nervous, and I was so flummoxed by having the microphone in both hands. It was such a gorgeous day and I met so many lovely, interesting, connected people.

How do you think your talk went over, did you feel the level of engagement was what you wanted?

I think so. It's so hard to tell. When you're talking to a group, if it's dead you can tell, this was not a dead group. So definitely people were engaged and they asked really interesting questions afterwards. They even laughed occasionally, so that was good! The audience was really good.

For events like these there is often a keynote speaker, what purpose do you think a keynote speech serves on days like GREAT Day?

To wake you up after lunch. Well, what's the purpose of a day like GREAT Day? From the college's point of view, they want to connect all the students and faculty emotionally to the college. They want a community, and part of that community is common experiences. Like how do you go from freshman year when you first meet people and there's a sort of discomfort to being a friend? I think it's common experiences that hit you both emotionally. You organize things to do with people you don't have a connection to yet, but if you go through something (major or minor) together, those are the kinds of things that connect you. GREAT Day is actually pretty diffuse, you have all these posters and even if you go to the same poster session you're looking at different posters from other people, you go to different presentation sessions. So the keynote is the unifying moment.

Preaching Mysticism from the Margins: A Queer Analysis of Margery Kempe

Sakshi Kumar

sponsored by Lydia Kertz, PhD

ABSTRACT

The landscape of the European Middle Ages presents an explicitly gendered and social homogeneity, but this is not to say that there were not figures who defied communal expectations. Drawing on scholarly research surrounding gender and sexuality in the Middle Ages, I argue that we can and should examine these deviating figures through both a historical and contemporary understanding of the term "queer," with consideration to the multitude of identities the term encompasses. This paper pays particular attention to the narrative of 15th-century Christian mystic Margery Kempe. *The Book of Margery Kempe* traces her journey as a mystic and prophet and the discord between her and several people and institutions. By applying a broad understanding of queerness to Kempe's character, we see how Kempe's identity as "this creature" becomes both the cause of her social exile and a tool to legitimize herself.

The term "queer," as we know it today, can be misconstrued as solely a sexual marker, one which is synonymous to homosexual. This is inaccurate, however. Queer is a term that encompasses a spectrum of significance with regards to sexual and social roles. It allows for flexibility in personal identification and sexual desire. Historically, the word queer was adopted into people's vernacular as early as the 16th century with the denotation of something "strange, odd, peculiar, [or] eccentric," the same definition found in the *Oxford English Dictionary* today ("Queer," 2018). Since before the 16th century, sexuality was publicly homogeneous. Any person exhibiting some sort of identity or behavior outside of the gender binary was socially ostracized. In terms of sexual identity, anything other than heterosexual relations for the sake of procreation was considered a sin (Zeikowitz, 2002, p. 67). If we look at queer as something that is strange and unconventional, anything that falls outside of the norm of the Middle Ages, presents, by definition, as queer. In this paper, I discuss this unconventional behavior that unsettles the homogeneity in Medieval literature, particularly in the case of Margery Kempe in *The Book of Margery Kempe*. Living in the 15th century, Kempe exemplifies behavior that does not always correspond to her gender identity—marking her with a

"queerness," or a sort of eccentricity. This causes trouble for Kempe, as she is outright casted off by many of the communities she comes in contact with. Although the term queer does not get linked to sexuality until much later, I also explore the sexual side of queer identity in *The Book of Margery Kempe* and the language surrounding the characters that encapsulate this identity. I propose that we, as readers, can interpret medieval figures as queer both through a historical lens and a contemporary lens. More specifically, Kempe embraces queer qualities that are communally rejected and subverts this rejection by using her queerness as a tool of empowerment.

The communities around Kempe loathed her, particularly the men. Among the multitude of possible reasons, one stands out: Kempe enters and inhabits many male-dominated roles and expectations.

While much of this behavior comes after she begins her endeavor to become a holy woman, Kempe exhibits a social dissidence from the beginning of the narrative. When Kempe initially proclaims her exclusive service to God, she decides that she will change neither her demeanor nor her social conduct. Readers are first introduced to Kempe as a garish figure, one with "gold pipes on her head" and cloaks "laid with divers colors between the dags" (Kempe, n.d./2001, p.8). She is aware of the rumor mill that surrounds her and the fraternal disdain toward her, yet Kempe refuses to "leave her pride nor her pompous array" (Kempe, n.d./2001, p. 8). She is ostracized right from the start, as women of this time were expected to dress in a subdued manner and manifest "passivity" especially in the presence of men. This is part of what dictates their "social approval" (Seale, 2018, para.1).

Kempe's pastoral calling—to step into a role of male authority—adds to her non-normative, queer expression, as well. When Kempe, executing God's will, orders a poor and sick man by the name of Richard to "lead [her] to Rome" in exchange for a reward, he refuses, replying "no, damsel. I know well your countrymen have forsaken you, and therefore it would be hard for me to lead you" (Kempe, n.d./2001, p. 56). Although her reliance on a man reinforces her expected gender role, Richard's response sheds light on the condemnation Kempe receives for her eccentric ambitions. Scholar Lynn Staley compares Margery Kempe to Julian of Norwich, a Christian anchoress, claiming that Kempe's invasion and self-proclamation as spiritual prophet was sinful, and those actions would have her "suspected of heresy, possibly of treason" (Stately, n.d./2001, p. xi). Women were not entitled to any sort of autonomy or privilege at this time, and to assert herself as a religious prophet stepped far outside her expected social role. This echoes the claim made by scholars Amy Kaufman and Paul Sturtevant (2018), that "men were conquerors, women were conquered" (para. 6), in sexual, religious, and economic senses.

Staley's translation selects language that echoes into Kempe's pilgrimages. Once she embarks, Kempe's pilgrimages include her preaching the gospel and advising individuals in the communities on the way. However, much of her preaching is perceived as soapbox lecturing, which leads to outside resistance and vilification. When Kempe

arrives in Bristol, the community loathes her so much that they "scorned her and despised her, banned her and cursed her, said much evil of her, slandered her, and accused her of saying things which she never said" (Kempe, n.d./2001, p. 78). When she goes to the Archbishop's chapel in York, the men there do not believe in Margery's visions, and they call her "lollard" and "heretic," swearing "many a horrible oath that she should be burnt" (Kempe, n.d./2001, p. 91). The men in the chapel also refuse to help her, as they have heard ill information regarding Margery, many declaring her a "right wicked woman," as they doubt her Christian faith (Kempe, n.d./2001, p. 92). As she arrives in Hessle, she receives no support for her gospel. Upon arrival, a friar insists that she be imprisoned immediately for her 'hoax' (Kempe, n.d./2001, p. 95). Kempe is told that she is "the greatest Lollard in all this country" (Kempe, n.d./2001, p. 95). She is then ushered through a crowd of people to the Duke of Bedford, and while walking, is assaulted with insults and threats from both men and women alike. The women "came running out of their houses," screaming, "burn this false heretic" (Kempe, n.d./2001, p. 95). Her preaching the word of God, as a woman, is far from expected social behavior at this time, causing her reputational decay. Reinforcing queerness or anti-normative behavior, the men in Beverly tell her, "Damsel, forsake this life that you have, and go spin and card as other women do, and suffer not so much shame and so much woe" (Kempe, n.d./2001, p. 96).

Kempe's social performance is not her only queer trait; neither is it the only thing that causes trouble for her. In a few cases, bold as she is, she believes she has the liberty to behave discourteously. When she comes across a group of bishop's men, she asks them who they are. They simply respond, "the bishop's men," and Kempe, without any imposition or reason, says, "Nay, forsoothe, you are more like the devil's men," and the men become extremely angry with her (Kempe, n.d./2001, p. 80). In another instance, Kempe is about to be jailed, and a steward demands that "You shall tell me whether you have this speech from God or from the devil, or else you shall go to prison" (Kempe, n.d./2001, p. 83). Kempe responds, expressing her unwavering love for God, claiming she would not mind the prospect of jail. This exchange is repeated for several lines, until the steward calls her, again, a "right wicked woman" (Kempe, n.d./2001, p. 83). Perhaps this is not rude through a contemporary reading, but the steward is stunned by Kempe's speaking at all, and he hears her speech as "boldness," which angers him (Kempe, n.d./2001, p. 83). In a time where women's voices are intensely restricted, Kempe's sometimes-snide commentary is considered "dangerous and destabilizing" (Corcoran, 2018, para. 10). This, in turn, sets Margery apart from "normal" behavior, thus queering her.

Within a sexual realm, Kempe's assumed heterosexual identity may be one of the few expressions that denote her social sameness. However, her endeavor to become a saint, a symbolic "bride of Christ," separates her from that marker of social homogeneity and begins a chain of queer or eccentric expression. The autobiography begins with Kempe as a married mother of fourteen children; her husband is described as a "wor-shipful burgess" (Kempe, n.d./2001, p. 6). Kempe fulfills the 15th-century normative roles for women: married, a mother, a caretaker, and a domestic servant. Once Kempe

has a child, she is attacked by violent sickness and feels haunted by the devil. This leads her to abandon her role as wife and mother and bind herself to God, and God only. John Kempe, her husband, poses a hypothetical question to Margery when he asks,

> If there came a man with a sword and would smite off my head unless I should common naturally with you as I have done before, tell me the truth from your conscience… Would you suffer my head to be smote off or else suffer me to meddle with you again, as I did at one time? (Kempe, n.d./2001, p. 18)

Kempe admits almost immediately that she would much rather her husband to be murdered than to have sex with him and "turn again to [their] uncleanness" (Kempe, n.d./2001, p. 18). Her desire for a newly-chaste marriage sets her apart from her contemporaries, as women who were married were *expected* to be objects of sexual pleasure and reproduction. Her refusal have a sexual relationship with her husband imposes a threat to "conjugal debt, that is, the notion that both husband and wife had a duty to perform sexually at the request of their mate," similar to a transaction (Makowski, 1977, p. 1). He reminds her several times that she must pay off this debt to him before embarking on her pilgrimage.

In her published piece, "Her Body is the Temple of the Holy Ghost: Why Margery Kempe is a Better 'Virgin,'" writer Katharine Beaulieu (2017) suggests that Margery's attempt at renewed chastity, despite her no longer being a virgin, "undermines…constructions of virginity" (p. 90), which also marks her as an eccentric figure through a spiritual and sexual lens. Beaulieu (2017) claims that vaginal tissue represented virgin status at this time, and "could not be regained once damaged" (p. 90). Once women's virginity was tainted, there was "little [they] could do to reclaim that virginity and be seen as whole and clean in the eyes of the Church and the Lord" (p. 90). In this way, Kempe blazes an abnormal—or queer—path to chastity and to becoming a well-known religious figure.

While gendered power dynamics seem wholly against her, Margery Kempe weaponizes her queerness in a male autocracy, and, in some respects, uses her demeanor for self-empowerment. An example of something that could indicate her inferior position is that Kempe's name is rarely mentioned in the book. In place of her name, the word "creature" is used throughout, a term that can have a degrading connotation when used to replace a person's name. In her introduction, Lynn Staley (2001) offers the interpretation that Kempe *knew* that if her name was written on the pages, she would not have been taken seriously (p. xi). Instead of a marker of inferiority, the use of the word "creature" becomes a source of empowerment for Kempe. It is, like Staley (2001) suggests, what ultimately gives her the "safety of distance," and allows her to "set herself up as a figure of spiritual authority" (p. xi). Staley (2001) defines "creature" as a word that "signif[ies] humankind's necessary relationship to God, the creator" (p. xxi). In spite of the many community members that condemn her, the narrative ex-

emplifies the handful of individuals who do believe in her spiritual ranking, those who buy into "the creature's" grace and proclamation of faith. Also, the word "creature" is genderless, without masculine or feminine undertones. So, while Kempe does exhibit queer behavior by attempting to access male-dominated spaces and roles, she herself does not want to be masculine. In this way, having a whole landscape of people refer to her as a creature is a source of empowerment.

Through her queer social and sexual identity, Margery Kempe also finds empowerment through her faith. During such a religiously-governed time period, a strong connection with God was deemed especially powerful. Kempe often has conversations with God, in which He advises her on what to do to achieve sainthood, and she offers her unwavering support and love for Him. Early on in the book, Kempe describes,

> This creature thought it was full merry to be reproved for God's love. It was to her great solace and comfort when she was chided and scolded for the love of Jesus for reproving of sin… She imagined to herself what death she might die for Christ's sake. (Kempe, n.d./2001, p. 23)

At one point, she envisions God nailed on the cross, and is so emotionally moved, she "cried she and wept without measure so that she might not restrain herself" (Kempe, n.d./2001, p. 52). Kempe's loud, emotional crying and weeping displays her true love of God. Kempe cries for an extended amount of time, even after leaving this sight, that "she was so full of holy thoughts and meditations and holy contemplations" (Kempe, n.d./2001, p. 53). As a testament of her reverence toward Him, "Our Lord Jesus Christ dallied to her soul that she could never express them afterward, so high and holy they were" (Kempe, n.d./2001, p. 53). Although Kempe's relationship with God is often doubted and condemned by surrounding society, God's love and intimacy make Kempe feel empowered.

Kempe serves as a monumental figure of her time. Although the medieval period seems far removed from contemporary culture, it is important to note the freedoms and restrictions on perceptions and language surrounding identity that women like Kempe faced and how they continue to impact people today. Despite the limited language available to the people of Kempe's time, does this mean that, we, as readers, should avoid exploring the possibilities of who Kempe might have been? Today, too, there is a struggle to categorize people in terms of the language we have and understand. We may not know precisely what Kempe would have wanted, but viewing her narrative through a queer lens opens up interpretations, and it allows for more understanding than her community members offered her.

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Unmasking the Southern Belle & the Black Mammy: The Intertwined and Violent Nature of Southern Antebellum Womanhoods

Krista Borst

sponsored by Justin Behrend, PhD

ABSTRACT

This essay aims to shed light on a topic that is not often talked about: violence inflicted by white women on the enslaved. The long and unchallenged ideology of paternalism only focuses on white men and lends itself to simplifying the extremely complex hierarchies at play. When studying the contours of womanhood and gender in the antebellum south, many historians revert to long held stereotypes and ignore that gender in this context is intimately tied to race relations and power that is often manifested through violence. Consistently brutalizing slaves was part and parcel of slave mistress' identity. Slavery was not left at the front door of plantation households, it was brought into the home; it cemented deeply ingrained racial and gender hierarchies that can be boiled down to the tension between black female slaves and their white mistresses. The power that mistresses could and did wield has to be acknowledged, and the seemingly insignificant ways that female slaves resisted was essential to claiming their identities as human beings and as women.

> *I do not know that her master ever whipped her, but I have often been an eye witness of the revolting and brutal inflictions by Mrs. Hamilton; and what lends a deeper shade to this woman's conduct, is the fact, that, almost in the very moments of her shocking outrages of humanity and decency, she would charm you by the sweetness of her voice and her seeming piety. (Douglass, 1855, p. 149)*

Frederick Douglass gives this account of his former mistress in his 1855 book, *My Bondage and My Freedom*. This story is important because it highlights an inconsistency in narratives of the southern belle and the dedicated house slave. When studying the contours of womanhood and gender in the antebellum south, many historians revert to long-held stereotypes and fail to acknowledge the intimate ties between

gender, race relations, and the power that is often manifested through violence. Elite white womanhood depended on casting black women as their opposite in every way, allowing themselves their entitled lives of privilege and luxury. Brutalizing slaves was part and parcel of the planter woman's identity, as they came into direct contact with slaves on a daily basis more often than the slave owners, whose overseers acted as a buffer between him and his slaves (Glymph, 2008, p. 24). This paper also examines ways black women resisted and survived their enslavement.

When reading Frederick Douglass' description of Mrs. Hamilton one might assume that only the occasional, crotchety old mistress behaved in such an 'evil' way. The idea that brutal mistresses were a small or nonexistent minority is simply false. In her essay "Mistresses in the Making: White Girls, Mastery, and the Practice of Slaveownership in the Nineteenth-Century South," Stephanie Jones-Rogers explores the ways in which planter class daughters were taught from the earliest days of adolescence how to master the art of owning human property. Jones-Rogers argues that as white southern girls aged with their slaves around them, "they developed relationships of power with enslaved people" (2015, p. 140). Throughout the years, she argues, "slaveownership became an important element of their identities, a fact that would shape their relationships with their husbands and communities once they reached adulthood" (p. 140).

One of the core themes in Jones-Rogers' work is the place that slaveholding parents had on training their children to develop their own techniques as property owners, beginning as soon as they were born. Slaveowning parents would typically assign slaves to their infant daughters, starting the conflict-filled relationship of female ownership and enslavement extremely early (p. 140). Jones-Rogers frames the plantation as a "school" for young white women, a place where they could experiment with and cement their skills as owners of human property. Jones-Rogers points out that "slaveowning parents also allowed their daughters to assume the roles of instructors and disciplinarians very early on" (p. 141).

One example of the cruelty of slaveowning women can be found in the testimony of Henrietta King, who suffered heinous abuse at the hands of her mistress and her mistress' daughter. At about eight or nine years old, Henrietta was tasked with emptying her mistress' chamberpot every morning. While doing this, her mistress also tested Henrietta's loyalty by placing a piece of candy on the counter next to the chamberpot, to see if Henrietta might take and eat it. Kept in a state of constant starvation, Henrietta could not resist the candy after a few days. When Henrietta was questioned about stealing the candy, she denied it:

> When she denied stealing it, her mistress commenced whipping her. Henrietta refused to remain still, so her mistress grabbed her by the legs and pinned her head under the rocker of her chair while her young daughter whipped Henrietta. For approximately an hour, her mistress rocked back

and forth on Henrietta's head while her daughter beat her with a cowhide. (Faust, 1992, p. 37)

This horrific incident left Henrietta deformed throughout her life, unable to even eat solid food. Apparently, the sight of Henrietta was so haunting and disturbed her mistress to the point of giving her to a female relative "who treated her kindly" (Faust, 1992, p. 37).

Stories such as this shatter the illusion of the innocent southern belle that was eerily disconnected from the bloodshed and human property ownership of her day. Further cracking the façade, Stephanie Jones-Rogers argues that even when a young mistress married, her identity as a slaveowner not only stayed fully intact, but was also strengthened. Jones-Rogers argues that "many of these women did not feel compelled to relinquish control over their slaves to spouses and male kin once they married. Instead, marriage marked a point at which their identities were fully realized" (2015 p. 143). Critical evaluation of a patriarchal, slaveholding society includes the women who contributed to it, and challenges the stereotype. When the personal, social, and economic authority that slaveholding women wielded is left out of the equation, an accurate and honest picture of the antebellum South is an impossibility.

Many written works ignore the intentional and cruel violence of white women, and they often argue that there was a camaraderie, or shared experience between black female slaves and white female slave holders. However, the opposite was more often true. For example, Marlie Frances Weiner claims in her book *Mistresses and Slaves* (1998) that the ideology of domesticity white women subscribed to logically "encouraged white women to recognize common experiences with other women. Circumstance and inclination led mistresses to intervene disproportionately on behalf of slave women" (p.121).

It is also common for the dynamics of the plantation household to be ignored, which contributed to the idea that a plantation was only the field where crops were produced. This line of thinking does not look at the domestic sphere and how members of the household, mainly women, actively upheld slavery and reinforced racialized and gendered hierarchies. This essay unravels historical stereotypes about both white and black southern women and addresses why these stereotypes were created and perpetuated. Besides analyzing stereotypes, it presents—through a new lens and a variety of sources—a more realistic view of the ways in which womanhoods played out and interacted in the antebellum South.

White Womanhood Under Slavery: The Image

What did it mean to be an elite white women in a slaveholding state? Anne Frior Scott, in her book *The Southern Lady: From Pedestal to Politics 1830-1930* (1970), explains that the ideal Southern woman was "a submissive wife whose reason for being

was to love, honor, obey, and occasionally amuse her husband, to bring up his children and manage his household" (p. 4). She explains that as the weaker sex, women were "formed for the less laborious occupations," meaning these women needed male protection to survive (p. 4). Another important distinction in elite Southern women was their sense of superiority and their ability to lead others to be more morally upstanding.

Thomas Nelson Page writes that the Southern lady's "life was one long act of devotion—devotion to God, devotion to her husband, devotion to her children, *devotion to her servants*, to the poor, to humanity" (Page, 1897, p. 38). He even goes so far as to call her "the head and font of the church" (p. 38). In general, many contemporary scholars uphold the ideal southern mistress and agree that many women lived up to these standards. The southern belle is too often displayed as being a true or typical depiction of the mistress, and the ways in which most elite white women fell drastically short of this ideal is not as often discussed. In reality, mistresses fell short of the southern belle stereotype in almost every way imaginable. Mistresses were often cruel and used violence to protect their privileged status. They did not share an experience with their female slaves and were not natural abolitionists. Looking at examples of extreme mistress-slave violence opens up a discussion into the contradictory nature of white southern womanhood.

WHITE WOMANHOOD UNDER SLAVERY: THE REALITY

Instead of being figures who selflessly interceded on the behalf of their female slaves, mistresses as slaveholding women wielded a great amount of power in the plantation household. Instead of focusing on a paternalistic system, where any and all power stems from the master, it is necessary to analyze the complex power dynamics of a plantation in a more nuanced way. Even if mistresses were solely confined to their domestic space, they were charged with running their households, and therefore they had direct control over the domestic slaves. Often, this was not a role of peaceful supervision, but of one fraught with whippings, beatings, and psychological manipulation. Slavery as an institution can only be enforced through continual displays of power by the planter class, and mistresses played a critical role in upholding slavery as an institution and protecting their privileged position in society.

Ex-slave Mary Armstrong, born on a farm near St. Louis, Missouri, recalls a few different instances of extremely violent mistresses of her past. On the first page of her transcribed interviews she mentions two different mistresses immediately. A heinous story unfolds with the recollection of Mary's first mistress, Polly Cleveland:

> "Old, Polly, she was a Polly devil if there ever was one, and she whipped my little sister what was only nine months old and jes' a baby to death. She come and took the diaper offen my little sister and whipped till the blood jes' ran—jes' 'cause she cry like all babies do, and it kilt my sister.

I never forgot that, but I got some even with that old Polly devil and it's this-a-way… one day old Polly devil comes to where Miss Olivia lives after she marries, and trys to give me a lick out in the yard, and I picks up a rock 'bout as big as half your fist and hits her right in the eye and busted the eyeball, and tells her that's for whippin' my baby sister to death… that old Polly was mean like her husban', old Cleveland, till she die, and I hopes they is burnin' in torment now" (1972, p. 25).

This story provides an example of a female slave fighting back, getting revenge for what her mistress did. This case in particular is interesting because when Mary told Polly's daughter, Miss Olivia who now owned her, what she did to Polly, Olivia simply replied "I guess mama has larnt her lesson at last" (Armstrong, 1972, p. 25). This suggests Olivia was well aware of her mother's slave-owning style, and while she might not have fully agreed, her mother's actions were allowed to continue unchecked. While this shows that even close relatives could show disgust at mistress' violence, that violence in many cases was still allowed to be inflicted without any repercussions.

The Black Woman and the 'Mammy': The Image

While there are many different aspects of black southern womanhood under slavery, it might be helpful to turn to what was imagined by white Southerners as the ideal of black womanhood, the 'Mammy' figure. Studying the Mammy figure helps to outline the sort of expectations female slaves were expected to live up to in order to be considered productive and successful members of society. The stereotypical Mammy figure typically consists of a large black woman past her childbearing years who is solely dedicated to the white family in her care, specifically the children. The most important characteristic of the Mammy was her imagined asexuality. Author Deborah Gray White makes a radical claim about the Mammy figure in her book *Ar'n't I a Woman: Female Slaves in the Plantation South* (1999), stating that:

> As the personification of the ideal slave, and the ideal woman, Mammy was an ideal symbol of the patriarchal tradition. She was not just a product of the 'cultural uplift' theory, she was also a product of the forces that in the South raised motherhood to sainthood… Mammy was the centerpiece in the antebellum Southerner's perception of the perfectly organized society. (p. 151)

Desexualizing the Mammy was a key component of her character because it meant she was not a threat to the white mistress and the issue of sexual promiscuity between black women and the master could be taken out of the equation. The Mammy was so important because she combined the characteristics of the perfect slave and the perfect woman (White, 1991, p. 61). She was the southern solution to her racial and gendered inferiorities. Because she was seen as the solution and her situation is made possible because of her forced bondage, the Mammy figure was also the perfect exam-

ple as to why slavery was necessary. White argues that "Mammy helped endorse the service of black women in Southern households, as well as the close contact that such service demanded (p. 61).

It is important to recognize that the Mammy figure was not a real person, and even if there were female slaves who fit the description, they were their own people whose sacrifices and seemingly sole devotion to their white family was a means of survival, and not a chosen way of life.

The Black Woman and the Mammy: The Reality

Playing the role of Mammy in the plantation household was only one of many different scenarios that slave women could operate under. It is critical to realize that resistance to oppression was a major part of slave women's view of womanhood. In order to gain any sense of human dignity, small acts of resistance not only undermined authority but also laid the groundwork for mobilization after emancipation. Female slaves' resistance, refusing to work or working very slowly, was a very common interaction that put mistress and slave in a struggle for power. Black women knew that their labor was a commodity white women needed, and they used that to their advantage in order to reclaim time and energy for themselves.

In order to get a better sense of how female slaves felt about their mistresses, it is necessary to turn to first-hand accounts. Harriet Ann Jacobs, born in 1813 in Edenton, North Carolina, escaped from slave labor and became a public speaker and activist. Harriet's grandmother was the daughter of a planter and a slave woman, and Harriet describes her in a way that is similar to the figure of the Mammy when she writes, under the pseudonym Linda Brent, "She became an indispensable personage in the household, officiating in all capacities, from cook and wet nurse to seamstress" (Jacobs, 1861, p. 3). Harriet notes that her grandmother worked overtime selling baked goods and other food to save money to buy her children's freedom. This demonstrates that Harriet's grandmother's priority was providing nourishment and safety for her own children, and not that for the white family that owned the plantation. When Harriet's uncle, her grandmother's son, was sold, her grandmother had money saved to put towards attempting to buy him back. However, this money was used for another purpose, as it was taken from her by her mistress:

> She had laid up three hundred dollars, which her mistress one day begged as a loan, promising to pay her soon. The reader probably knows that no promise or writing given to a slave is legally binding; for, according to Southern laws, a slave, *being* property, can *hold* no property. When my grandmother lent her hard earnings to her mistress, she trusted solely to her honor. The honor of a slaveholder to a slave! (Jacobs, 1861, p. 3)

It is important to note here the direct use of the term slaveholder Harriet uses to describe her grandmother's mistress. She never groups masters and mistresses into different categories of authority, she refers to them both equally as slaveholders and god-breathing machines. She is careful to document in her autobiography how it was her grandmother specifically who provided for her needs, not her mistress, which clashes with the still widely held belief that mistresses were the head of an extended family who took pains to provide for her slaves.

RESISTANCE OF FEMALE SLAVES UNDER MISTRESS' OPPRESSION

One of the defining characteristics of slavery in general is slave resistance to the system that oppressed them. While what history remembers is often large-scale uprisings led by black men, it is also important to analyze the daily, micro-resistance that female slaves participated in. Female slaves defiantly resisting their mistresses exposed the cruelty of their mistress' behavior and cracked the façade of the romanticized plantation household.

Mistresses painstakingly detailed in their journals the harrowing task of 'training' their female slaves and how often their slaves defied them. Tryphena Blanche Holder Fox, a slaveholding mistress born in Massachusetts, complains about the work ethic of her slave Susan in her diary:

> Susan goes by fits and starts—good three or four weeks & then so ugly & contrary that an angel could hardly keep mild & pleasant. To-day it has been a push, hurry, push, to get the washing anywhere near done & though it is four o'clock she is just hanging out the colored clothes. (1997, p. 75)

Susan also had multiple children while working for Tryphena and would refuse to work for the four weeks following a birth. She would run away often and leave her children with Tryhpena, but she would always return and maintain a slow working pace, demonstrating some mobility and capacity for manipulation.

Mistresses were affected by the pain and violence that surrounded them, and often saw slaves as a burden. Even if they wished for that burden to be removed from their lives, they would never relinquish the core belief of black people as an inferior and servile class. A main concern that mistresses voiced in their personal diaries was the strain that the management of slaves placed on them personally. So, when historians claim that white southern women were natural abolitionists, what they mean is white southern women wanted to be free from seeing and interacting with black people while also demanding their labor.

Amelia Akehurst Lines, a slaveholder who was also born and raised in the North, reveals her hatred unabashedly, writing: "We have eaten our share of negro filth. Anna

and I do *despise* the race. I wish the abolitionists had to eat sleep and live with them. until they had enough of their 'colored brothers and sisters'" (Lines & Dyer, 1982, p. 192).

White and black womanhood in the antebellum South is a complex and deeply interconnected entity that can be difficult to navigate. Above all, planter class white women in many cases wielded authority over their plantation household and also upheld the institution of slavery forcefully, through brutal acts of violence. The plantation household brought the white mistress into constant contact with domestic slaves, who were typically women. Unmasking the still prevalent stereotypes of docile and well-cared-for slaves and ornamental southern belles is necessary to attempt to have a more realistic sense of how southern gender hierarchies actually operated. Planter women's entire identities rested on the fragile idea that they were entitled to control black female labor. This put limitations on female slaves' ability to create spaces for their own needs and the needs of their families. Thavolia Glymph, author of *Out of the House of Bondage: The Transformation of the Plantation Household* (2008), puts it very succinctly when she writes:

> White Southerners measured themselves partly in the distance that separated them from enslaved (and free) black people. Southern white women were expected to measure that distance in their gentility and in certain habits—order, punctuality, and frugality. Black women represented the obverse of all these things, which is why mistresses could rail about the inefficiency of slaves even when they in fact completed their work. (p. 74)

Not only did the female slave have to be weary of sexual assault from masters, overseers, and other slaves, but they also needed to live up to the impossible standards of their mistresses. White planter women could sometimes find themselves in positions of real authority over other human beings, and as people they were largely interested in protecting their privileged place in society. If planter women's identities rested on subjugating black women, and black women were constantly resisting oppression, that means that on the whole black and white southern women were in a constant state of conflict and struggle.

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Effects of a Ketogenic Diet on Stereotypic Behavior in Mice

Molly Brady

sponsored by Allison Bechard, PhD & Terry Bazzett, PhD

ABSTRACT

Stereotypic behaviors are repetitive, invariant, and purposeless actions resulting from central nervous system dysfunction. As one of the diagnostic criteria for autism, stereotypic mice have been used as a model for investigating mechanisms underlying autism. The ketogenic diet (keto diet) is a high fat, low carbohydrate diet that changes the body's main source of energy from glucose to ketones. It has numerous beneficial effects, including reducing self-directed repetitive behavior and increasing sociability. In this study, aged mice were fed a keto diet for seven weeks to assess its effects on stereotypic behavior and sociability. Home cage observations for stereotypic behaviors and a three-chamber social assay were used to evaluate behavior before and after administration of the keto diet. Brains were processed for immunohistochemistry of Delta-FosB, a transcription factor produced from chronic activation of striatal neurons. The keto diet decreased stereotypy across the test period, however, social behavior did not change significantly. Immunohistochemistry of ΔFosB in the nucleus accumbens was inconclusive and warrants further investigation.

INTRODUCTION

Stereotypic behavior is highly repetitive, purposeless actions and is seen in human disorders such as autism spectrum disorder (ASD), as well as in caged animals. Stereotypy can result from an underlying central nervous system disorder or pharmacological treatment with stimulants, and is often associated with neurological changes in the basal ganglia (Phillips et al., 2016). The rise in prevalence of autism has increased the need for mouse models to investigate mechanisms and treatments. As autism has a complicated symptomatology, using rodent models to analyze core behavioral symptoms such as excessive motor movement, reduced sociability, and abnormal development can lead to insights regarding underlying pathology and potential treatments (Bey & Jiang, 2014).

The keto diet has gained attention in recent years due to a wide variety of associated health benefits. A keto diet is characterized by increased fat and protein consumption and decreased carbohydrate intake. Practical use includes enhanced weight loss, decreased

epileptic seizures, decreased risk of cardiovascular disease, and increased sociability in ASD individuals (Gogou & Kolios, 2018; Paoli, Rubini, Volek, & Grimaldi, 2013; Williams & Cervenka, 2017). Recent studies administered a keto diet to both ASD children and adults with significant improvements in core autistic features (Lee et al., 2019).

Ketosis is the process of burning fats for energy rather than glucose, and results from cellular alterations that lead to metabolic and behavioral changes. While the central nervous system typically relies on glucose as an energy source, lack of dietary carbohydrates necessitates an alternative energy source. Fat is broken down by the liver and astrocytes into ketone bodies (acetoacetate, β-hydroxybutyric acid, and acetone), which are then used as a source of energy for the central nervous system (Boison, 2017). As a result, brain-derived neurotropic factor (BDNF) and neurogenesis increase, while oxidative stress and neuroinflammation decrease. Cognitive processes benefit, especially working and spatial memory (Masino & Rho, 2012). Further, the keto diet leads to improved mitochondrial functioning and altered NADH dehydrogenase complex mRNA gene expression, which have implications for decreased cellular stress (Cooper et al., 2018). These findings exhibit the metabolic changes that can ameliorate neuronal loss and allow more efficient central nervous system (CNS) functioning (Wang et al., 2018).

The beneficial use of a keto diet for autism is still an emerging area of interest. While the disorder is prevalent and well-studied, the causes are still yet unknown beyond both environmental and genetic influences. Beyond behavioral deficits, autism has been associated with metabolic dysfunction and can be comorbid with epilepsy or other seizure disorders (Napoli, Duenas, & Giulivi, 2014). Thus, the ketogenic diet benefits multiple aspects of autism through similar mechanisms, leading to overall improvements in both behavioral symptoms such as social anxiety, stereotypy, and cognitive functioning.

In this study, a keto diet was administered to a group of mice exhibiting various behavioral deficits associated with mouse models of autism including stereotypical motor movements, decreased sociability, and susceptibility to seizures (Bey & Jiang, 2014). The strain of mouse used, FVB/NJ, is not commonly used as a mouse model of autism spectrum disorder; however, the mice involved in the study had a history of stereotypy and antisocial behavior within the lab. Further, this strain of mice is also especially seizure-prone (Goelz et al., 1998). Thus, the combined behavioral and neurological symptoms warranted therapeutic investigation with a ketogenic diet to determine whether stereotypy and antisocial behaviors would decrease with consumption of the diet. Prior research has shown positive results in autism spectrum disorder mouse models, including increased sociability, decreased self-directed repetitive behavior, decreased anxiety, and higher nociceptive (pain) thresholds (Ruskin et al., 2013; Castro et al., 2016). However, few studies have examined the effects in older populations of mice, focusing rather on adolescent or young adult mice (Ruskin, Fortin, Bisnauth, & Masino; 2017). Regarding beneficial effects on non-stereotypic

mice, ketogenic diets have been shown to improve longevity of mice, preservation of physiological functions in year-old C57BL/6J mice, and increase locomotor activity and alertness (Roberts et al., 2017). As there is support for benefits of a keto diet in both younger autism spectrum disorder-model mice and aged healthy models, the current study focused on the potential effects of administering a keto diet to aged mice exhibiting stereotypic behavior.

MATERIALS AND METHODS

Subjects

Fifteen-month-old FVB/NJ mice (JAX stock #001800) were used in the experiment. All subjects were inbred from mice obtained from Jackson Labs (Bar Harbor, Maine). The animals were housed individually and kept under a 12-hour light/dark cycle. All animals received ketogenic paste (F3666; Bio-Serv, Flemington, NJ) in a temperature-controlled vivarium with ad libitum access to food and water. All procedures were performed in accordance with the Institutional Animal Care and Use Committee of the State University of New York at Geneseo, and were consistent with the National Institute of Health Guide for the Care and Use of Laboratory Animals.

Materials

The ketogenic diet consisted of 75.1% fat, 8.6% protein, and 3.2% carbohydrate. HealthyWiser urinalysis strips were used to ensure all animals reached ketosis. Food consumption and body weight were monitored throughout the study, and all measures were taken to minimize animal suffering.

Baseline: 3 weeks		KD Administration: 3 weeks
Home-cage Observations 2x per Week (every 3 days)	**KD Adjustment Period** 1 Week	**Home-cage Observations 2x per Week** (every 3 days)
3-Chamber Social Assay (once per mouse at the end of the three-week period)		**3-Chamber Social Assay** (once per mouse at the end of the three-week period)
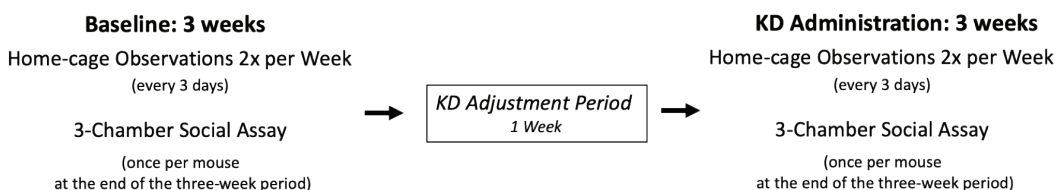
Figure 1. Methods used to investigate effects of a ketogenic diet before and after administration.

Behavioral Analysis

Mice were analyzed for overall sociability and stereotypy levels using a three-chamber apparatus and home-cage observations. All behavioral observations occurred for three weeks before ketogenic diet administration, and three weeks while consuming the ketogenic diet, as seen in Figure 1. To test sociability, each mouse underwent three 10-minute phases in which it could pass freely between chambers. Empty inverted wire pencil holders (10 cm tall and wide) were placed in the left and right chambers. In the first phase, the test animal explored the apparatus, and the wire cages were empty to account for side bias. In the second phase, a C57/BL6 mouse of the same

sex (JAX stock #000664) was placed in the wire cage within the first chamber, and the test mouse was allowed to roam and interact freely as a test of sociability. In the third phase, a second C57/BL6 mouse of the same sex was placed in the last wire cage in the third chamber to test for social novelty preference. Coders were blind to the condition.

Self-directed grooming and stereotypy levels were quantified through hour-long observational periods. Each mouse was observed for a one-minute period in succession. Each mouse was given one behavioral rating (as specified in the ethogram in Table 1), per focal period, for a total of six ratings throughout one hour. Sessions took place during active hours every three or four days over a three-week period.

Table 1
Abbreviations.

Behavior	Abbreviation	Definition
Spinning	S	Mouse turns in a complete circle at least three times in a row without stopping.
Other	O	Any other abnormal behavior repeated three times in a row without stopping; most often includes hanging from the cage top and biting the bars or backflipping.
Active	A	Any normal, active behavior, including roaming cage, eating, grooming, etc.
Inactive	I	Laying down, not moving.

Histology

After a total of seven weeks of behavioral observations, all animals were sacrificed and underwent perfusion. Four animals were transcardially perfused, while the other six were extracted and drop-fixed in 4% paraformaldehyde (PFA) for four weeks. For all brains, PFA was refreshed twice within the first 24 hours to aid fixation and transferred to 30% sucrose in phosphate buffered saline (PBS) for 48 hours before snap-freezing in isopentane. Brains were stored at -20 degrees C, then sliced at 30 µm using a Leica cryostat into wells of PBS stored at 4 degrees C.

The ΔFosB immunohistochemical procedure (using FosB Monoclonal Rabbit IgG Antibody (ThermoFisher Scientific) was obtained from relevant studies (Phillips et al, 2016; Werme, et al., 2002). All procedures were conducted at room temperature. Slices were exposed to H_2O_2 (0.3% in PBS) for 15 minutes, then blocked (PBS, 1.5% Triton X and 3% normal donkey serum) for 2 hours, and incubated in primary antibody (diluted 1:1000 in PBS with 0.3% Triton X and normal donkey serum) overnight. Samples were then incubated in biotinylated goat anti-rabbit secondary antibody (1:200, Vector Laboratories, Burlingame, CA) for 2 hours and treated with an avidin/biotin peroxidase complex (Vectastain ABC Kit, Vector Laboratories) for 90 minutes. Slices were then stained for 8 minutes in 0.06% diaminobenzidine and

0.1% H2O2 in PBS. Finally, the slides were rinsed in increasing concentrations of ethanol (70%, 95%, 100% each for one minute), dipped in xylene for 10 minutes, then cover-slipped using DPX Mountant (Fisher Scientific).

Results

Behavioral Analysis

Overall levels of stereotypy were reduced across all stereotypic mice ($p = 0.045$, n = 10) as seen in Figure 1. However, when spinning or other stereotypic behavior were examined alone, there was not a significant decline.

The three-chamber social assay did not yield significant changes in sociability with ketogenic diet consumption. Test mice preferred to spend more time with a stimulus mouse than an empty chamber regardless of diet condition ($p = 0.012$, $p = 0.005$). There was no significant preference for the familiar or new stimulus mouse in either diet condition (Figure 2). Self-directed repetitive grooming behavior also did not decrease significantly.
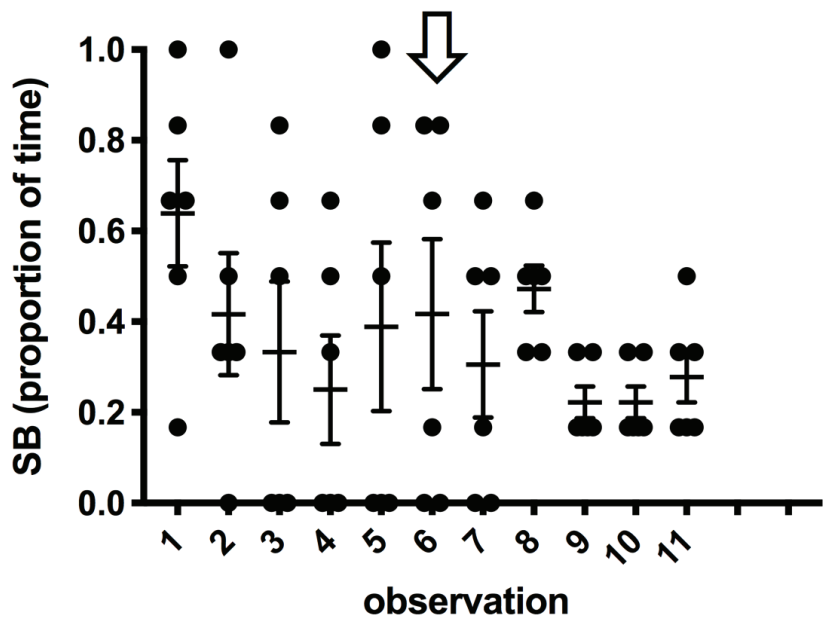
Figure 2. Overall levels of stereotypy significantly decreased with consistent consumption of KD. Arrow represents introduction of KD.
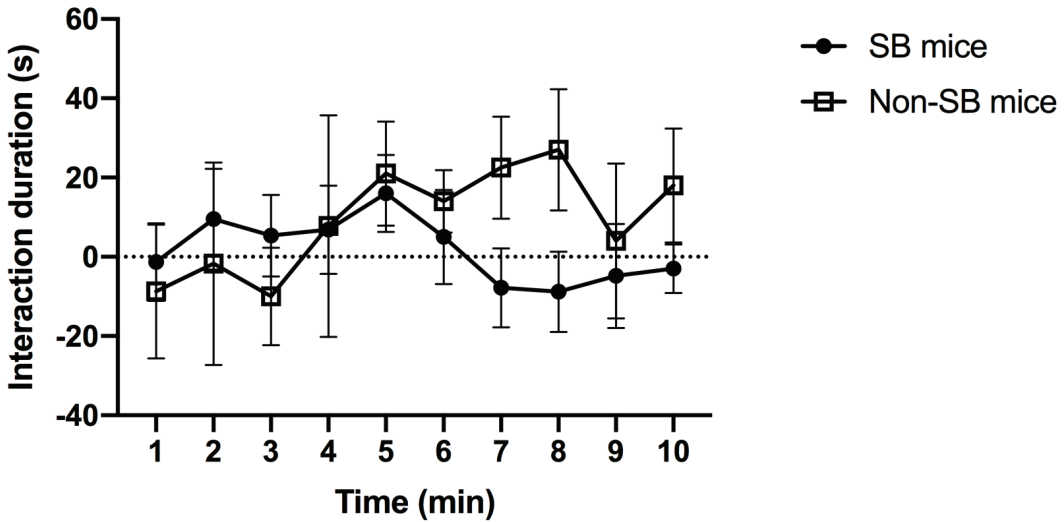
Figure 3. A delta comparison of non-significant interaction duration for new and familiar stimulus mice before and after administration of KD.
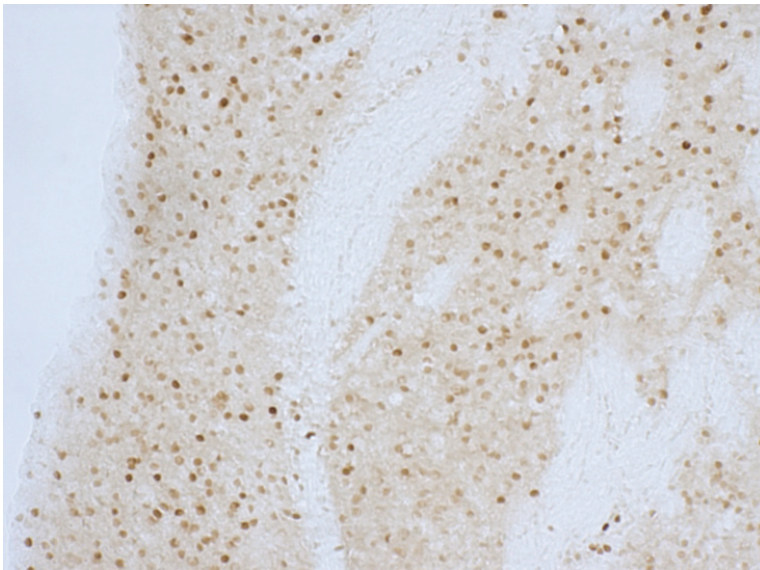
Figure 4. ΔFosB expression in the nucleus accumbens in a positive control.

Histology

Efforts to visualize ΔFosB expression using immunohistochemistry were unsuccessful due to issues with brain preservation. Positive control C57BL/6J mice of similar age were injected with ethanol (1.12 g/kg) 30 minutes prior to euthanasia, then processed with the same protocol described above. Results are displayed in Figure 4, and show successful staining of nucleus accumbens tissue.

DISCUSSION

These findings demonstrate that overall stereotypy decreased with continued consumption of a ketogenic diet. Although the sample size was small, leading to non-significant differences for spinning and all other stereotypy, respectively, a significant decrease occurred when all stereotypic animals' behavior was analyzed together. The cause of the change in behavior may have several underlying mechanisms influenced by the ketogenic diet at multiple target sites. The increase in circulating ketone bodies alters production of inhibitory neural mediators and ion channel modulators in various brain regions, which lead to decreased abnormal signaling and excess activity (Rogawski et al., 2018). Other mechanisms of interest include reduced reactive oxygen species and neuroinflammation, which may lead to increased neuronal inhibition via decreased glutamate release (Ruskin et al., 2013).

Previous studies have shown positive sociability changes in autism spectrum disorder mouse models including social transmission of food preference and the three-chamber sociability assay (Ruskin et al., 2013; Ruskin et al., 2017). Although Ruskin et al. (2017) found sex differences in sociability improvements of in the EL mouse, the current study did not find any significant sex effects (although the small sample size created excessive variance). The current study did not find any significant improvements in sociability after consumption of KD, and there may be multiple contributing factors. Social disposition is prone to impacts and influence during earlier stages in life when the brain is still developing (Verpeut et al., 2016). Thus, sociability is less likely to change as the mouse ages, and the mice in the current study were considerably old, there was likely to be less impact at such a late stage in life. Further, as sociability is a complex behavior, the sample size may have been too low to detect and significant alterations in interactions within the three-chambered test. Finally, as the FVB/NJ mouse is one of the most social species of mouse, overall sociability may have been less subject to influence by the ketogenic diet than other mouse models of autism (Bey & Jiang, 2015).

We would have expected to see heightened expression of ΔFosB in the nucleus accumbens and striatum in mice exhibiting increased levels of stereotypy compared to those who showed little or no stereotypy. ΔFosB is implicated in both addictive behaviors and voluntary movement, and thus would be expected to express in higher concentration in areas involved in movement and reward (Phillips et al., 2016; Werme et al., 2002). Thus, the basal ganglia, specifically the nucleus accumbens, are likely implicated in the observed stereotypy. The inconclusive nature of the current study thus requires replication in order to confirm behavioral findings with increased n-values and improved processing of the brains to support improved histology results.

The current research does, however, provide substantial foundation for further investigation into the neural mechanisms of a novel genetic mouse model for autism spectrum disorder. Human autism spectrum disorder can present in a variety of behavioral and developmental deficits, and the therapeutic impact of a ketogenic diet on the various aspects is still yet to be fully understood. The current findings help to bridge

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the gap between rodent research and human research, which will eventually lead to a greater understanding of why the ketogenic diet yields such success in decreasing abnormal behavior. A goal of the research is to provoke further investigation into the functional methods of the diet, which may provide insight regarding the neural basis of autism spectrum disorder itself.

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The American Modern Dancer—Loïe Fuller and Isadora Duncan

Madison Harding

sponsored by Jonette Lancos, MFA

ABSTRACT

Both Loïe Fuller and Isadora Duncan paved the way for Modern Dance in America. Bringing new and individual elements, breaking previous stylistic restrictions, and changing the look of dance in America at the turn of the 20th century, these two women are considered the forerunners of American Modern Dance. With their free and natural movements, and as well as their dance clothing, they were also able to liberate the female form from standards previously faced by all women.

At the turn of the 20th century, art pieces from Japan and Paris, changes in fashion, and new forms of architecture influenced the beginning of the new "Modern" America and American dance. Two of the most prominent and influential forerunners in the American Modern Dance movement were Loïe Fuller and Isadora Duncan. Though each was distinct in style, both spurred from natural inspirations and rejected the rigidness of dance styles that had existed before them. Fuller brought the use of colored lights on an all black stage to emphasize the dancer, and Isadora Duncan brought both free and natural movements that followed free, movable, and nonrestrictive clothing for women. These two women were both highly recognized for their talent and innovation they brought into the world of modern American dance.

Modern dance began as a form of rebellion against the strict formalism of classical ballet, and a characteristic element of its style and aesthetic is freedom (Kraus et al., 1991, p. 114). Modern dance was affected by both social, and cultural changes occurring at the time, as well as different art forms from other countries. The Art Nouveau Movement created a new style of decoration for household objects, focusing on the use of either linear patterns or sinuous curves, where both ideas also influenced the new modern dance style. In addition to this, Ukiyo-e prints, popular art from Japan, also had significant effects on the American modern dance movement. A main element in these prints, were their light-heartedness, and the qualities present in these prints, as the image was seemingly lifted from the page, creating the concept of the "floating worlds" which was then transferred into the modern dance movement through the use of free, natural, and lifted movements. As far as cultural movements and happenings in America at this time, the Physical Culture Movement, which originated with Bernarr Macfadden, focused on

a new lifestyle that emphasizes an individual's physical health and well-being. This movement then drew attention to dance as a movement-based art form.

Loïe Fuller, one of the first and most influential American modern dancers, is characterized as "the embodiment of the Art Nouveau movement" with her use of mixed media choreography. She brought many new innovations to the dance world and changed the public's view on dance as a whole. Fuller was first inspired by the way light shone in a stained glass window in Notre-Dame de Paris seemed to dance on her white handkerchief. She attempted to replicate and expand on the experiences she had with those colored lights, using a long skirt in the *Serpentine Dance* to reflect and emphasize the colored lights on stage. Fuller emphasized the importance of these lights by saying that "our knowledge of motion is as primitive as our knowledge of color." Because of these ideas, it seemed only logical to Fuller to combine these elements and focus on the dancer and their natural, free-flowing movements. Not only did her long, light reflecting skirt bring a new element to the American dance scene, but Fuller also was the first artist to drape the stage entirely in black. In doing so, she was able to center the attention on only the performer, with no other distractions (Chitwood, 2009). Also, Fuller was one of the first dancers to perform as a soloist, captivating the world with her original natural movement style, and changing the look of American dance.

Isadora Duncan, who is often recognized as the first modern dancer—despite Fuller's earlier arrival in American dance—created a significant original style of movement that is still recognized today. Duncan was born by the sea, and movement of the ocean and its tides inspired her dance style (Brown et al., 1998, p. 8). Her nature-based movement was seen both as a new form of individual expression and as a breaking away from the rigidity of the classical ballet technique, echoing her belief, "that dance should come from and be an expression of the spirit, inspired by nature" (Brown et al., 1998, p. 7). Duncan originally began her training in classical ballet, but she broke away from the technique when she thought the style did not suit her or her spirit, which then led to the discovery of her own style of movement (Kraus et al., 1991, p. 116). Not only did Duncan reject the ballet technique but also the conventional dress that came with it. She did away with the restrictive corsets, shoes, and tutus of classical ballet, and she danced barefoot with free and bare limbs in a flimsy and short Greek inspired tunic (Kraus et al., 1991, p. 117). Her free and natural movement, along with her loose and non-restrictive clothing, embodied the liberation of her spirit through her dancing, while entertaining and inspiring audiences. Another element brought into dance by Duncan, was the idea of dancing to "the accompaniment of great musical works…including many selections which had never been considered suitable for dance"(Kraus et al., 1991, p. 117). Many of these works were very large and dramatic, in the way that they were to be appreciated on their own, yet Duncan only considered the "best" musical works for her dancing, as her movements reacted to the music. With her distinct choreographic and performance style, combined with the pieces of music she chose to dance to, Isadora Duncan was able to create her own style of dance as a theater art.

Both Loïe Fuller and Isadora Duncan brought great change to the theater arts, and both are credited to the creation of American Modern Dance. Both dancers were highly focused on free, natural, and expressive movements as emotional and physical responses to music, adding to the impulsiveness of the natural movement. Another natural element utilized in either performance or choreography is "improvisation," which both Duncan and Fuller exercised in their performances, allowing dancers the ability to improvise or converse with the audience only through movement (Shawn, 1975, p. 80).

Loïe Fuller and Isadora Duncan were tremendous influences on modern dance in their time. By freeing themselves from the restrictive dance forms, both were catalysts in the birth of many new forms and styles of dance to come in the future. Their work was able to broaden the theater arts in America, as well as around the world.

Today, evidence of the work by Fuller and Duncan is still seen in all different types of dance performances. Stages today are often draped in all black, and they frequently feature colored lighting in order to complement costuming, or to emphasize the mood of the piece, both of these elements created by the work of Fuller. Modern dance was born out of the innovations of Duncan and Fuller, and thus many of their choreographic elements are still present today. Modern dance is centered around the free and natural movement of the body, largely taken from Duncan's dance style. Modern dancers perform barefoot, wearing non-restrictive clothing just as Duncan did in her time. Fuller's more "serpentine" style of movement is also very prevalent in modern dance today, as much of the style is based on circular movements. Modern dance—and dance as we see it performed today—owes a great debt to the works of both Loïe Fuller and Isadora Duncan.

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An Interview with Joseph Cope, Associate Provost for Student Success

Jaime DeVita

How would you define GREAT Day; what is it to you?

Cope: GREAT Day, I think, is a really important opportunity for the campus to push pause on the day-to-day activities of campus and celebrate and showcase all the really exciting and interesting work that students do in terms of research, creative performance, and community engagement. So it really is a showcase for the best that Geneseo has to offer. I think it's also a good way for us to demonstrate to the wider community all of the exciting things going on at Geneseo that may not always be visible, so at the department level, departments may know that they have a great cohort of students who are doing mentored research, but what GREAT Day gives us is the opportunity to showcase that to the rest of the campus, as well as to the wider community. I also think that it's important as a form of mentorship. In many cases the work being showcased during GREAT Day are culminating experiences for students. It's work that they may have been building up to in the course of three or four years, and so if we're thinking about those first-year students or second-year students who are really trying to find their place at Geneseo, or imagine what they're going to do in the future. It gives us an opportunity to show what our students are doing in really concrete ways, and start to open up conversations about pathways for other students to get involved going forward.

What does GREAT Day mean in terms of student success?

GREAT Day shows all of our students what is possible on our campus, and provides a kind of peer modeling of the really exciting things that are going on on our campus. The other thing is in the world of higher education, there's a lot of research that shows that high impact practices. Those are things like mentored research, community learning, and study abroad, that have a really big impact on students' success: their completion of a degree, their ability to find a major that's a good fit for their interests. GREAT Day gives us a chance to highlight what kinds of high impact experiences are available on campus, and build momentum for ensuring that there is equitable access to those kinds of programs, so that every student who comes here, can envision "this is the kind of experience that is maybe going to help me figure out what I want to do after Geneseo," or what my values and commitments are.

How does GREAT Day represent what is seen within the classrooms of the various fields of study on this campus?

I think one of the strengths of GREAT Day, and this has to do with the enormous student participation in it, is to really see the curriculum manifested in ways all over the events that go on during GREAT Day. So you can go from one room where Chemistry students are talking about the research that they may have done with a faculty member to a panel that's showcasing really fun INTD 105 papers, to a creative performance in the Union, and to think about academic work as something that doesn't just happen in the classroom, but that is really integrated and connected in all sorts of ways…I think GREAT Day gives us an opportunity to model that, and live it.

At last year's GREAT Day, you sponsored several students from your INTD 188 class "First Year Seminar." What do you look for in a work that deems it appropriate for GREAT Day?

I have pretty consistently tried to sponsor students since we got started with GREAT Day. In a lot of cases, in my department—which was the history department—we had a departmental requirement that any student that was doing an honors thesis, would present at GREAT Day. The idea behind that is in the history department, students who do an honors thesis spend two semesters doing a really deep dive, similar to what they would do in graduate school, and we wanted to think about that research as something that doesn't just live in a 60-page honors thesis, but as something that is shared more broadly with the community. I think part of the answer to the question is, it's a reflection of how we think about students participating; it's a reflection of this sort of "Geneseo ethic" that our research is meaningful, impactful, significant to the "real world." What we want is to work with students on thinking about ways to take what is maybe a very narrow research topic, and make it accessible to a wider audience. In terms of thinking about how you know panels are constructed it is about taking something that's really exciting and maybe innovative and giving students the opportunity to show off a little bit—the ways that they've creatively taken their learning and the skills that they've gotten from their classes, and applied it to an unstructured problem or an issue that they see as important. One of the things that we've tried to do with the student ambassadors is to give those students space to show off a project or a problem that have identified and how they applied their academic skills to that. Last year, some of the student ambassadors were working with Geneseo Central School on developing a sustainability curriculum that could be brought into high school classes. These students, who were science majors at Geneseo, had the opportunity to work closely with faculty mentors. They were then able to go out and do that in the community, and provide a real benefit, to students at Geneseo High School. What we can do at GREAT Day is show that off, and show how our students aren't confined by the curriculum, but are actually doing what we expect people to do with a Liberal Arts degree—to take those skills and those competencies and that learning, and apply it in new contexts.

You have been a faculty member at Geneseo for almost 20 years, how has GREAT Day changed throughout your years on this campus?

I was actually here before there was a GREAT Day. When I arrived here at Geneseo there were a variety of different, largely disciplined-based opportunities to showcase work. In the humanities we had the "Humanities Undergraduate Paper Symposium" that would run annually, and the idea was the humanities disciplines could nominate students or panels to give a set of presentations. Similar things were happening in the sciences, in the social sciences. Around my fifth or sixth year at the college, we pooled all those together into GREAT Day, and the idea was rather than sort of focusing what's going on in the humanities specifically or what's going on in STEM fields specifically, let's have a day at the college where everybody can come together, and put a pause on the academic calendar, and really celebrate learning as it's manifested across campus. It's changed over the years; first in the scale of it. The fact that we had more than a thousand students last year who participated in GREAT Day—those numbers are off the charts. That means that almost a fifth of Geneseo students are doing something on GREAT Day, and the range of projects that are presented at GREAT Day I think has evolved in really interesting ways. So a lot more creative work, a lot more opportunities for performances, the ways that the Insomnia Film Festival has now appeared as the end-of-the-day activity on GREAT Day—we have an opportunity to look at what Geneseo students are doing creatively in digital media. The other thing that I think has been really powerful over the last five to seven years is the way that the GREAT Day keynote speaker has, I think, been selected with care, to model that liberal arts ethic of learning applied to the "real world." So we've had opportunities to hear from people who are involved in direct scientific research—journalists on the ground during Hurricane Katrina and the experiences that had associated with that. I think that the GREAT Day keynotes are really reflecting that ethic of the liberal arts environment in really powerful ways.

How has your perception of GREAT Day changed since becoming an administrator?

I don't think it really has. I think as a faculty member, you would come out and make sure that to announce to classes that GREAT Day is not a "day off," it's a day where we expect students to be engaged with the work of their peers. If anything I think the lens shifts a little bit in my current role because of my focus on student success, so I might think about GREAT Day a little bit differently than as a history faculty member, showcasing the work—the really inspiring work—that my students are doing. Now I think of it, in that bigger picture, how does this also support the principles that we're trying to advance at Geneseo in terms of building students who are equipped to function in a world full of complicated problems and where they're really going to be pressed to apply their academic skills and knowledge to those kinds of problems. So, I don't think my overall attitude to GREAT Day or my impressions of GREAT Day have changed much, but my sense of the scale and significance has shifted.

Land Rights and Regime Change: Trends in Mapuche Territorial Conflict from 1970 to Present

Cecilia Brey

sponsored by Karleen West, PhD

ABSTRACT

The Mapuche people are an indigenous group located in the Southern Cone region of South America with a strong claim to their ancestral lands in south-central Chile, especially in the Araucanía region. Historically, relations between the Mapuche people and the Chilean government have been poor, marked by conflict relating to territorial claims, natural resource extraction, and violence against Mapuche activists. This paper examines both present-day and historical conflicts between the Mapuche people and the Chilean government since Salvador Allende's presidency in 1970. I analyze how regime change and neoliberal economic policies have affected Mapuche mobilization strategies, the efficacy of these efforts, the government's handling of environmental conflict, and economic activity that has led to overexploitation and ecosystem damage in Mapuche lands.

INTRODUCTION

In Chile, conflict between the state, corporations, and indigenous groups has mirrored the oppression of ethnic minorities ubiquitous in Latin America. The Mapuche are Chile's largest indigenous group, and they have strong ties to their ancestral lands in the Araucanía region in Chile and in parts of southwestern Argentina. They have struggled with issues regarding social justice, state recognition of their ethnic identity, and the politics of resource and territorial control (Dillehay & Rothhammer, 2013). Their territory is economically valuable, due to its richness in natural resources and agricultural suitability. Since Chile's independence, Mapuche lands have been encroached upon to the point where current populations are restricted to only a small percent of their original territory. Historically, they have received few protections from the state, and the ones that are written into law are often poorly enforced.

This paper explores the nature of territorial conflict between the Mapuche and the Chilean government, from 1970 to present. During that time, Chile experienced rapid regime change from a Marxist government, to nearly two decades of authoritarian military rule,

to a shaky period of democratization. Indigenous rights were not a priority of any Chilean regime and indigenous groups have been victim to discriminatory practices that affect their livelihoods. However, the extent of land encroachment, legal protections, and indigenous mobilization strategies varied between regimes. In the 1970s, the treatment of indigenous peoples became gradually more progressive until they were completely reversed during the military regime. Relations between the state and the Mapuche remain poor to this day. In response, the Mapuche have developed a dynamic series of mobilization and organization strategies to demand land and justice from the Chilean state.

DEMOGRAPHICS AND GEOGRAPHY

The Mapuche are the largest indigenous group in Chile. Their name indicates an intrinsic relationship to the land, as the word "Mapuche" means "People of the Land" in their native language (Minorities in Chile, 2019). As of 2019, about 1.3 million Mapuche people live in Chile, making up about 84% of Chile's indigenous population and about 9% of Chile's total population (MRGI, 2019). A high percentage of Mapuche live in urban areas, especially in the capital city of Santiago. The majority of Chilean Mapuche who live in rural areas are concentrated in their ancestral territory, Chile's Araucanía region, located in the south-central part of the country. The Mapuche and their subgroups used to occupy a more extensive area, but their territory has been systematically reduced as a result of intervention by the Chilean state (Azócar et al., 2005). Today, the Mapuche occupy only 5% of their ancestral territory (Carruthers & Rodriguez, 2009). Migration to urban centers is a consequence of poor economic opportunities and lack of livable space due to land encroachment. The Araucanía is also one of the poorest regions of Chile despite the abundance of natural resources. (Azócar et al., 2005). In Mapuche communities, healthcare and education opportunities are poor, crime rates are high, and infrastructure is limited compared to the rest of the country (Dillehay & Rothhammer, 2013). The lack of opportunities in the region is an indication that the Mapuche receive very few economic benefits from natural resource extraction.

ORIGINS OF LAND CONFLICT

Historically, the Mapuche have dedicated themselves to agriculture (MRGI, 2019). Before Chilean conquest, the Mapuche organized their land with a common property system, where each community occupied a specific place of governance under a community leader called a lonko (Azócar et al., 2005). After Spanish conquest, the Mapuche enjoyed relative territorial autonomy from the colonial state as a result of the 1641 Treaty of Quillín with Spain, which designated the Biobío River as the border between Chile and Mapuche territory (Carruthers & Rodriguez, 2009). This colonial autonomy, which was highly unusual for a Latin American indigenous group, continued until several decades after Chilean independence. However, in the 1880s, conquests of Mapuche land officially began as a result of Chile's changing economic interests (Carruthers & Rodriguez, 2009). Lands were taken by means of violence

and fraud, both by the Chilean state itself and by neighboring private landowners, mainly for the purpose of establishing medium-to-large scale farms (Richards, 2013). Over the course of the next thirty years, the Mapuche were regulated to small *reducciones* (reservations), granted to them by collective land titles (Di Giminiani, 2013). However, valuable pieces of these designated lands were raided and taken as well (Richards, 2013). Chile sought an assimilatory process of 'respectful integration' of the Mapuche in Chilean society, which downplayed indigenous culture and emphasized the European nature of Chilean history and institutions (Carter, 2010). As the Mapuche gradually lost claim to their land and became subordinated, stigmatized, and forgotten, they became progressively poorer and more disadvantaged than the rest of Chilean society.

As a response to Mapuche resistance of land conquests, Chile's attitude toward the Mapuche became more negative (Richards, 2013). The media began to portray them as primitive, uncivilized beings who were incapable of fully exploiting their lands, so it was up to the Chilean state to do it for them (Richards, 2013). The state used this utilitarian argument to justify these conquests. Chile saw Mapuche territory as a new source of land, labor, and markets to boost agricultural exports and alleviate economic crises (Kowalczyk, 2013). The emergence of Chile as a land-developing agrarian society created the illusion that most of Mapuche lands were empty and unused. Chilean politicians went as far as calling their territory a "land without people and owners," although it was strategically utilized and maximized by the Mapuche to the best of their abilities (Azócar et al., 2005, p. 58). The belief that the Mapuche were not making adequate use out of their territory fueled the desire to encroach upon it, an argument that remained a driving force behind future land claims.

REASONS AND CONSEQUENCES OF LAND EXPLOITATION

Since Mapuche territory became part of the Chilean state, natural resource abundance combined with the lack of consultation with indigenous groups resulted in land overexploitation and damage. Until the mid-twentieth century, Mapuche lands were exploited mainly for agricultural purposes (Richards, 2013). However, from the mid-20th century to present, the Mapuche have been fighting to protect their land from other large-scale industries, including agribusiness, mining, fossil fuel extraction, and hydroelectric dam construction (Torres-Salinas et al., 2016). Mining is a lucrative industry in Chile, and reserves of gold, silver, copper, and coal exist in Mapuche territory (Environmental Justice Atlas, 2019). Chilean mining companies currently operate under Pinochet-era laws that allow them to use the land without government interference and with disregard to indigenous land claims (UN Human Rights Council, 2018). Mining can result in air pollution, biodiversity loss, disruption of water systems, and soil contamination, all of which can cause food and water scarcity and a variety of other health problems (Environmental Justice Atlas, 2019).

Because of the spiritual significance of rivers and the extent of environmental impacts, the Mapuche have been at the forefront of the fight against hydroelectric dam construction in Chile. The hydroelectric dam sites in the Araucanía present a threat to indigenous economies through biodiversity loss and displacement due to flooding and the disruption of natural flows of water (UN Human Rights Council, 2018). Mapuche tradition views river and stream networks as the veins of Mother Earth and a representation of life itself, so the spiritual significance of rivers is impacted when their flows are disrupted (Brady, 2018). Like mining companies, large hydroelectric companies have a monopoly on rivers in the region, and Pinochet-era laws facilitate encroachment (Brady, 2018). Chile has been attempting to incorporate hydropower into its national energy plan, but projects are developing more slowly than anticipated due to unexpected environmental and geological impacts (Brady, 2018). Frequent protests by Mapuche activists and other indigenous groups are also slowing the development of future hydroelectric projects in Chile.

Forestry is the most important industry in the Araucanía and is perhaps the most destructive ecologically and culturally, and the majority of Mapuche activism focuses primarily on removing forestry companies from the region. There is significant overlap between forestry and Mapuche lands, since about 57% of forestry plantations in Chile are located in the Araucanía (Torres-Salinas et al., 2016). Like other large-scale industries, forestry has severe cultural and ecological impacts. In the decade between 1997 and 2007, the total area of forest near the Biobío River decreased by 22% (Torres-Salinas et al., 2016). Some of the claimed lands were either deforested for timber or cleared and converted into monoculture tree farms (Torres-Salinas et al., 2016). The removal of native forests and cultivation of non-native species is especially harmful to the landscape. For example, the cultivation of eucalyptus trees in the area is a large contributor to water scarcity, as eucalyptus absorbs huge amounts of water from the ground (Torres-Salinas et al., 2016). The availability of groundwater is important for rural Mapuche communities, since only small-scale water infrastructure is available and these sources are susceptible to contamination and over-extraction (Torres-Salinas et al., 2016). Tree plantations apply pesticides to their crops by plane, which poisons water resources and livestock (Kowalczyk, 2013). Community displacement is also an issue as residents near forested areas are forced to relocate to more isolated communities in the mountains to make room for these companies. The destruction of native plants as a result of large-scale farming prevents spiritual rituals and traditional medicine from being practiced as traditional plants, trees, and herbs become scarcer as non-native species become more common (Moloney, 2010). Overall, the development of industry in Mapuche land has resulted in negative impacts on health, land value, and water and food resources, further exacerbating issues of poverty and scarcity. Mental health issues, such as depression, stress, and trauma, have been increasing in these communities as a consequence of poverty and the loss of self-autonomy that result from the loss of their lands.

The Allende Years (1970–1973)

The presidency of Salvador Allende began during the final years of a period of optimism for the Mapuche and other indigenous groups in Chile. Allende was one of the founders of the Chilean socialist party and the head of Chile's left-wing Popular Unity coalition (Tedeschi et al., 2014). In 1970, he became the first democratically elected Marxist president in Latin American history after four previous unsuccessful runs (Tedeschi et al., 2014). When Allende entered office, he advocated for profound economic and social change focused on improving the seven conditions of the poor and decreasing the role of private property and foreign investments (Tedeschi et al., 2014). His presidency came on the heels of Chile's Agrarian Reform Period (1962–1973), which was designed to redistribute lands back to indigenous groups and non-indigenous poor rural landowners (Carruthers & Rodriguez, 2009). Allende promised to bring an end to Chilean *latifundios* (large privately-owned plantations), whose tremendous political influence kept them from expropriation under previous presidents (Winn et al., 1974). The reform was enacted in response to the increasing protests of Mapuche and peasant groups, who felt distanced from national politics as a consequence of early 20th-century land usurpation (Carruthers & Rodriguez, 2009). The continuation of the Agrarian Reform placed the Popular Unity government in an especially favorable light, especially since the highest amount of land was redistributed between 1970 and 1973. Around 20,596 hectares were redistributed during President Eduardo Frei's administration from 1964–1970, but by comparison, 152,418 hectares were expropriated during Allende's brief period in office (Carter, 2010). Part of the reason why the majority of land redistribution occurred under Allende was due to the lifting of some protections the reform had on wealthy landowners, lowering the amount of land they were allowed to retain before redistribution (Winn et al., 1974). On the surface, Allende's continuation of the Agrarian Reform marked a sign of progress in terms of indigenous territorial rights and a sign that their demands were finally being acknowledged.

Although the Agrarian Reform did redistribute some land back to indigenous communities, the main goal of the reform was to strengthen the rural farming society without any particular consideration of ethnicity (Azócar et al., 2005). While left-wing groups were relatively sympathetic to the struggles of indigenous peoples, they tended to see their problems in terms of poverty and other problems common to all landless or subsistence peasants (Carter, 2010). The regime did not recognize that indigenous groups have ancestral ties to the land that non-indigenous peasants to do not. Consequently, this view tended to result in the government overlooking indigenous demands and created a kind of racism that saw Mapuche communities as backward, primitive, and in need of Marxist enlightenment (Carter, 2010). Although this reform was seen as a step forward in terms of indigenous territorial rights, there was strong opposition from wealthy landowners, who believed that the regime was infringing upon their rights and liberties by seizing and redistributing their land (Winn & Kay, 1974). Consequently, some accounts from this time period paint a picture of a virtual civil war between wealthy landowners and indigenous and peasant collec-

tives, noting that lands were not always turned over peacefully and landowners often inflicted violence upon neighboring indigenous groups (Carter, 2010). The Agrarian Reform generated some optimism, but ultimately Mapuche communities still felt like their needs were not completely being met.

The nature of the Agrarian Reform made the Mapuche appear as passive recipients of government policy, but they grew more active in the Chilean political sphere during this time period. The response to the shortcomings of the Allende regime marked a change in Mapuche identity, political participation, and mobilization strategies. The Mapuche began to reject the concept of 'respectful integration' into Chilean society perpetuated by elites and non-indigenous Chileans. Instead, they moved toward a new approach based on protests, demands, and alliances with non-indigenous working-class groups (Carter, 2010). Mapuche activists determined that the best way to achieve their people's demands was through a broad class-based alliance with the non-indigenous working poor (Carter, 2010). This relationship was merely a strategic one, since the Mapuche still did not have a lot of trust in left-wing political organizations, viewing them as manipulative and ignorant of their circumstances (Carter, 2010).

An example of this attempt to create a class-based alliance occurred in 1973, when Rosendo Huenuman, a Mapuche activist, launched a successful campaign that landed him a position as a member of Allende's Congress (Carter, 2010). Huenuman was a union representative who was appalled by the cruelty and injustice committed by landowners when expelling indigenous peoples from their reservations (Carter, 2010). He joined the Communist Party because he believed that mainstream party structures were the only way of securing the demands of his community (Carter, 2010). When elected to Congress, he presented a motion to include financing in indigenous land demands, but his own party voted against him, convincing him that mainstream politicians are inherently racist against indigenous peoples despite their broad claims that they are allied with all working-class and marginalized groups. Overall, there were other instances that pointed to the limitations of an alliance with the left, such as the regime's failure to recognize indigenous political participation and self-determination (Richards, 2013). Toward the end of the regime, there were anti-Communist sentiments being expressed in Mapuche communities, and their distrust toward the Chilean state continued.

Spontaneous organization and protest flourished during the Allende period, not only by the Mapuche, but also within many other social sectors, including peasant and student groups (Carter, 2010). The Mapuche alliance with non-indigenous organizations continued within their protests and social movements, both violent and non-violent. In the 1970s, members of Mapuche community joined a leftist guerilla student organization called MIR (Movimiento de Izquierda Revolucionaria, or Revolutionary Left Movement) to reclaim original Mapuche land that had been taken by one of the region's most prominent families (Carter, 2010). The armed Mapuche and MIRistas worked side-by-side to launch several campaigns to reclaim the land. One Mapuche member of the organization, Rafael Railaf, notes that the word *campesino* was chosen

instead of Mapuche because "we thought if we struggled alone, we would be weak, because we were very few, we weren't millions like the winka [Chileans]" (Richards, 2013, p. 58). The government intervened on the side of the Mapuche and provided them with financial and technological assistance to start a collective farm on the land (Carter, 2010). This was also part of the state's controversial and widespread efforts to force collective production practices upon the Mapuche (Richards, 2013). The Mapuche did achieve success and unexpected government support through this alliance, but their indigenous identities continued to be ignored and marginalized.

Despite the prominence of class-based alliances, the Mapuche did continue to organize as Mapuche during this time period by placing strong emphasis on indigenous identity. National Mapuche congresses held in 1969 and 1970 laid the groundwork for a new indigenous law. This law was passed under Allende in 1972, which marked the first time that indigenous peoples were legally recognized as existing independently of their lands, created the Institute of Indigenous Development and a promise to restore more Mapuche lands (Richards, 2013). This legislation, combined with the regime's land reform efforts, would be some of the last positive advancements in favor of Mapuche territorial rights before the 1973 regime change.

The Pinochet Years (1973–1990)

On September 11, 1973, General Augusto Pinochet seized power from Allende in a military coup (Tedeschi et al., 2014). Allende was found dead soon after (Tedeschi et al., 2014). The coup was facilitated mainly by international funding and internal instability. The United States was suspicious of Allende's regime and gave millions of dollars to his political opponents, including Pinochet (Tedeschi et al., 2014). In addition, factional divisions within the Popular Unity coalition, the growing opposition from the Chilean center and right, and economic instability also contributed to Allende's fall (Tedeschi et al., 2014). Once in power, Pinochet immediately established a military junta, suspended the Constitution, dissolved Congress, imposed strict censorship laws, and outlawed all left-wing political parties associated with Allende's Popular Unity coalition (Richards, 2013). Pinochet was most infamous for launching a campaign of terror against political opponents and anyone perceived as leftist, where offenders were incarcerated, brutally tortured, and executed (Richards, 2013). Because the Mapuche were part of an ethnic minority and had a tendency to ally themselves with left-wing parties, they received treatment similar to anyone associated with the left. An estimated forty-one Mapuche were executed by the regime and another eighty disappeared and were likely killed (Carruthers & Rodriguez, 2009). One member of a Mapuche community recounts that elite landowners who supported Pinochet often suspected their Mapuche neighbors of supporting Allende and held them at gunpoint whenever they tried to walk across their property (Carruthers & Rodriguez, 2009). The Mapuche immediately found that the new political atmosphere would reverse any progress they had made to gain political and territorial recognition.

Pinochet ruled Mapuche territory with paternalism and repression. The regime was especially intolerant of activist organizations whose leaders resented the loss of their lands to outside companies, which was the common cause among many Mapuche activists during this time (Carruthers & Rodriguez, 2009). Pinochet initiated an Agrarian Counter-Reform, which rapidly returned recovered lands from Mapuche communities back to wealthy landowners (Carter, 2010). By the end of this period, only 16% of Mapuche land that had been recovered before the military regime remained in the hands of Mapuche communities (Carter, 2010). The regime issued a decree that facilitated the division and sale of Mapuche lands by eliminating historic land grant titles and replacing them with individual property deeds (Carter, 2010). This meant that land could be sold to non-indigenous buyers after twenty years, although buyers got around this through loopholes, such as renting out lands on a ninety-nine year lease (Carter, 2010). This way, land could be withheld and exploited for indefinite amounts of time.

In 1975, Pinochet instituted a series of neoliberal economic reforms known as the "Chilean Miracle." These reforms had the aim of creating a "rightest shrunken state with extreme free market capitalism" (Richards, 2013, p. 71). This was characterized by an export-based economic strategy that emphasized the importance of natural resource extraction (Richards, 2013). In the Araucanía, an area rich in natural resources, this meant an increased focus on farming and timber for export and greater competition from foreign agricultural corporations (Richards, 2013). Forestry was especially important, and the regime enacted measures to continue the rapid expansion of the industry even though it was being halted by the presence of Mapuche *reducciones*, especially in the Araucanía (Kowalczyk, 2013). Pinochet's decrees included Forest Ordinance 701, which provided subsidies to forestry plantations under the pretext of reducing erosion, giving the National Forestry Corporation control of Mapuche lands (Youkee, 2012). Subsidizing the forestry industry was a direct contradiction of the neoliberal ideal that the government should remain hands-off with respect to economic affairs, suggesting that the potential for economic growth was more important than strictly following neoliberal ideals. By this time, much of the land that had been returned to local farming elites or deeded to corporations became pine and eucalyptus farms, providing a foundation for the industry in the region (Newbold, 2004). However, this destroyed native species and further reduced Mapuche land holdings. Although timber became the most important industry during this time period, wheat farms and the early stages of hydroelectric plants were also industries that received attention and resulted in the encroachment and loss of indigenous lands (Richards, 2013).

As a consequence of the fear that Pinochet instilled among political dissenters, the ability to voice opposition to the regime was limited. In addition to this fear, the regime introduced a strict anti-terrorism law to eliminate Pinochet's political opponents, so any public opposition to the regime could be condemned as a "terrorist" action (Terry, 2019). The anti-terrorism law permitted the state to use a military court for civilian defendants, allowed undisclosed witnesses to present evidence without

challenge from the defense, and allowed defendants to be convicted of a crime based solely on witness testimony (Akhtar, 2013). Additionally, the law permitted judges to keep Mapuche individuals in jail longer than the three-month limit established for other Chilean citizens (Terry, 2019). This severely limited activists' right to a fair trial and allowed the regime to quickly eliminate anyone suspected of political dissent. The law is still in use today and condemned by international human rights organizations for limiting civil liberties.

The Pinochet regime marked a change in the treatment of indigenous groups by the Chilean state; during the Allende years, indigenous issues tended to be forgotten or ignored, but the Pinochet regime took a more blatant anti-indigenous stance by which indigenous groups were more severely hurt by new legislation. Neoliberal reforms promoted globalization and cultural homogeneity, which hurt the importance of ethnic identities within Chile (Kowalczyk, 2013). The regime's attempts to terminate the Mapuche as a people acted as a unifying force among them, strengthening their Mapuche identity and giving way to new cultural organizations that simultaneously defended Mapuche communities and promoted Mapuche culture (Carter, 2010). The Mapuche protest strategy shifted from making demands and pressuring authorities to deliver to promoting organization among Mapuche communities to resist the Chilean state (Carter, 2010). Because Chile was under a dictatorship, the Mapuche could no longer participate in politics through alliances with political parties (which had been completely abolished) nor could they rely on government response as they did during the Allende years. Instead, movements focused on building Mapuche culture as a way to rebuild solidarity and generate the strength to resist the oppressive regime.

The Mapuche developed strategic alliances with civil society organizations and advocacy NGOs, offering workshops, legal advice, and initiatives to promote rural development (Carruthers & Rodriguez, 2009). As the movement to strengthen Mapuche identity continued, a number of Mapuche cultural societies were developed during the Pinochet regime. For example, the Centros Culturales Mapuches (later Ad-Mapu) was created in 1978 to provide a platform to discuss cultural, socio-economic, and political issues within Mapuche communities and provided a base for new Mapuche movement organizations (Akhtar, 2013). It was formed legally because it publicly stated that it was apolitical, but they had a hidden agenda of opposition to the dictatorship (Carter, 2010). Ad-Mapu marked a turning point in Pinochet-era Mapuche mobilization during a march on May Day in the early 1980s. All of the participants were Mapuche and affiliated with Ad-Mapu, and none were from the trade unions or workers' movement, reflecting a move away from the previous strategy of class-based alliance (Carter, 2010). Due to the regime's tendency to exile political dissenters, the Comite Exterior Mapuche was formed in 1978 by Mapuche exiles in Europe to facilitate community mobilization from overseas. The Comite eventually evolved into Mapuche International Link, which still exists today and continues to promote the interests of indigenous peoples in Chile from abroad (Mapuche International, 2019). These organizations marked a turning point in Chilean identity politics and demon-

strated innovative ways of generating solidarity against an oppressive regime without generating suspicion or negative attention.

1988 Plebiscite and Mapuche Voting Behavior

The 1980 Constitution created by Pinochet's regime provided for a plebiscite in which voters could decide whether or not Pinochet would serve another term (Puddington, 2019). The plebiscite was held in 1988, and 55% of voters rejected the possibility of Pinochet being in power for eight more years (Puddington, 2019). A newly elected president and Congress would replace Pinochet in 1990 and Chile would begin its process of democratization. Some Mapuche viewed the plebiscite as a way to legally voice their opposition to the regime without the possibility of a consequence. However, some Mapuche communities exhibited unexpected voting behavior in the plebiscite by voting in favor of Pinochet (Carter, 2010). This was due partly to the promises of material benefits (e.g. electricity and pensions) if the regime were to continue (Carter, 2010). In addition, blind respect and fear for the regime still prevailed in these communities, and the idea that Pinochet would punish those who voted against his reelection was a very real threat (Carter, 2010). Some Mapuche were unfamiliar with the democratic traditions of Chile and did not fully understand what their vote would mean in the context of this election. However, the outcome of the plebiscite opened the door for democracy and gave some activists hope that they would once again legally be able to stand up for themselves.

Transition to Democracy: Alwyin, Frei, and Lagos Years (1990–2006)

Contemporary political analysts characterized Chile's transition to democracy as limited. Pinochet instilled a complex voting system to allow for the continuation of neoliberal economic policy and prevent a majority left-wing administration (Carter, 2010). However, the next administration under President Aylwin was formed from a coalition of center and left-wing parties called the Concertación (Kowalczyk, 2013). In terms of relations between the Mapuche and the Chilean state, democratization could be divided into two phases (Carter, 2010). The first phase was characterized by relief that the oppressive military regime was finally over. There was a hope that the new, democratically elected government would finally meet Mapuche demands for land reform and constitutional recognition (Carter, 2010).

When Patricio Aylwin ran for president in 1989, one of his platforms was known as the Nueva Imperial Agreement, which promised the resolution of indigenous land disputes, constitutional recognition, and programs for indigenous economic development (Carruthers & Rodriguez, 2009). Mapuche leaders were both hopeful that this meant the government was finally listening to their demands, but others were suspicious that this simply a strategy used by political leaders to garner more elec-

toral support (Carruthers & Rodriguez, 2009). Aylwin served part of the agreement when his administration created the Ley Indígena (Indigenous Law) that led to the legal framework for indigenous communities and for the administration of a Public Record of Indigenous Lands and Waters (Di Giminiani, 2013). The law was designed to reintroduce land subsidies to Mapuche communities affected by high levels of poverty (Di Giminiani, 2013). The law created the National Corporation for Indigenous Development (Corporación Nacional de Desarrollo Indígena, or CONADI), which was a government body charged with the protection of indigenous lands from extensive development (Di Giminiani 2010). CONADI would also provide a settlement dispute platform between landowners and indigenous communities (Di Giminiani, 2013). The Mapuche became hopeful that they would finally become the agents of their own political futures with the existence of a state institution that was designed to protect their own interests. This period was promising; finally, indigenous groups were getting political recognition for their territorial rights.

The consequences of neoliberalism were still prominent in Chile's economy during democratization. Neoliberalism had shaped the context of Chilean democracy, and economic goals of the Concertación coincided with Chile's former neoliberal agenda (Richards, 2013). This furthered the expansion of the forestry and logging industry (Carter, 2010). At this time, the demand for wood and paper was going up, so the demand for land was becoming insatiable (Carter, 2010). This negatively impacted the Mapuche and the environment, since it meant that the agriculture and timber industries would continue to get preferential treatment over Mapuche communities and small businesses (Richards, 2013). The Concertación continued to criminalize social mobilizations, claiming that they created chaos and undermined the national interest, with "national interest" only implying economic interest (Carruthers & Rodriguez, 2009). Ultimately, the Concertación's economic policy goals directly contradicted with their initial promises of protecting the environment and promoting indigenous rights. The continuation of neoliberal policies was a key reason for the disappointing results of CONADI and the Nueva Imperial Agreement of the 1990s.

Although CONADI initially seemed promising, a number of Mapuche have become disillusioned with the organization over time. CONADI has a history of corruption that began the first year it was founded, when the first director was removed from his post when he opposed hydroelectric projects that would have left a total of 22,000 hectares of Mapuche ancestral territory under water or uninhabitable (Carter, 2010). In terms of dispute settlement, CONADI's power was limited due to a change in the law that would only allow arrogated land to be transferred to claimants only if the current owners were willing to sell the property to the Chilean state (Di Giminiani, 2013). CONADI was also responsible for the funding of programs that exploited Mapuche culture in the national market via ethno-tourism projects and the marketing of artisan products (Richards, 2013). This seemed to indicate that CONADI was answerable to the state, and not to the indigenous communities it claimed to represent. As a result, CONADI has faced some opposition from both indigenous communities and international institutions, such as the Inter-American Commission of Human

Rights (Haughney, 2012). CONADI's apparent support of economic interests confirmed that these issues were still strongly embedded in the state and continued to prevent advancement of indigenous rights.

The second phase of democratization's effects on indigenous rights occurred when a wave of disappointment and disillusionment swept over Mapuche communities when they realized that the state was not meeting their demands for land claims and the organizations designed to represent them were failing to do so (Carter, 2010). This phase began in 1994 under the presidency of Eduardo Frei and continues today (Carter, 2010). The indigenous programs developed by the Frei and later Lagos administrations focused mainly on poverty alleviation as opposed to a comprehensive review of land claims and self-government (Haughney, 2012). These initiatives included giving Mapuche communities land subsidies, education and housing grants, and providing them training programs to enter the job market (Kowalczyk, 2013). Frei avoided addressing more radical land demands, such as autonomous territory, self-government, and collective political representation (Haughney, 2012). This approach was likely related to the historical tendency of the Chilean left to think of indigenous issues as class-based as opposed to ethnicity-based. The prevailing attitude of Chilean administrations in the late 1990s and early 2000s continued to perpetuate the idea that the problem with indigenous groups had to do with redistribution, not recognition.

A criticism of the Concertación was the failure to enforce legal framework that they proposed in the early 1990s with the purpose of protecting the environment from large-scale projects. In 1994, an environmental law was developed that allowed for citizen comments on proposed projects. This allowed local communities to inspect plans, make recommendations, and propose additional mitigation of impact and compensation (Haughney, 2012). Corporations would be required to present studies of the impacts of proposed projects to the communities that would be affected (Haughney, 2012). This law was ineffective due to a series of loopholes. In reality, citizen comments were generally ignored since it was high-ranking political officials who had the power to make final decisions, and they almost always acted in accordance with economic interests (Carruthers & Rodriguez, 2009). In this case, small communities were considered a minority that should yield to the greater interests of the nation, even if it meant putting their homes or health at risk. Corporations released as little information as possible to the community regarding the impacts of proposed works (Haughney, 2012). Although this law intended to strengthen environmental protections, it was ineffective due to the power of large corporations and the desire of high-ranking politicians to promote economic growth.

One of the biggest demands among Mapuche activists after democratization was the official recognition of Mapuche and other indigenous groups in the Constitution. Although they were considered part of the Chilean nation, they never received constitutional recognition (Puddington, 2019). The lack of recognition reflects poorly on the Chilean state because Chile was, and still is, one of the few Latin American

countries that does not give indigenous groups constitutional recognition (MRGI, 2019). The lack of Constitutional recognition is symbolic of the lack of recognition that the democratic Chile gives the Mapuche in terms of policy, rights, and liberties within legal framework.

Police crackdowns of conflicts in indigenous communities became more frequent beginning during the Frei administration. The slogan of the administration was "Law and Order," emphasizing national security and the protection of large corporations over protecting the environment and indigenous groups (Haughney, 2012). In 1994, the government was motivated to strengthen security measures to avoid any potential outbreaks of an armed secessionist movement similar to the Zapatista movement that was happening in Mexico (Muños, 2007). For example, a Mapuche Organization called Consejo de Todas las Tierras (All Lands Council) engaged in a series of nonviolent land occupations, but 144 participants in the demonstrations were arrested under the anti-terrorist law (Haughney, 2012). This was the beginning of the harsh police oppression of indigenous environmental activists that would continue to present day.

Mapuche organizations responded to the increased use of security forces by using more means of peaceful mass protest and nonviolent land occupations (Haughney, 2012). However, these activists were not immune to police violence. In 1999, over 1,000 protesters gathered outside the congressional building in Valparaíso to demand the return of Mapuche lands taken over by lumber companies. Police attacked the protestors using clubs, tear gas, and water hoses, resulting in 180 arrests and hundreds of injuries (Minorities Project, 2004). President Frei also deepened tensions by signing a number of decrees toward the end of his term that permitted further dam construction in the Bíobío River, an issue that the Mapuche had been fighting against since the Pinochet years (Muñoz, 2007). A number of dam projects were introduced that had considerable consequences for Mapuche culture, an example of which is the Ralco dam in the upper Biobío, which led to the displacement of around a hundred indigenous families by the time it was completed in 2004 (Carruthers & Rodriguez, 2009).

In the late 1990s, as a response to the shortcomings of Chile's newly democratized regime, a new Mapuche nationalism movement spread among Mapuche activists in order to promote community and solidarity. Chile's resurgence of indigenous movements in the 1990s was partially inspired by a wave of indigenous recognition throughout Latin America, as states began to abandon assimilationist policies and give indigenous peoples constitutional recognition, which the Mapuche still did not have (Carruthers & Rodriguez, 2009). Around this time, a Mapuche national flag was developed, a movement began to recover the Mapuche language in communities that had converted to Spanish, and Mapuche chiefs, shamans, and spokespeople began to mobilize more effectively (Terry, 2019). An emerging Mapuche activist group behind this movement was Aukiń Wallpapu Ngulam, one of the first Mapuche organizations that questioned the relationship between the Mapuche and the Chilean state instead of focusing on the consequences of economic policy (Kowalczyk, 2013). Activists

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within the movement protested against the negative effects of lingering neoliberal reforms by adopting a vocal anti-capitalist stance (Terry, 2019). Although nonviolent protests were still more common, the late 1990s saw the emergence of more small Mapuche activists groups like the AWN that would resort to sporadic acts of violence to demand the return of their ancestral lands (Moloney, 2010). Their most frequent tactics included arson, shootouts, and equipment sabotage (Kowalczyk, 2013). Violent protest is a strategy that continues to be used among a small number of Mapuche activists, although only about 2–3% of protests since the early 2000s have been considered violent or extreme (Kowalczyk, 2013). Violent protests were used as a way for the Chilean media to depict the Mapuche as aggressive and dangerous without recognizing the extent of their mistreatment by the Chilean state. The violent protests made headlines, but they but the majority of Mapuche protests during the democratization period were nonviolent (Haughney, 2012). However, even the nonviolent protests were promptly shut down by police forces, and the protestors were often arrested under Pinochet's anti-terrorism law.

When Ricardo Lagos came to power in the year 2000, there was hope that there would be more receptiveness toward Mapuche demands, as he would be the most left-leaning leader the Concertación had seen. He was a socialist and many believed that he would reintroduce Allende-era land reforms (Jiménez, 2013). In an effort to ease tensions from the previous administration, the Commission for Historical Truth and New Treatment, a special government body composed of a board of indigenous and non-indigenous members, issued a report calling for the formal recognition of political and territorial rights for indigenous peoples, as well as more efforts to promote their cultural identity (Rohter, 2004). Lagos confirmed that this report was an effort to "correct the errors, at times inevitable, that the Chilean state committed in its treatment of ethnicities" (Rohter, 2004).

However, Congress took no action and the measures proposed in the report were never adopted (Rohter, 2004). Instead, he continued Frei's policies of violently targeting Mapuche organizations that were considered subversive. Under his administration, the state used heavy force in searches and raids of Mapuche communities through the use of helicopters, Special Forces, and violent detentions (Haughney, 2012). Young children and the elderly were often detained, often for extended periods (Haughney, 2012). The most prominent attack against Mapuche movements under the Lagos administration was aimed at the Conflicto Arauco Malleco (CAM), which engaged in occupations of lands long claimed by Mapuche communities, especially those in the hands of logging companies (Jiménez, 2013). This organization was infamous for its extreme campaigns that were viewed as terroristic in the eyes of the state (Brett, 2004). The CAM practiced "productive recovery" of disputed lands, meaning they intended for their land operations to be permanent (Brett, 2004). Although many of the CAM's members have been engaged in radical left-wing parties, especially during the Pinochet regime, they were generally skeptical of the involvement of left-wing politicians in national politics and more moderate Mapuche activist groups (Brett,

2004). The Lagos administration took an especially strong stance against the CAM beginning in 2002 and used the Anti-terrorism Law to detain its leaders (Brett, 2004).

The Lagos administration was praised when it introduced a new code of criminal procedures designed to strengthen defendants' rights in Mapuche-related conflict, but the continued use of anti-terrorism legislation allowed the government to sidestep the protections that the new code would have offered Mapuche defendants (Human Rights Watch, 2004). The administration was criticized for its handling of the death of an unarmed 17-year-old Mapuche activist who was killed by a police officer during a nonviolent occupation of a logging estate (Haughney, 2012). The Lagos administration, although initially promising, marked a continuation of state-sponsored violence against Mapuche activists and did not adequately address the Mapuche demand for land.

BACHELET AND PIÑERA YEARS: 2007–PRESENT

The administrations of Michelle Bachelet echoed the one of Lagos in a sense that she was a socialist who had been subject to repression under the Pinochet dictatorship and had entered office with a pledge to reform indigenous policy (Haughney, 2012). Bachelet represented a new face of the Chilean presidency as the first woman to ever hold office, and she served two non-consecutive terms, the first from 2006–2010 and the second from 2014–2018. In April 2007, Bachelet launched a promising proposal to reform five areas of indigenous policy: participation, rights, the urban indigenous, indigenous women, and education (Haughney, 2012). Some of the more specific proposals within Bachelet's list of reforms included a new law on indigenous participation, the long-awaited constitutional recognition of the Mapuche people, the creation of a women's department in the CONADI, and the pursuit of funding from the Inter-American Development Bank for indigenous cultural and economic development (Haughney, 2012). President Bachelet also promised to ban the use of the Anti-terrorism Law against indigenous protesters (Carruthers & Rodriguez, 2009). Some Mapuche organizations came forward with their own proposals, which included the draft of a new constitution that would guarantee the political and territorial rights of the Mapuche (Haughney, 2012).

Bachelet did not completely deliver on her promises, and she was criticized for the use of racism and state terrorism toward Mapuche protesters (Carruthers & Rodriguez, 2009). Much of the fallout from the Ralco dam project occurred during Bachelet's first term and further harmed relations between the Mapuche and the Chilean state. Initially, Bachelet was praised for adopting the UN Declaration on the Rights of Indigenous Peoples and the ILO Convention concerning indigenous rights, which the Mapuche could utilize as important legal tools (Tomaselli, 2013). However, Chile has repeatedly violated these regulations and Mapuche organizations have appealed to international bodies for sanctions against the state and respect for their rights (Kowalczyk, 2013). Mapuche organizations have criticized these regulations, believing that international law and funding are created based on a distorted and romanticized view

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of the Mapuche's relationship with nature (Kowalczyk, 2013). Bachelet had continued to implement the Anti-terrorism Law and promote the development of industry in Mapuche homelands during her second term, and relations continued to be poor.

During Bachelet's first term, the Mapuche achieved an important milestone in political participation: establishing the foundations for their own political party. The Mapuche Nationalist Party, also known as Wallmapuwen, was founded in 2005 and is currently striving to be an official political party in order to ensure indigenous representation in municipal elections (Kowalczyk, 2013). Wallmapuwen aims at representing all the inhabitants of the Wallmapu (Mapuche lands) regardless of ethnicity. The Wallmapuwen hoped to have the Chilean state grant autonomy (within the Chilean political-administrative structure) to the Araucanía region and adjacent municipalities. Their long-term objective is an "autonomous and democratic Wallmapu, where wellbeing and progress will be for all its sons and daughters...where our rightful territory and resources will be truly respected" (Mapuche International, 2019). However, the existence of the Wallmapuwen as an official political party was limited by Pinochet-era laws that established a binomial system for parliamentary elections, ensuring that half of parliament would be occupied by the political right (Kowalczyk, 2013). However, some Mapuche also feared that the Wallmapuwen would eventually become co-opted by the dominant political order like Mapuche politicians in the past. The Wallmapuwen still does not yet exist as an official political party and Chile remains one of several Latin American countries where ethnicity-based political parties do not exist.

Sebastián Piñera is the current president of Chile, and the relations between the state and the Mapuche continue to be poor. Like Bachelet, Piñera served two nonconsecutive terms, the first from 2010–2014 and the second from 2018-present. Unlike Bachelet, Piñera's political stance was more center-right, making indigenous groups more skeptical of him from the beginning. When Piñera first entered office in 2010, he planned to continue to promote the draft of the constitutional amendment that would recognize indigenous groups, changing its label from a 'low-urgency' to 'high-urgency' act, but the bill is still blocked for discussion by the Senate (Tomaselli, 2012). In his inaugural speech on May 21, 2010, President Sebastián Piñera once again promised a new indigenous land policy, the reform of the CONADI, and constitutional recognition of indigenous peoples (Tomaselli, 2012).

The 2010s were marked as a decade of continued Mapuche protest. Movements against Piñera began at the start of his first term in 2010, when Mapuche activists based in Europe formed a protest group to interrupt his public speeches in London, Paris, and Berlin (Tomaselli, 2012). Protests and tensions flared up during his first term, and Chile called those years some of the most violent in decades in terms of indigenous protest (Tomaselli, 2012). Protesters were frequently met with violence from the Carabineros, Chile's police force (Puddington, 2019). Frequent demonstrations to release Mapuche political prisoners tended to be ignored. There was a marked increase in violence, with more attacks against police and logging companies (Youkee, 2012).

In 2014, the Inter-American Court of Human Rights condemned Chile for the use of its Anti-terrorism Law and violating the due process rights of eight Mapuche activists who had been convicted under that law (Bonnefoy, 2014).

A year into Piñera's second term, relations between the Mapuche and the state remain tense, especially within the months following the killing of Mapuche farmer Camilo Catrillanca (Muñoz, 2018). Catrillanca was riding home on a tractor after working in the fields and was accused of taking place in a car theft, and he was shot when he rode away from police after a confrontation (Bonnefoy, 2018). The four officers directly involved in the killing were removed from the police force (Bonnefoy, 2018). Piñera issued an investigation against the killings and made several statements indicating he planned to issue justice to Catrillanca, but his later responses were criticized for supporting the right to police to "defend themselves when they are attacked," even though Catrillanca did not attack the police who killed him (Bonnefoy, 2018). Militarizing the response to Mapuche protest continues to be one of the biggest issues under the Piñera administration, with Mapuche communities complaining of being frequently attacked and harassed by police forces (Bonnefoy, 2018). Piñera is against the Mapuche autonomy demanded by the Wallmapuwen, arguing that Chile "should not be divided in two" (Muñoz, 2018). In 2015, the government removed the governor of Araucanía for openly advocating for political and legal reforms for the Mapuche (Bonnefoy, 2018). The Chilean government continues to report Mapuche demonstrations and roadblocks negatively and strongly support natural resource extraction in Mapuche lands, which has been exacerbating health problems in the region as well as limiting the size and scope of viable Mapuche territory.

Conclusion

Mapuche territorial rights have historically been poor since they became part of the Chilean state. The land distribution policies during the Allende regime seemed to indicate progress, but even those initiatives did not completely address indigenous demands and were promptly reversed during the Pinochet dictatorship. The lingering effects of the Pinochet regime, including neoliberal economic policies and the Anti-terrorism Law, had significant impacts on Mapuche land holdings and activism from Chile's democratization period until today. Since the 1970s, Chilean leaders (with the exception of Pinochet) have made empty promises to give the Mapuche the rights and recognition that they deserve, often to no avail.

Mapuche identity and mobilization strategies have changed to accommodate their changing territorial rights. Beginning during the Allende regime, the Mapuche began to embrace their indigenous identity and use it as a strategy to make demands from the state and participate in politics. The emergence of national and international Mapuche organizations during the Pinochet regime provided a foundation for community mobilization on a larger scale, and many of these organizations remain active today. While uncommon, the use of violence in Mapuche protest arose during the 1990s as a desperate measure to attract attention to their issues. Unfortunately, the

Chilean state and media has publicized these acts of violence in order to portray the Mapuche as aggressive and dangerous.

The Mapuche continue to sacrifice their culture, health, and livelihoods in order to accommodate economic interests in their ancestral lands. In addition to suffering from Chile's highest poverty rates and lowest standards of living, Mapuche communities must contend with a government that prioritizes economic interests over indigenous peoples.

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Find Passion and Discovery in College Radio Talk Show: A *Geneseo Today* Experience

Jesus Hernandez

sponsored by Michael Saffran, MS

ABSTRACT

Geneseo Today is an original WGSU public affairs program, featuring conversations with community and campus newsmakers about important issues, trends, and real-world topics affecting the local community, airing in two half-hour segments each weekend. As the Executive Producer and Host of *Geneseo Today* during the 2018–2019 academic year, I conducted several interviews for the episodes, and I edited and produced the half-hour episodes to broadcast on a twenty-mile radius. During the academic year, I encountered triumphs, downfalls, gained skills, memories, and life-long lessons that will serve me upon entering the workforce.

PROLOGUE

During my time as the *Geneseo Today* Executive Producer and Host, my main objective was to see what is going on at the college campus, the town of Geneseo, and the surrounding communities. I went out to find guests, discuss a topic, edit the interview, and produce the final product to broadcast over the airwaves. Since I did not know all that was going on in Geneseo during my undergraduate years, I wanted to inform students and Geneseo residents on under-discussed topics such as nutrition, health, education, and civic engagement. Throughout the year, I wanted to examine topics from various guests, along with putting some personal interest in the mix.

Towards the end of the year, I attended the Intercollegiate Broadcasting System Conference in New York City, where I met important personnel in radio media, and gained exposure to new ideas in the field. Additionally, I believed the conference would stimulate creativity for the Geneseo Today program and inspire a strong finish for the final weeks of the academic year. My experiences as Executive Producer and Host of this public affairs show has been a transformational experience in my final year as an undergrad.

The Journey Begins

In June 2018, I learned that I got a job as Producer and Host of *Geneseo Today.* I was excited to start, and I felt that this experience might open many doors. However, I had many questions because I didn't know what to do. I felt stuck. I kept thinking to myself, "Where am I going to find people to interview? Who should I interview? What are the topics need to be talked about?" These questions guided my planning throughout the summer.

I returned to campus to begin the academic year. I was nervous because I didn't know what to do; I felt that I had no direction to turn. Three weeks into the semester, I still hadn't produced an episode. Because my faculty director had expected me to already have produced one, I felt ashamed and embarrassed. One night, as I was catching up on some homework assignments, I said to myself, "What's going on—Why are you not interviewing people? They won't reach out to you, so you need to start contacting people! Otherwise, it's going to be a long year!" So, I began contacting people one after another, and soon I got a "Yes" from a student ambassador. I felt like I had accomplished something, even though it was just one yes.

The day of that first interview was interesting. I was prepared; I had mapped out my questions for the interview, but I was still nervous. I didn't know what to expect from this interview, or if it would sound good when finished. Though I was filled with self-doubt, I edited and produced it, and it was a better first product than I had anticipated.

Before too long, I began scheduling people on a regular basis. I would regularly interview up to three people each week. Producing shows and meeting deadlines—on top of my academic courses and extracurricular activities—became sometimes exhausting. But I did not let exhaustion become an obstacle; I kept interviewing people and producing episodes weekly.

To produce episodes, I learned how to use the software Audacity. Though my supervisor advised me that a half-hour episode could take two or three hours to edit, I quickly learned that some episodes could take up to five hours, as I might have to add a voiceover to add minutes, or heavily edit an interviewee's responses. At times I wished there was a machine that would automatically edit episodes, but then I also understood that the process of editing was itself enjoyable. To pace my recording schedule and avoid having to record the whole broadcast in one take, I would do the first ten minutes on one day, and then work on the next ten minutes the next day, until I fully produced the episode to send it to the faculty director for airing.

When I went home for fall break, I felt relieved. I had already met the expectation of producing eight episodes for the semester, but I wanted to do more. I continued to meet people to get an idea of additional topics to address. I continued to interview more people and produce more episodes. By the end of the semester, I had recorded

fifteen episodes, and of those, eleven aired. I had interviewed student leaders, faculty members, local town leaders, and even the College President.

Interviewing the College President was one of the highlights of the year. I planned the interview early in the year, and anticipated recording it by the end of November. Though I was nervous, I felt honored to interview her. I thought, "I wonder how many people can get to say that they were able to get a full thirty-minute conversation with her?" Once the fall semester was over, and I finished editing my final interview, which was the college president's interview, I felt a sense of peace. But I knew that it was far from being over; I still had to find eight new people to interview for the next semester.

Coming to an End

In the new semester, I was ready to continue to give my best. I was promoted to be the Executive Producer and Host of the show, and I continued to interview more people from Geneseo's administration, as well as the Mayor of Geneseo. I believed it was my duty to put all my energy into this, but something else had changed. No longer was I concerned about making the quota; I was more focused on learning new things about the happenings in Livingston County. I discovered more about what I could do to improve the show, and what I could do to tailor it to my needs and special interests. One example was when I did "Asking for a Friend," and discussed specific health issues from anonymous students. This was something I wanted to talk about, as I have a passion for public health.

In March 2019, the faculty director and I went to the 2019 Intercollegiate Broadcasting System Conference in New York City. I initially wanted to go to seek advice from experts and professionals, and maybe find a job in this field for the years after I graduate from Geneseo.

Overall, the conference was amazing! Though I didn't get a job offer, I learned about getting the news on the radio, picking the best staff, strategizing in the business, navigating lawsuits, and much more. I also went on a tour to a radio station and met the people who worked there. They advised on what I can do to find work in radio and public health fields. In addition, a WGSU alum joined us for the Awards Ceremony, where WGSU was named a finalist for "Best Promotional/Contest Award" for the 2018 Genny-Fest Music Festival and Food Truck Rodeo. Not only did I meet many people who shared my passion for radio, the conference also sparked some creativity that I wanted to take with me for my show.

My final interview was with the Mayor of Geneseo, Margaret Duff. After recording her interview and producing and submitting the episode to my faculty director for the last time, part of me was sad because it meant that my time as the program host was over. I also appreciated that I got the opportunity to do this, as I learned valuable experiences and skills for future directions. I walked out of the studio for the last time,

I left with my head held high, knowing that I did a great job, and I had contributed my service to the station to the fullest.

AREAS OF IMPROVEMENTS

One of the things that I learned during the journey was to work on self-confidence about producing these episodes and sending them to the faculty director. I honestly felt that I was too much a perfectionist, that all the episodes had to look excellent, or I'd feel guilty that I hadn't put forth my strongest effort. Throughout the year, I was able to use this experience as a springboard to make even better episodes than the last one.

After producing these episodes, one of my goals is to be okay with failure as long as I'm learning and changing. I have had a hard time accepting failure because I would feel really guilty. I need to acknowledge that in the end, everything will be fine and will be a stepping stone towards becoming a better person.

LEARNING OUTCOMES & THE FUTURE AHEAD

Among of the learning outcomes that I have gotten out of being a part of this transformational experience was to speak better in public. I learned how to speak clearly and watched the pace of asking questions. The second learning outcome was to produce and edit content. I learned so much from editing through the Audacity software, how to split cut, lower and increase audio levels, and perform voiceovers. Lastly, I felt that my organizational skills improved. I was disorganized in the beginning because I had a lot of people to interview, and I lost track as to which interview I was preparing for, which were already recorded, and which were ready to air. To solve it, I broke everything down into sections such as upcoming interviews, who to contact for interview, and finished interviews. I checked it on a regular basis, and updated as I go. This way, I was ready to give updates to my faculty director when I met with him, as well as to the other executive council members.

As time went on, I interviewed student ambassadors, representatives from board of elections, community leaders, and even the Provost and the President of the College. I have truly enjoyed talking to people about what's really going on in Geneseo. I appreciated being the program host because I was passionate and invested my time interviewing people and producing content to the audience.

I never thought I would ever exceed the amount as my predecessors have done in previous years. Usually past producers have produced sixteen interviews by the end of the year, but I produced twenty-three. Regardless, I didn't care about the quantity of the episodes. I sensed that the show's mission was to shed light on topics with guest speakers and build a bridge between the college students and the residents. I always gave my fullest effort in preparing for the interviews, meeting interviewees outside of Blake Hall, and walking them to the studio. I have appreciated the feedback on how I can become a better producer. Being a part of the station and taking on the role of

host and producer of *Geneseo Today* made me become more reflective overall. It helped me realize more what I had accomplished so far, and what work still needed to be done. Regardless of whether I work in radio again, this experience gave me valuable tools and skills that will be useful in a breadth of careers. My ultimate goal is to use the foundation of radio and communication to promote wellness, advance prevention, and reduce health disparities in the community.

Overall, it's been an amazing time being a part of WGSU 89.3-FM. I am fortunate to have spent my final undergraduate year with WGSU. Being the producer and host of this program will hold a special place as I leave Geneseo, and I'm excited to see what new challenges the next chapter of my life will bring.

Vee is for Voiceless

Abigail Ritz

sponsored by Maria Lima, PhD

ABSTRACT

In *On Beauty*, Zadie Smith explores the nature of beauty in art, in academia, and in relation to ethnicity, revealing the myriad ways societal conceptions of beauty affect expressions of self. What does it mean then that the most canonically beautiful character in a novel focusing so explicitly on beauty and justice is not given her own voice? Eighteen-year-old Victoria Kipps is consistently objectified, stereotyped and sexualized throughout the narrative, both by the male gaze and by female judgment. Her objectification is reflective of the way society fetishizes the beauty found in women who are not white, and of a hegemonic stereotyping of her identity that separates her from her sense of self, thus rendering her unable to fully come to voice.

> "Speech *is* beautifully useless
> They *are* the damned.
> The beautiful know this."
> —Nick Laird, "On Beauty," emphasis his own

Slut. Not terribly interesting. A dangerous commodity. Purely decorative. A typical, pretty-girl, power-game-playing deeply shallow human being, vain, evil, jealous lover, virgin, lovely, gorgeous, beautiful, beautiful, beautiful, countless times beautiful: this is Victoria Kipps in the eyes of others. Yet, never once does the most beautiful character in Zadie Smith's *On Beauty* possess her own voice, her own mind. Of course, Victoria is not necessarily an exception as the other Kipps—Monty, Michael, even Carlene—do not entirely possess voices within a novel focused primarily on the drama of the Belseys. However, when necessary, the narrative is given over to the dispossessed voice of Carl, the perhaps over-possessed voice of Claire—even illustrating the thoughts of the seemingly irrelevant Katie Armstrong. On the other hand, the pivotal character Vee—Victoria's chosen name—exists only within the conception of others—solely visualized and never realized. Victoria herself declares to Howard upon ending their affair, "'I know you think [...] that you…*know* me. You *don't* know me. This,' she said and touched her face, her breasts, her hips, 'that's what you know. You don't know *me*'" (Smith, 2005, p. 390). And, obviously, she is correct, not only in terms of the ways in which Howard knows her, but in terms of the ways in which *anyone* knows her. What does it mean, then, that the most typically beautiful character within a narrative based upon exploring concepts of beauty is not given full subjectivity? In being framed almost entirely through

the eyes of others, Victoria reflects the myriad ways in which beauty, when objectified, overtakes a sense of self in the beautiful.

As the most typically beautiful character in the novel, Victoria embodies aesthetic and theoretical relevance both as a literary entity (that is, as a character to be read) and as a person with whom other characters interact within the world Smith creates. In this theoretical heaviness, Victoria loses, to the reader, a sense of personal individuality or subjectivity—this is to say, in being characterized as so beautiful Victoria's character is imbibed with a level of meaning within the narrative that overwhelms any relation of her individuality to the reader.[1] In the context of Claire's poem "On Beauty" (borrowed from Nick Laird), this overwhelming symbolism is related in the line directly following those included in the epigraph to this essay: "They [the beautiful] stand around as unnatural as statuary" (Smith, 2005, p. 153). This association of the beautiful with art—thus the association of the beautiful to all that is found in art—theory, truth, ideals, and so on—dehumanizes the beautiful. With this being said, Victoria's beauty as a black woman is not only recognized, but seen as the idealized human expression of beauty; as Ulka Anjaria (2008) notes, "Victoria's beauty…is unflinchingly canonical, and in this way so overpowering, to herself and to others, that it is able to express itself only in a misguided and undiscriminating sexuality" (p. 47). In portraying black beauty as representative of the canonical ideal, Smith firmly positions her narrative and the debates encapsulated in her narrative firmly within a postcolonial space. However, while this portrayal of blackness as an ideal is revolutionary in a certain sense, the canonical acceptance of Victoria's beauty is still situated within or supporting of a larger hegemony which promulgates a stereotype of beauty exclusionary of the less accepted, though more traditional, beauty represented by Kiki. In critic Anjaria's point that Victoria's beauty can only be expressed within the framework of the environment surrounding her through "misguided and undiscriminating sexuality," we see how this beauty, or rather its effect upon others, portents such significance to those in contact with her, and thus to herself through her interaction with these individuals, that people are unable to accept Victoria's presence simply as a person.

However, her beauty can only be processed within the strictures of society, thus it is expressed or seen through a sexualized lens. Thus, throughout the narrative it can be understood that the function of her beauty is not so much reflective of a revolution but of a fetishization by society of stereotypical expressions of beauty found in ethnic identities. This societal fetishization of beauty is reflected in Victoria's association with—and, due to her lack of overt development throughout the narrative, seeming affirmation of—the stereotype of the jezebel, which Tracy Walters (2008) describes as a hypersexualized caricature of the slave woman created by white males in order to justify their consistent objectification and violation of black women (p. 134). The

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1   This is a common critique of Smith's characterization of women: she places in these characters so much symbolic meaning that they seem, to some, to be underdeveloped as individuals and seen only as concepts. While this may seem like a mistake to some, I think that in Victoria's case this overt and overwhelming symbolic characterization is reflective of people's tendency to invest in beauty meaning which overwhelms the individuality of that which is beautiful.

jezebel stereotype reveals itself today in the hypersexualization of the black female form not only in hip-hop, but in the entertainment industry in general, particularly in pornography.[2] These environments portray black women as sexual deviants or sexual "freaks," and this deviancy is reflected in Victoria's own imitation of and distribution of pornographic and hypersexualized images of herself based on sexual encounters throughout the novel. In being ascribed to a certain stereotyped sexualized form, Victoria's individuality and ability to express herself beyond the strictures of this stereotype are stunted.

Victoria's beauty enables her obfuscation through an objectification of her body, and thus herself, throughout the narrative, especially in sections devoted to or focused upon the male gaze. It is in this sense that she most obviously relates to the stereotype of a jezebel—in recognizing her beauty, men immediately define Victoria (in a sexual context) as a sexual object, as is perhaps best related by Erskine's comment that, "'You have to have your cock strapped to your leg when you pass that girl in the corridor" (Smith, 2005, p. 345). Her silence throughout the plot forces readers to look at Victoria through this hypersexualized male gaze—thus, much of Victoria's humanity must be read through subtext. The most obvious culprit of Vee's objectification is clearly Howard, who sees in Victoria a representation of concepts, a fulfillment of subconscious urges and an escape from issues within his own life—never fully realizing her as a person, and thus never relating her as such within his narrative. In engaging in a sexual relationship with Victoria, one in which neither party is truly interested, Howard attempts to escape the issues and confines of his present life and live not only a different life, but, given Victoria's overt contrasts and similarities with Kiki, to relive his youth. In this sense, a relationship with Victoria affirms a view of himself wherein Howard is virile and free of the conflict between his ideology and his reality.

To a certain extent, Victoria uses this objectification by males, such as Howard, Erskine, and Carl, to promote herself and her power within male-dominated spaces; she does, after all, exert some level of agency, even control, in her various sexual encounters and objectified portrayals. Through utilization and assertion of her sexuality (i.e. through actualization of and acting upon how others perceive her beauty) Victoria exerts control over her own life and attempts to subvert the oppressive control of her father's ideals on her actions. As stated upon Victoria's return from her European travels she was "flush with social and sexual success;" she has thus realized her ability to obtain power and self-confidence through her sexuality and through the affirmation of her beauty in the eyes of others (Smith, 2005, p. 45). However, having been raised entirely within the parochial framework of a strikingly male-dominated environment she only knows how to exert power *within* this structure, she does not know how to exist in defiance to the established structure—given her family's ideological basis in structuralist and modernist ideals it follows that Victoria would not be taught to exert power outside of the established structure, and in fact she is taught to "fiercely defend

2   To explore a historically oriented examination of the jezebel figure in American culture, read Dr. David Pilgrim's (2012) historical overview "The Jezebel Stereotype," published through Ferris State University's Jim Crow Museum of Racist Memorabilia website.

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[her] faith and [her] politics" (Smith, 2005, p. 279). As is noted in literary theory, inverting a binary, or inverting an established power structure (i.e. replacing male dominance with female dominance, females wielding male established aesthetics to gain power) does not break down this structure, but rather reinforces it. Thus, in a certain sense, the association of Veronica's aesthetic with a deviation from the female form into a more masculine or androgynous aesthetic—which can be seen in her initial description by Howard wherein he cannot identify her gender from her scalp (Smith, 2005, pp. 39-41) and her outfit of a "'nice suit'" on the night of the Emerson Hall (Smith, 2005, p. 343)—allows her to associate herself and her beauty with the masculine aesthetic and thus assert power within the hegemony. In the words of Kanika Batra (2010), her embodiment or display of "masculinity enhances… [her] desirability since she shows herself to have a sexual appetite similar to her male counterparts" (p. 1087). It would be simplifying to entirely equate the utilization of the masculine aesthetic, especially when it leads to androgyny (an aesthetic generally related not to inverting the binary, but breaking it down) with giving in to a binary, but this does not overrule the fact that Victoria wields her beauty in such ways so as to assert her own power. Additionally, as previously stated, neither Howard *nor* Victoria were truly interested in one another, as for Victoria Howard serves not so much as an object of sexual desire but as an opportunity to escape from her grief over her mother. Not only this, but engaging in a sexual relationship with Howard allows her to exert some level of control over a life thrown into upheaval. In sleeping with Howard in the midst of her grief, Victoria uses her sexual instinct to combat the reality of her mother's death. She is thus playing into Freud's conception of a death drive, wherein sexual and life instincts—called *Eros* (the Greek word for love, specifically sexual love)—balance out a drive to death and self-destruction known as *Thanatos* (death).

Additionally, engaging in a relationship with Howard allows Victoria to subvert the power and influence of her father's oppressive patriarchal beliefs as Victoria's lack of voice in the narrative and within the wider societal structure ultimately takes root in these patriarchal beliefs as she lacks voice within the family, this lack that is enabled by her mother's subservience to Monty's beliefs. Thus, the familial narrative is ultimately controlled by her father and brother. She cannot exert power in the familial context so these attempts to flout power through buying into society's sexualization of her beauty serve as the only way she knows to subvert the repression she experiences at home. Of course, Victoria's family's imposition of voicelessness upon her is not due to her beauty, but rather due to her womanhood.

A more successful manifestation of Victoria's attempts to subvert (subconsciously or consciously) the stifling structures imposed upon her identity and expression thereof by her family, is her renaming, and thus redefining, of herself as Vee. By renaming herself, Victoria is escaping the pressure of those ideals imposed on her by the name Victoria—the name, due to its association with the Victorian age, which implies domesticity, a devotion to family and home. More than this, it implies a deep-rooted loyalty to Britain and British ideals rooted in imperialism. Thus, her name, and her subsequent renaming, reflect Victoria's difficulty in reconciling the roots of her name

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with the roots of her identity both as a privileged, intellectual, modern woman, and as a black woman with Caribbean roots living not only in England, but in America. Howard notices the manifestation of her mixed roots and the structured effects of her upbringing in her accent, noting, "She was already developing the woozy transatlantic accent of Howard's own children. It was a shame. He liked that North London voice, touched by the Caribbean and, if he was not mistaken… an expensive girls' school" (Smith, 2005, p. 257).

In that Victoria not only represents the pinnacle of beauty, but the pinnacle of black female beauty within the novel, we cannot ignore her contrast with Kiki's beauty, especially in the context of Howard's affair with Vee. Vee is, physically, all that Kiki has once been: young, thin and hot; she thus contrasts Kiki's present body, which Walters (2008) describes as a "black fat body [which] stands at the margins of white America's standard of beauty" (p. 130). Additionally, our conception of Victoria exists in stark contrast to Kiki's complicated inner narrative—Vee's perceived lack of complexity due to her lack of subjectivity means that she is perceived by Howard as easier to engage with than Kiki. This lack of complication is perhaps best seen in the difference in the sexual interactions between Howard and Kiki and Howard and Vee. Sex with Victoria is, on the surface, everything which sex is made out to be in the modern world—pasteurized and clean, filled with orifices and moans—but it is empty and unsatisfying. Sex with Kiki, on the other hand, is real, filled with experience and actual and legitimate passion (fueled by anger and disappointment though it may be); Kiki is thus allowed to possess within the novel an authenticity which Victoria does not have.

Despite this, Kiki and Vee *do* share similarities, in that their different types of beauty are stereotyped by surrounding society (or structured by Smith within the stereotypes of society)—whereas society perceives Vee as the hyper-sexualized jezebel, Kiki is perceived as the mammy, the faithful black female servant relegated to service in the home and subservience to whites—Kiki herself reflects on her embodiment of this stereotype in the eyes of others, thinking, "I'm the Aunt Jemima on the cookie boxes of their childhoods, the pair of thick ankles Tom and Jerry played around. Of course they find me funny" (Smith, 2005, p. 51). Thus, this comparison reflects the ways in which society stereotypes both of their types of black beauty—Vee's more canonical beauty, and Kiki's more traditional beauty—thus rendering them both voiceless, at least when they ascribe to these views (Kiki's development throughout the narrative serves to subvert the societal perception of her, whereas Victoria's lack of development continues a lack of subjectivity).

Interestingly, it is in Vee's comparison to Kiki, and the exploration of the various ways in which society objectifies their bodies and their sexuality, that Victoria's possible manifestation of a type voodoo of loa (spirit)—the Erzulie-Freda, an empowering female figure—becomes clear. In her relation to this manifestation of Erzulie, Victoria's character is still caught up within a realm of symbolic meaning (thus, there is little exploration of her subjectivity), however, she achieves a certain development and positive association outside of her stereotyped associations with beauty in her rela-

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tion to the Erzulie-Freda. Madame Erzulie, the voodoo spirit represented in Carlene's Hyppolite painting, is representative of "love, Beauty, purity, the ideal female" (Smith, 2005. p. 175), and exists in various different manifestations. Kiki's association with and representation of various manifestations of Madame Erzulie are clear throughout subtextual hints in the narrative and in Carlene's association of Kiki with the spirit. It is Vee's potent and overpowering sexuality that associates her with the manifestation of Erzulie-Freda, who is represented by a "beautiful young woman of lush appearance…who embodies the possibility of transformation" (Fischer, 2008, p. 114). In embodying certain aspects of Erzulie-Freda, Victoria is embodying the power of the Freda to initiate transformation in the narrative. This is reflected in the fact that she is the key agent of change in the narrative: the affair with Howard reveals how deeply entrenched his conflict between ideology and reality is; the subsequent revelation of the affair allows for the effects and transformative power of truth on the Kipps and Belsey families. In the context of Scarry's theories on beauty, the transformative power of Erzulie-Freda allows her to move others to look beyond themselves and enact justice.

However, one could argue that Vee is in no way representative of the Erzulie-Freda throughout the narrative as not only does her character not experience a visible and overt transformation in the narrative to a more empowering and realistic (as opposed to stereotypical or ideological) individual as other characters—such as Kiki and Howard—but nobody else, not even her mother, sees in her beauty the transformative power (and thus, in the context of Scarry's theory the ability of her beauty to force others to move toward justice) of Erzulie. By this I mean that her mother chooses to give Kiki the painting over anyone else in the family, despite, as Victoria relates, the fact that the painting is "their *birthright*, for fuckssake" (emphasis Smith's own), thus overtly associating the Erzulie with Kiki as opposed to any members of her own family (Smith, 2005, p. 279). Additionally, this view of Victoria as Erzulie-Freda still plays into the idea that due to her beauty, Victoria's individuality is overwhelmed by associations to entities—theories, characters—beyond herself. Yet, this association of Vee's sexuality with an empowering manifestation, especially one outside of the marginalizing and sexualizing Western canon is a rare glimpse into one of the ways in which Vee's beauty aligns with Elaine Scarry's theories of beauty and social justice. In the sense of her associations with the Erzulie-Freda, Victoria's beauty will not—if she fully develops into an individual able to be associated with this manifestation— wield power over her, but rather she will wield her beauty. Her associations with the Erzulie-Freda[3] are overt in her physical descriptions and actions throughout the novel, but arguably Victoria requires further development beyond her current self-centered conception and her current state of expressing internalized hypersexualization as a rebellion to her own voicelessness.

Throughout the narrative of *On Beauty*, Victoria—Vee—in all of her overwhelming beauty reflects the myriad ways in which societal perceptions of and fetishizations of

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3   The Erzulie is said by Carlene to represent, "love, beauty…the *mystère* of jealousy, vengeance and discord" (Smith, 2005, p. 175).

beauty can render those perceived as beautiful entirely voiceless within their own narratives and their own lives. Thus, the beautiful, in being imbibed with an overwhelming number of stereotypes and theories and concepts and ideals, are distanced from their own individuality and rendered speechless. Voiceless. Marginalized as sluts, jezebels, mammies. It is only through becoming aware of the hidden individuality of these characters, by acknowledging the silencing effects of our own overwhelming views on beauty, that we can begin to allow those beautiful people to express their beauty in a way that is empowering to both themselves and others.

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Spectral Characterization of Anti-Regular Graphs

Eric Piato and Joon-yeob Lee

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Abstract

From the eigenvalue equation we obtained by using Chebyshev polynomial of the second kind, we deduce three functions in terms of A_n. Through analyzing the functions, we discovered that the interval $\Omega = [(-1-\sqrt{2})/2, (-1+\sqrt{2})/2]$ contains only the trivial eigenvalues 0 and -1. We also figured out that as n increases, the eigenvalues of A_n become almost symmetric about the number -1/2. Finally, we conjectured that the eigenvalue-free interval bound Ω does not contain an eigenvalues of any threshold graph other than 0 and -1, and that among all threshold graphs on n vertices, the antiregular graph A_n has the eigenvalues closest to the boundary points of Ω.

1. Introduction

Graph theory is a field of mathematics that studies graphs, which are mathematical structures composed of vertices and edges. Since graphs are often used to model pairwise relations between objects, graph theory has numerous applications on other academic fields such as computer science, sociology, biology, physics, and so on. The topic of our research, however, was not about the application of graphs. Rather, it strictly dealt with pure mathematical aspect of graph theory. In particular, we studied the eigenvalues of connected anti-regular graphs. The main results of this report state that when A_n is an $n \times n$ adjacency matrix of a connected anti-regular graph, the only eigenvalues of A_n within the interval $\Omega = \left[\dfrac{-1-\sqrt{2}}{2}, \dfrac{-1+\sqrt{2}}{2} \right]$ are the trivial eigenvalues $\lambda = -1$ or $\lambda = 0$, and any closed interval containing Ω contains eigenvalues of A for large enough n. Also, the interval bound of each eigenvalue that becomes more accurate as n increases and the almost symmetric distribution of the eigenvalues are discussed. Before getting into the main results, we introduce the materials and topics related to graph theory that are necessary to understand them in Section 2. After that, we will go

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over the discoveries and their proofs in Section 3. Finally, in Section 4, we conclude and discuss possible future works related to the results.

This paper details the process of demonstrating the main results of a published paper through the scope of an undergraduate student, explaining the rigorous mathematical tone and formal proofs of earlier work (Aguilar et al., 2018). Thus, we discuss the basic concepts of graph theory extensively, and the proof of each theorem that requires higher-level mathematical knowledge is omitted for brevity. Also, different topics in this report are arranged so as to require a minimal mathematical background of calculus and linear algebra to understand the story of spectral graph theory. For this purpose, a glossary of terms is included at the end of the report

2. Basic Concepts on Graph Theory

2.1 Graph

Before introducing anything else, we need to know what a graph is. In order to do that, we define the notation $\binom{S}{2} = \{\{x, y\} \mid x, y \in S, x \neq y\}$. The definition of a graph is the following.

Definition 2.1. A graph G consists of two sets V and E where E is some subset of $\binom{V}{2}$. The set V is called the vertex set of G, and E is called the edge set of G. In this case we write $G = (V, E)$.
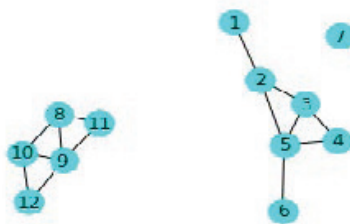
Figure 1. An example of a graph with 12 vertices and 14 edges

Throughout this report, we will only consider **simple graphs**, which are graphs without loops or multiple edges. Below are the descriptions of concepts related to graphs, vertices, and edges.

The cardinality of the vertex set V, and that of the edge set E are called the **order** and **size** of G, respectively. By definition, it is clear that the cardinality of an edge set satisfies $0 \leq |E| \leq_{|V|} C_2$. When given two vertices $u, v \in V$, we say that u and v are

adjacent or **neighbors** if $\{u,v\} \in E$. In this case, we write $u \sim v$. The **neighborhood** of $v \in V$, denoted by $N(v)$, is the set of all vertices adjacent to v:

$$N(v) = \{u \in V \mid u \sim v\} = \{u \in V \mid \{u,v\} \in E\}.$$

The **degree** of a vertex v, denoted by deg (v), is the cardinality of $N(v)$. It is clear that if G is a simple graph then $0 \le \deg(v) \le n-1$ for all $v \in V(G)$. A graph G is said to be k-**regular** if every vertex has degree k. We also say that G is a regular graph of **regularity** k. The concepts of regularity and degree are important because they are directly related to the topic material of our research, the anti-regular graph. The **degree sequence** of a graph G, denoted by $d(G)$ is the sequence of the vertex degrees of G listed in decreasing order. Let the order of G be n. Then, the vertex $v \in V$ is **isolated** if $\deg(v)=0$, and **dominating** if $\deg(v)=n-1$. If u and v are distinct vertices of a graph G then a **path** in G from u to v is a sequence of distinct vertices such that the first term is u and the last term is v where the consecutive inner vertices are adjacent to each other. A graph G is said to be **connected** if for any distinct vertices $u,v \in V(G)$ there exists a path from u to v, and is called **disconnected** otherwise. The **complement graph** of graph $G = (V, E)$, denoted $\overline{G}$, is a graph with the same vertex set as G and whose edge set consists of all edges not present in G. We can see that if $|V| = n$, $v \in V$, and $\deg(v)=k$ for G, then $\deg(v)=(n-1)-k$ for $\overline{G}$.

2.2 Graph Isomorphism

When we consider different graphs, we often find graphs that are called *equivalent*. More precisely, since the structure of a graph depends entirely on the make-up of the edge set, two graphs with the same edge structure are considered to be equivalent, or **isomorphic**, even though the vertices might be distinct or differ by rearrangement. The formal definition is the following.

Definition 2.2. The graph $G_1 = (V_1, E_1)$ is **isomorphic** to the graph $G_2 = (V_2, E_2)$ if there exists a bijection $\sigma : V_1 \to V_2$ such that if $\{u,v\}$ is an edge in G_1 then $\{\sigma(u), \sigma(v)\}$ is an edge in G_2 and if $\{u,v\}$ is not an edge in G_1 then $\{\sigma(u), \sigma(v)\}$ is not an edge in G_2. In this case, we say that σ is an **isomorphism** from G_1 to G_2 and we write $G_1 \cong G_2$.

If we consider the vertex set as an arbitrary choice of labels for vertices, the bijection $\sigma : V_1 \to V_2$ described above is essentially $\sigma : V \to V$. Then the bijection is also called

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a **permutation**. Now, we can think of an isomorphism of a graph unto itself. An **automorphism** of a graph $G = (V, E)$ is an isomorphism of G unto itself. That is, it is a permutation $\sigma : V \rightarrow V$ such that $\sigma(E) = E$ where $\sigma(E)$ is the edge set of the graph whose vertex set is permuted by the bijection σ. When the vertex set of G is $V = \{1, 2, \ldots, n-1, n\}$, an example of a permutation (automorphism, in this case) is

$$
\sigma = \begin{pmatrix} 1 & 2 & 3 & \ldots & n-2 & n-1 & n \\ 3 & 5 & 1 & \ldots & n & n-1 & 2 \end{pmatrix},
$$

meaning the images of 1, 2, 3 are 3, 5, 1 respectively, and so on. It is important to remember that some properties of the graph are invariants, meaning they are preserved by an isomorphism. The examples of such properties are the order, size, degree, degree sequence, and so on.

2.3 Anti-regular Graph

In this section, we will introduce some special classes of graphs and graph operations that are necessary to understand anti-regular graphs, and then define the anti-regular graph.

An **empty graph** is a graph such that all the entries in the degree sequence is zero. On the other hand, a **complete graph** is a graph such that all the entries in the degree sequence is $n-1$ where n is the order of G. The empty graph and the complete graph of n vertices are often denoted E_n and K_n, respectively. When $|V| = n$, an empty graph is 0-regular where every vertex is isolated, and a complete graph is $(n-1)$-regular where every vertex is dominating. Given two graphs G and H with disjoint vertex sets, we define the **union** of G and H, denoted by $G \oplus H$, as the graph with vertex set $V(G) \cup V(H)$ and edge set $E(G) \cup E(H)$. The **join** of G and H, denoted by $G \vee H$, is the graph obtained from $G \oplus H$ by connecting every vertex in G to every vertex in H. A **threshold graph** is a graph that can be constructed from a one-vertex graph, or K_1, by repeated applications of the two operations $G \oplus K_1$ and $G \vee K_1$. In this case, G is a graph constructed by the same rule that builds up a threshold graph from K_1. This iterative construction can be expressed with a binary sequence $b = (b_1, b_2, \ldots, b_n)$ where $b_1 = 0$, and for $i \in \{2, \ldots, n\}$, $b_i = 0$ if $v_i \in V(G)$ was added by union and $b_i = 1$ if v_i was added by join. For example, a threshold graph expressed by the binary sequence $b = (0,1,1,1,1)$ is a complete graph K_5. Now we can define the anti-regular graph.

Definition 2.3. An **anti-regular graph** G is a graph such that there are precisely two vertices with the same degree.

Among all graphs whose order is $n \geq 2$, the anti-regular graph G and its complement graph $\overline{G}$ are the only two graphs that have the maximum number of vertices with distinct degrees. The equal degrees in the connected graph is $\lfloor n/2 \rfloor$, and $\lfloor (n-1)/2 \rfloor$ in the disconnected graph (Behzad and Chartrand, 1967). One interesting thing about the anti-regular graph is that it is an example of a threshold graph. That is, it can be constructed by the same rule that builds up the threshold graph. For example, the binary sequence that builds up the connected anti-regular graph of n vertices is $b = (0,1,0,1,...,0,1)$ when n is even, and $b = (0,0,1,0,1,0,...,0,1)$ when n is odd.

2.4 Spectral Graph Theory

When studying graphs, we often find it useful to introduce matrix representation of them since the eigenvalues and eigenvectors of the matrices can be used to infer various properties of the graphs. A branch of graph theory—**spectral graph theory**—studies the properties of a graph in relationship to the characteristic polynomial, eigenvalues, and eigenvectors of matrices associated with the graph, such as its adjacency matrix or Laplacian matrix. In this report, we will focus on adjacency matrices.

Definition 2.4. Let G be a simple graph and the vertex set V of G be $V = \{v_1, v_2, ..., v_n\}$. The **adjacency matrix** A of G is the square $n \times n$ matrix such that its element A_{ij} is 1 when there is an edge from v_i to v_j, and 0 when there is no edge.

Since $v_i \sim v_j$ if and only if $v_j \sim v_i$, it is clear that $A_{ij} = A_{ji}$ and thus A is a symmetric matrix. Also, since G is a simple graph and no vertex is adjacent to itself, the diagonal entries of A are all 0. Before getting into the research, we will revisit some basic concepts from linear algebra.

A vector $\vec{x}$ is an **eigenvector** of the matrix M if there exists $\lambda \in \mathbb{R}$ such that $M\vec{x} = \lambda\vec{x}$. In this case, λ is called an **eigenvalue** of M. To find the eigenvalue λ, we modify the equation above as $(\lambda I - M)\vec{x} = \vec{0}$ where I is the identity matrix. Since we want the eigenvector $\vec{x}$ to be nontrivial, it must be that $\det(\lambda I - M) = 0$. Then, $p(\lambda) = \det(\lambda I - M)$ is called the **characteristic polynomial** of M. It is clear that the roots of the characteristic polynomial are the eigenvalues of M. The **spectrum**

of a graph G is the list of the eigenvalues of the adjacency matrix A in increasing order $\lambda_1 \leq \lambda_2 \leq \cdots \leq \lambda_n$. That is, the spectrum of G is $(\lambda_1 \leq \lambda_2 \leq \cdots \leq \lambda_n)$. Notice that the term "spectral graph theory" came from this concept. An important result in linear algebra is that if M is a symmetric matrix, then the eigenvalues of M are all real numbers. That is, the eigenvalues of the adjacency matrix A of a graph G are all real numbers. The eigenvalues of the graph G is invariant. That is, even if the labeling of vertices might change due to some isomorphism, the eigenvalues of every graph isomorphic to G has the same eigenvalues as the original G.

2.5 Chebyshev Polynomial and Tridiagonal Toeplitz Matrices

Our research deals with the eigenvalues of the connected anti-regular graphs. While studying the eigenvalues, we reasoned that Chebyshev polynomials were of much use since we introduced tridiagonal Toeplitz matrices as we proceeded. The connection between the eigenvalues of tridiagonal Toeplitz matrices and Chebyshev polynomials is well-known (Mason & Handscomb, 2002; Kulkarni et al., 1999). Thus, we will briefly go over some of the basics of Chebyshev polynomials and tridiagonal Toeplitz matrices that are used in our research.

There are several kinds of Chebyshev polynomials. However, all of them have close relationship with the trigonometric functions 'cosine' and 'sine' (Mason & Handscomb, 2002). Particularly, the one that is used to derive an important expression for the eigenvalues of the connected anti-regular graphs in our research is the Chebyshev polynomial of the second kind. The **Chebyshev polynomial of the second kind** of degree n, denoted $U_n(x)$, is defined by

$$(1) \qquad U_n(x) = \frac{\sin(n+1)\theta}{\sin\theta},$$

where $x = \cos\theta$. The first few polynomials for $n \in \{0,1,2,3\}$ are $U_0(x) = 1$, $U_1(x) = 2x$, $U_2(x) = 4x^2 - 1$, and $U_3(x) = 8x^3 - 4x$. In order to satisfy the equation $U_n(x) = 0$, it must be that $(n+1)\theta = m\pi$ where $m \in \mathbb{Z}$. Therefore, the zeros of $U_n(x)$ are determined to be

$$x_m = \cos\left(\frac{m\pi}{n+1}\right).$$

Using the definition (1), we get the three-term recurrence relation

$$U_n(x) = 2x \cdot U_{n-1}(x) - U_{n-2}(x) \qquad (2)$$

for $n \geq 1$. A **Toeplitz matrix** is a matrix in which each descending diagonal from left to right is constant. Then, a **tridiagonal Toeplitz matrix** is a matrix of the form

$$T = \begin{bmatrix} a & c & & \\ b & \ddots & \ddots & \\ & \ddots & \ddots & c \\ & & b & a \end{bmatrix}$$

for $a, b, c \in \mathbb{R}$. For our purpose, let $b = c = 1$ and T be a $k \times k$ matrix. That is,

$$T = \begin{bmatrix} a & 1 & & \\ 1 & \ddots & \ddots & \\ & \ddots & \ddots & 1 \\ & & 1 & a \end{bmatrix}.$$

When letting $\det(T) = \phi_k$ and expanding it along the last row, we get

$$\phi_k = a \cdot \phi_{k-1} - \phi_{k-2}$$

with $\phi_0 = 1$ and $\phi_1 = a$. Consider a Chebyshev polynomial of second kind, defined as $U_k(\frac{a}{2})$. By the recurrence relation (2) we know that

$$U_k\left(\frac{a}{2}\right) = 2 \cdot \frac{a}{2} \cdot U_{k-1}\left(\frac{a}{2}\right) - U_{k-2}\left(\frac{a}{2}\right)$$

with $U_0(\frac{a}{2}) = 1$, $U_1(\frac{a}{2})$ and $a/2 = \cos\theta$. Thus, we can conclude that

$$U_k\left(\frac{a}{2}\right) = \phi_k. \qquad (3)$$

3. Spectral Characterization of Anti-Regular Graphs

3.1 Background

Our research began with looking into general threshold graphs. When considering the binary representation of iterative construction (introduced in Section 2.3), we noticed that we could group consecutive zeros and ones and label each as 0 and 1 respectively. Since every binary sequence constructing any threshold graph starts with 0, we reasoned that the characterization of the eigenvalues of any threshold graph could

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be similar to that of a threshold graph made from binary sequence $(0,1,0,1,\ldots,0,1)$, which is a connected anti-regular graph of even vertices. Therefore we wanted to know about the spectrum of connected anti-regular graphs, and found the topic generally under-studied. Hence we started to research the connected anti-regular graph of even vertices, and then explored the case of odd vertices. While doing that, we familiarized ourselves with new concepts such as block matrix multiplication, tridiagonal Toeplitz matrices, and Chebyshev polynomials. Setting up conjectures using programming and computational plotting was very methodologically useful.

3.2 Anti-Regular Graph G_n with Even Vertices

Since our initial interest was the anti-regular graph constructed by the binary sequence $b = (0,1,0,1,\ldots,0,1)$, we will first consider the case of connected anti-regular graph with even vertices. That is, let $G_n = G_{2k}$ where $k \in \mathbb{N}$. As mentioned in Section 2.3, the anti-regular graph is an example of a threshold graph. Now consider the adjacency matrix A of a threshold graph G whose vertex set $V(G) = \{v_1, v_2, \ldots, v_n\}$ is labeled consistent with the iterative construction of G. It takes the form

$$A = \begin{bmatrix} b_1 & b_2 & \cdots & b_{n-1} & b_n \\ b_2 & 0 & \cdots & b_{n-1} & b_n \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ b_{n-1} & b_{n-1} & \cdots & 0 & b_n \\ b_n & b_n & \cdots & b_n & 0 \end{bmatrix}.$$

(4)

For the connected anti-regular graph A_n, the alternating binary sequence is

$$b = (b_1, b_2, b_3, b_4, \ldots, b_{n-1}, b_n) = (0,1,0,1,\ldots,0,1).$$

Example 3.1. When $n = 8$, the adjacency matrix A_8 of G_8 is

$$\begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 \end{bmatrix}.$$

However, this form is hard to manipulate or figure out the eigenvalues. We can rearrange the labeling of vertices using an isomorphism (permutation) in such a way that the resulting matrix has a block structure that is easier to manipulate. The advantage with the block structure is that we can consider each block as an ordinary entry and apply the same matrix algebra, provided that the dimensions of the blocks match. Let $J = J_k$ be the $k \times k$ all-ones matrix and let $I = I_k$ be the $k \times k$ identity matrix.

Lemma 3.1. *$n = 2k$ for $k \geq 1$. The adjacency matrix of G_n can be written as*

$$A_n = \begin{bmatrix} 0 & B \\ B & J - I \end{bmatrix} \tag{5}$$

where B is the $k \times k$ matrix

$$B = \begin{bmatrix} & & & & & 1 \\ & & & & \cdot^{\cdot^{\cdot}} & 1 \\ & & & \cdot^{\cdot^{\cdot}} & \cdot^{\cdot^{\cdot}} & \vdots \\ & & \cdot^{\cdot^{\cdot}} & \cdot^{\cdot^{\cdot}} & & \vdots \\ 1 & 1 & \cdots & \cdots & & 1 \end{bmatrix}.$$

Remark 3.1. The permutation that relabels the vertices of G_n from (4) to (5) is

$$\sigma = \begin{pmatrix} v_1 & v_2 & v_3 & \cdots & v_{n-2} & v_{n-1} & v_n \\ v_{\frac{n}{2}} & v_{\frac{n}{2}+1} & v_{\frac{n}{2}-1} & \cdots & v_{n-1} & v_1 & v_n \end{pmatrix}.$$

It is clear to see that, based on the definition of the anti-regular graph, the last vertex added will have the highest degree, so it will be fixed under the permutation. The second to last vertex added will have the lowest degree, so it will be set to v_1. Then, all odd vertices will be permuted to vertices with indices equal to their degree, while all even vertices will be permuted to vertices with indices equal to their degree plus one. The resulting adjacency matrix when $n = 8$ is

$$A_8 = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 & 0 \end{bmatrix}.$$

Hereafter, whenever we refer to A_n, it will be the block form as (5), not (4).

3.3 The Eigenvalues of the Adjacency Matrix A_n

Let P be an $n \times n$ invertible matrix with eigenvalue λ and corresponding eigenvector. Then, $\det(P) \neq 0$. Therefore, $\lambda = 0$ cannot be the root of the characteristic polynomial of P, that is, $\lambda \neq 0$. It is clear that

$$P\vec{x} = \lambda\vec{x}.$$

Since P is invertible and $\lambda \neq 0$ it follows that

$$\frac{1}{\lambda}\vec{x} = P^{-1}\vec{x}.$$

Consequently, if λ is an eigenvalue of P then $1/\lambda$ is an eigenvalue of P^{-1}. That is, if we know the eigenvalue of either P or P^{-1} then we can also figure out the eigenvalue of the other. Therefore, We will concentrate on A_n^{-1} to obtain the eigenvalues of A_n.

Lemma 3.2. *Let M be a 2k × 2k matrix consisting of four k × k blocks of the form*

$$M = \begin{bmatrix} 0 & X \\ X & Y \end{bmatrix}.$$

If X^{-1} exists, then

$$M^{-1} = \begin{bmatrix} -X^{-1}YX^{-1} & X^{-1} \\ X^{-1} & 0 \end{bmatrix}.$$

In our case,

$$B^{-1} = \begin{bmatrix} & & & & -1 & 1 \\ & & & \ddots & \ddots & \ddots \\ & & \ddots & \ddots & \ddots & \\ -1 & \ddots & \ddots & & & \\ 1 & & & & & \end{bmatrix}.$$

Thus,

$$A_n^{-1} = \begin{bmatrix} -B^{-1}(J-I)B^{-1} & B^{-1} \\ B^{-1} & 0 \end{bmatrix}$$

and this is also a block matrix. From now on, we let

$$A_n^{-1} = \begin{bmatrix} V & W \\ W & 0 \end{bmatrix}.$$

Notice that $W = B^{-1}$ and by a straightforward computation,

$$V = \begin{bmatrix} 2 & -1 & & & \\ -1 & \ddots & \ddots & & \\ & \ddots & \ddots & \ddots & \\ & & \ddots & 2 & -1 \\ & & & -1 & 0 \end{bmatrix}.$$

Example 3.2. When $n = 8$, we have

$$A_n^{-1} = \begin{bmatrix} V & W \\ W & 0 \end{bmatrix} = \begin{bmatrix} 2 & -1 & 0 & 0 & 0 & 0 & -1 & 1 \\ -1 & 2 & -1 & 0 & 0 & -1 & 1 & 0 \\ 0 & -1 & 2 & -1 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & 0 & 0 & 0 & 0 \\ -1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}.$$

Now, consider some eigenvalue α of A_n^{-1} and the corresponding eigenvector $\vec{z}$. We can view $\vec{z}$ as a $2k \times 1$ matrix consisting of two $k \times 1$ blocks x and y such that

$$\vec{z} = \begin{bmatrix} x \\ y \end{bmatrix}.$$

Then, since $A_n^{-1}\vec{z} = \alpha\vec{z}$, we know that

$$\begin{bmatrix} Vx + Wy \\ Wx \end{bmatrix} = \begin{bmatrix} \alpha x \\ \alpha y \end{bmatrix}.$$

Thus,

$$Vx + Wy = Vx + \frac{1}{\alpha}W^2 x$$
$$= \alpha x,$$

or

$$(\alpha^2 I - \alpha V - W^2)x = \vec{0}.$$

Let $R_\alpha = \alpha^2 I - \alpha V - W^2$. In order to obtain the eigenvalue α, x should be nontrivial, and thus R_α should be non-invertible. By a straightforward computation, we get

$$R_\alpha = \begin{bmatrix} f(\alpha) & \alpha+1 & & & & \\ \alpha+1 & \ddots & \ddots & & & \\ & \ddots & \ddots & \ddots & & \\ & & \ddots & f(\alpha) & \alpha+1 & \\ & & & \alpha+1 & \alpha^2-1 \end{bmatrix}$$

where $f(\alpha) = \alpha^2 - 2\alpha - 2$. It is clear from the last row or column of R_α that $\alpha = -1$ is a simple root of $\det(R_\alpha) = 0$. Thus, suppose $\alpha \neq -1$, and let

$$S_\alpha = \frac{1}{\alpha+1}R_\alpha = \begin{bmatrix} h(\alpha) & 1 & & & & \\ 1 & \ddots & \ddots & & & \\ & \ddots & \ddots & \ddots & & \\ & & \ddots & h(\alpha) & 1 & \\ & & & 1 & \alpha-1 \end{bmatrix}$$

where

$$h(\alpha) = \frac{f(\alpha)}{\alpha+1}.$$

Then $\alpha \neq 1$ is an eigenvalue of A_n^{-1} provided that $\det(S_\alpha) = 0$. The appearance of S_α is important because it is a **tridiagonal pseudo-Toeplitz matrix**. The reason S_α is called pseudo-Toeplitz is because the leading $(k-1) \times (k-1)$ submatrix is Toeplitz but the rest is not, due to the last entry $\alpha - 1$. As shown in (3), when a matrix is a tridiagonal Toeplitz matrix, its determinant satisfies a recurrence relation related to Chebyshev polynomial of the second kind when conducting Laplace expansion.

If we let

$$\phi_k(\alpha) = \det \begin{bmatrix} h(\alpha) & 1 & & & & \\ 1 & \ddots & \ddots & & & \\ & \ddots & \ddots & \ddots & & \\ & & \ddots & h(\alpha) & 1 \\ & & & 1 & h(\alpha) \end{bmatrix}_{k \times k}$$

and expand $\det(S_\alpha)$ by its last row, we get

$$\det(S_\alpha) = (\alpha - 1)\phi_{k-1}(\alpha) - \phi_{k-2}(\alpha).$$

Using (3), we can easily deduce that $\phi_k(\alpha) = U_k\left(\frac{h(\alpha)}{2}\right)$. Since it must be that $\det(S_\alpha) = 0$, using the definition (1),

$$\begin{aligned} \alpha &= \frac{\phi_{k-2}(\alpha)}{\phi_{k-1}(\alpha)} + 1 \\ &= \frac{U_{k-2}\left(\frac{h(\alpha)}{2}\right)}{U_{k-1}\left(\frac{h(\alpha)}{2}\right)} + 1 \\ &= \frac{\sin(k-1)\theta + \sin k\theta}{\sin k\theta} \end{aligned}$$

where

$$\cos\theta = h(\alpha)/2 = \frac{\alpha^2 - 2\alpha - 2}{2(\alpha+1)}.$$

Using the fact that α is the reciprocal of the original eigenvalue of A_n, we have proven the following.

Theorem 3.1. *Let n = 2k and let A_n be the adjacency matrix of the connected anti-regular graph with n vertices. Then $\lambda \neq -1$ is an eigenvalue of A_n if and only if*

(6)
$$\lambda = \frac{\sin k\theta}{\sin k\theta + \sin(k-1)\theta}$$

where

$$\theta = \arccos\left(\frac{1 - 2\lambda - 2\lambda^2}{2\lambda(\lambda+1)}\right).$$

Note that the domain of arccos is $[-1,1]$ and therefore we must have

$$-1 \leq \frac{1 - 2\lambda - 2\lambda^2}{2\lambda(\lambda+1)} \leq 1.$$

In Jacobs et al. (2015), it is proven that a threshold graph has no eigenvalue in the interval $(-1,0)$. Also, since λ cannot be 0 and -1 in our case, we have $\lambda < -1$ or $0 < \lambda$. Thus, $2\lambda(\lambda+1) > 0$. Since

$$\frac{1 - 2\lambda - 2\lambda^2}{2\lambda(\lambda+1)} \geq -1,$$

by rearranging the inequality we obtain $1 \geq 0$. Therefore, the left part of the inequality is always true. Likewise, since

$$\frac{1 - 2\lambda - 2\lambda^2}{2\lambda(\lambda+1)} \leq 1,$$

by rearranging the inequality, we obtain

$$4\lambda^2 + 4\lambda - 1 \geq 0.$$

Using the quadratic formula we get

(7)
$$\lambda \leq \frac{-1 - \sqrt{2}}{2} \text{ or } \frac{-1 + \sqrt{2}}{2} \leq \lambda.$$

Now let

(8)
$$F(\theta) = \frac{\sin k\theta}{\sin k\theta + \sin(k-1)\theta}.$$

Note that the range of arccos is $[0,\pi]$. Using the trigonometric identity we get

$$\sin k\theta + \sin(k-1)\theta = 2\sin\frac{(2k-1)\theta}{2}\cdot\cos\frac{\theta}{2}.$$

Therefore, the function $F(\theta)$ has singularities when

$$\theta = \frac{2j\pi}{2k-1}$$

where $j \in \{1,2,\ldots,k-1\}$. Thus, the domain of $F(\theta)$ is $(0,\pi)$ except for those singularities. Also, at the boundary points, using l'Hóspital's rule,

$$\lim_{\theta \to 0} F(\theta) = \frac{k}{2k-1} \tag{9}$$

and

$$\lim_{\theta \to \pi} F(\theta) = k. \tag{10}$$

Consequently, we can say the following.

Theorem 3.2. *Let A_n be the adjacency matrix of the connected anti-regular graph with n vertices where n is even. No eigenvalue of A_n is in the interval*

$$\Omega = \left[\frac{-1-\sqrt{2}}{2}, \frac{-1+\sqrt{2}}{2}\right]$$

except for the trivial eigenvalue $\lambda = -1$.

Now that we figured out the eigenvalue bounds, we will look into the distribution of the eigenvalues. In Theorem 3.1, the variable λ must satisfy the equation (6) and

$$\theta = \arccos(\frac{1-2\lambda-2\lambda^2}{2\lambda(\lambda+1)})$$

in order to be an eigenvalue of A_n. Since

$$\frac{1-2\lambda-2\lambda^2}{2\lambda(\lambda+1)} = \cos\theta$$

we have

$$(2\cos\theta+2)\lambda^2 + (2\cos\theta+2)\lambda - 1 = 0.$$

Using the quadratic formula we get two equations for λ, and we can define the following functions:

(11) $$f_1(\theta) = \frac{-(\cos\theta+1)+\sqrt{(\cos\theta+1)(\cos\theta+3)}}{2(\cos\theta+1)}$$

(12) $$f_2(\theta) = \frac{-(\cos\theta+1)-\sqrt{(\cos\theta+1)(\cos\theta+3)}}{2(\cos\theta+1)}.$$

Note that

(13) $$f_1(\theta)+f_2(\theta)=-1.$$

We will use the equation (13) to show the bipartite character of the eigenvalues as

n increases. It is clear that both $f_1(\theta)$ and $f_2(\theta)$ are continuous and differentiable on $(0,\pi)$, and $\lim\limits_{\theta\to\pi^-} f_1(\theta)=\infty$ and $\lim\limits_{\theta\to\pi^-} f_2(\theta)=-\infty$. Below are the figures of the functions $f_1(\theta)$, $f_2(\theta)$, and $F(\theta)$ for the value $k = 10$ and $k = 20$ in the interval $0\leq\theta\leq\pi$. The horizontal line $\lambda=-1/2$ is added to represent the line of symmetry.
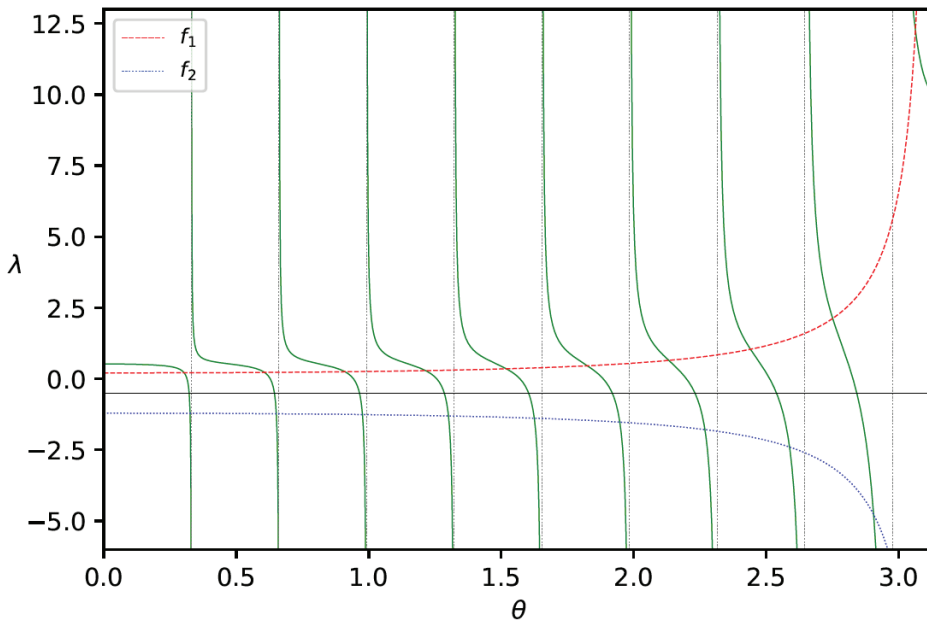
Figure 2. Eigenvalues when k = 10
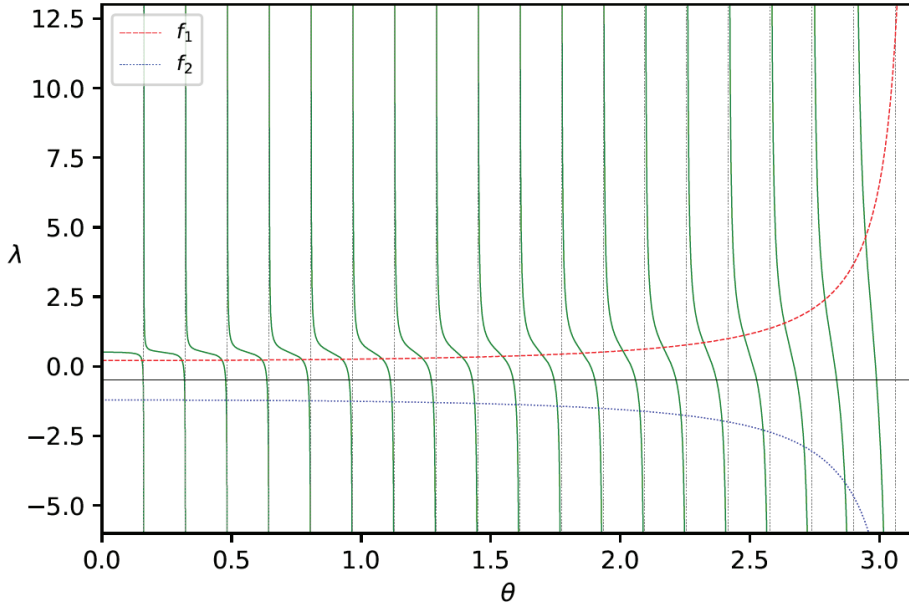
Figure 3. Eigenvalues when k = 20

Note that regardless of the values of k and θ, the intersections always occur above $\dfrac{-1+\sqrt{2}}{2}$ and below $\dfrac{-1-\sqrt{2}}{2}$. This corresponds to the discovery on the eigenvalue bounds mentioned in Theorem 3.2. From now on, we clarify some observations on the functions $F(\theta)$, $f_1(\theta)$, and $f_2(\theta)$, and we state the interval estimates for the eigenvalues of A_n. The following three lemmas describe the behavior of each function within its domain.

Lemma 3.3. *The function $f_1(\theta)$ strictly increases in the interval $0 < \theta < \pi$ and the function $f_2(\theta)$ strictly decreases in the interval $0 < \theta < \pi$.*

Lemma 3.4. *On its domain, the function $F(\theta)$ is strictly decreasing.*

Lemma 3.5. *Define the interval $\zeta_j = \left(\dfrac{2(j-1)\pi}{2k-1}, \dfrac{2j\pi}{2k-1}\right) = (\beta_{j-1}, \beta_j)$ for $j \in \{1,2,\ldots,k-1\}$ and let $\zeta_k = \left(\dfrac{2(k-1)\pi}{2k-1}, \pi\right) = (\beta_{k-1}, \beta_k)$. Within each interval, the function $F(\theta)$ satisfies the following:*

I) For $j \in \{2,3,\ldots,k-1\}$,

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$$\lim_{\theta \to \beta_{j-1}^+} F(\theta) = \infty$$

and

$$\lim_{\theta \to \beta_j^-} F(\theta) = -\infty.$$

II) For $j = 1$,

$$\lim_{\theta \to \beta_0^+} F(\theta) = \frac{k}{2k-1}$$

and

$$\lim_{\theta \to \beta_1^-} F(\theta) = -\infty.$$

III) For $j = k$,

$$\lim_{\theta \to \beta_{k-1}^+} F(\theta) = \infty$$

and

$$\lim_{\theta \to \beta_k^-} F(\theta) = k.$$

Using Lemmas 3.3, 3.4, and 3.5, the following theorem states the interval estimates for the eigenvalues of A_n.

Theorem 3.3. *Let* A_n *be the adjacency matrix of the connected anti-regular graph with* $n = 2k$ *vertices. Let* $F(\theta)$ *be defined as in (8), and let* $f_1(\theta)$ *and* $f_2(\theta)$ *be defined as in (11) and (12).*

i)   *The functions* $F(\theta)$ *and* $f_1(\theta)$ *intersect exactly k times in the interval* $0 \le \theta \le \pi$. *If* $\theta_1^+ < \theta_2^+ < \ldots < \theta_k^+$ *denote the* θ *values where they intersect then the positive eigenvalues of* A_n *are*

$$f_1(\theta_1^+) < f_1(\theta_2^+) < \ldots < f_1(\theta_k^+).$$

Moreover, for $j \in \{1, 2, \cdots, k\}$,

$$f_1\left(\frac{2(j-1)\pi}{2k-1}\right) < f_1(\theta_j^+) < f_1\left(\frac{2j\pi}{2k-1}\right).$$

ii)   *The functions* $F(\theta)$ *and* $f_2(\theta)$ *intersect exactly* $(k-1)$ *times in the interval* $0 \le \theta \le \pi$. *If* $\theta_1^+ < \theta_2^+ < \ldots < \theta_{k-1}^+$ *denote the* θ *value where they intersect then the positive eigenvalues of* A_n *are*

$$f_2(\theta^+_{k-1}) < \ldots < f_2(\theta^+_2) < f_2(\theta^+_1).$$

Moreover, for $j \in \{1, 2, \ldots, k-1\}$,

$$f_2\left(\frac{2j\pi}{2k-1}\right) < f_2(\theta^-_j) < f_2\left(\frac{2(j-1)\pi}{2k-1}\right).$$

3.3 The Eigenvalues of A_n when n is Large

Before looking into the behavior of the eigenvalues when n is large, we need to know about the uniform continuity.

Definition 3.1. A function $f : D \to \mathbb{R}$ is **uniformly continuous** on D provided that for every $\epsilon > 0$, there exists a $\delta > 0$ such that for all $x, y \in \mathbb{D}$, if $|x - y| < \delta$ then $|f(x) - f(y)| < \epsilon$.

We can see that the definition is very similar to the $\epsilon - \delta$ definition of limit. However, the uniform continuity deals with the continuity of a function at an arbitrary point in the domain whereas $\epsilon - \delta$ definition of limit focuses on a fixed point. Notice that the uniform continuity is a stronger concept then continuity. That is, a function being continuous does not guarantee that it is also uniformly continuous. However, if the function is continuous in a closed interval and thus has finite bounds, we can say that it is uniformly continuous on the interval. For example, the function $f_1(\theta)$ and $f_2(\theta)$ we used in the last section are not uniformly continuous on the interval $[0, \pi)$, but they are on the interval $[0, r\pi]$ where $r \in (0,1)$. Using this definition, we can prove the following theorem that describes the behavior of the eigenvalues for arbitrary n. The explicit proof of it can be found in the original paper (Aguilar et al., 2018). The theorem shows that as we increase n, the eigenvalues of A_n shows almost-perfect symmetry up to the range we want them to be.

Theorem 3.4. *Let* A_n *be the adjacency matrix of the connected anti-regular graph where* $n = 2k$. *Let* $\lambda^+_1 < \lambda^+_2 < \cdots < \lambda^+_k$ *denote the positive eigenvalues and let* $\lambda^-_{k-1} < \lambda^-_{k-2} < \cdots < \lambda^-_1 < -1$ *denote the negative eigenvalues of* A_n. *Fix* $r \in (0,1)$ *and let* $\epsilon > 0$ *be arbitrary. Then for k sufficiently large,*

$$|\lambda^+_j + \lambda^-_j + 1| < \epsilon$$

for all $j \in \{1, 2, \ldots, k-1\}$ *such that* $\dfrac{2j}{2k-1} \leq r$.

Note that since this is true for all $\epsilon > 0$, we can adjust the accuracy of this symmetric behavior by modifying k value. For example, since $k \to \infty$ as $\epsilon \to 0$,

$$0 < \lim_{k \to \infty} |\lambda_j^+ + \lambda_j^- + 1| < \lim_{\epsilon \to 0} \epsilon$$

and thus

$$\lim_{k \to \infty} |\lambda_j^+ + \lambda_j^- + 1| = 0$$

for $j \in \{1,2,\ldots,k-1\}$.

3.5 The Case when n is Odd

Up until now, we have explored the connected anti-regular graph of even vertices. In this section, we will look into the connected anti-regular graph of odd vertices. That is, let $n = 2k + 1$ where k is any non-negative integer. It is known that the eigenvalues of

$$\begin{bmatrix} 0 & 1 & \cdots & 0 & 1 \\ 2 & 0 & \cdots & 0 & 1 \\ \vdots & & \ddots & & \vdots \\ 0 & 0 & \cdots & 0 & 1 \\ 2 & 1 & \cdots & 1 & 0 \end{bmatrix}_{2k \times 2k}$$

are identical to those of the adjacency matrix of the anti-regular graph generated by the binary sequence $(0,0,1,0,1,\cdots,0,1)$ of the length n, except for the obvious eigenvalue 0 (Godsil and Royle, 2001).

Using the same permutation in remark \ref{perm remark} that arranges A_n into a block form, we get

$$(14) \qquad \begin{bmatrix} O & B \\ C & J-I \end{bmatrix}_{2k \times 2k}$$

where J is a $k \times k$ all-one matrix, B is defined the same way as in the case $n = 2k$, and

$$C = \begin{bmatrix} & & & & 2 \\ & & & 1 & 2 \\ & & \iddots & \vdots & \vdots \\ & \iddots & \iddots & \vdots & \vdots \\ 1 & 1 & \cdots & 1 & 2 \end{bmatrix}.$$

The proof of the following is a straightforward computation.

Lemma 3.6. *Consider the matrix (14) and denote it as $\overline{A}_n$ where $n = 2k+1$. Then*

$$\overline{A}_n^{-1} = \begin{bmatrix} X & Y \\ Z & O \end{bmatrix}$$

where $X = -C^{-1}(J-I)B^{-1}$, $Y = C^{-1}$, and $Z = B^{-1}$. Explicitly,

$$X = \begin{bmatrix} 2 & -1 & & & \\ -1 & \ddots & \ddots & & \\ & \ddots & \ddots & & \ddots \\ & & \ddots & 2 & -1 \\ & & & -1/2 & 0 \end{bmatrix}$$

and

$$Y = \begin{bmatrix} & & & & -1 & 1 \\ & & & \cdot^{\cdot} & 1 & \\ & & \cdot^{\cdot} & \cdot^{\cdot} & & \\ -1 & 1 & & & & \\ 0.5 & & & & & \end{bmatrix}.$$

Just like the case when n is even, from $\overline{A}_n^{-1}\vec{z} = \alpha\vec{z}$, we get

$$Xx + Yy = \alpha x$$
$$Zx = \alpha y,$$

and thus

$$(\alpha^2 I - \alpha X - YZ)x = 0.$$

Let $P(\alpha) = \alpha^2 I - \alpha X - YZ$ so that $\det(P(t)) = \det(tI - \overline{A}_n^{-1})$ is the characteristic polynomial of $\overline{A}_n^{-1}$. By straightforward computation,

$$P(\alpha) = \begin{bmatrix} f(\alpha) & \alpha+1 & & & \\ \alpha+1 & \ddots & & \ddots & \\ & & \ddots & \ddots & \ddots \\ & & \ddots & f(\alpha) & \alpha+1 \\ & & & \dfrac{\alpha+1}{2} & \alpha^2 - \dfrac{1}{2} \end{bmatrix}$$

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where $f(\alpha) = \alpha^2 - 2\alpha - 2$. Since it is known that $\lambda = -1$ cannot be an eigenvalue of A_n where n is odd (Jacobs et al., 2015), $\alpha \neq -1$. Therefore, we can divide $P(\alpha)$ and obtain

$$Q(\alpha) = \frac{1}{\alpha+1} P(\alpha) = \begin{bmatrix} h(\alpha) & 1 & & & & \\ 1 & \ddots & \ddots & & & \\ & \ddots & \ddots & \ddots & & \\ & & \ddots & h(\alpha) & 1 & \\ & & & 1/2 & \dfrac{\alpha^2 - \dfrac{1}{2}}{\alpha+1} \end{bmatrix}$$

where $h(\alpha) = \dfrac{\alpha^2 - 2\alpha - 2}{\alpha+1}$. Thus, α is an eigenvalue of A_n^{-1} provided that $\det(P(\alpha)) = 0$. Since the leading $(k-1) \times (k-1)$ submatrix of $Q(\alpha)$ is identical to that of $S(\alpha)$ in the even case, we can use the same polynomial $\phi(\alpha)$ that correlates to Chebyshev polynomial of the second kind, $U\left(\dfrac{h(\alpha)}{2}\right)$. By expanding $Q(\alpha)$ along the last row, we get

$$\begin{aligned} \det(Q(\alpha)) &= \frac{\alpha^2 - \dfrac{1}{2}}{\alpha+1} \phi_{k-1}(\alpha) - \frac{1}{2}\phi_{k-2}(\alpha) \\ &= \frac{\alpha^2 - \dfrac{1}{2}}{\alpha+1} U_{k-1}\left(\frac{h(\alpha)}{2}\right) - \frac{1}{2} U_{k-2}\left(\frac{h(\alpha)}{2}\right) \\ &= 0. \end{aligned}$$

By the definition of $U_k(x)$, substituting $\alpha = \dfrac{1}{\lambda}$ and rearranging provides the proof for the following theorem.

Theorem 3.5. *Let $n = 2k-1$ and let A_n be the adjacency matrix of the connected anti-regular graph with n vertices. Then $\lambda \neq 0$ is an eigenvalue of A_n if and only if*

(15)
$$\frac{2-\lambda^2}{\lambda+\lambda^2} = \frac{\sin(k-1)\theta}{\sin k\theta}$$

where

$$\theta = \arccos(\frac{1-2\lambda-2\lambda^2}{2\lambda(\lambda+1)}).$$

Note that θ is defined just as in the even case. That is, we can use the functions $f_1(\theta)$ and $f_2(\theta)$ as they are defined in the even case. Now let

$$G(\theta) = \frac{\sin(k-1)\theta}{\sin k\theta}.$$

When substituting $f_1(\theta)$ and $f_2(\theta)$ into the left term of (15) and denoting each as

$g_1(\theta)$ and $g_2(\theta)$, we get

$$g_1(\theta) = 2+3\cos\theta + \sqrt{(\cos\theta+1)(\cos\theta+3)}$$
$$g_2(\theta) = 2+3\cos\theta - \sqrt{(\cos\theta+1)(\cos\theta+3)}.$$

By (15), we know that λ is an eigenvalue of A_n when $G(\theta) = g_1(\theta)$ or $G(\theta) = g_2(\theta)$.

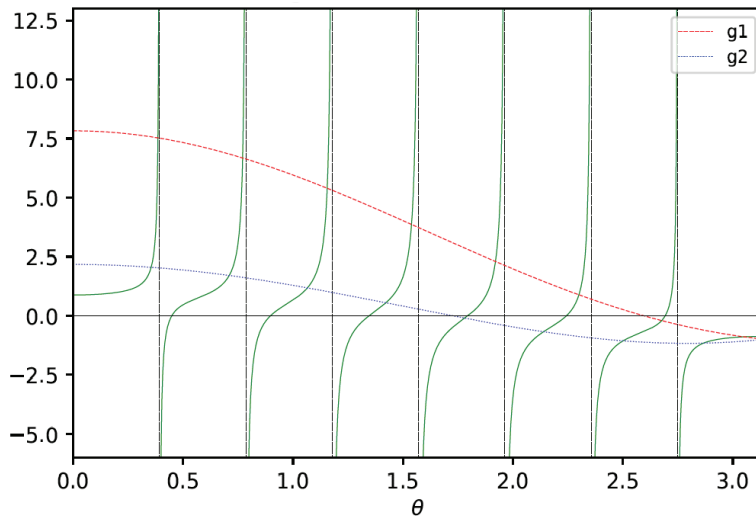The situation when $n = 17$ or ($k = 8$, equivalently) is shown in the following figure.

Figure 4. Eigenvalues when n = 17

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By the same process as in the even case, we can prove that theorems 3.3 and 3.4 also hold for $g_1(\theta)$ and $g_2(\theta)$. Consequently, we can conclude for the odd case the same results shown in the even case; the sharp bounds and the symmetry of the eigenvalues of A_n. However, notice that the function $G(\theta)$ has singularities when $k = \dfrac{j\pi}{k}$ where $j \in \{1,2,\ldots,k-1\}$ and thus we can divide the interval $(0,\pi)$ into k subintervals such that $\eta_j = \left(\dfrac{(j-1)\pi}{k}, \dfrac{j\pi}{k}\right)$ for $j \in \{1,2,\ldots,k-1\}$ and $\eta_k = \left(\dfrac{(k-1)\pi}{k}, \pi\right)$. That is, the intervals that help estimate the eigenvalues are different from the case when n is even.

4. CONCLUSION

Throughout the report, we observed the eigenvalues of connected anti-regular graphs, and clarified their characteristics such as the interval bounds and distribution. We started with investigating anti-regular graphs with even vertices. In order to obtain the eigenvalue expressions, we permuted the labels of the vertices to make the adjacency matrix of the anti-regular graph in a block matrix form. Then, we took the inverse of it to obtain the tridiagonal Toeplitz matrix whose determinant is zero. Using the relation between the tridiagonal Toeplitz matrix and the Chebyshev polynomial of the second kind, we obtained the ratio expression of the eigenvalue. Using the equation for the eigenvalue, we could derive and plot three functions whose intersections are the eigenvalues of the adjacency matrix. We discovered that when n is the order of the graph, the trivial eigenvalue $\lambda = -1$ was the only eigenvalue in the interval $\Omega = \left[\dfrac{-1-\sqrt{2}}{2}, \dfrac{-1+\sqrt{2}}{2}\right]$, and there were strictly increasing sequence of $n/2$ positive eigenvalues and strictly decreasing sequence of $n/2-1$ negative eigenvalues excluding $\lambda = -1$. Also, each eigenvalue had its own interval bound so that it could be specified. Then we proceeded to the connected anti-regular graphs with odd vertices and found out that the same observation held for characterization and distribution of eigenvalues. The difference was that they had different interval bounds.

Note that we stated in Section 3.1 that our initial interest was the characterization of the eigenvalues of general threshold graphs. In future studies, we could investigate the eigenvalues of general threshold graph using the results of the connected anti-regular graphs with even vertices since we can create an alternating binary sequence $(0,1,0,1\ldots,0,1)$ for any general threshold graph by grouping consecutive zeros and ones and labeling them 0 and 1, respectively. Also, we could prove the conjecture that

the "forbidden" interval Ω does not contain an eigenvalue of any threshold graph other than the trivial eigenvalues $\lambda = 0, -1$.

GLOSSARY

adjacency matrix if n is the order of a graph, then the adjacency matrix of a graph is the square $n \times n$ matrix such that its $(i; j)$ entry is 1 when there is an edge from i^{th} vertex to j^{th} vertex, and 0 when there is no edge.

adjacent two vertices of a graph are adjacent if they are connected with an edge.

anti-regular graph a graph such that there are only two vertices with the same degree.

automorphism an isomorphism of a graph onto itself.

complete graph a graph such that every vertex is a dominating vertex.

connected graph a graph such that there exists a path for any two distinct vertices.

degree the degree of a vertex is the number of vertices adjacent to it.

degree sequence the sequence of the vertex degrees of a graph.

disconnected graph a graph that is not connected.

dominating vertex a vertex which is adjacent to every other vertex.

edge an unordered pair of two vertices.

empty graph a graph such that every vertex is an isolated vertex.

graph an ordered pair *(V, E)* of two sets: vertex set*(V)* and edge set*(E)*.

isolated vertex a vertex which is not adjacent to any other vertices.

isomorphic graphs two graphs are isomorphic if there exists an isomorphism between them.

isomorphism a bijection from the vertex set of a graph to that of another graph that preserves connectivity (edges).

join the join of two graphs G_1, G_2 is the graph constructed by connecting every vertex in V_1 to every vertex in V_2, from the union of G_1 and G_2.

neighborhood the neighborhood of a vertex of a graph is the set of all vertices adjacent to it.

order the cardinality of the vertex set of a graph.

path a sequence of distinct vertices.

permutation a bijection from the vertex set of a graph to itself.

regular graph a graph in which every vertex has the same degree.

size the cardinality of the edge set of a graph.

spectral graph theory the study of the properties of a graph in relationship to the characteristic polynomial, eigenvalues, and eigenvectors of matrices associated with the graph.

spectrum the spectrum of a graph is the list of the eigenvalues of its adjacency matrix in increasing order.

threshold graph a graph that can be constructed by repeatedly adding a single isolated vertex or a single dominating vertex.

Toeplitz matrix a matrix such that each descending diagonal from left to right is constant.

tridiagonal Toeplitz matrix a Toeplitz matrix such that the entries other than the main diagonal and its upper and lower adjacent diagonals are zero.

union the union of two graphs $G_1(V_1, E_1)$, $G_2(V_2, E_2)$ is the graph with vertex set $V_1 \cup V_2$ and the edge set $E_1 \cup E_2$.

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Dance and the New Deal

Samantha Schmeer

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Dance, like all art, acts as an important factor in social change. Dancers and choreographers have frequently sought to challenge the status quo, whether by removing women's corsets and incorporating natural movements into pieces as Isadora Duncan did, or by creating dances with political subject matter, like in Kurt Jooss's *The Green Table*. Despite the clear importance of the arts, securing funding has always been and continues to be an uphill battle. The period of the Great Depression in the 1930s saw huge growth in many artistic spheres through the implementation of Franklin Delano Roosevelt's New Deal. The art projects and programs of the New Deal acted as a harbinger of the National Endowment for the Arts and laid the foundation for dance to be recognized as its own genre separate from theatre. This paper will explore the history of dance and dance funding, beginning with and focusing on the Federal Theatre and Federal Dance Projects. It will go on to discuss the National Endowment for the Arts and engage with larger ideas about artistic funding.

Art is an important factor in social change, and dance is no exception. Dancers and choreographers have frequently sought to challenge the status quo, whether by removing women's corsets from wardrobes and incorporating natural movements into pieces as Isadora Duncan did, or by creating dances with explicit political subject matter, like in Kurt Jooss's *The Green Table*. Despite the clear importance of the arts in society, securing funding has always been and continues to be an uphill battle. During the Great Depression of the 1930s, the arts saw immense growth through the implementation of President Roosevelt's New Deal. The art projects and programs of the New Deal acted as a harbinger of the National Endowment for the Arts and laid the foundation for dance to be recognized as a genre separate from theatre (Dils, 2012). Though dance is a little-discussed facet of the New Deal, it is of incredible importance to the history of dance as a whole. The Federal Dance Project—a part of the New Deal—allowed for dance to distinguish itself as its own art form in the United States, provided a basis for future funding of dance, and demonstrated how influential dance as an art can be when even a small effort is made to fund it.

The New Deal clearly demonstrates the progress that can be made by giving adequate funding, power, and voice to the arts. When Roosevelt took office in 1933, he faced the hurdle of helping the country recover from the Depression. Thus, the New Deal was born (Dils, 2012). This series of programs and projects aimed to restore prosperity to Americans, and though it did not end the Great Depression, it restored confidence and

spirit to many Americans, brought relief to millions, and provided a basis for more long-term structural reform. Among these projects were programs specifically aimed at supporting artists, as well as "promot[ing] American art and culture and to give more Americans access to…'an abundant life'" ("A New Deal for the Arts," n.d.). Many New Deal artists were politically active and were "united by a desire to use art to promote social change, these artists sympathized with the labor movement and exhibited an affinity for left-wing politics" ("A New Deal for the Arts," n.d.). This sparked controversy and ultimately played a role in the programs' destruction, as could be seen within the Federal Dance Project.

When the Federal Dance Project (FDP) was created in 1936, it acted as a "semi-autonomous unit" within the Federal Theatre Project. Dancers brought the Project to life after months of advocacy, most notably Heather Tamiris, who wanted a Works Progress Administration program specifically for unemployed dancers (Cooper, 1997, p. 28). At this time in the United States, dance had not completely distinguished itself as its own art form, and was instead almost always grouped with theatre. Under the FDP, dance units were set up in New York City, Chicago, Los Angeles, Philadelphia, Tampa, and Portland, Oregon, and unemployed dancers "were hired under four categories: ballet, modern dance, vaudeville, and teaching" (Dils, 2012, p. 1). Don Oscar Becque was hired as the first director of the FDP. However, the FDP was fraught with tension from the time of its creation.

Low funding caused many struggles for the FDP. Becque claimed that "excessive political activity, the virtual impossibility of getting scenery, costumes and theatres for dance productions [prevented] any sort of professional standards being set up" ("Federal Dance Project," n.d.). Some audiences and political figures did find the organization unprofessional, partly due to the politics that took place within it. The Dancing Teacher's Business Association did not like the prevalence of progressive attitudes within the FDP, which is perhaps odd or hypocritical considering that the New Deal itself was rather progressive. The Association stated, "The association deplores the obvious lack of respect for taxpayers' money… [and the] masking of political and propagandistic drivel under the guise of 'unite against war and fascism'… [I]t is high time that dancing was removed from the hands of the long-haired boys and girls who represent the 'modern' movement…" ("Federal Dance Project," n.d.). Though the use of political commentary within FDP dances rubbed some people the wrong way, it was also seen as a strength by others, and artists within the FDP were unwilling to relent and soften their subject matter simply to assuage the discomfort of others. Helen Tamiris, for one, was not shy about her intent to highlight unemployment, racial inequality, war, and other social ills in her work: "The validity of modern dance is rooted in its ability to express modern problems and, further, to make modern audiences want to do something about them" (Tish, 1994, p. 331). Though modern dance did later enter a period of abstraction, Tamiris' idea continues to be at the core of modern dance today.

The FDP was created at the insistence of modern dancers, so it mostly served that community. Ballet was already an accepted form of fine art in Europe and in many parts of the United States, and theatre flourished during this time (Kraus, 1997). It had not yet gained the footing it would have in the twenty-first century, so it ruffled the feathers of many traditionalists. These negative attitudes were then even further aggravated by the political nature of modern dance choreography, as controversial themes were not nearly as common within traditional ballet (Krauss, 1997). Despite the backlash, modern dance made a name for itself through the FDP. Many of the famous trailblazers of modern dance were members of the FDP at one point. For example, Doris Humphrey, Charles Weidman, Heather Tamiris, and Roger Pyor Dodge all acted as choreographers (Dils, 2012). Many of these important figures also acted as the directors of individual units, such as Ruth Page and Bentley Stone who led the Chicago unit for a time. After Becque's departure, Lincoln Kerstein, who is now well-known as the co-founder of the New York City Ballet, took over. Tamiris followed after him (Dils, 2012). These figures are all well-known to any person studying dance, but their roles in the FDP, which helped them to gain notoriety, are scarcely discussed.

As the 1930s neared came to an end, many New Deal programs faced cuts. This was true for the FDP, which was absorbed back into the FTP in 1937. The Federal Theatre Project, and therefore FDP, was then terminated in 1939 when Congress blocked funding over fears of wasteful spending, racial integration, and communist agitation as the U.S. hurtled into World War II ("Federal Dance Project," n.d.). Despite the tensions and the fact that it was relatively short-lived, the FDP was successful. It produced many original works that depicted social injustices, some which received high praise, critical acclaim, and awards. Tamiris' work *How Long Brethren* depicted the privation of unemployed African Americans in the South, and it won her *Dance Magazine*'s annual award for excellence in 1937 (Tish, 1994). Additionally, the FDP provided hundreds of jobs, brought dance to many Americans who otherwise may not have experienced it, and solidified dance, especially modern dance, as a genre in and of itself (Lancos, 2018). Dance gained its own distinction separate from theatre, which undoubtedly allowed for dance to become the art form it is today. It also demonstrated what was possible when arts were funded, as this was "the first national program dedicated to the support of dance and dancers," and "never before or never since has the government so extensively sponsored the arts" ("A New Deal for the Arts," n.d.). This set the stage for later programs, such as the National Endowment for the Arts.

After the dissolution of the New Deal programs, dance did not receive consistent federal funding for a period of many years. Modern dance continued to grow and evolve through this period, but it was not until the Eisenhower presidency that the dance and arts community received funding at the national level (Kraus, 1997). Dance was gaining prominence as an art form that could demonstrate "American excellence" (Dils, 2012, p. 2). During the Eisenhower presidency from 1953 to 1961, the American Ballet Theatre, the New York City Ballet, Jose Limon Dance Company, Martha Graham Dance Company, and the Alvin Ailey American Dance Theatre were each

sent overseas as a method of cultural diplomacy during the Cold War. Later, The FDPs most direct successor was born, the National Endowment for the Arts (Dils, 2012). Created in 1965 by Congress and President Lyndon B. Johnson, the NEA was part of a set of domestic programs launched by Johnson, often known as Johnson's Great Society. These programs also funded the National Endowment for the Humanities and Public Broadcasting. Under the NEA, dance is its own genre, a factor that can be largely attributed to the progress made within the FDP and FTP, despite the gap in time between the programs (Dils, 2012). Just as the WPA, and therefore FDP, faced backlash, largely from those with conservative political ideology, the NEA faces similar criticisms. There are, however, crucial differences between the NEA and WPA programs. The NEA's funding is not as extensive, as it does not provide wages for dancers in the way the WPA did (Dils, 2012). Today, dancers in large companies and commercial venues are often represented by unions that were created during the 1930s and motivated by New Deal policies.

The battle for funding the arts, despite what artists, citizens, and researchers know that funding accomplishes continues to be an uphill battle. Primary and secondary schools do not prioritize arts nearly to the level that would be possible given more funding. Art programs within higher education institutions often face cutbacks when budgets are reduced. Many of these programs rely heavily on donors to support them (Flannery, 2019). Outside of education, the NEA is a particularly vital resource for institutions in smaller, underrepresented communities that don't necessarily attract the attention of wealthy philanthropists. Sadly, some people see the agency, and its counterpart the National Endowment of the Humanities, as examples of frivolous government spending on programming that serves only a small fraction of the population. This opinion is not a new one. It was seen even when these programs were in their infancies during the New Deal. However, an examination of the history of funding for dance clarifies how important this funding is. When the arts are funded, creativity flourishes, people become more well-rounded, and all citizens—even those not involved directly in politics—can take part in and understand political discourse. Upon signing the NEA, President Johnson said, "Art is a nation's most precious heritage. For it is in our works of art that we reveal to ourselves and to others the inner vision which guides us as a nation. And where there is no vision, the people perish" (Lependorf, 2017, para. 2).

Though not often discussed, the Federal Dance Project was essential to creating the art form as we see it today. The FDP allowed for dance to continue to change and evolve, something that may not have been possible otherwise, or at least may have taken considerably longer. Modern dance may have originated in Europe, but the United States quickly became the focal point for dance experimentation with new movement styles, and it is hard to imagine what dance would look like today without the New Deal.

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Interview with Lytton Smith, Director of the Center for Integrative Learning

Nicole Callahan

How would you define GREAT Day?

That's a great question. That's a big one. I mean for me the Boyd showcase comes to mind—particularly a showcase of student research and creativity. On the one hand, it gives students professional expertise, delivering their research to an audience, which I think is rare at undergraduate institutions. But even more than that, the other thing that comes to mind, I think it's a check-in as well. It's a celebration because it gives a chance for students to see the really cool stuff that one another is working on. And it could be a great week.

What does GREAT Day mean in terms of student success?

It means a tremendous amount. I think one of the key things is that it allows students to recognize what's going on and build on it. So there's an inspiration aspect to it. I think it's a confidence builder towards participating in off-campus presentations. Something might be designed for GREAT Day and that leads to something else, or somebody might do something at GREAT Day and then think, "Hey, that wasn't so bad, I can do this." Then they take it to an undergraduate or a disciplinary venue. I think it's also important in terms of equity and access. It's a day where every student can talk and participate because class is canceled. So a lot of the obstacles to attending conferences, like if you're a carer, or if you're off-campus, or if you have financial barriers—GREAT Day doesn't have those obstacles.

How does GREAT Day represent what is seen within the classrooms and within the various fields of study on this campus?

I think it creates a space for people to move through. So you might go to a poster session, or go see a friend's poster, or you connect with another class, or you find something you weren't expecting. If you're interested in a particular topic and you see that there's a panel you head there and listen to something. But part of it's also the importance of the GREAT Day Program in that, you look at the program and think, "I wish I could go to that," or "I'm glad that I know that that exists." Hopefully that isn't just my experience as a member, I hope that's an experience the students have too.

What do you think the role of undergrad research is at Geneseo, and what do you think it should be?

One of the things I love most about Geneseo is that undergraduate research is really central. I think it's at the forefront. I think faculty and staff here take students seriously as researchers. I think that, as an undergraduate, it can be hard to take yourself seriously as a researcher, and I'm impressed at how students come to do that, because it's not easy. It's something they should do because amazing research is produced by undergraduates here.

You know, I think sometimes students don't realize that there are TRAC [Travel, Research and Creativity] Grants for attending conferences. I think the fact that people don't realize they exist is a sign that there's this great resource there that, when students find out about it, they say, "Wow, there's a means to achieve this." There are things like the ambassadorship program, so there are those opportunities to engage in research. I've always been a great believer in the ideas of pedagogy theorist Paulo Freire. He talks about student-teachers and teacher-students, the idea that students have expertise, and the classroom is never hierarchical. There's not just one person with the knowledge there. And so, I think the role of student research is to serve as a reminder that students contribute expertise, contribute knowledge, that they can create, and discover, and articulate. GREAT Day is a great way of achieving that, but also symbolizing that for the rest of the year.

As the director of the Center for Integrative Learning, you interact with a lot of areas of undergraduate research and self motivated study on campus. So what do you think Geneseo's culture surrounding undergraduate research is?

Yeah, I mean I think the culture is one of empowering students. It's a place where I see faculty and staff working really hard to make sure that there are opportunities for students. They work on making research possible and making it clear why it's a valuable thing to be doing. So that's the point being a college. Particularly a liberal arts college like this one, where the sciences are strong, while it's still firmly being a liberal arts college. The point is not to sit and listen for four years. The point is to gain knowledge, to gain skills, and to come to understand yourself. Research is an important means for doing that. What's also striking I think—and I'm not just saying this because of my role—but culture is integrative, which is to say that students have always been finding ways to bring different subjects together or different experiences together.

You know, so it could be that they're involved in a club, so they're relating that to a class that they're taking. They're thinking, "How does my studying a particular history class relate to my work within an activism club?" That desire to join the dots is something that I think speaks to the culture of curiosity here. And you know, I'm always inspired by seeing colleagues fostering that culture of creative curiosity. But

that also comes from the students, it comes from the sort of a student who chooses SUNY Geneseo.

Are there any other points about integrative learning or undergraduate research opportunities at Geneseo that maybe you haven't gotten to touch on yet that you think are important?

I want to find more ways for students to get from a GREAT Day presentation to an ambassadorship application, or to get from a GREAT Day presentation to national fellowships and scholarships. I recognize that there are steppingstones along the way. It might be that a GREAT Day presentation leads to something in a class or a conference or a directed study. But that's largely on me to help make those links, but I'm also always looking to collaborate with students to find ways to make GREAT Day itself as integrative as students want it to be. I'm lucky because of one of my involvements, I'm always in a GREAT Day room where there's a group of creative writers and a group of scientists. I'm listening to subjects that I wouldn't otherwise come into contact with. I think it's very easy, because we've got so many friends and colleagues in our own disciplines, to have a GREAT Day where its all philosophy or all mathematics, and I think one of the things that excites me most is when I hear students talking about how they were just in a biology presentation and now they're off to an anthropology presentation on ceramics. I try to foster that.

Space-Efficient Knot Mosaics of Size 7

Gregory Vinal

sponsored by Aaron Heap, PhD & Doug Baldwin, PhD

ABSTRACT

Mosaic knot theory is a young and exciting area of mathematics. Since it is still in its mathematical infancy, there are many basic questions still unanswered. The main goal of the field is to represent knots on a square grid using a certain set of tiles. From those tiles we can build knot projections. The smallest $n \times n$ grid that each knot with crossing number 10 or less can fit on is unknown. In this paper, we explain how we developed a program that creates and identifies every knot on a 7×7 mosaic, and we find every knot with crossing number 10 or less that can fit on a 7-mosaic with tile number 27 or 29.

INTRODUCTION

Mosaic knot theory is an area of knot theory that aims to represent a knot projection on some $n \times n$ grid, using a specific set of tiles. In other words, we aim to restrict knot projections into being composed of the tiles which are shown in Figure 1 laid in a $n \times n$ grid, in order to introduce more structure into otherwise unstructured projection. There are some natural advantages to this approach; namely, given a mosaic representation of a knot projection, that projection can be recreated exactly with minimal information. Additionally, this approach allows computers to analyze a knot projection, since there is a natural representation of a knot mosaic as a matrix.
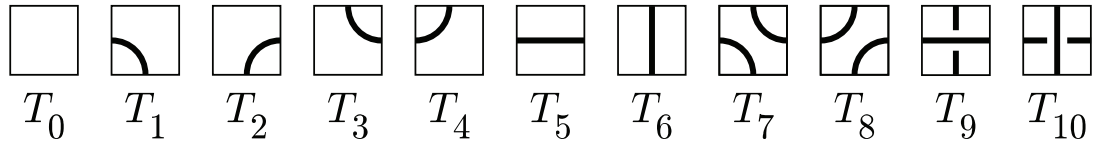

Figure 1: All Mosaic Tiles

It is known that any knot with finite crossings can be represented on a suitably large $n \times n$ grid (n-mosaic)(Lomonaco & Kauffman, 2008). One example of this is shown for the canonical representation of the trefoil in Figure 2. Notice that all the crossings are preserved, and the mosaic on the right is indeed the same projection as the freely-drawn projection on the left. In this way, we have taken a projection that is unregulated and can be arbitrarily complex and converted it into a mosaic that is structured. The field of mosaic knot theory is very new, with the first paper on the subject being published

in 2008 (Lomonaco & Kauffman, 2008). Because of this, we know certain things, but other simple questions remain open. For example, we know that the trefoil can be represented on a 4 × 4 grid (and no smaller) and that the figure-8 knot can fit on a 5 × 5 grid minimally. However this property for knots with more than 8 crossings is unknown in general. For each knot with crossing number 10 or less, we set out to find the smallest $n \times n$ grid on which that knot can be represented, and its densest representation, thus completing the table of knots up to and including 10.
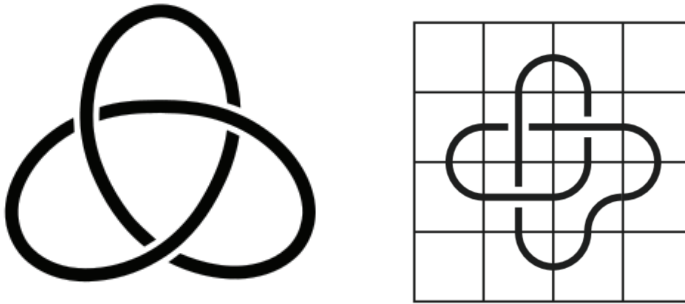

Figure 2: Representing a Projection on a Mosaic

Preliminary Definitions

First, we should offer rigorous definitions for the objects that we will be talking about:

Definition 2.1

A **knot** is a simple closed curve in S^3. A **link** is the nonempty union of a finite number of knots.

Definition 2.2

A **connected sum** of two knots is a knot formed by deleting a segment (1-ball) inside each knot and gluing together the resulting boundary points (1-spheres).

Definition 2.3

A **composite knot** is a knot that is the connected sum of two non-trivial knots. A **prime knot** is any knot that is not composite.
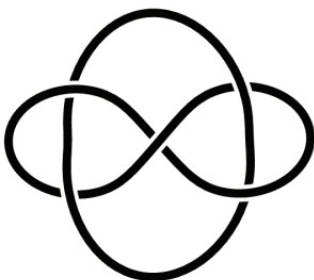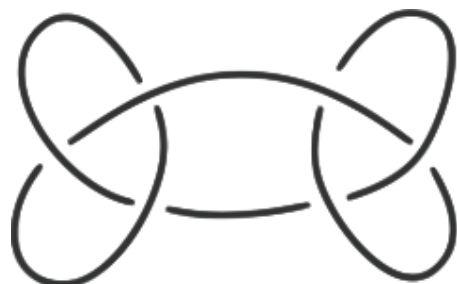

Figure 3: The Whitehead Link

Figure 4: A Composite Knot

It is hard to draw in S^3, so we draw knots on paper. Consider the following definition:

Definition 2.4

A **knot projection** or **knot diagram** is a projection of a knot into a plane with arcs at crossings differentiated into over-crossings and under-crossings. A **link diagram** is a similar projection of a link. In simpler terms, a link is more than one knot in space. Figure 3 shows two unkots that are linked non-trivially. However, Figure 3 and Figure 4 viewed together is also a link, as it is three knots in the same projection. Notice that links can be trivially linked together.

In order to form a connected sum of two knots, we cut each knot at some point and glue the knots together at their boundaries. Figure 4 shows a composite knot. Notice that this knot is the connect sum of two trefoils. Knot theory is interested in distinguishing knots, and so we need to define equivalence between knots:

Definition 2.5

Two knots, K_1, K_2 are said to be **knot equivalent** if there is a continuous function, i: $[0,1] \times S^3 \to S^3$, such that

- $i(0, S^3)$ is the identity function
- $i(1, K_1) = K_2$
- For all $t \in [0,1]$, $i(t, S^3)$ is a homeomorphism to S^3.

We call i an ambient isotopy. We also need to define how we classify knots:

Definition 2.6

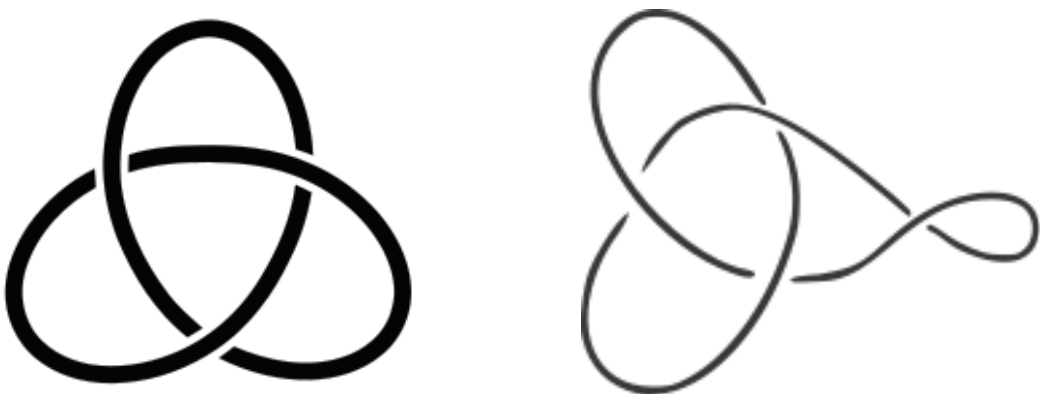The fewest numbers of crossings needed to represent a knot is called its **crossing number**.

Figure 5: Two Projections of the Trefoil

The two knots shown in Figure 5 are the same, and the continuous deformation (ambient isotopy) from one to the other is pretty clear. However, these are two different knot projections. We can quickly tell because the knot projection on the left has three crossings and the knot projection on the right has 4 crossings. When we say that two knots are the same, we are saying that the two knots differ only in ways like the differences shown in Figure 5, namely that there is a smooth, continuous deformation from one into the other, which can be rigorously defined using an ambient isotopy. Notice that although the knot projection on the right has 4 crossings, the knot it represents has crossing number 3, since 3 is the minimal amount of crossings in any projection of the knot. We must also define what we mean by a knot mosaic. The following three definitions will suffice:

Definition 2.7

A **connection point** of a tile is a midpoint of a tile edge that is also the endpoint of a curve drawn on the tile.

Definition 2.8

A tile is **suitably connected** if each of its connection points touches a connection point of an adjacent tile.

Definition 2.9

An $n \times n$ **knot mosaic**, or **n-mosaic**, is an $n \times n$ matrix whose entries are suitably connected mosaic tiles. Consider the following examples:
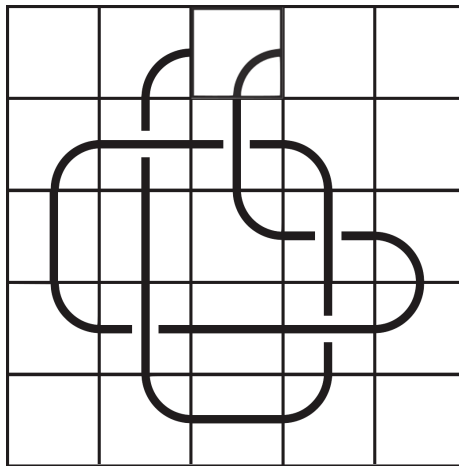
Figure 6: This is not Suitably Connected

The matrix shown in Figure 6 is not a knot mosaic. Notice how in Figure 6, there is a tile in the (1,3) position that is not suitably connected. In particular, there is a connection point on the right edge that is not touching a connection point of the tile adjacent to it. Therefore, this matrix has a tile that is not suitably connected and is therefore not a knot mosaic. However, the knots shown in Figure 7 are both knot mo-

saics because every tile has connection points that are adjacent to connection points on the tiles that are adjacent to them.

Figure 7: Two Knot Mosaics

There are some characteristics of a knot mosaic that we would like to optimize, arising from natural questions that one might ask. What is the smallest size mosaic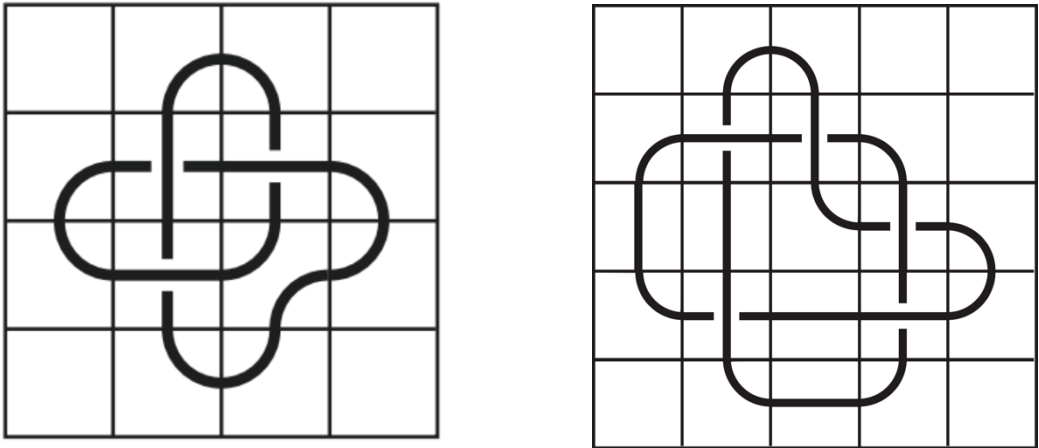 on which a specific knot can fit? What is the smallest number of non-blank tiles needed to create a specific knot? Consider the following definitions.

Definition 2.10

The **mosaic number** of a knot is the smallest $n \times n$ grid on which that knot can fit.

Definition 2.11

We define the **tile number** of a knot as the fewest number of non-blank tiles that are needed to represent that knot.

Definition 2.12

We define the **minimal mosaic tile number** of a knot to be the fewest number of tiles needed to represent a knot on its minimal mosaic.

Minimizing the number of tiles that must be used is not as straight forward as one might think; it is not always the case that tile number can be realized on a minimal mosaic. More specifically, the 9_{10} knot can fit on a 6×6 grid using 32 tiles minimally, but it can fit on a 7×7 grid using only 27 tiles (Heap & Knowles, 2019). Figure 8 shows the 9_{10} knot on a 6-mosaic using 32 tiles. This is the fewest number of tiles that are needed to represent this knot on a 6-mosaic (Heap & Knowles, 2019). However, we can see in Figure 9 that the 9_{10} knot can be represented using only 27 tiles. Therefore on the smallest mosaic, the fewest number of tiles needed to represent the 9_{10} knot is 32. However, the fewest number of tiles needed to represent the 9_{10} knot over

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any mosaic size is 27 (Heap & Knowles, 2019). Therefore, the minimal mosaic tile number of the 9_{10} knot is 32, but the tile number of this knot is 27.
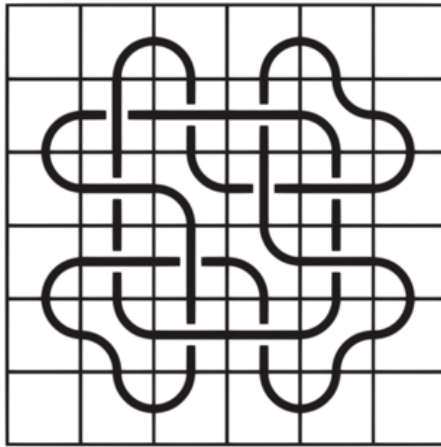
Figure 8: Space-Efficient Representation of 9_{10} with Mosaic Number Realized
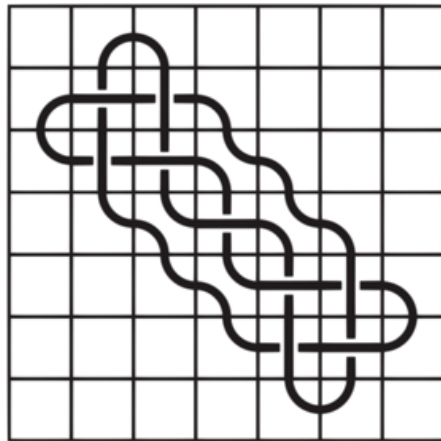
Figure 9: 9_{10} with Tile Number Realized

Definition 2.13

A **space-efficient** *n*-mosaic is an *n*-mosaic in which the number of tiles used is minimized for a mosaic of size *n*.

Definition 2.14

A knot mosaic is **minimally space-efficient** if it is a space-efficient mosaic and the mosaic number is realized. Notice that both representations of the 9_{10} knot shown in Figures 8 and 9 are space-efficient mosaics. However, Figure 8 is a minimal space-efficient mosaic, since it is space efficient and the mosaic number is realized. With these new terms in hand, we can rigorously define the goals of our research; we hope to find the mosaic number, minimal mosaic number, and space-efficient representation of every knot with crossing number 10 or less.
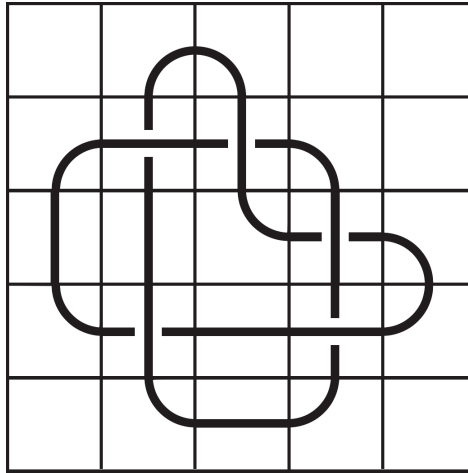
Figure 10: 5_1 with Mosaic Number Realized
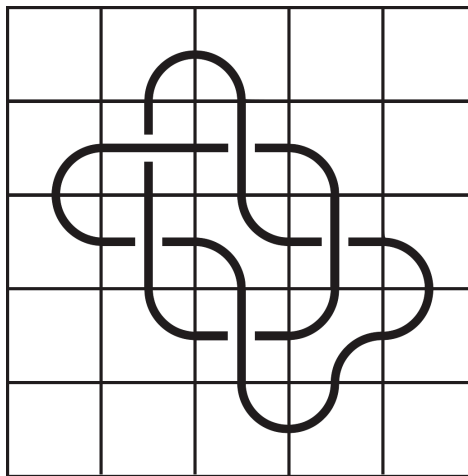
Figure 11: Space-efficient representation of 5_1

SPACE-EFFICIENT 7-MOSAICS

The concept of tile number and space-efficiency were introduced by Heap & Knowles (2019). There, he provided all possible space-efficient layouts for an *n*-mosaic for all *n* ≤ 6. Heap has also already published an exhaustive list of all knots with mosaic number less than or equal to six (Heap & Knowles, 2018). The goal of our research is to complete the table of knots for crossing number up to and including 10 by using only a 7-mosaic. In other words, we hope that every knot with crossing number less than 10 can be realized on a 7-mosaic or smaller, and we are looking to find the space efficient representations of each of these knots. It is known that all knots with crossing number 8 or less can fit on a 6-mosaic or smaller Heap & Knowles, 2018). Therefore, when we say that we are looking to find all knots with crossing number 10 or less, we are really only looking for the remaining 9 & 10 crossing knots that were not able to be realized on a 6-mosaic. Heap and LaCourt had previously developed a

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list of all space-efficient layouts of 7-mosaics. They also showed that if a knot is in its space-efficient layout, the interior of the knot mosaic will not contain a T_5 or T_6 tile (as shown in Figure 1). In other words, the only tiles needed to make a space-efficient knot mosaic are the T_1, T_2, T_3, & T_4 tiles to build the outer shell, and the T_7, T_8, T_9, & T_{10} tiles are used to fill the interior of the layout, since those have the densest possible configuration and four connection points per tile.

Theorem 3.1

If a 7-mosaic is in a space-efficient layout, then it fills one of the layouts shown in Figure 12 (Heap & LaCourt, 2019):
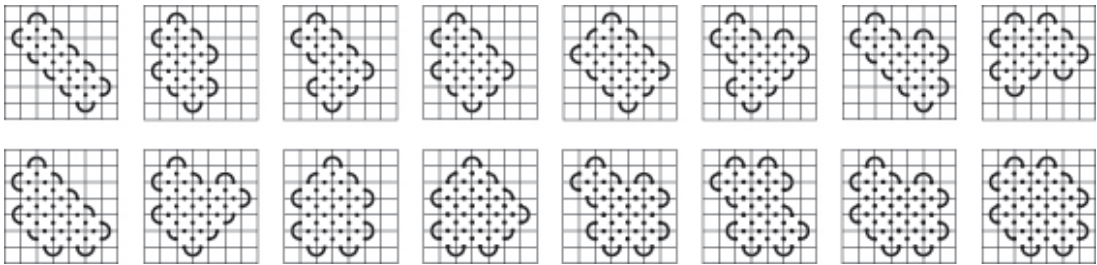

Figure 12: All Space-efficient 7-mosaics

We then set out to build a process for finding all knots with crossing number 9 or 10 that have mosaic number 7, and their corresponding space-efficient representation. Additionally, we also tried to find all knots with mosaic number 6 and minimal mosaic tile number 32 whose tile number is only realized on a 7-mosaic, such as the 9_{10} knot described above. We ran the algorithm for each of the space-efficient 7-mosaic layouts. At the time of writing this, the first 4 layouts of the 7×7 mosaic shown in Figure 12 are completed, and the program is still running on the larger layouts. We have found several new 9 & 10 crossing knots, and the results so far are shown below:

Theorem 3.2

The following prime knots have mosaic number 7 and tile number 27:

1. 9_6, 9_{15}, 9_{18}

2. 10_5, 10_6, 10_7, 10_8, 10_9, 10_{10}, 10_{13}, 10_{14}, 10_{15}, 10_{16} , 10_{17}, 10_{18}, 10_{19}, 10_{24}, 10_{25}, 10_{26}, 10_{29}, 10_{30}, 10_{31}, 10_{32}, 10_{33}, 10_{35}, 10_{36}, 10_{38}, 10_{39}

Theorem 3.3

The following prime knots have mosaic number 7 and tile number 29:

1. 9_{22}, 9_{25}, 9_{29}, 9_{30}, 9_{32}, 9_{33}, 9_{34}, 9_{36}, 9_{38}, 9_{39}, 9_{42}, 9_{43}, 9_{44}, 9_{45}, 9_{47}, 9_{49}

2. 10_{23}, 10_{27}, 10_{37}, 10_{40}, 10_{42}, 10_{43}, 10_{45} *through* 10_{57}, 10_{67} *through* 10_{73} , 10_{79}, 10_{82}, 10_{83}, 10_{84}, 10_{86}, 10_{87}, 10_{90} through 10_{95}, 10_{101}, 10_{102}, 10_{103}, 10_{106}, 10_{107}, 10_{112},

10_{113}, 10_{114}, 10_{117}, 10_{128} *through* 10_{136}, 10_{145}, 10_{146}, 10_{147}, 10_{149} *through* 10_{153}, 10_{156}, 10_{158}, 10_{160}, 10_{161}, 10_{162}, 10_{163}, 10_{164}

In other words, we have shown that all but 2 (so far) knots with crossing number 9 and all but 29 of the knots with crossing number 10 have mosaic number 7 or less.

We also found all knots with crossing number up to 32 that share the 9_{10} property of tile number not being realized on a minimal mosaic. As a matter of fact, Heap found thirteen 9- and 10-crossing knots that had minimal mosaic tile number 32 and mosaic number 6. We have found all 13 on a 7-mosaic using fewer tiles (either 27 or 29).

Theorem 3.4

The following prime knots have mosaic number 6, minimal mosaic tile number 32, and tile number 27:

1. 9_{10}

2. 10_{11}, 10_{20}, 10_{21}

Theorem 3.5

The following prime knots have mosaic number 6, minimal mosaic tile number 32, and tile number 29:

1. 9_{16}, 9_{35}

2. 10_{61}, 10_{62}, 10_{64}, 10_{74}, 10_{76}, 10_{77}, 10_{139}

Of course, the proof of this theorem is a series of pictures, and the validity of these theorems is not dependant completely on the validity of the algorithm.

OUR METHOD OF PROOF

The smallest layout for the 7-mosaic has 13 entries that must be filled, each populated with one of four possible tiles. Naïvely, this results in 4^{13} possible options, or 67,108,864 possible knots and links. For the largest layout, which has 23 entries that must be filled, there are 4^{23}=70,368,744,177,664 possible configurations. Over all possible layouts there are about 77 trillion possible configurations. Therefore, we employed computers. In order to do this, we had to develop a program that would produce and analyze all knots that can be placed on a 7-mosaic. James Canning and I, with the aide of Aaron Heap and Doug Baldwin developed a program that, when given a layout for any *n*-mosaic, would fill that layout with every possible knot and link that can fit in it, and identify every prime knot that among that list. The first step is to utilize the natural translation from a knot mosaic to a matrix. In other words, we can represent a knot mosaic as a matrix, which is very easy for a computer to produce, store, and work with. We simply replace every tile T_i and replace it with the number *i*. This correspondence is shown in Figure 13.

$$\begin{pmatrix} 0 & 2 & 1 & 0 \\ 2 & 10 & 9 & 1 \\ 3 & 9 & 8 & 4 \\ 0 & 3 & 4 & 0 \end{pmatrix}$$

Figure 13: Representing a Mosaic as a Matrix
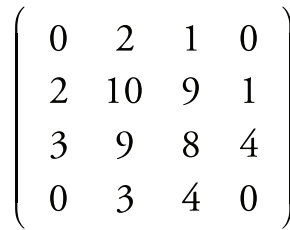
We also need a small Lemma:

Lemma 4.1

Given a knot mosaic matrix, the first non-zero tile must be T_2, when reading across rows from left to right.

Proof: Let M be a knot mosaic matrix. Then, for the base case assume that the first non-zero tile is in the $(1,1)$ position. Then, it cannot have any connection points on its left edge. Additionally, it cannot have any connection points on it right edge. Additionally, all tiles have at least 2 connection points. Therefore, if a tile is in the $(1,1)$ position and is non-zero, it must have connection points only on its right and bottom edges. Therefore it must be T_2. Now, assume that the first non-zero tile is in the $(1,j)$ position. In other words, assume $M(1,\ell) = 0$ for all $\ell < j$. Then, for the same reasons as above, the connection points of this tile must be on the right and bottom edges, and must therefore be T_2. Lastly, assume that the first non-zero tile is in the (i,j) position. In other words, assume $M(i, \ell) = 0$ for all $\ell < j$ and the first i-1 rows are all zeros. Then, for the same reasons as above, the connection points of this tile must be on the right and bottom edges, and must therefore be T_2. Therefore, no matter where the first non-zero tile occurs, it must be T_2, as desired.

We now need to define an integral part of our research, and that is Dowker-Thistlethwaite (DT) notation. In 1983, M. Thistlethwaite and C. Dowker published a paper that provided a way to classify any knot projection. Moreover, they provided an algorithm that can take a knot projection with n crossings and represent it as a sequence of n even integers. They also proved that given a DT notation, a knot projection that produced the notation can be recovered (Dowker & Thistlethwaite, 1983). The algorithm is as follows:

1. First, pick a starting point and orientation of the knot.

2. Follow the path of the knot, and when a crossing is encountered, denote that crossing with a 1. Denote the next crossing encountered with a 2, and so on.

3. If a crossing is an even number, *n*, and the strand is an under-crossing, denote it as *-n*.

4. Every crossing will have one even and one odd number associated to it (Dowker & Thistlethwaite, 1983).

5. Order the odd numbers sequentially.

6. The even numbers in the order that they appear (when paired with the ordered odd numbers) is the DT notation of the knot projection.

Consider the following calculation of the DT notation of this projection of the 4_1 or Figure 8 knot:
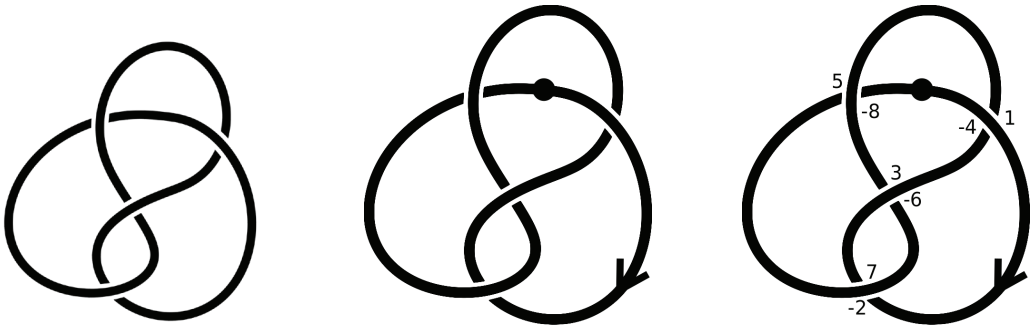

Figure 14: Finding the DT Notation of the 4_1 knot

Then, list in increasing order the odd numbers and match their corresponding even numbers:

$$\begin{bmatrix} 1 & 3 & 5 & 7 \\ -4 & -6 & -8 & -2 \end{bmatrix}$$

This leaves the final DT notation of [-4,-6,-8,-2] for this projection of the 4_1 knot, with the given starting point and orientation. There are a few things that cannot be assumed. First, the DT notation of a knot projection is tied to the projection of a knot, not the knot itself. As a consequence, a knot projection with *n* crossings will have a DT notation of length *n*, regardless of the crossing number of the knot depicted. Consider, once again, the knots originally shown in Figure 5 shown in Figure 15. These are two different projections of the same knot. However, the projection on the left produces the DT notation [4,6,2] (when the starting point is at the highest point and going counterclockwise), and the projection on the right yields the DT notation [4,8,6,2] (with the same starting condition). For any projection of a knot with crossing number *n*, a DT notation of that projection is reduced if and only if it is of length *n*. In this case, the DT notation produced by the knot projection on the left is reduced and the DT notation obtained by the knot projection on the right is unreduced, as the crossing number of this knot is 3.

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Figure 15: Two Projections of the Trefoil again

Additionally, the same projection can produce many different DT notations, based on the starting position and orientation chosen. Consider once again Figure 14. Based on the starting point and orientation chosen, the DT notation produced was [-4,-6,-8,-2]. However, if we keep the same starting point but have the opposite orientation, we obtain the DT notation [4,6,8,2]. Therefore, knot projections do not produce unique DT codes.[1] However, there are a number of useful attributes that the DT notation has. First, a DT code does uniquely describe a knot projection. In other words, given a DT notation, the knot projection that produced it can be recovered. Additionally, there is an algorithmic way to reduce a given DT notation to its reduced, canonical form. Also, the canonical DT notation uniquely identifies prime knots. In other words, given a prime knot, it has a unique reduced DT notation, down to a factor of -1. Lastly, the main benefit of using DT notation is that computers can compute it, given a way to "read" a knot projection. The second step in our research, then, was to write a code that would receive a matrix representation of a knot mosaic as input and output the DT notation of that matrix.[2] This was done by writing out how to "walk" along a mosaic. Consider the following algorithm:

1. First, starting in the (1,1) position and reading across rows, locate the first non-zero tile, and record the index of that tile, say the (i,j) position. We knot from above that this must be T_2. Therefore, the tile in the $(i,j+1)$ position is non-zero, as the mosaic is suitably connected.

2. Then, initialize the current tile to be the tile in the $(i,j+1)$ position, and the previous tile to be (i,j). Additionally, initialize the crossing count to 1.

3. While the index of the current tile is not equal to (i,j), do the following:

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1   However, both of these DT notations are reduced, as they are both of length 4 and the projection from which they were derived represent a knot with crossing number 4.
2   Or more precisely the DT notation of the projection that the matrix represents

a) If the current tile is a crossing tile (T_9 or T_{10}), record an ordered pair whose first entry is the index of the current tile and whose second entry is the crossing count. Add 1 to the crossing counter.

b) if the crossing is and under-crossing and the crossing count is an even, multiply the second entry of the ordered pair by -1.

c) Then, using the current tile type and the relative position of the previous tile, set the previous tile's value to be the index of the current tile, and increment the current tile's row or column value by ±1, depending on the tile type (Example below).

4. Take the list of ordered pairs of indices and crossing count, and order them by the first value.

5. Then, for every 2 ordered pairs that have the same first element, create a new unordered pair of their second elements.

6. Order each of these unordered pairs by placing the odd element first and the even element second.

7. Order the ordered pairs by their first indices.

8. Create a list whose entries are the second indices of each ordered pairs in the order that they appear.

In short, steps 1 and 2 are initialization steps, step 3 is the part of the algorithm that tells the computer how to trace the knot, and steps 4 through 8 are simply formatting the information and distilling the DT notation of the mosaic.

Step 3(c) refers to using the previous tile and current tile to decide which tile to move to next. As promised, consider the following example: suppose we are in some (m,n) position, and the previous tile has coordinates $(m,n\text{-}1)$, or to the left of the current tile. Additionally, assume we know that the tile in the (m,n) position is tile T_8. Then by following the curve of the strand on the tile, we know that the next tile we must move to is the tile directly above the tile we are currently occupying. In other words, we set the previous tile value to be (m,n), and set the current tile value to $(m\text{-}1,n)$ and iterate the while condition again. This is how the computer can walk along the knot, and this information is encoded as a long switch statement, giving every possible situation and instructions for how to handle each case.

Additionally, at this step we sort out the knots and the links, and reject the links, since we are only looking for prime knots. The second part of this function counts how many tiles we visit. We can calculate how many strands are on the mosaic by counting the number of non-blank tiles, and adding to that the number of 7s, 8s, 9s and 10s since these tiles each contain two stands, so they should be counted twice. If we have not traced every strand, i.e. the number of tiles that we visited is less than the number of strands, we know that we have somehow completed a closed loop without

traversing every strand on the mosaic, which means that there is some other loop on the mosaic which was not traversed.

Next, we needed a way to get a computer to reduce the Dowker-Thistlethwaite notation produced in the last step. Thankfully, in the 1990s, Morwen Thistlethwaite and others developed a computer program called *Knotscape* that can reduce a DT notation to the canonical, reduced form. Fortunately, this program does not reduce the DT notations of composite knots. This is beneficial because we are only concerned with the mosaic number of prime knots. We took the code for this program and slightly adapted it to fit our needs. More specifically, the program initially read from a file, and produced output to a file. The program also only read a single knot at a time. We changed the program to receive standard input and produce standard output, as well as to run on a loop while there is input still being supplied. Additionally, the program in its unadapted form returns an empty output when presented with the DT notation of a composite knot. So, we recorded the output, and if it was empty, we knew that the knot was a composite knot and we are not concerned with composite knots.

Lastly, we just needed a function that could identify a knot given its unique, reduced DT notation. The canonical DT notations for all knots with crossing number 16 or less is well known and readily available. Therefore, we compiled a table of all knots with crossing number 10 or less, with the entries of each row being the name of the knot (using the Rolfsen naming system), and the reduced DT notation of that knot. Then, we could search the table for the DT notation of that knot, and print the name of the knot.

Hence, the combination of these three functions could take any knot mosaic and produce the name of the depicted knot if it is a prime knot, or denote it as a link or composite knot if that is the case. Now, we needed a way to produce every knot mosaic, and we would then have everything we needed to sort through all possible knots.

We did achieve this, but we made it a little more efficient. The basic goal is filling each layout with the T_7, T_8, T_9, & T_{10} tiles. When we are filling a particular layout, we know that it has a certain number of blank tiles. For ease of reference, suppose it has 13 blank tiles that need to be filled. We could simply generate all possible vectors of length 13 using the 4 possible entries, and systematically populate the layout using each vector. In other words, for each vector produced, we place the first vector component into the first available tile (reading left to right along rows, then top to bottom down the columns, like a book), the second vector component into the second blank tile, and so on until the entire layout is populated. By doing things this way, we simply need to generate every possible vector of length 13 to produce every possible knot and link that can be represented on the given knot mosaic. However, we are not concerned with the vectors that contain all 7s, for example, because that vector, and by extension the knot mosaic it produces, will not contain any crossings so there is not a possibility of it being a non-trivial knot. Therefore, we only produced every vector that had at

least 9 crossings to populate the mosaic layouts, as we needed the knot mosaic to have a lest 9 crossings for it to represent a knot with crossing number 9.

The final program worked as follows, using the functions outlined above:

1. Choose a 7-mosaic layout that has *n* blanks.

2. Build every possible vector with 9 or more crossings of length *n*

3. For every vector, produce a 7-mosaic a by filling the 7 layout with the entries of the vector.

4. Find the unreduced DT notation of each of those mosaics, and eliminate links.

5. Reduce each DT notation, and eliminate composite knots.

6. Look up and print the name of the prime knot that corresponds to each reduced DT notation.

7. Repeat this process for every 7-mosaic layout.

Then, the combination of all these programs can produce, analyze, and name every knot that can fit on a 7-mosaic.[3] We can now look at some of the results that we found.

Ongoing Work

In order to verify that the algorithm we created could accurately find all the knots we were looking for, we tested the algorithm using all the 6 × 6 mosaics from Heap (2018). The results exactly matched the results that Heap found by hand. Therefore, we concluded that the program could accurately find all knots. This of course strongly suggests that our algorithm is sound and produces correct and concise results, but it does not prove it. Thankfully, our final results are not entirely reliant on the accuracy of the algorithm we wrote.

The output of the algorithm is a list of at most 150 knots mosaics. We hope that all knots with crossing number up to 10 can fit on a 7-mosaic. If the algorithm produces some mosaic for every knot with crossing number up to 10, that will suffice to show that every knot with crossing number up to 10 has mosaic number less than or equal to 7. However, this will not necessarily find the minimal mosaic tile number for each of these knots. That fact can be checked by hand once a list of all the knot mosaics has been produced. In this way, we are using the algorithm generated to sort through the high volume of possible knots, but once that number has been reduced to a small number of results, we can verify the results of the algorithm by hand. Because of this,

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3   These programs only use the fact that the mosaic is a 7-mosaic in the phase where the layout is being populated. These functions work for any *n*-mosaic, but the reduction program only can identify knots of up to crossing number 16.

the validity of the algorithm, although beneficial, does not impact the validity of our findings.

While the algorithm is running, I have developed a website where a user can build a knot mosaic and have the knot that was drawn identified. This website required a new function that would decide if a given knot mosaic matrix was suitably connected or not.

In short, the function cycles through each entry of the matrix, checks where it has connection points, and checks that the four neighbors of the tile (should they exist) all have connection points where appropriate. If it is decided that the knot mosaic matrix is indeed suitably connected, then the rest of the program as outlined runs, and the knot is identified.

Our hope is that in the near future, the program finds all the remaining 9 and 10 crossing knots. Additionally, we hope that the website will be hosted for the public to use, to further aide in the research of knot mosaics.

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Lester Horton: A Revolutionary

Emma Holtzman

sponsored by Jonette Lancos, MFA

Abstract

This essay details the influence of Lester Horton, a promonent dancer and coreographer of the 1950s, on the cultural influence in modern dance. Horton was influenced by the work of the Denishawn School of Dancing and Related Arts, whose traditions stressed an inherent drama and movement inspired by Native American form. Horton is notable for founding the first racially integrated dance companies in the United States, the Horton Dance Theater, and his use of stories like Oscar Wilde's *Salome* and parables from the bible to make his coreography narratively focused as opposed to focusing on dance alone.

The decade of the 1950s saw the advent of many new black concert dance companies, including those directed by Lester Horton, a dancer and choreographer credited with launching the modern dance movement in Los Angeles. With his choreography, Horton established the country's first integrated dance company (Kraus et al., 1969, p. 250). In his short career, he developed a dance training technique that continues to be relevant in the 21st century. Horton's interest in movement was inspired by a performance he saw of the dancing company Denishawn School of Dancing and Related Arts. The inherent drama in the choreography caught his eye and inspired him to create a unique style of movement. Denishawn's take on cultural dance forms, specifically the Native American form, maintained the traditional style while dancers had a ballet and modern technique driving the movement. This then motivated Horton to study ballet, modern dance, and choreography.

Horton became one of the most innovative artists of his time, creating "one of the first racially integrated dance companies in the United States" (Lapointe-Crump, 2006, p. 64). Horton combined theatre and dance with the use of elaborate costumes, expressive arm and body gestures, and the use of props, developing the new genre known as the choreodrama. This new form of dance allowed the flow of the choreography and theatrical drama to unite (Lapointe-Crump, 2006, p. 65). Most notably, Horton's dance company—Horton Dance Theatre—performed Oscar Wilde's play *Salome* as a choreodrama. Horton's dances were not only unique in that they included a theatrical aspect, but they also encouraged conversation around the themes of the dances. This includes gender roles, inequalities, racism, culture, and political engagements of the 1930s. One of his most influential works, 1948's *The Beloved*, captures the life of a husband and wife in which the husband kills his wife with a Bible as he accuses her of infidelity (Lancos,

2019). This work was among the most powerful pieces he created; soon after, he established the West Hollywood Dance Theatre (Lapointe-Crump, 2006, p. 65). Lester Horton and his technique still impact the modern world today because of his use of social activism and storytelling through his dances such as *The Beloved*.

Horton's goal was to "develop strong, fearless and richly emotive dancers who were unafraid of their sensuality" (Lapointe-Crump, 2006, p. 66). He was so impressed by dancers' innate storytelling abilities that he felt it was vital for the development of *The Beloved*. This dance was later performed by the Dance Theatre of Harlem, which was founded and directed by Arthur Mitchell, thus expanding the profile of this highly acclaimed dance. This dance was performed by one male and one female dancer, set in Puritan New England, as it portrays themes of bigotry, intolerance, jealousy, and rage (Lancos, 2019). Archival film shows the dance performed on stage, with a set consisting of a table and two chairs. A Bible is also used a prop that the male figure uses to beat his wife with. This dance shows several new themes that audiences had never seen on stage before in a type of theatrical dance (Horton, chor. 1948).

The Beloved begins with a husband and wife sitting still in their chairs on opposite sides of the table. The quick, intricate choreography adds to the onstage energy the dancers present with their body language and facial expressions. From the beginning of the piece, the dancers' movements tell the story. The female dancer uses her partner as a crutch as she develops her legs, shifting her weight placement each time. Her energy and body language show the audience that she is begging her partner for mercy. The male dancer is very stiff and serious in all of his movements. He almost shows no soft emotions at all, which is very intriguing to watch. The two dancers go back to the table and the male dancer stretches his hand out to his partner. This part of the dance is tense, but it also shows the hard and soft dynamic of their movements. Both dancers have similar attacks and intentions in this piece that cannot be taught, reflecting Horton's desire for his dancers to portray characters with their entire body and mind. This is one quality of the combination of the way his dancers tell the story he envisioned. One of the main reasons Horton created this piece is to show the domestic violence that mostly occurs away from the public eye, especially in the home, and it can even be within the highest socioeconomic class. Horton not only had strong technical dancers, but he showed important themes and raw human emotion through his choreographies.

Horton's dance techniques were based on Native American dances, anatomical studies, and other movement influences. In addition to creating his technique and choreographing several works, Horton established the Lester Horton Dance Theater, one of the first permanent theaters dedicated to modern dance in the U.S., in Los Angeles in 1946. He was also among the first choreographers in the U.S. to insist on racial integration in his company. Horton's art was much more important to him than the race of his dancers. Now, his legacy is perhaps most visible today in Alvin Ailey's work, where the Horton technique is the foundation for masterpieces, including *Revelations* and *Cry*.

Cry was created to first portray African American women's struggle throughout the slave trade. However, as the dance goes on, we see the woman's strength for enduring all that she has. In the end, *Cry* intends to show how women, who have been enslaved and treated like property, can still manage to be free. In the first section of the dance, we see the expressive emotion shown in the dancer's use of contractions, arched movements, and curves to express her pain. Soon after, the dancer throws a fabric cloth to either side, where she stretched over to the opposite horizontal showing a curve in her torso. Throughout *Cry*, we see many contractions mainly all linking to the stomach. Angular and parallel movements can be seen where the dancer balances on one leg and lifts her other leg into a right angle. This movement is common in many of Ailey's other dances, including parts of *Revelations*. In fact, all three of these movement styles can relate to Martha Graham's modern techniques. Lester Horton built his technique from modern styles and created his own distinctive style from there. When Lester Horton established his dance studio in Los Angeles, California, he became a major part in Alvin Ailey's life.

Alvin Ailey met Lester Horton in 1947 at his studio in Hollywood, which began their teacher-student relationship and the birth of the preservation of one of the greatest modern techniques in the United States (LaPointe-Crump, 2006, p. 66). Horton was Ailey's mentor, teacher, and friend. Ailey was drawn to the fact that Horton ran the first multi-racial dance school in the United States, in which one could study classical ballet, jazz, and Native American styles of dance (Lancos, 2019). In continuing Horton's technique, Ailey was determined to maintain a similar interracial dance company for America. Ailey "insisted on celebrating the human spirit…artist and humanist rolled into one" (Kraus, 1969, p. 211). Horton's role in producing "African style movement" within his choreography was something new for audiences to see. The movement was "…blatant and bold, startling with bursts of ethnic energy"(LaPointe-Crump, 2006, p. 66).

Horton's technique allowed a dancer's body movement to do the talking. His inclusion of other styles of dance, such as Native American and Indian Tribal, contributed to his holistic and multiracial approach in dance (Lancos, 2019). Overall, Horton truly paved the way for future modern dance innovators, especially Alvin Ailey and Garth Fagan. Not only did Horton produce this great technique that can be used to train dancers all over the world, but he showed that dance can be available to all backgrounds of people and cultures.

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La Mobilité est une Illusion: La Hiérarchie Sociale chez la Littérature du XVIIème Siècle

Social Mobility in Enlightenment Literature

Emily Cecala

(translated to English by the author)

sponsored by Kathryn Fredericks, PhD

Résumé

L'Âge des Lumières était une époque des changements et de l'esprit critique. Pendant le XVIIIème siècle, la société française préparait pour une révolution imminente. La littérature de cette époque soulignait les problèmes sociaux qui étaient les causes principales des troubles politiques pendant ce siècle. Dans cette dissertation, j'examine la mobilité sociale avec l'analyse de *Le Jeu de L'Amour et du Hasard* de Pierre Marivaux et *Candide* de Voltaire. Les deux écrivains utilise plusieurs figures de style comme le symbolisme pour exprimer des idées de la classe et de la mobilité sociale qui imprégnaient la société française pendant cette époque. J'utilise la recherche des experts littéraires et des philosophes comme Roland Barthes pour promouvoir l'idée que Marivaux et Voltaire écrivaient leurs oeuvres afin d'analyser critiquement leur société. Le thème de la hiérarchie sociale dans ces oeuvres reste pertinent maintenant et ces deux écrivains ont fait un impact significatif dans le monde de la littérature.

Abstract

The Enlightenment was a time of change and critical thought. Throughout the Eighteenth Century as French society moved towards the French Revolution of 1789, Enlightenment-era literature highlighted societal problems that would eventually lead towards widespread political unrest. In this paper I discuss social mobility through the analysis of Marivaux's *Le Jeu de L'Amour et du Hasard* (1730) and Voltaire's *Candide* (1759). Both authors use a variety of literary tools such as symbolism and representations of travel to portray the difficulties which heavily permeated eighteenth-century French society. I reference literary critics such as Roland Barthes to support the idea that Marivaux and Voltaire use their works as critical analyses of the rigid class structure that existed during this time. The theme of social class presented in these works remains relevant today, and both texts have made a lasting impact in global literature.

La littérature du XVIIIème siècle traitait beaucoup de thèmes. Pendant ce siècle, beaucoup d'aspects de la société changeait alors que la France préparait pour la Révolution Française en 1789. Dans le XVIIème siècle, les rois comme Louis XIV avaient le pouvoir absolue et toute la littérature du siècle suivrait les règles comme la bienséance, la vraisemblance et les Trois Unités. En le siècle suivant, les citoyens, et donc les auteurs, ignorait ce dévouement aveugle. Les philosophes comme Voltaire préconisait le traitement des thèmes comme la tolérance, le fanatisme et les classes sociales.

Les classes sociales pendant le XVIIIème siècle était complexe. Il y avait trois classes sociales. Il y avait Le Premier État, ou le clergé. Cette classe payait une petite partie de ses revenus et cette classe était un pourcent de la population. Il y avait aussi le Deuxième État, ou la noblesse. La noblesse faisait deux pour cent de la population, mais la noblesse contrôlait presque toute la société et les personnes de cette classe ne payaient pas de taxes. La reste de la population était le Troisième État. Les gens de cet état payaient beaucoup des taxes. Ces taxes et l'inégalité des taxes étaient une grande raison pour la Révolution Française. À cause de la turbulence sociale, la classe sociale était un grand thème du siècle (Collins). Louis XIV, le grand roi du siècle précédent, est mort en 1715 et la noblesse, ou le Deuxième État, luttait pour le pouvoir. La bourgeoisie, membres du Troisième État, devenait plus puissant aussi. Pendant ce siècle, les classes sociales étaient soulignées et la littérature la reflétait.

Il y avait plusieurs écrivains du siècle, mais deux écrivains les plus influents étaient Voltaire et Marivaux. Né en 1688 Pierre de Carlet Chamblain de Marivaux était un dramaturge important du siècle. Pendant qu'il étudiait la loi à Paris, il fréquentait les salons littéraires de Paris et éventuellement, il a abonné la loi pour la littérature. Marivaux écrivait plusieurs œuvres brillants comme *L'Île des Esclaves* et *Le Jeu de L'Amour et du Hasard* (« Pierre Marivaux, » 1998). Voltaire, ou François Marie Arouet, est né le 21 novembre 1694 dans la classe de milieu. Ses contes philosophiques critiquaient l'Église et le Roi, donc Voltaire était emprisonné. Voltaire préconisait pour la liberté d'expression et la liberté de la religion. Ses contes philosophiques comme *Candide* était très influents et ils inspiraient la Révolution Française (Collins).

Marivaux et Voltaire traitaient beaucoup de thèmes dans ses œuvres, mais un thème omniprésent et la classe sociale. Puisque les classes sociales étaient si complexes dans la société du siècle, la classe sociale était une grande idée de la littérature du siècle. Les classes dans la société étaient très évidentes dans la littérature. *L'Encyclopédie* de Diderot et d'Alembert a dit :

> La *société* étant si nécessaire à l'homme, Dieu lui a aussi donné une constitution, des facultés, des talents qui le rendent très-propre à cet état ; telle est, par exemple, la faculté de la parole, qui nous donne le moyen de communiquer nos pensées avec tant de facilité & de promptitude, & qui hors de la *société* ne seroit d'aucun usage. (1876, p.132)

Eighteenth-century French literature examined many societal themes. Throughout the century, structures of society were changing as France was inching toward the French Revolution of 1789. Louis XIV had absolute power and all literature of the period had to follow a strict set of rules such as la bienséance, la vraisemblance and les Trois Unités. In the following century, citizens and post-revolution authors boldly ignored this blind devotion to royalty. Philosophers of the era, like Voltaire encouraged the examination of difficult themes including tolerance, fanaticism and the past and current make-up of social class.

Social class structures during the 18th Century were extremely complex. There were three distinct social classes. The Premier État, comprised of clergy, made up only one percent of the population and paid a very small amount in taxes; The Deuxième État, or the nobility, made up only two percent of society, but controlled almost everything and did not pay any taxes; the remainder of the population comprised the Troisième État. Members of this large class had a crushing amount of taxes to pay and the inequity of taxation was a significant reason for the French Revolution. Because of the turbulence caused by these disparities, social class became an important literary theme. After the death of Louis XIV, the nobility of the Deuxième État fought over power. The bourgeoisie, or wealthier members of the Troisième État, also saw an increase in power. During this time, social classes were rightly focused on in various literary genres.

There were many Enlightenment-era writers, but two of the most influential writers were Pierre de Carlet Chamblain de Marivaux and François Marie Arouet, more popularly known as Voltaire. Born in 1688, Marivaux was one of the primary playwrights of the century. While he studied law in Paris, he frequented the local literary salons and eventually abandoned his study of law for literature. Throughout his career, Marivaux wrote several famous works such as *L'Île des Esclaves* in 1725 and *Le Jeu de l'Amour et du Hasard* in 1730 ("Pierre Marvaux,"1998). Voltaire was born November 21, 1694 into a more upper-class family. His philosophical tales criticized the King and the Catholic Church, and because of that he was often imprisoned. Voltaire advocated for freedom of expression and religious freedom. His philosophical tales, the most famous of which being *Candide* in 1759, were extremely influential and were a great inspiration for the French Revolution.

Marivaux and Voltaire work with a variety of themes in their works, but an enduring and recurring theme is the divisions of social class. Social class was evident in almost all works of the century. For example, the entry on "Société" in Diderot and D'Alembert's *Encyclopédie* states:

> Society being so necessary to man, also being a constitution given to man by God, is a set of faculties and talent that render man sufficient for this state that are, for example, the faculty of discussion that gives the means to communicate our thoughts with such ease and promptitude that outside of society would have no use. (1876, p. 132)

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La société est nécessaire et une grande partie de la société est les classes sociales. Il y avait beaucoup de commentaire sur la société pendant le siècle, donc il y avait aussi un commentaire sur les classes sociaux.

Une pièce fameuse de Marivaux était *Le Jeu de l'Amour et du Hasard.* Dans cette pièce, les personnages se déguisaient dans les vêtements d'une autre classe. Les personnages de la haute classe, Dorante et Silvia, s'habillaient comme leurs valets, Lisette et Arlequin. Les personnages faisaient cela parce que Silvia voulait observer Dorante. Dorant avait la même idée et il se déguisait aussi. Malgré le changement de vêtements, Dorante et Silvia devenaient amoureux et Lisette et Arlequin les suivaient. Les personnes de la même classe sociale étaient ensemble. Ce fait montre qu'on ne pouvait pas changer sa classe sociale, même si on s'habillait comme quelqu'un d'une autre classe. Les critiques disaient que ce fait rende cette pièce assez conservatrice. Amy Wyngaard (2000) a dit, « Many critics, however, have remarked on the conservatism of Marivaux's works, noting that the force of the master/servant role reversals is weakened by the servants' good-natured return to their proper role in the end. » Dans *Le Jeu de l'Amour de du Hasard,* Lisette et Arlequin retournaient à leur classe originale. C'est assez conservateur pendant un siècle où les domestiques gagnaient plus de statut.

Les vêtements étaient très importants pendant le XVIIIème siècle. Amy Wyngaard (2000) a dit,

> Above all, clothing became a highly charged symbol of this emerging conflict of social systems and hierarchies. In the spectacle of the city street, an individual's garments and accessories allowed for the most visible and effective conveyance of signs of real and desired success. During this time, the (il)legibility of clothing emerges as a dominant theme in literary and artistic representation, providing a mimetic and metaphorical means to explore related issues of class and hierarchy. (p. 524)

Les vêtements de Silvia, Dorante, Lisette et Arlequin était l'élément principal qui séparait les valets et les maîtres. Pendant le siècle, il y avait les règles pour les vêtements des domestiques, donc les domestiques avaient les vêtements distincts comme les tresses (Wyngaard). Dans les interprétations de la pièce, les vêtements des personnages avaient un contraste fort. Silvia, et Lisette quand elle se déguisait comme Silvia, portait les robes élégantes et complexes. Dorante, qui était aussi de la haute classe, portait les belles chemises en soie. Les valets, à l'autre côté, portait les vêtements simples. Les pièces étaient prévues d'être jouées, donc Marivaux utilisait les vêtements pour montrer les différences de classe entre les maîtres et les valets.

Les vêtements étaient une chose superficielle parce que les vêtements ne pouvaient pas cacher la différence de classes entre les maîtres et les valets. Dorante dit à Silvia quand elle était habillée comme Lisette, « Tu as l'air bien distingué, et l'on est quelquefois fille de condition sans le savoir » (Marivaux, 1730/2015, p. 19). Dorante avait l'idée que Silvia n'était pas la soubrette qu'elle représentait. Ctte scène montrait que Silvia est encore dans sa classe originale, pas celle de Lisette.

Society is a necessary part of human existence and an integral part of society is a social class structure. Since there was much discussion of society throughout the century, a discussion about social class was practically inevitable. French society was controlled by the divisions of social class. The nobility had such a strong governance over society, that they oppressed the Troisième État to a breaking point. Satire was very evident in the works of Voltaire and Marivaux to show the scorn of the Troisième État toward the nobility.

One of Marivaux's most famous works is *Le Jeu de l'Amour et du Hasard.* In this play, the characters disguise themselves in the clothing of a different class. The characters from the nobility, Dorante and Sylvia, dress like their valets Lisette and Arlequin. The characters do this because of Silvia's desire to observe Dorante, her new fiancé who she has never met. Dorante has this same idea and disguises himself as well. Despite this disguise and deceit, Dorante and Silvia end up falling in love and Lisette and Arlequin follow. In the end, the characters of the same social class end up together. This outcome shows that one cannot change his or her social class even if they disguise themselves as a member of the other class. Because of this bleak outlook on social mobility, many literary critics consider this work to be conservative. Critic Amy Wyngaard (2000) wrote, "Many critics, however, have remarked on the conservatism of Marivaux's works, nothing that they force of the master/servant role reversals is weakened by the servants' good-natured return to their proper role in the end" (p. 526). In *Le Jeu de l'Amour et du Hasard,* Lisette and Arlequin returned to their original class and the dream of social mobility portrayed through the disguise is never achieved. This is a rather conservative stance in an era where servants were beginning to gain more status.

Clothing was very important during the 18th Century. According to Wyngaard (2000),

> Clothing became a highly charged symbol of this emerging conflict of social accessories allowed for the most visible and effective conveyance of signs of real and desired success. During this time, the (il)legibility of clothing emerges as a dominant theme in literary and artistic representation, providing a mimetic and metaphorical means to explore related issues of class and hierarchy. (p. 524)

The disguises of the main characters and the lack of actual societal changes in the play show the immobility of French society. Disguises may change, but in the end the social class of each character remains stagnant.

The clothing of Silvia, Dorante, Lisette and Arlequin was the main element that separated the valets and the masters. In Act I, Scene VII, Dorante says to Silvia while she was dressed as Lisette, "You have a very distinguished air about you and sometimes one is a girl of distinction without knowing it" (Marivaux, 1730/2015, p. 19). Dorante had the idea that Silvia wasn't the maid that she portrayed herself as. This scene shows that even with the clothes of a maid, she remains in her original class, not that of Lisette.

Il y avait les instances où Lisette a oublié qu'elle est soubrette. En Acte II, Scène VII, Lisette et Silvia avaient une discussion de les événements qui se passaient et Silvia a dit,

> Moi, j'y entends finesse ! Moi, je vous querelle pour lui ! J'ai bonne opinion de lui ! Vous me manquez de respect jusque-là ! Bonne opinion, juste ciel ! Bonne opinion ! Que faut-il que je réponde à cela ? Qu'est-ce que cela veut dire, à qui parlez-vous ? Qui est-ce qui est à l'abri de ce qui m'arrive, où en sommes-nous ? (Marivaux, 1730/2015, p. 40)

Les personnes de la classe de Lisette appréciait leur nouvelle classe. Silvia et Dorante n'appréciait pas la nouvelle classe. Ça montre que les classes étaient très différentes et le fait que la classe des valets n'était pas appréciée. C'est le but des pièces de Marivaux. Michel Gilot (1991) même dit,

> Si cette société assigne à chacun son rôle, si les maîtres ou les hommes ont des privilèges dont sont dépourvus les valets ou les femmes, pourquoi ne pas intervertir les rôles ou s'emparer de privilèges interdits ? C'est l'objet de pièces comme l'Île des Esclaves (1725), *le Jeu de l'amour et du hasard* ou la Nouvelle Colonie : des jeux de vérité. (p.10)

Dans *Le Jeu de l'Amour et du Hasard,* l'auteur intervenait avec les rôles et créait un jeu de classe. Marivaux faisait cela dans ces œuvres parce qu'il voulait montrer les différences de classe et le privilège de la haute classe. Dans le XVIIIème siècle, les gens devenaient mécontents avec le roi et la noblesse, donc les jeux dans les pièces de Marivaux montre ce mécontentement et le fait que la classe et une construction qui peut être changé par les vêtements. Elisabeth Haghebaert (1999) a dit que les pièces de Marivaux montrait ces problèmes lorsqu'elle a dit, « *Le jeu de l'amour et du hasard* bénéficie d'une hétérogénéité favorable à l'expression d'une réflexion critique qui prend pour objet des problèmes de société » (p.149). Ce mécontentement avec la noblesse continuait pendant le siècle et en 1785 quand Pierre de Beaumarchais a écrit *Le Mariage de Figaro,* la pièce était un affront de la haute classe et le classème du siècle alors que la France s'approchait la révolution.

Malgré le fait que *Le Jeu de l'Amour et du Hasard* critiquait la classe et la société, les personnages restait dans ses classes originales. Lisette et Arlequin s'aimaient et Silvia et Dorante s'aimaient aussi. En face de toute la critique de la classe dans cette pièce, la pièce restait assez conservatrice. Marivaux n'était pas un écrivain révolutionnaire. Louisa Shea (2012) a même dit,

> Indeed, as far as politics are concerned, Marivaux can hardly be called a revolutionary. True, several of his plays do raise the specter of social mobility, but only, as in Le jeu de l'amour et du hasard, to reaffirm, in the end, the social order. Disguised as a servant, the young aristocrat Sylvie believes she has fallen in love with a valet, only to find out that he is a nobleman in disguise. Even the more radical L'ile aux esclaves, in which masters

There were instances where Lisette forgot that she was a servant. In Act II, Scene VII, Lisette and Silvia have a discussion of the events that happened and Silvia says,

> I hear sharpness in your voice! I'm fighting with you for him! I have a good opinion of him! You have been lacking respect for me until now! Good opinion, my God! Good opinion! What's the need for me to respond to that? What does that aim to say, to whom are you talking to? Who is at the refuge of what is going on, where are we? (Marivaux, 1730/2015, p. 40)

Here, Lisette enjoys her new social status while Silvia does not. Silvia is very upset at the fact that Lisette, disguised as her, talks to her like a servant. This shows that the difference between social classes is very apparent and that the class of valets is not at all appreciated. Critic Michel Gilot (1991) notes:

> If this society assigns a role to everyone, if the masters or the men of privilege who are lacking valets or wives, why not intervene in roles that takes these forbidden privileges? That is the objective of works such as *L'Île des Esclaves* (1725), *le Jeu de L'Amour et du Hasard* or *La Nouvelle Colonie: des jeux de verité.* (p. 10)

In *Le Jeu de l'Amour et du Hasard,* Marivaux intervened with these societal roles and created a game of social class. This showcases class differences and the privilege of the upper class. In the 18th Century, citizens became unhappy with the King and the nobility and Marivaux's work shows this discontent and illustrates that class is a social construct that can be changed by something as simple as clothing. Elizabeth Haghabaert (1999) says that the plays of Marivaux display these problems: *"Le Jeu de l'Amour et du Hasard* benefits from a favorable heterogeneity of pression when it came to the critical reflection of societal problems" (p. 149). This discontentment with the nobility continued throughout the century and in 1785 Pierre de Beaumarchais wrote *Le Mariage de Figaro,* a play that was an attack of the upper class and classism as France approaches its revolution.

Despite the fact that *Le Jeu de l'Amour et du Hasard* criticizes society, the characters remain in their original social classes. In addition, the people of the same class end up falling in love. During the period, there was so much uproar about class inequities in literature, but here Marivaux is conservative. Because of this, many critics claim that Marivaux is not a revolutionary writer. According to Louisa Shea (2012),

> Indeed, as far as politics are concerned, Marivaux can hardly be called a revolutionary. True, several of his plays do raise the specter of social mobility, but only, as in Le jeu de l'amour et du hasard, to reaffirm, in the end, the social order. Disguised as a servant, the young aristocrat Sylvie believes she has fallen in love with a valet, only to find out that he is a nobleman in disguise. Even the more radical L'ile aux esclaves, in which masters and servants temporarily switch roles, concludes, like the end of Carnival,

> and servants temporarily switch roles, concludes, like the end of Carnival,
> with a return to the normal course of affairs, the masters having learned,
> at best, to be somewhat more humane. (p. 1140)

Les pièces de Marivaux ne décrivaient pas la vraie mobilité sociale. Les personnages de la basse classe occupaient un haut rang pour un petit moment Les personnages comme Lisette et Arlequin n'occupaient jamais cette haute classe en réalité. C'était simplement un jeu. Cette réalité était un fait que Marivaux exprimait dans ses autres œuvres comme Île aux Esclaves et c'était un objet que Marivaux voulait exprimer. Dans sa partie du siècle, c'était la vérité que Marivaux voyait.

Voltaire, à l'autre côté, représentait la mobilité sociale dans ses œuvres, mais cette mobilité était la mobilité vers le bas. Dans le XXVIème chapitre, Candide et Martin dînaient avec six rois détrônés. Candide a donné un peu de ses richesses à un de ces rois. Le plus pauvre de ces rois, Théodore, roi détrôné de la Corse a dit, « Je suis Théodore ; on m'a élu roi en Corse, on m'a appelé Votre Majesté, et au présent à peine m'appelle-t-on Monsieur ; j'ai fait frapper de la monnaie, et je ne possède pas un denier » (Voltaire, 1759, p. 39). Voltaire a écrit cela pour montrer la juxtaposition entre la richesse d'un roi et la pauvreté des rois détrônés. Tous les six rois détrônés sont tombés de grâce.

La vieille dame est tombée de grâce aussi. Quand Candide l'a rencontré, la vieille dame était servante. Cette vieille dame était la fille du pape Urbain X et la princesse de Palestine. Elle était élevée dans un palais pour quatorze ans aussi. Elle a même dit, « une de mes robes valait mieux que toutes les magnificences de la Vestphalie » (Voltaire, 1759, p.12). Voltaire incluait ces détails pour montrer la richesse de la vieille femme avant sa esclavage au Morocco. Après cet esclavage, la vieille dame était laide et servante. Ces détails établissaient la juxtaposition entre l'état de la vieille dame devant son esclavage et son état après son esclavage. Avec la vieille dame, Candide et les six rois détrônés, Voltaire utilisait la juxtaposition pour montrer le fait que la classe de quelqu'un pouvait tomber et la classe pouvait tomber beaucoup.

Voltaire utilisait la beauté pour établir la juxtaposition aussi. Avec la vieille dame, elle était belle avant son esclavage. La vieille dame a dit,

> Je croissais en beauté, en grâces, en talents, au milieu des plaisirs, des respects et des espérances ; j'inspirais déjà de l'amour ; ma gorge se formait ; et quelle gorge ! blanche, ferme, taillé comme celle de la Vénus des Médicis ; et quelles yeux ! Quelles paupières! (Voltaire, 1759, p.12)

On peut comparer la beauté de la vieille dame avant son esclavage avec sa laideur après son esclavage. Quand Candide a rencontré la vieille dame, elle avait « les yeux éraillés et bordés d'écarlate » et son nez touche à son menton (Voltaire, 1759/2012, p.12). C'est la même situation avec Cunégonde. Après son esclavage, Cunégonde « a perdu sa beauté et est devenu horriblement laide » (Voltaire, 1759, p. 40). La beauté est un symbole de la classe et la beauté symbolise la haute classe et la laideur symbolise la

> with a return to the normal course of affairs, the masters having learned, at best, to be somewhat more humane. (p. 1140)

Marivaux's plays do not depict true social mobility. The members of the lower class reach a level of nobility for only a brief moment. Lisette and Arlequin are never members of the upper class even with their disguises. It is only a game and an illusion. Marivaux expresses this in his other works like *L'Île des Esclaves.* During this part of the eighteenth century, this is the reality that Marivaux witnessed and desired to portray to the public.

Voltaire, on the other hand, included actual social mobility in his works, but this mobility was more downward. In the 26th chapter of *Candide*, Candide and Martin dine with six dethroned kings. Candide gave some of his riches to one of these kings. The poorest of these kings, Theodore of Corsica, says, "I am Theodore; the people elected me king in Corsica and people called me Your Majesty, and now they have pain even calling me Monsieur; I once coined money and now I don't have a farthing" (Voltaire, 1759, p. 39). Voltaire writes this to show juxtaposition between the wealth of a king and the poverty of someone with no power like all the six dethroned kings.

The old woman also falls from grace. When Candide meets her, the old woman is a servant. She was daughter of Pope Urban X and the princess of Palestine. She was raised in a palace until she was fourteen years old. She even says, "one of my dresses was worth more than all the treasures of Westphalia" (Voltaire, 1759, p.12). Voltaire included this to show the wealth of the old woman before slavery and to juxtapose it with her state after slavery in Morocco, where she became an ugly servant. These details give the reader a harsh comparison between the condition of the old woman before and after. With both the old woman, Candide and the six dethroned kings, Voltaire utilized juxtaposition to show the fact that social class can plummet at any time.

Voltaire also uses beauty to establish juxtaposition. The old woman was beautiful earlier in her life: She says,

> I believed in beauty, in grace in talent in the middle of pleasures, of respect and of hope; I already inspired love; my throat was shaped; and what throat! White, firm, built like that of Venus of the Medicis; and what eyes! What eyelids! (Voltaire, 1759, p.12)

When Candide met the old woman, she had, "rough eyes that brimmed scarlet" and her nose touched her chin (Voltaire, 1759, p.12). The same situation happens with Cunegonde, who was also a princess before slavery. After slavery, Cunegonde, "lost her beauty and became horribly ugly" (Voltaire, 1759, p. 40). Beauty was a clear sign of class. When those characters in the tale were rich, they were also beautiful. When they lost their riches, they also lost their beauty at or around the same time.

basse classe. Lorsque les femmes de l'histoire étaient riches, elles étaient belles aussi. Quand elles ont perdu ses richesses, elles ont perdu la beauté aussi.

La philosophie de Voltaire et le fait que la mobilité en haut était impossible est contre les thèmes du siècle. Selon le philosophe Roland Barthes, Voltaire oubliait souvent l'histoire. Dans son essai, « The Last Happy Writer, » Barthes (1972) a dit, « Voltaire's second happiness was precisely to forget history, at the very moment it was supporting him. In order to be happy, Voltaire suspended time ; if he has a philosophy, it is that of immobility » (p. 85). Barthes avait raison. La mobilité en haut étaient absente dans *Candide*. Dans la société du siècle, il y avait beaucoup de mobilité. Roland Barthes (1972) a dit aussi, « The bourgeoisie was so close to power that it could already begin not to believe in history » (p. 88). La bourgeoisie gagnait la pouvoir pendant ce siècle, donc l'objet de Voltaire de l'immobilité en haut était faux. Barthes (1972) a dit que c'était typique pour Voltaire; il a dit, « He has no system except the hatred of system » (p. 88). Cet objet était raisonnable parce qu'avec *Candide,* Voltaire critiquait beaucoup de systèmes.

Cette critique est évidente avec Eldorado. Eldorado était une utopie, ou un endroit parfait. Il n'avait pas l'inégalité dans Eldorado. En plus, le village le plus pauvre était riches en termes des normes de Westphalie. En plus, Eldorado était une société déiste. Quand Candide et Cacambo parle avec un vieil homme d'Eldorado, l'homme a dit, « Nous ne le prions point. Nous ne rien à lui demander, il nous a donné tout ce qu'il nous faut ; nous le remercions sans cesse » (Voltaire, 1759, p. 22). Quand Candide a demandé l'état des prêtres, l'homme a dit « nous sommes tous prêtres » (Voltaire, 1759, p. 22). C'est un criticisme de la religion organisée et les prêtres qui occupaient la haute classe de la société. Le clergé ne payait pas beaucoup de taxes et ils formaient seulement un pourcent de la population. Dans son utopie, tout le monde était un prêtre, donc Voltaire pensait que la société idéale est une société sans clergé. Quand Candide a appris cela, il a dit, « Quoi ! vous n'avez point de moines qui enseignent, qui disputent, qui gouvernent, qui cabalent, et qui font brûler les gens qui ne sont pas de leur avis » (Voltaire, 1759, p. 22). Cette phrase et une autre attaque sur le clergé qui était dans la haute classe. Dans Eldorado, il n'avait pas un clergé oppressif comme la société de Voltaire et celle de Candide.

Voltaire utilisait une utopie pour montrer les problèmes de la société. L'utopie montrait l'idéal et elle créait la juxtaposition entre un endroit idéal et la société qui existait, *Candide* est un commentaire sur la société et son usage d'une utopie montrait les problèmes avec la société de Candide et de Voltaire. Les personnages n'avaient pas la mobilité en haut, seulement la mobilité vers le bas. Ce n'était pas le cas dans la société de Voltaire parce que la bourgeoisie gagnait le pouvoir, mais Voltaire montre que la mobilité en haut était impossible. Comme Marivaux, Voltaire avait une position conservatrice sur la mobilité.

Le XVIIIème siècle était un siècle important pour la littérature. Le France changeait beaucoup avec le début de La Révolution Française et la littérature du temps reflétait

According to Roland Barthes, Voltaire often forgot or didn't include history in his works. In his essay, "The Last Happy Writer," Barthes (1972) says, "Voltaire's second happiness was precisely to forget history, at the very moment it was supporting him. In order to be happy, Voltaire suspended time; if he has a philosophy, it is that of immobility" (p. 85). Barthes has a valid point, as upward mobility is absent in *Candide*. Whereas in society during this century, there was a lot of mobility. Barthes (1972) also says, "The bourgeoisie was so close to power that it could already begin not to believe in history" (p. 88). The winning of power by the bourgeoisie class was prominent during this century, so Voltaire's portrayal of immobility of the upper class was false. Barthes (1972) said that this was typical for Voltaire, that "he [had] no system expect the hatred of system" (p. 88). This depiction of Voltaire is reasonable because with *Candide*, Voltaire criticized mant systems.

Voltaire made this criticism using the Eldorado chapters. Eldorado is a utopia, or a perfect place. There is no inequality in Eldorado and the poor of Eldorado are still considered rich in Westphalian terms. Also, El Dorado is a Deist society. When Candide and Cacambo talked to an old Eldoradan man, the man says, "We do not pray to Him. We don't have anything to ask of Him, he gives us everything that we need and we thank him always" (Voltaire, 1759, p. 22). When Candide asks him about priests in this society, the old man says, "We are all priests" (Voltaire, 1759/2012, p. 22). This shows a criticism of organized religion and the clergy that made up the Premier État. In the utopia of Eldorado, everyone is a priest, therefore Voltaire thinks that an ideal society would be one without clergy. When Candide learns this, he says, "What! You don't have any monks that teach, that argue, that govern, that conspire, that burn people who are not of their opinion" (Voltaire, 1759, p. 22). This phrase is another attack of the clergy that were of the upper class. In Eldorado, there was no oppressive clergy like that of the societies of both Voltaire and Candide.

Voltaire uses the utopia of Eldorado to show many societal inequalities of both the past and present time. The utopia of Eldorado is the ideal and created a contrast between this ideal and the existing society. *Candide* is a commentary on society and its use of a utopia shows the inequalities that existed in the worlds of both Voltaire and Candide. Like Marivaux, Voltaire shows a rather conservative stance on social mobility, preferring that of an egalitarian society, as is represented by the famous ending of *Candide* where Candide states "we must cultivate our garden" (Voltaire, 1759, p. 45).

France was evolving as the nation prepared for the French Revolution. During the Age of Enlightenment, its literature reflected the discontentment of the Troisième État towards current social order. Marivaux displays social immobility in *Le Jeu de l'Amour et du Hasard*, where one sees this mobility with disguise, but only an illusion, and in the end everyone remains in their original class. This shows that social mobility wasn't a reality of the times. Voltaire demonstrates that downward mobility is possible, but like Marivaux, upward mobility is portrayed to be impossible. In *Candide,* Voltaire uses the utopia of Eldorado and considerations of beauty to show the corruption of the higher classes and society at large. Both works have restricted views on social mobility

le mécontentement du peuple avec la société. Marivaux montrait l'immobilité sociale dans son œuvre *Le Jeu de l'Amour et du Hasard.* Dans cette œuvre, il y avait l'apparence de la mobilité et le changement de classe, mais c'était seulement un jeu et à la fin de la pièce, tout le monde occupait sa classe originale. Ce fait montrait que la mobilité sociale n'était pas une réalité du temps. Voltaire montrait que la mobilité vers le bas est possible, mais comme Marivaux, la mobilité en haut était impossible. Voltaire a fait un commentaire de la classe sociale dans son œuvre *Candide.* Il montre que le clergé et la société était corrompus en utilisant l'utopie et la beauté. Tous les deux œuvres avaient une position conservatrice sur la mobilité sociale et ce conservatisme montrait mécontentement du peuple envers la société. Ce mécontentement montrait aussi le commencement de la révolution qui venait à la fin du siècle.

and illustrates the frustration of the citizens towards current societal norms. The frustration illustrated by these authors is what eventually leads to the French Revolution of 1789, and a 19th Century full of continued political unrest, inequality, and further questions on the future of a structured French society.

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Interview with Dimitri Wing-Paul, Student Editor for *Proceedings of GREAT Day 2018*

Nicole Callahan

Have you had any experience with GREAT Day yourself and if so, how did that go?

Yes, I have participated in GREAT Day every year since my sophomore year. I have presented in both poster format and a PowerPoint format. All my experiences presenting at GREAT Day have gone really well. I feel like it helped me learn how to about my research and how to engage with audience members; basically, how to communicate. It was just an amazing experience overall.

What do you think GREAT Day adds to the Geneseo community?

It shows what students can do and shows what students are passionate about. So, GREAT Day reveals what students love doing and how their research aligns to their interests and future career goals.

What did work for *The Proceedings of GREAT Day* teach you about GREAT Day?

Honestly, at first, I had a limited view on GREAT Day. I had thought it had to be on their research, with collecting participants. I thought people had to have some sort of coding and exploring all the forms of analyzing the data. After my experience of working on *The Proceedings*, I've learned that there is more than that. Students come from different backgrounds like music or dance, it's not as limited as I thought it was. Typically, people think GREAT Day is about the sciences and psychology, but there's more than that, and I'm glad I got to experience more of the large fields of research.

What has *The Proceedings* taught you about editing and academic writing?

It's not easy! It taught me that it's more than just fixing up grammatical errors.

What are your plans for after you graduate [in the Spring of 2019] and do you think working on *The Proceedings* has helped guide you in any way?

I have currently been accepted to a master's program at the School of Psychology at Georgia State University. I feel like my experience working on *The Proceedings* is helpful in terms of me learning how to write well, because you're looking at other people's papers, critiquing them, and then applying those experiences to yourself. Being on top of deadlines, the experience of getting things done quickly, is applicable to grad school. You have to constantly work on demand and be efficient and organized, and that's basically how we made *The Proceedings.*