Table of Contents

Vanguard Staff ...........................................................................................................................................................................4
Letter from the Editor ...................................................................................................................................................................5
Letter from the College Provost ..................................................................................................................................................6

Humanities Division

The Cult of Destructivity ..............................................................................................................................................................7
By Emily Brownell
The Power of Cute .........................................................................................................................................................................16
By Mary Christopher
A Career is a Journey, Not a Predetermined Destination ......................................................................................................26
By Cami Christopulos
Witch Burning ..............................................................................................................................................................................32
By Anesce Dremen
Double Standards Regarding Sex and Gender in Steinbeck’s East of Eden ...........................................................................39
By Dana Ehrmann
On Winged Words .................................................................................................................................................................49
By Micole Gauvin
Female Characters in August Wilson’s Plays ............................................................................................................................59
By Lindsay Phillips
An Assessment of the Reader-Novel Relationship in Wilkie Collins’ The Moonstone .........................................................69
By April Schultz
Forming a Relationship through Communication ..................................................................................................................73
By Lindsay Stephan
In Defense of the Counterintuitive ............................................................................................................................................79
By Allison Von Borstel

Natural Sciences Division

Curcumin Restores the Growth of Beta-cells in Non-obese Diabetic Mice ...............................................................................85
By Suresh Graf
Polyvalency of Subcluster A2 Mycobacteriophages: the Role of Tail Fibers and Their Amino Acid .........................................95
By Beth Klein
The Effectiveness of Commercial Topical Rubefacient Creams on Handgrip Endurance .....................................................113
By Jacelyn Peabody, Beth Klein, Alexis Kingery, Beth Klein, Kayla Palmer, Logan Sedig, Phung Nguyen
Three Mantis Species Adopt More Cautious Hunting Behavior When Facing Dangerous Prey ............................................123
By Logan Sedig

Social Sciences Division

The Façade of Food Consumption .............................................................................................................................................132
By Shanthi Cambala, Alexis Hosch, John Noonan, and Nyamaragachaa Bayarsaikhan
The Short-Term Effects of Hatha Yoga on Mood States ..........................................................................................................135
By Samantha Heyne
The Dynamic Between Income Inequality and Electoral Participation in the U.S. .....................................................................165
By Megan Von Borstel
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I am honored to provide you the second issue of The Carthage Vanguard. Last year, inspiration for this journal arose from a conversation regarding the underappreciated talent of collegiate scholars. Today, the Vanguard is an avenue for talented, young researchers to share their work at the undergraduate level. The articles published exemplify the unique perspectives, scholarly ambition, and profound research from our authors. Their research is of exemplary quality and should be celebrated.

The staff of this publication is comprised exclusively of students at the small, liberal arts school of Carthage. “The Vanguard” name was created to describe the group’s mission: to create a multi-disciplinary journal by undergraduate students that could publish exemplary work from every corner of academia. While this name’s original meaning (troops moving at the head of the army) nods to ancient Carthage during the Third Punic War, it seems fitting in this context as it denotes a group of people leading the way in a new development. The journal did just this in the past year by accepting submissions from undergraduates of other universities nationwide, thus broadening the scope and depth of perspectives and research.

A special thank you to our advisor, Joe Wall, without whom this journal would not be possible. Professor Wall has been a key proponent for the journal since its inception, and he embodies the leader we all aspire to become: one who chases his dreams, emanates happiness, and proves that with hard work and determination, anything is possible. Thank you for believing in us; I am truly blessed to call you both a professor and mentor. To our team: this journal would not have been as successful without each and every one of you; I am proud of all of your efforts, dedication, and assistance throughout the process. To Gregory Woodward, Julio Rivera, and Dennis Munk, your academic advice was fundamental and much appreciated. To Ed Smeds, our generous benefactor, we extend our gratitude. Your monetary assistance for this venture made the efforts for The Carthage Vanguard feasible.

This journal recognizes the abilities of undergraduate scholars. I hope you enjoy the articles and catch a spark of inspiration. Thanks again - it’s been an incredible journey.

Best regards,

Cami Christopulos
Cami Christopulos
Editor of Humanities and Social Sciences
A Letter from the College Provost

You hold in your hands the second issue of the Carthage Vanguard Interdisciplinary Research Journal. As you page through it, you will be as impressed as I am at the range and quality of the work it includes. You will have the opportunity to learn from the outstanding work of our Carthage students, now joined in this issue by work from across the country.

Undergraduate research is one of the hallmarks of a Carthage education. Through the various activities that fall under this rubric, students apply what they have learned in the classroom in new and important ways. They gain important insight into the world of work in their chosen field. And finally, they can participate in and contribute to the production of knowledge, upon which the future breakthroughs so important to our world will be based.

The Carthage Vanguard speaks to this last feature of undergraduate education, and in a way entirely consistent with the Carthage undergraduate experience. It is fully operated by undergraduate students, who maintain responsibility for all aspects of the publication. They ensure quality by following a double-blind review process consistent with the practices of our most respected academic journals.

So: enjoy! I am certain that the Carthage Vanguard will continue to be an important part of the intellectual life of Carthage College.

Sincerely,

David Garcia
Provost, Carthage College
The Cult of Destructivity: Mothers and Daughters in George Eliot’s *The Mill on the Floss*

By Emily Brownell

This examination of George Eliot’s *The Mill on the Floss* focuses its attention on the relationships between mothers and daughters in the novel. The argument is rooted in a historical context created by a dialogue between Mary Wollstonecraft, with reliance on her *Vindication of the Rights of Woman*, and George Eliot. The primary relationship examined is Maggie Tulliver’s relationship with her biological mother, Elizabeth Tulliver. However, for the purposes of the argument, the word “mother” is extended to also be defined by Virginia Woolf’s statement in *A Room of One’s Own* that “we look back through our mothers if we are women” (1989). With respect to this definition of a mother, the paper will also look into Maggie’s relationship with other “mothers” such as Mrs. Stelling, the schoolteacher’s wife, and the archetypal “mothers” created in the books that she reads. The historical context for this text focuses on the education of women and Wollstonecraft’s assertion that this education should be expanded in order to cultivate a woman’s mind in addition to her domestic abilities. Ultimately, this system of education, arising out of the Victorian cult of domesticity, causes unsalvageable damage to the mother-daughter relationship exhibited by Maggie’s interactions with Mrs. Tulliver.

George Eliot’s *The Mill on the Floss* is a woman’s bildungsroman. The novel follows Maggie Tulliver through her formative years and into early adulthood. The Tulliver family begins the novel with a good deal of wealth. However, it unfolds that Mr. Tulliver has lost a lawsuit involving Mr. Wakem and burdened the family with a substantial amount of debt. The financial crisis causes rifts in relationships, but it also provides a space for positive change, particularly between Maggie and her mother. Largely, this is a novel of education that exhibits the differences between a woman’s instruction and a man’s. Within this education, the novel explores the idea of Maggie’s role models. This reading works through the primary relationship between Maggie and her mother with regards to education. Additionally, it focuses on the other women available to Maggie as role models through her community as well as the portrayals of women in the books that she reads. While the primary relationship between Maggie and her mother is harsh and in many ways unpleasant, neither character is regarded without sympathy. A reading of this novel cannot help but shift from identification with Maggie to painful compassion for Mrs. Tulliver.

**Literature Review**

Feminist criticism of *The Mill on the Floss* has largely focused on the relationships between men and women. In some instances the conversation focuses on the relationship between Maggie Tulliver and her brother, Tom. David Moldstad discusses this relationship as one of invention of society and individual judgment” (2014) set forth in Sophocles’ *Antigone*. In accordance with this idea, the conflict between Maggie and Tom is not purely one of domination. Rather, it is a conflict created by the different demands placed on the siblings by the society in which they live. In contrast, Mary Jacobus argues that their difference comes from a problem with knowledge drawn directly from books (1994). Additionally, some critics approach Maggie in terms of her relationship to her male suitors, Phillip Wakem and Stephen Guest. Fisher and Silber take this approach to affirm that Maggie’s conflicts as she grows older center around these men because this is “the one area of female choice” (2003). Further, when these conflicts arise she falls back into her internalized problem of “emotional desire and female duty of self-sacrifice” (Fisher & Silber, 2003).

This reading will add to the conversation by shifting the lens from the relationships between men and women to those exclusively between women. Specifically, it
The Carthage Vanguard

Volume 2

Tulliver

The Education of Elizabeth and Maggie Tulliver

Not only does the ten-year span of this novel situate Maggie's education during a specific moment in time, but it also puts Mrs. Tulliver's adolescence close to the time Mary Wollstonecraft wrote her Vindication of the Rights of Women in 1792. Before Mrs. Tulliver married, the Victorian cult of domesticity and the ideals of True Womanhood—the very ideals Wollstonecraft argues are limiting—would have been the prevailing system of education for young women. Mothers generally directed the education of young women in the 1800s and their primary influences in this instruction are, as Wollstonecraft says, "the society they live in" (1995) and their own experience with education. For this reason, we must first explore the unmarried Mrs. Tulliver, Elizabeth Dodson's, education in order to adequately understand Maggie Tulliver's education.

Virginia Woolf writes in A Room of One's Own that "we think back through our mothers if we are women" (1989). For Elizabeth Tulliver, Louis Godey could have been one of these "mothers." His Lady's Book and Lady's Magazine were published throughout the timeline of the novel. Margaret Beetham's A Magazine of Her Own charts the history of the British women's magazine. Although this was an American publication, Beetham states, "the cultural similarities extended beyond a common language and certain common publications" (1996). The magazine mimicked the structure and content of earlier publications in Europe, such as the Female Preceptor of 1813, by addressing middle-class women with articles on fashion and dress as well as poetry (Beetham, 1996). These articles were generally written and created by women; however, with Godey as the publisher, all content must have met his approval. This requires that the content in his magazine be written, to a certain extent, through a male lens. It could not have been an entirely accurate depiction of a woman's experience.

Additionally, the British publication The Christian Lady's Magazine was circulated between 1834 and 1849. According to Armstrong and Brake's Nineteenth-Century British Periodicals, a microfilm collection of over 200 publications distributed between 1800 and 1900, this magazine ran similar articles to those printed in Godey's Lady's Magazine such as 'Hints of Sewing,' 'Dialogue of a Mother and Daughter,' and 'The Idol Self' (2001). While these articles were generally written and edited by women, it was men, Robert B. Seeley and W. Burnside, who published the magazine (Armstrong, 2001). The male publishers would have served the same purpose for the magazine as Godey did for his publication. Armstrong and Brake note that, "basic knowledge of politics, economics, geography, science and factory legislation were all addressed in [the magazine's] pages" (2001); however, this information was funneled through the lens of the male publishers. Furthermore, Charlotte Elizabeth, the primary editor for 12 years of the publication's run, "did not hesitate to castigate the writings of the intellectual and early feminist, Mary Wollstonecraft" (Armstrong, 2001). Given that Mrs. Tulliver would have had only her own education and the social conversations of her society to reference while she raised Maggie and Tom, Charlotte Elizabeth and her fellow writers could also be seen as "mothers" for Mrs. Tulliver.

Maggie's mothers, on the other hand, seem more ambiguous. It is possible that Eliot could have written Maggie as a product of the influence of early nineteenth century woman authors. For example, Jane Austen's novels were published between 1811 and 1818 meaning that these texts would have been available to Maggie's youth. Some of these novels, such as Pride and Prejudice, meditate on some of the same values and teachings of young women as The Mill on the Floss. They are influenced by conduct manuals and exhibit strong women who break through the conventions of their education in order to make their own decisions about their lives; Elizabeth Bennet does so when she refuses a marriage proposal—the premiere goal of a woman in her position.

While these texts would have provided Maggie Tulliver with strong women who would have certainly been adequate "mothers," there is no direct evidence in the
text to support the idea that she would have had access to these texts in the first place. They are not cited as a part of her education. Instead, Maggie’s education relies on books written by men such as, “Virgil, Euclid, and Aldrich” (Eliot, 2008). Siber and Fisher state that The Mill on the Floss, “depicts the female’s appointed social role as harmful both to individual girls and women, and to society” (2003). There is no space for Maggie’s complexity and no positive “mothers” for her to look back through. Maggie becomes a very real heroine to the novel and the period in which she was written. She, much like the audience that receives her, struggles with an identity in this socially constructed role, but cannot escape it.

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**Her instruction as a young lady gave her an appeal in the eyes of men because she could be controlled**

Wollstonecraft asserts that women as well as men should have an education that prepares them, “for the more important years of life, when reflection takes place of sensation” (1995). At the time of the novel, Mrs. Tulliver is situated in these years of her life and has not been prepared for them the way Wollstonecraft would have liked. Rather, Elizabeth Dodson would have been raised in an educational system much like the one Wollstonecraft references by saying, “Rousseau, and most of the male writers who have followed his steps, have warmly inculcated that the whole tendency of female education ought to be directed to one point: — to render them pleasing” (Wollstonecraft, 1995 96). This form of education would have stressed the ideals of purity, piety, submission, and domesticity in order to raise a woman of the house. In some ways this education was successful for Elizabeth Dodson in the scope of her short-term life. She is chosen by Mr. Tulliver for a wife “because she wasn’t o’er ‘cute—bein’ a good-looking woman too, an’ come of a rare family for managing…she was a bit weak, like; for I wasn’t agoin’ to be told the rights o’ things by my own fireside” (Eliot, 2008). Elizabeth Dodson was not a wild young woman. She likely never threw her bonnet onto the floor as Maggie does, and it must have been a rare sight to see her in a dirty pinafore. Her instruction as a young lady gave her an appeal in the eyes of men because she could be controlled. As the chief goal of such instruction was to do precisely this, Elizabeth Dodson’s education was successful by these criteria.

In order to “render women pleasing” to men, educational practices focused careful attention on beauty and dress. As a young woman, Elizabeth Dodson mastered the “curriculum” regarding fashion and comportment. We are told that Mrs. Tulliver had been “the flower of her family for beauty and amiability” (Eliot, 2008). Again, Wollstonecraft references ideas popular in the years Elizabeth Dodson would have been educated as a young woman:

> Beauty cannot be acquired by dress, and coquetry is an art not so early and speedily attained. While girls are yet young, however, they are in the capacity to study agreeable gesture, a pleasing modulation of voice, an easy carriage and behavior; as well as to take the advantage of gracefully adapting their looks and attitudes to time, place, and occasion. (Wollstonecraft, 1995)

While Wollstonecraft critiques this education, as it focuses on “adapting [women’s] looks and attitudes” (1995) for pleasure, these are important pieces of Mrs. Tulliver’s background because they align with the way she tries to raise Maggie. Mrs. Tulliver draws on her experience and the education she was given in order to raise her children.

It is important to note that the virtues held in such high esteem by the Victorian educational system for women applied almost exclusively to the upper class, elite members of society. Such virtues relied too heavily on keeping a woman in the private sphere of the home to be applied to women required to work outside of the home. Eliot makes it clear that this is the type of woman the Dodsons would have raised as she points to their privilege and status in their society as well as their concern with domestic hobbies.

There were particular ways of doing everything in that family: particular ways of bleaching the linen, of making the cowslip wine, curing the hams, and keeping the bottled gooseberries; so that no daughter of that house could be indifferent to the privilege of being born a Dodson, rather than a Gibson or a Watson. (Eliot, 2008)

All of the particulars this passage points to fall into the private home sphere. The young women in the Dodson family were raised with very specific instructions as to running a household. It follows naturally that these material pieces of her life would be some of the most important to Mrs. Tulliver.

**Beauty and Education**

Elizabeth Tulliver and her daughter, Maggie, are largely opposing characters at the start of the novel. Maggie is wild and unrefined, as well as intelligent and
in constant pursuit of knowledge. Mr. Tulliver describes Maggie as, “[t]oo ‘cute for a woman,” saying that, “[i]t’s no mischief much while she’s a little un, but an over-‘cute woman’s no better nor a long-tailed sheep” (Eliot, 2008). Conversely, Mrs. Tulliver has been refined by her upbringing and is described as, “dull-witted” (Eliot, 2008). Her husband specifically states, “as I picked the moth-er because she wasn’t o’er ‘cute — bein’ a good-looking woman too” (Eliot, 2008), which directly contrasts his description of Maggie, but also makes it clear once again that a woman will be of value only if she is beautiful and unintelligent. These conflicting personalities fuel the negative relationship between the two. However, this relationship stems largely from the way Mrs. Tulliver has chosen to raise Maggie, which is the same way she was raised as a girl. Mrs. Tulliver concerns Maggie’s education with beauty and domesticity—the same ideals instilled in her as a girl and throughout her education as a young woman.

By quoting the phrase, “best things,” Eliot gives the impression that these are not objects of any consequence to other people.

To begin the discussion of Maggie’s education, there is the concern of beauty. Mrs. Tulliver expresses displeasure at the tone of Maggie’s skin being tanned from the sun, “as [it] makes her look like a mulatter,” meaning a person of mixed race (Eliot, 2008). This remark indicates that Maggie, despite her mother’s wishes, spends a good amount of time outside without her bonnet protecting her skin from the sun. This remark, insinuating that Maggie’s skin has tanned in the sun, is particularly insulting given the attitude in Victorian England that all races were inferior to the British Anglo-Saxon lineage. While it is clear that Mrs. Tulliver is frustrated by her daughter, she does not relinquish her grasp on Maggie’s education. Rather, she continues her work to mold Maggie into the picture of a woman she would be proud to call her daughter. Maggie’s hair poses another great point of disdain for her mother as it, “won’t curl all [Mrs. Tulliver] can do with it, and she’s so frenzy about having it put i’ paper, and [Mrs. Tulliver has] such work as never was to make her stand and have it pinched with th’ irons” (Eliot, 2008). It is not only that Maggie’s hair does not stay curled, but also that Maggie does not let her mother curl it or sit quietly like a young girl should in order to keep her hair neatly in place. Instead, she is, “incessantly tossing her head to keep the dark heavy locks out of her gleaming black eyes” (Eliot, 2008). Maggie’s beauty, in terms of Mrs. Tulliver’s description, is hampered by her wild nature.

The focus on beauty flows directly into dress and domesticity when Mrs. Tulliver scolds Maggie for throwing her bonnet off and onto the floor. “Take it up-stairs, there’s a good gell, an’ let your hair be brushed, an’ put your other pinafores on, an’ change your shoes — do, for shame; an’ come an’ go on with your patchwork, like a little lady” (Eliot, 2008). This instruction sums up the virtues Mrs. Tulliver tries to instill in Maggie. She should be concerned with her beauty, so her hair should be brushed. Then, Maggie should be concerned with her dress and put on a cleaner pinafore before concerning herself with domestic hobbies like continuing her patchwork. Maggie calls the patchwork, “foolish work” (Eliot, 2008), saying she does not want any of it. She would rather concern herself with books as she does when her mother leaves her alone with Mr. Tulliver and Mr. Riley. However, even then, Mr. Riley scolds her saying, “I advise you to put by the ‘History of the Devil,’ and read some prettier book” (Eliot, 2008). In this world all things beautiful seem to be concerned with all things dull and unintelligent.

Effects of the Loss of the Family Fortune

The second chapter of the third book in The Mill on the Floss is titled “Mrs. Tulliver’s Teraphim, or Household Gods” (Eliot, 2008). The starting point is particularly clear in that this chapter title defines itself. Teraphim is a Hebrew word referring to idols kept for private worship, or as Eliot translates, “Household Gods” (2008). As discussed above, Mrs. Tulliver was raised to value her domestic abilities. The details to be discussed here are those that describe Mrs. Tulliver’s teraphim in terms of her material possessions. Mrs. Tulliver is found by her children in “...the store-room, where [she] kept all her linen and all the precious ‘best things’ that were only unwrapped and brought out on special occasions” (Eliot, 2008). These “best things” include tablecloths with patterns stitched by Mrs. Tulliver’s own hands as well as teapots, china, and various other items from a time when she was still Elizabeth Dodson. By quoting the phrase, “best things,” Eliot gives the impression that these are not objects of any consequence to other people. Moreover, when juxtaposed with the idea that this chapter is about her teraphim, the quotation marks seem to mock Mrs. Tulliver for worshipping such trivial items as if they were idols representing a god.

Connecting this description of her “best things” to the importance of domesticity for women to Mrs. Tulliver’s generation, creates a more sympathetic reading of this excerpt. Mrs. Tulliver is devastated about the even-
At women and contained engravings, poetry, and articles. As previously stated, it was a magazine aimed at reinforcing Elizabeth’s notions of the primary concerns of her sex, but they would also implicitly influence negative connotations of her sex as well. This is appropriate given another quoted passage by Wollstonecraft stating that a woman, “has nothing in her favour, but her subtlety and her beauty” (165).

An Exploration of Mothers

Maggie’s ideas of what it means to be a woman, much like her mother’s, come almost entirely from men. While women wrote most of the articles and poems in Godey’s magazine, they came through the lens of a man. In the novel, Maggie lacks a system of positive women role models because while her “mothers” extend from the living women around her to the women in the books she reads, none of these women exhibit any semblance of depth in their character. For Maggie Tulliver, the closest ideas of “mothers” are the men who write the books she reads. Unfortunately, these men have created and perpetuated archetypes that give Maggie something at once feminine and false to find herself in. In some ways, these archetypes become her “mothers” by default. She looks for identification in her books and finds only the witch in Defoe’s The History of the Devil. Maggie looks for a “mother” in this archetype. She poses that, “the devil takes the shape of wicked men, and walks about and sets people doing wicked things” (Eliot, 2008). In the witch, Maggie finds injustice and oppression at the hands of men, but this instinct is stifled as she is told it is, “not quite the right book for a little girl” (Eliot, 2008). Her heroic witch is viewed as an inappropriate misinterpretation. The witch, according to Defoe, was an image used to assert power over a group of people, mainly women, rather than grant power to these people. Identifi-
fying with the witch would be anti-Christian, something that would not be welcome within the surrounding society in St. Oggs.

Slowly, Maggie gives up the idealized picture she has created of herself. She steps away from her thirst for knowledge and desire to do more than her mother, aunts, and cousin. Wollstonecraft writes that in this system of education, “men are prepared by various circumstances for a future state, they constantly concur in advising women only to provide for the present” (1995). Maggie begins to recognize this emptiness in her education saying, “[i]f she had been taught ‘real learning and wisdom, such as great men knew,’ she thought she should have held the secrets of life; if she had only books that she might learn for herself what wise men knew!” (Eliot, 2008). She remembers her own schoolbooks with nostalgic regret, “she had often wished for books with more in them: everything she learned [at St. Ogg’s] seemed like the ends of long threads that snapped immediately” (Eliot, 2008). Maggie’s emphasis on “more” signifies her yearning and desperate desire to read outside of her sex as well as her frustration with the knowledge she was given. The sewing metaphor is no accident on the part of Eliot. To Maggie, her education was a commitment to tedious work that took her nowhere, like following a long piece of thread through to the end of a stitch only to have it break off leaving the work to unravel start anew; this was the nature of her education. Maggie uses the sewing metaphor because that is what she has learned. She cannot produce a different comparison because she has no basis for such thought. Her education was limited in such a way as to allow her to cultivate her knowledge of all things domestic rather than to cultivate her mind.

Maggie is associated with original sin in her multiple interactions with the tree of knowledge

In contrast, Maggie finds herself attacking Tom’s old schoolbooks in hopes of attaining any amount of knowledge she can, in order to prepare herself or to find the “secrets of life” (Eliot, 2008). Maggie “began to nibble at this thick-rinded fruit of the tree of knowledge” (Eliot, 2008). Here, Maggie is connected to Eve and original sin. She is stepping outside of her sex and risking the downfall of humanity to gain a bit of the knowledge forbidden to her. The “thick-rinded fruit” poses a challenging contrast to the apple most often associated with the tree of knowledge. A thick rind is not easily removed or eaten through. However, Maggie “nibble[s]” at the fruit rather than peeling it or piercing into it with a strong and determined mouth. She is careful and wary because she has never been privy to this information and it is foreign, exciting, and a bit terrifying to bite down for the first time.

Eventually, these studies see Maggie deluded to tears, loneliness, and fits of anger until she comes upon Thomas à Kempis. She is initially intrigued simply because the name is familiar enough to her that she can attribute some ideas to it. The marks left behind by a previous reader become Maggie’s “invisible Teacher” (Eliot, 2008). This guiding hand points to the only passages Maggie decides to read from the text. She takes this hand as a supreme source of information and ignores all other passages leading her to misinterpret the text and come away with a desire to devote her life to it. Maggie resolves that renunciation would be her “entrance into the satisfaction which she had so been craving in vain” (Eliot, 2008). Thomas à Kempis is attractive to her because the annotated sections give her the role models for which she has spent her life searching.

Out of the biblical narrative of the original sin comes another one of the destructive archetypes Maggie has the ability to perceive herself within. The archetype of the fallen woman dates back to Milton’s Paradise Lost, where it exists as a recurring theme. Maggie is associated with original sin in her multiple interactions with the tree of knowledge. In addition, as the second book closes, Maggie’s interaction with Tom about the lawsuit and their father’s illness echoes the close of Paradise Lost when Adam and Eve move into the world and out of the safety of Eden (Eliot, 2008). When Maggie does not return to St. Oggs for five days after leaving with Stephen, Tom accuses her of “carrying on a clandestine relation with Stephen Guest...[and] behav[ing] as no modest girl would have done to her cousin’s lover” (Eliot, 2008). He sends her out of Dorlcote Mill because she has shamed the family and disgraced their name. The town looks down on her as this “fallen woman” until a letter from Stephen restores her credibility with her family. Even after Stephen’s letter has been made known, Maggie faces ill-conceived notions by many of the townspeople.

As a fallen woman, no matter how untrue the identification, Maggie becomes an outcast in St. Oggs. The town, including her family, shuns her. Maggie’s role models have failed her again. The history of St. Oggs is a significant piece of the novel as much like that of the Virgin Mary upon the discovery of her out-of-wedlock pregnancy.

An Understanding Between Mother and Daughter

Eliot’s The Mill on the Floss explores women as a
mystery to other women. Maggie Tulliver and her mother do not understand one another, nor do they attempt to do so, when the novel opens. In Simone de Beauvoir’s The Second Sex, she asserts that this mystery exists between men and women as a result of women’s systematic oppression throughout history. She contextualizes the ways in which women have become an “Other” to men because this oppression has been passed down through generations. In relation to The Mill on the Floss, this mystery exists between women largely due to the fact that a male lens shapes their lives. In this text, de Beauvoir states that this “mystery is never more than a mirage that vanishes as we draw near to look at it” (1952). In this fashion, as the novel progresses and the two become more closely linked, Maggie and Mrs. Tulliver develop a greater and deeper understanding of one another out of necessity.

Maggie and her mother are constantly at odds over the subject of her education during her formative years. In the opening scenes, Maggie is reading Daniel Defoe’s “The History of the Devil” (Eliot, 2008) and refusing to do her patchwork. Meanwhile, Mrs. Tulliver cannot figure out Maggie’s character. She refers to Maggie as “half an idiot i’ some things” (Eliot, 2008); and consistently expresses exasperation at Maggie’s refusal to sit for her hair to be done or dress in a clean pinafore (Eliot, 2008). The frustration that occurs in the moments when the two interact indicates an inability to understand the reasoning behind the other’s actions. This stems from their ability to live somewhat separate lives. As members of a higher class, both Maggie and her mother have the time and resources to do the things they find pleasing. Maggie spends a good deal of time outdoors in the natural world while Mrs. Tulliver prefers to spend her time indoors. This separation allows the pair to live independently of each other; but it does not foster civility when the two are forced together.

Mrs. Tulliver begins to support Maggie in the wake of the family crisis. She seems, in many ways, to connect with the description of the “overgrown child” as “[c]hildren, I grant, should be innocent; but when the epithet is applied to men, or women, it is but a civil term for weakness” (Wollstonecraft, 1995). Her education, being centered on domesticity, lacked longevity and left her wanting for knowledge. However, as the novel progresses, it becomes clear that Wollstonecraft more accurately represents Mrs. Tulliver as she says, “[p]arents often love their children in the most brutal manner, and sacrifice every relative duty to promote their advancement in the world” (1995). For Maggie, “advancement in the world” was measured by marriageability. Elizabeth Tulliver aimed to educate Maggie to be a woman a man would want to marry. She attended to her daughter’s hair and dress and directed her towards domestic practices, the very same which lead Elizabeth Dodson to become Elizabeth Tulliver. She recognized that in order for Maggie to be successful in attaining a husband—the ideal of their upper middle class lifestyle—she would have to fit the desirable picture of a wife. Maggie must refrain from being disagreeable because what she offered to a husband was a domestic partner rather than a formidable opponent. It was not out of disdain for Maggie that Mrs. Tulliver scolded her for her desire for knowledge rather, it was out of love. Given, “that the proportion of women to men within the marriageable age-group of fifteen to forty-nine was 107 percent...this ideal was not even available to every woman” (Poovey, 1988). Elizabeth Tulliver simply wanted her daughter to live an easy and comfortable life.

Mrs. Tulliver has lost her sweet, delicate, and kind ideal of Maggie while falling away from the overbearing and oppressive nature of her early mothering

After the loss of their status in society, Maggie and her mother are forced to live more closely. Mrs. Tulliver and Maggie once avoided one another in order to enforce their ideal, silent, and absent companion. As time has passed and circumstances have changed, the two learn to find comfort and support in each other. As stated in The Second Sex, “the more relationships are concretely lived, the less they are idealized” (De Beauvoir, 1952). Where Mrs. Tulliver had criticized Maggie at an earlier point of life, she now finds elements of endearment; Maggie has also begun to learn to accept the things her mother finds to be important. “The mother was getting fond of her tall, brown girl...and Maggie...was obliged to give way to her mother about her hair” (Eliot, 2008). Additionally, Maggie is even “glad of anything that would...cheer their long day together” (Eliot, 2008), indicating that she is spending lengthy periods of time with her mother and starting to appreciate them.

This beginning of mutual respect flows out of a loss of both Maggie and Mrs. Tulliver’s ideal companions. Their desires for others have fallen away out of necessity just as de Beauvoir says the ideals fall away when women and men have to work closely together. When the Tullivers lost their fortune, their lives changed drastically. With this loss comes perspective. Mrs. Tulliver has lost her sweet, delicate, and kind ideal of Maggie while falling away from the overbearing and oppressive nature of her early mothering. Similarly, Maggie loses her passion and desire for an education of the great minds in her brother’s books, but she gains a supportive guide in her
mother.

Slowly, throughout the novel, the women all become closer and more supportive of one another. Where once Mrs. Tulliver would have taken great pains to criticize and correct Maggie’s looks and complexion, now she says, “Maggie’s arms are a pretty shape” (Eliot, 2008), even though they are a bit more brown than is ideal. Lucy even jumps in to defend Maggie’s complexion as, “[a] painter would think [it] beautiful” (Eliot, 2008). This closeness experienced by the women continues to develop throughout the sixth and seventh books of Eliot’s The Mill on the Floss. There are moments when they falter, but the mothers and daughters become confidants. After Maggie’s disappearance from and return to Dorlcote Mill, her family does not easily accept her. However, the introduction of Stephen’s letter brings Maggie and her mother to an important point in their relationship. Maggie admits she “was always naughty and troublesome to [her] mother. And now [she] might have been happy if it hadn’t been for [Maggie]” (Eliot, 2008). Mrs. Tulliver had lamented about her bad luck to Maggie after her return to the Mill. She follows to say that she “must put up wi’ [her] children...there’s nothing else much left to be proud on, for [her] furnitur’ went long ago” (Eliot, 2008). In this interaction, Maggie exhibits that she has learned the importance of her mother and has realized that the agony she felt being raised by a woman who did not understand her was not a one-sided event.

Mrs. Tulliver has begun to come into her own as a parent after the loss of her husband. Wollstonecraft cites the need for a broader education for women as parents:

[To] be a good mother—a woman must have sense, and that independence of mind which few women possess who are taught to depend entirely on their husbands. Meek wives are, in general, foolish mothers; wanting their children to love them best. (1995)

This transformation, in some ways, begins to occur in Elizabeth Tulliver: as at the start of the novel she fawned over Tom and pleaded with him to come to her aid when the family fortune was in danger of disappearing. She looked to him because she had not been given the sense to rely on herself. As the time has passed, she has been forced to gain some of this sense while Maggie has been shown the realities of the life her mother worked desperately to protect her from. However, while Mrs. Tulliver has begun to appreciate her daughter, it is clear that this flows only from the loss of something better. She says she is fond of her children because her “furnitur went long ago” (Eliot, 2008), not because they are her children. The attachment Mrs. Tulliver has to her various teraphim can be sympathized with because they are her life’s work, but this does not mean that this attachment should come hierarchically before an attachment to her children. Mrs. Tulliver can never fully shake the limits her education prescribed her. Maggie and her mother do form a bond as the novel begins its closing chapters, but the mother-daughter relationship has suffered irreparable damage at the hands of the system of education forced on the pair by the society they live in.

Conclusion

As the text comes to a close, Maggie’s role models—the good, the bad, and the contrived—come together to simultaneously condemn her and provide her the space to free herself. The river floods while Maggie is away from the Mill. She returns in a boat to save Tom in an act he later refers to as an “almost miraculous divinely-protected effort” (Eliot, 2008). In this moment, Maggie returns to the Virgin Mary saving St. Ogg from the flood. She is a saint disguised all of her life by the judgment of others. This judgment quickly catches up with her as the Mill begins to give way and “huge fragments [are] being floated along” (Eliot, 2008). As the sun rises, Tom warns Maggie of the fate that is about to take them both down “in a deep hoarse voice, loosing the oars, and clasping her” (Eliot, 2008). The water pulls them down and Maggie can be seen, once again, identifying with the fallen woman. She is Eve destroying humanity and she is the version of herself condemned to drown for her relationship with Stephen contrived by the town surrounding her. When the boat resurfaces Maggie is the witch: she has drowned and therefore, she is innocent.

The Mill on the Floss is a woman’s bildungsroman. It is a novel of education, but this does not stop at the education of its characters. Maggie Tulliver spends the course of the novel identifying with false “mothers” from the flesh and blood women around her to the painful archetypes created in her books. The education she is given causes a rift in the relationship she has with her mother, but the evidence proves that the relationship between a mother and daughter cannot simply be kind. This novel does not stop at discussing the education of women and their relation to their mothers in the Victorian Era. It continues by giving its readers a mother to look back through. Maggie Tulliver has taken her lack of “mothers” and created herself to fill the void.
REFERENCES:


The Power of Cute

Redefining Kawaii Culture as a Feminist Movement

By Mary Christopherson

“Kawaii” is a term that has taken on a life of its own within its country of origin, Japan. So much so, that although it is commonly translated to “cute,” the meaning of the word has no precise English translation. Kawaii has become more than “cute;” rather, it expanded into such a social phenomenon among Japanese youth that it even evolved into its own culture. This culture or “counterculture” acts as an opposition to modern standards for how people should behave in society. At the forefront of this movement are young women. Because of this, the kawaii phenomenon arguably underscores a third-wave feminist movement which women can utilize to uplift themselves on an individual and social scale. This claim will be reiterated through two main points: that kawaii challenges pre-established social and gender norms that oppress women, and that kawaii empowers women through a celebration of femininity. These claims will be discussed through historical context of the usage and evolution of kawaii, and then argued through in-depth social analyses using real-life examples of popular media in modern-day Japan.

Doe-eyed girls in 30-second commercials dance heartily to sell fruity shampoos, while guardrails shaped like pink rabbits adorn construction sites in Tokyo as a reminder to be careful. Both these examples are found readily in Japan and utilize cuteness in order to communicate a message to a broader audience. Indeed, one unique facet of Japanese culture is this purveyance and emphasis on the value of cuteness. In Japan, cuteness is used perhaps more than any other tactic to sell products and relay messages. The word “kawaii” is generally used as the Japanese word for cute. However, this is merely a rough translation. “Kawaii,” in relationship with Japanese culture, has rapidly taken on a life of its own. What began as a mere aesthetic descriptor with the likes of “pretty” or “sexy” has surpassed its origins to become a unique phenomenon on its own, and in some aspects can even be classified as a culture. This dissertation argues that “kawaii phenomenon” was largely created by and for women and thus underscores a third-wave feminist movement due to its breaking down of social and gender standards as well as its empowerment of women.

Background

Because kawaii is a largely new concept that has taken root only within the last century, there is overall a lack of extensive research on the phenomenon itself. Kawaii, while quite renowned internationally, is often misunderstood due to a lack of background information. The origins of kawaii, both as a word and a trend, suggest that it is derived from oppressive ideals that infantilize and render women inferior. While this may appear true in certain contexts, kawaii has developed into a complicated construct containing multiple categories and numerous definitions. One such category of kawaii has manifested into a youth culture mainly prominent in areas like Harajuku, where young people frequent to...
meet like-minded individuals who may possess similar interests in fashion and paraphernalia. This aspect of kawaii, while largely driven by consumer companies, is still greatly influenced by young artists. In this way, kawaii has been more or less reclaimed by women to cater to them rather than oppress them. This can be seen when analyzing the history of the usage of kawaii and its evolution into a multi-faceted construct with no definite meaning.

**Emergence of Kawaii**

Kawaii as a descriptor was arguably initially based around the expectations of men (Botz-Bornstein, 2011), and derives from the word kahohayushi [顔映ゆし], meaning “unable to look at due to pity” [気の毒で見ていない] (“語源,” n.d.). However, kawaii as a social construct was largely created and cultivated by and for women. Because of this, it was able to expand into something more than its original usage. Kawaii’s origins of usage can be traced to the end of World War II (Okazaki & Johnson, 2013). During this time, disposable incomes of the youth were on the rise, especially among young women (Kinsella, 1995). Kawaii really blossomed as a trend, however, starting in the 1970s. At this time, a form of childish handwriting became an increasing fad amongst teenagers, most notably teenage girls. These youth adapted a style of writing that utilized simplified, rounded characters in addition to cartoon symbols such as hearts and faces thought to be inspired by comics. The new script became such a phenomenon that it was even banned in certain schools. This contemporary style of handwriting became increasingly incorporated into commodities marketed toward a youthful audience such as magazines, advertisements, and fonts on word-processing programs (Kinsella, 1995). Consumer companies such as Sanrio also attempted to capitalize on cuteness with an emerging line of “fancy goods,” such as clothing, that were “deliberately designed to make the wearer appear childlike and demure” (Kinsella, 1995). The 1980s reveals evidence of a period in which kawaii began to metamorphose into a culture within society and thus the period in which the context of kawaii began to change. With the increase in consumerism among youth came a growing attitude among girls who were not satisfied merely owning kawaii possessions. Instead, they took it upon themselves to embody kawaii on their own, adopting kawaii qualities in their clothes, mannerisms, and speech.

**Kawaii as a Culture**

The emergence of a youth movement in which young adults began to embody kawaii qualities themselves marked the point in which kawaii emerged as a culture, as well as a change within the meaning of the word itself. In the beginning, kawaii was used to refer to things that were “immature and small” (Okazaki & Johnson, 2013) and consisted of products, such as clothing, that were “deliberately designed to make the wearer appear childlike and demure” (Kinsella, 1995). The 1980s reveals evidence of a period in which kawaii began to metamorphose into a culture within society and thus the period in which the context of kawaii began to change. With the increase in consumerism among youth came a growing attitude amongst girls who were not satisfied merely owning kawaii possessions. Instead, they took it upon themselves to embody kawaii on their own, adopting kawaii qualities in their clothes, mannerisms, and speech.

Kawaii culture was largely created by and for women, and thus underscores a third-wave feminist movement

Two main driving forces of this notion to “personify” the kawaii ideal included girls’ manga and the rise of female pop idols. Manga was prevalent during this era due to low prices, girls’ manga being no exception. These comics, including Riyoko Ikeda’s Rose of Versailles and Yumiko Igarashi’s Candy Candy, were created by female mangaka and frequently portrayed female protagonists who were as sweet and charming as they were ardent and headstrong (Okazaki & Johnson, 2013). This, alongside their depictions with large sparkling eyes and elaborately detailed clothing, helped spur emulation within young girls. Another key factor was the emergence of pop idols. Matsuda Seiko, who debuted in 1980, is considered a major instigator in the proliferation of idols within the Japanese music industry. Seiko, who was 18 at the time of her debut, became popular due to her childish demeanor that extended beyond speech and appearance and into her behavior and personality. “[She] took faltering steps and blushed, cried, and giggled for the camera... [and] published several books... filled with large wobbly handwriting... and ‘heart-warming’ poems...” (Kinsella, 1995). As more and more girls began to adopt these pop culture trends into their own lives, the word ‘kawaii’ began to exceed its use as a mere descriptive term or consumerist objective but also became a culture entirely its own.
Today kawaii not only pervades normal Japanese culture, but has also embodies a culture all its own. A culture can be defined as “[t]he customs, arts, social institutions, and achievements of a particular nation, people, or other social group” as well as “[t]he attitudes and behavior characteristic of a particular social group” (“Oxford,” n.d.). Sharon Kinsella (1995) further describes culture as “the sphere to which people turn to fulfill spiritual, emotional, intellectual, and sexual needs and desires which are not met within the fabric of their lives at work, at school, at home.” By both definitions, kawaii embodies a culture all its own. Girls integrated kawaii in all facets of their lives: not only in appearance but also in speech, mannerisms, values, even in the food they consumed. Thus kawaii became more of a lifestyle than mere aesthetic. With the assimilation of kawaii into the intricacy that is the human lifestyle came the evolution of its definition into something equally complex. Throughout the 80s, youth gathered in areas around the country, including iconic places such as Harajuku. There, they ignited fashion trends of their own by designing ensembles from second-hand and remade articles of clothing (Okazaki & Johnson, 2013). These people, with the aid of magazines and amateur photographers, wore increasingly outspoken outfits that would branch off into the sub-genres of fashion known today such as lolita, decora, and kogal. These trends consistently pushed the boundaries of what could be classified as “kawaii.” Today, what qualifies as kawaii can be enigmatic and sometimes contradictory: “it is synonymous with beautiful, lovable, suitable, addictive, cool, funny” but can also be “ugly but endearing, quirky and gross” (Okazaki & Johnson, 2013). Along these lines, kawaii reveals itself as a culture that has grown to exceed its original meaning, nowadays possessing indicative qualities of a social movement.

Kawaii as a Feminist Movement

As is previously mentioned, kawaii’s growth into a culture was largely attributed to girls and young women. Despite this, the concept of kawai seems primarily disadvantageous to modern Japanese women upon first glance. Many would argue that it further perpetuates gender stereotypes and exalts the historically imbued concept that women are subservient to men or seek the approval of men. This is additionally evidenced by the attribution of kawaii as “childlike,” as children are often powerless and lack self-reliance in standings of society. However, when examined in-depth, the modern kawaii youth movement possesses countercultural notions that challenge and disassemble established understandings of femininity, which can benefit both men and women by opposing rigid gender lines. Masafumi Monden aptly illustrates this idea in her thematic analysis of shōjo media: “[Kawaii] can be read as having two faces: one being an idealized construction imposed predominantly by men and the other being manoeuvred by the girls themselves” (Monden, 2014). The latter of this can be seen when analyzing the change in the perceptions of women in Japan throughout recent history, which notably coincides with the growth of kawaii after World War II. Coinciding with this is the notion that kawaii culture acts as an empowerment towards women rather than a de-habilitation. Consequently, it can be argued that kawaii culture underlies its very own feminist movement. In order to provide evidence of this claim, three main arguments will be discussed: 1) kawaii is a third wave feminist movement, which allows for its integration into society with lesser resistance; 2) kawaii goes against traditional social norms, which allows both women and men who are oppressed and unsatisfied with these roles to turn to a new means of establishing their identity; and 3) kawaii provides empowerment to girls by celebrating femininity and using it as a medium with which to raise themselves on both and individual and broader societal scale.

The modern kawaii youth movement possesses countercultural notions that challenge and disassemble established understandings of femininity, which can benefit both men and women by opposing rigid gender lines
Shibuya, including the facets that youth take on and perpetuate through their lifestyle and identity, often to levels deemed extreme by surrounding society.

This distinction is best illustrated through examples such as that of the artist and public figure Kumamiki, a notable ‘feminist kawaii’. Kumamiki is a video blogger and designer who is relatively well known among the Harajuku scene as well as internationally. Kumamiki exhibits feminine and childish qualities such as speaking in a high-pitched voice and wearing elaborate make-up. However, Kumamiki is ‘feminist kawaii’ in that she has a large control over all facets of her professional and creative output. Her outfits are created and arranged by herself, and she also creates her own designs, which she sells through her own brand (Okazaki & Johnson, 2013). Additionally, Kumamiki does not conform or perpetuate mass-produced social or gender expectations. Rather, she challenges them through her fashion and career choices. An important aspect that separates Kumamiki, or ‘feminist kawaii,’ is an aspect of agency—in other words, the ability to make one’s own decisions free from the pressure of society. Therefore from this point on, it should be apparent that when the word “kawaii” is used throughout this discussion, it is referring to this distinct category of kawaii as embodied by people such as Kumamiki. This type of kawaii is not necessarily created and sustained by large corporations, but rather by individuals and smaller name brands and can be found in places such as Harajuku and Shibuya.

**Kawai as Third-Wave Feminism**

Like many democratic countries, Japan has a long history of feminist activism. In a sociological context, feminism is typically defined as a movement toward the equality of male and female genders. Consensus views of feminism tend to consist of women’s rights movements, such as the Shin Fujin Kyōkai who petitioned the government for the allocation of women into political organizations in the 1920s (Mackie, 2003). While de jure equality is important, the values and practices of those who make up a society are equally consequential, especially within context of the modern age. Women who are socialized or pressured by society to conform to certain expectations can be a hindrance to equality, as those who are uninterested in these norms and pursue other paths may suffer. For example, while giving a speech at the Tokyo Assembly this past June, congresswoman Ayaka Shiomura was repeatedly interrupted with sexist taunts such as “Shouldn’t you get married soon? [早く結婚したほうがいいんじゃないか]” (“Business Journal,” 2014). Shiomura, who is 35 and still single, defies traditional ideals of a woman’s role as solely bride and caretaker and as such was publicly shamed and humiliated. Incidents like this inhibit women like Shiomura who choose separate goals, such as career paths, by preventing them from pursuing decisions free from gender-based scrutiny.

Thus, the interest in equalizing women’s positions when it comes to issues such as agency, or the ability for women to make volitional decisions, can also equate to feminism. These decisions include those that defy traditional roles as well as those that embrace them. In certain countries, feminist movements typically advocate a disassociation with feminine attributes; to gain equality, women attempt to become more like men. In contrast to this, Japanese feminism has tended to follow a different method of achieving status in society, which Sumiko Iwao (1993) illustrates in an analytical text on Japanese women:

> In the movement for higher status of women, which involves gain for women but not necessarily for men, the nonconfrontational approach helps ease social resistance as women shift away from traditional role expectations and can be a factor that prevents or deflects backlash.

In Japan, women have not necessarily demanded men’s attention to women’s inequality, but rather attempted to gain social status and agency through methods that were non-aggressive. Japanese women have not sought to become regarded on the same terms as men, but rather to create a sort of “women’s space” for themselves. “Excluded from participation in the activities dominated by men, women have ended up establishing a separate world of their own” (Iwao, 1993). This illustrates how women in Japan have been able to attain status in society without wholly separating themselves from feminine qualities.

Meanwhile in countries like America, women who enjoy traditional roles such as motherhood have felt alienated from earlier first and second-wave feminist movements that rejected these roles altogether. Thus, in response to this, a “third-wave” brand of feminism has emerged. Snyder-Hall defines this “third-wave” feminism in her text Third-Wave Feminism and the Defense of Choice:

> Third-wave feminism is pluralistic and begins with the assumptions that women do not share a common gender identity or set of experiences and that they often interpret similar experienc-
es differently. It seeks to avoid exclusions based on race, ethnicity, religion, sexual orientation, gender identity, and so forth. It recognizes that women in different subject positions often have very different perspectives.

Snyder-Hall also discusses how this emerging branch of contemporary feminism “views freedom not as simply ‘the capacity to make individual choices’ but rather as the ability to determine your own life path” (Snyder-Hall, 2010). In this way, third-wave feminism is highly adaptable and can be difficult to define in exact terms. However, one critical component of its interpretation is the emphasis on allowing women to make self-determined choices regarding their own lifestyles. This includes the choice to engage in activities that are typically considered feminine, which is where kawaii culture comes in. Kawaii culture coincides with third-wave feminism in that it allows women to partake in what are considered female activities, such as wearing dresses or donning make-up, by their own choice rather than by a pressure to conform to societal standards. In fact, it can be argued that kawaii even encourages girls to challenge social standards through feminine expression. As shown historically in earlier movements, this type of third-wave feminism is beneficial for Japanese society as it can provoke change without being antagonistic.

Kawaii can be classified as feminist because it celebrates femininity. It does this by blurring the lines between gender dichotomies and challenging social norms of acceptable behavior and girlishness; it promotes girlishness among both men and women. Kawaii is also feminist because of the way in which it empowers women, thus giving them self-determination to make choices without pressure from patriarchal or other social forces.

History of Women’s Social and Gender Norms

Throughout the nineteenth and twentieth centuries, Japan’s emergence as a modern capitalist society brought about the rise and fortification of certain gender roles. These included the ascribed status of women as “good wives and wise mothers” to their families and “passive supporters” of the state (Mackie, 2003). During the initial period of the Meiji Restoration, women were also refused the banning of prostitution, denied voting rights, and excluded from early political debates for nationalistic reasons. Outside the law, women were socially obligated to maintain chastity to ensure marriage, thus revealing how “morality [and] customs... were framed in terms of men’s desires” (Mackie, 2003). This implies a historically established role in which the societal woman became the lesser, subservient counterpart to man socially, politically, and sexually. In addition to this were the accepted ideals of femininity, which can be seen in paintings, women’s fashion, and other aspects of the Meiji period and beyond. Femininity was thought of as pitiful, and women who sought out things like educations were taught that they could possess feminine traits like beauty and intelligence at the same time. Girls and female adolescents were allowed certain freedoms such as behaving spontaneously or wearing their hair long and loose; however, they were expected to change their “[d]emeanor, clothing, hairstyles, manners, and even some forms of speech” as they grew older into something more “modest and subdued” (Iwao, 1993). Women who did not follow these expectations were berated. Indications of these standards of women as submissive and compliant above all can still be seen in modern society. However, evidence suggests that perceptions of women have greatly changed over the past few decades as female autonomy increased in the law, in education, and in the workforce. This change has been arguably reinforced through movements like that of kawaii culture.

Sumiko Iwao (1993) reveals a “backstage revolution” in which women achieved more independence and freedom in society through passive and roundabout methods, and used this in order to change the social roles they deemed insufficient (Iwao, 1993). She cites this movement’s beginnings after World War II, coinciding with the emergence of the booming kawaii trend. Among the various changes brought on by this post-war era, married women found their positions as wives and mothers increasingly unsatisfying as they gained more freedom in context of law and education (Mackie, 2003).

Japanese women have not sought to become regarded on the same terms as men, but rather to create a sort of “women’s space” for themselves

With this newfound independence, women needed to reevaluate their places in society through more individualistic tactics including finding employment, as well as through non-traditional pursuits such as resuming their education. Along with this came an increase in independent revenue, which allowed women the freedom and assurance to support themselves without having to marry and depend on a husband’s income (Iwao, 1993). This yearning to seek other means of fulfillment may unveil an explanation as to why the kawaii trend was so popular among young women of this time. The self-indulgent principles of kawaii which challenged pre-established

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values in society were appealing, especially to maturing women caught between old and new social standards. These girls sought new methods of self-satisfaction that did not depend on a husband and family; kawaii offered a means of fulfilling this through rejection of adulthood values—including marriage—and instead embracing a world of childhood play. The popularity of the kawaii trend reflects an era in which women were growing increasingly unsatisfied with traditional social roles. Yet kawaii culture would come to play its own part in revolutionizing society by further deconstructing established perceptions and gender norms for men and women. While these changes were initially met with general resistance, kawaii’s increasing pervasiveness in mainstream consumerism would come to allow kawaii culture to become an integrated part of society.

Kawaii as a Counterculture

Kawaii has evident countercultural aspects that further promote a changing perception of those who take part in it. To onlookers, those who participated in kawaii culture were rebelling against traditionally established roles and convictions; this belief still persists today as interpretations of kawaii continue to push the boundaries of what is acceptable in society. Sharon Kinsella (1995) describes how cute culture of the 90s promoted consumption, which was thought of as “anti-social and immoral” in Japanese culture. This stance against consumerism was largely due to Japan’s traditional value of placing community above the individual, a notion that kawaii seems to disrupt through focusing on individualistic indulgence in material objects. ‘Cute’ people of history, especially women, were often scapegoated for the issues of modern society; in fact, several analyses of the kawaii movement compare it to the movement of black culture in America (Kinsella, 1995; Botz-Bornstein, 2011). Young people who engaged in kawaii were depicted as “spending horrendous amounts of money on music, clothes, and cute ‘things’ in Harajuku and Aoyama...” (Kinsella, 1995). Kawaii was “even meant to pinpoint ‘potentially disruptive young girls and women’ (Botz-Bornstein, 2011). On the other hand, this consumption could also be perceived as “...an escape from traditional Japanese culture” where “kawaii-ness signified freedom” (Botz-Bornstein, 2011).

Young women challenged societal ideals of cuteness and thus femininity by taking them to an extreme.

In this context, kawaii was regarded in a more favorable light. Nevertheless, kawaii’s strong correlation with consumerism and materialism made it quick to be criticized as society was reluctant to embrace its inevitable changes.

Along with decadent consumption, cuteness was perceived as rejecting adulthood, and thus its associated responsibilities (Kinsella, 1995). This was especially true for young women. To many Japanese, entering the working world signified the end of innocence and freedom and the beginnings of a harsh and exploitative white-collar career. Ivo Smits (2012), in a short study on Japan’s kawaii culture, surmises kawaii’s inherent rejection of these ‘adult’ values:

[Kawaii] was associated with childhood. Young people were reluctant to grow up, because they would have to pretend to be something they were not, and they felt they could no longer be authentic. The cuteness culture was a way of resisting this. Which did not, incidentally, mean that people stood still. They got jobs, had children, but they also created an opportunity for themselves to escape into a safe, cheerful fantasy world.

Such convictions still exist today. When asked about her clothing line Party Baby, Kumamiki explains: “I thought that becoming an adult was boring; I wanted to be an adult with the innocent, sparkly feeling of being a child” (Okazaki & Johnson, 2013). She emphasizes this statement with a claim that by being childlike, she is maintaining a sense of innocence that inspires creativity, and it is simply something pleasurable for her. “When you grow up, this kind of sensibility disappears, but I

Image 1. Screenshot of Kyary Pamyu Pamyu as shown in her music video “PON PON PON”, where a flock of black birds emerge from her open mouth.
want to keep these innocent feelings eternally,” she explains (Okazaki & Johnson, 2013). Due to its ubiquity in consumer goods, it is not merely young people who can engage in kawaii culture. “A fifty-year-old woman with a Hello Kitty key ring is showing that she still belongs” note Smits and Cwiertka (2012), professors at Leiden University. In this way, people of any age can preserve the ideals associated with kawaii culture, such as rejecting conceptions of adulthood, while still maintaining their role as a functional member of society.

In addition to rejecting traditional, repressive notions of adulthood, kawaii also heavily subverts gender roles. Upon its emergence in the 70s, women who followed kawaii trends were generally blamed for “feminizing society.” Incidentally, following cute style was “not actually traditional feminine behavior at all, but a new kind of petulant refusal to be traditional subservient females” (Kinsella, 1995). During the rise of kawaii, in fact, there were more young women in the work field than any other time before the postwar era; however, this was also criticized for conflicting with traditional roles in which the women of a household belonged in the home. Women responded to this criticism by “defensively strengthening a ‘girls only’ culture and identity” (Kinsella, 1995), and further emphasizing the girlish aspects of their identity. Some of these young women would build feminine identities to the extent that they were labeled “too girly” or “too cute.” In this way, they challenged societal ideals of cuteness and thus femininity by taking them to an extreme. Along with female ideals, kawaii also subverts standards of masculinity. As mentioned, kawaii possesses attributes typically associated with femininity and is largely dominated by women. However, in actuality it does not exclude men. Many young men actively participate in kawaii fashion and culture and also find it to be liberating. When asked whether he would consider his artwork “kawaii,” Shigetomo Yamamoto, creator of MGX Factory and the MonsterGirls design, responded, “Yes! To say something is kawaii gives it a real power, a kind of motivational strength” (Okazaki & Johnson, 2013). Men like Yamamoto who engage in and perpetuate kawaii culture can also sustain its benefits, such as freedom of creative expression. Men in modern society also suffer from restrictive gender expectations, including the expectation to become breadwinners, or thus enter demanding white-collar careers that alienate them from the rest of society, including their own family (Botz-Bornstein, 2011). Through rejection of adulthood and embracing of the feminine, men too can find release within kawaii culture.

One notable example of kawaii challenging social and gender norms is pop idol Kyary Pamyu Pamyu. Born Kiriko Takemura, Kyary grew to fame as a frequent er of the Harajuku scene in addition to running a popular fashion blog. Kyary's local renown grew until she was approached by Yasutaka Nakata and debuted as an idol in 2011. Her debut single, PON PON PON, currently has over 75 million views on Youtube and has spawned an array of parodies, vocal remakes, and dance covers across the Internet. The immense popularity of this song alone may largely be attributed to its visual originality.

Kyary negates stereotypes and likewise challenges social and gender standards. By confronting these standards, Kyary epitomizes a stance that girls can still be ‘kawaii’ while simultaneously being ‘unendearing’ or gross

In the video, Kyary performs a simple choreographed dance in a pink and orange ensemble, surrounded by brightly colored novelties including decorated hats, plastic baubles, and a boxes of junk food. Through its overabundance of childish toys, and impenitent usage of pink, the music video makes a strong inclination towards the feminine and childish. Kyary heavily establishes herself as an “icon of kawaii culture” (Wappler, 2014) that she is presently known for. Simultaneously,
Kyary challenges proper ideals of femininity by presenting an air of what can be considered disconcerting: throughout the video, an overweight woman with a disturbingly obscured face dances behind her; in another clip, Kyary opens her mouth to release a flock of black birds [Image 1], which is accompanied by the visage of a swan bearing a crown of bullet shells. These contradicting images of cute and creepy largely make up Kyary’s identity as an idol. Like PON PON PON, most of Kyary’s videos are largely nonsensical but with an underlying sense of visual artistry.

This sense of absurdity additionally pervades the idol’s overall image, making itself known in her fashion choices and live venues. In the official cover photo of her extended play album Moshi Moshi Harajuku, Kyary dons false eyelashes and eye-enlarging contacts. However, she stares into the viewer wide-eyed, with her hair disheveled and her mouth painted over with cartoon “fangs,” invoking a sense of uneasiness [Image 2]. Earlier in her career, Kyary was also known for her hengao or “strange faces,” in which she would often exhibit on variety shows and social media photos by twisting her facial features to unattractive lengths. Kyary says of her image “I try to create chemistry between kawaii and darkness... [t]he dark isn’t supposed to be there, but that’s what I like about it” (Wappler, 2014). This notion plays an important role in how kawaii consistently challenges preconceived ideas of cuteness. Although kawaii is typically disregarded as a shallow obsession with physical appearance, artists like Kyary reject such a dismissal by adding a complex, artistic layer to their overall commodities. “Cuteness, though ostensibly devoid of irony, does not negate darkness, and can in fact be a means to accessing darkness, as characters become loci of emotion and identification” (Vartanian, qtd. in Wakeling, 2010).

Kyary represents the complexity and paradox that distinguishes kawaii culture. In contrast to other contemporary idols, Kyary has a greater amount of control over her creative output. While Nakata writes and produces her songs, Kyary mentions how the two exchange ideas and, based on these discussions, she also decides how to perform them. She also independently maintains her blog and Twitter, posting photos and clever word plays that focus on herself and her experiences, and plays a choice role in the fashion she wears. This is important in that Kyary exhibits a sense of autonomy and assertiveness within her social status that prevents her reduction into a manufactured commodity. Through her own means, Kyary negates stereotypes and likewise challenges social and gender standards. By confronting these standards, Kyary epitomizes a stance that girls can still be ‘kawaii’ while simultaneously being ‘unendearing’ or gross. This dualistic notion presents kawaii as something multi-layered and complex, thus encouraging the idea that girls can be ‘kawaii’ in whatever way they may choose.

**Kawaii as Empowerment**

Another aspect in which kawaii can be applied to feminism is through its empowerment of women. In order to discuss the extent of kawaii’s empowerment, it is crucial to first define the word “empowerment” and what it means within context of Japanese feminism. An article listed in the Journal of Extension (1999) defines empowerment as follows:

> ...empowerment is a multi-dimensional social process that helps people gain control over their own lives. It is a process that fosters power (that is, the capacity to implement) in people, for use in their own lives, their communities, and in their society, by acting on issues that they define as important.

Essentially, empowerment acts as a means by which people can exert control over various aspects of their lives, whether on an individual, group, or community basis (Page & Czuba, 1999). Researcher Sarah Mosedale (2004) states that in order for a social group to be empowered, they must first be lacking an extent of that power, or essentially a voice and ability to exhibit control within a society. She expands on this by noting “it is not necessary for powerful individuals to prevent women from doing something they want to do because social norms and customs already achieve this” (Mosedale, 2004). Therefore, a minority group such as women may be legally equivalent to men in modern society but still be rendered unequal by social norms. Japanese women, then, can be considered disempowered through traditionally established perceptions and expectations of them as illustrated in the above section. Women can be empowered through varying means within different facets of society. While kawaii is largely an aesthetic, its culture creates a space in which participants, a majority of them women, possess agency, creative control, and are able to express their voices and identities.

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The Carthage Vanguard

ally free from scrutiny of social and gender-related expectations, thereby allowing girls to assert their own authority over these spaces. One instance of this that may be analyzed includes the Lolita sub-genre of fashion.

While the word “lolita” has origins in the controversial 1955 novel of the same name written by Vladimir Nabokov, the similarities end with its etymology. Lolita fashion consists of Victorian style outfits such as lacy petticoats, skirts with ruffles, and peter pan collars (Dee, 2013). This brand of fashion assumes a hyper-feminized image of women, almost reducing those who sport the look into infantilized children. However, this hyper-feminization is where Lolita finds its power. Rinrin Doll, a prominent Lolita model, upon asking what kinds of people are attracted to Lolita fashion, responded with the following:

“They are very shy. When I talk to the guests at tea parties, a lot of people say that they don’t have self-confidence, but when they wear Lolita clothing they feel that they can become a different person. They can have an alternate personality and can express how they feel more freely in these clothes than they do in their normal lives (Okazaki & Johnson, 2013).

Rinrin’s statement underlines Lolita’s ability to inspire self-confidence in girls. This includes the confidence to make one’s own decisions. Engaging in Lolita fashion is a choice for those who participate. These girls actively choose to reject beauty standards in favor of engaging in this distinct style. They coordinate their own outfits, often to extreme detail that includes elaborate jewelry and makeup. Thus, Lolita acts as a medium through which girls can more freely and openly express themselves and establish their identities in a unique and creative way. Lolita girls conspicuously take mainstream expectations and ideals of femininity and draw them out to extremities. In this sense, they reclaim standards imposed on them by society into something that uplifts rather than oppresses them.

Along with allowing girls self-determination and identity expression, Lolita also creates a space in which girlishness is valued, rather than considered detrimental. Like people who share similar passions or hobbies, Lolita acts as its own community in which girls can establish relationships with each other through exchanging tips on dress and makeup, organizing activities with each other such as hanami viewing, and trading outfits and accessories. In addition, it allows them the opportunity to make success for themselves whether it be creatively or professionally. This is done by creating a unique “girls only” space free from male and heterosexual narrative.

Angelie Pretty is one of the earliest established brands of Lolita fashion. Founded in 1979 by Youko Honda, Angelie Pretty has become a leading icon of contemporary Lolita fashion both nationally and internationally. Angelic Pretty’s style is referred to as “sweet Lolita,” and the official website explains the concept behind the brand as “adorable clothing...like that of a fairy princess” (“Angelie Pretty,” n.d.). Most, if not all of the designers on the Angelic Pretty team are female; therefore, through Lolita fashion companies, women are allowed career and leadership opportunities. Young women who run lolita fashion blogs can also find creative and professional success. Maki and Asuka, two of the company’s head designers who receive most of the limelight on behalf of the company, describe in an interview how their designs are meant to encourage girls to “make their own story” because every girl has “their own princess story” (AzIndies, 2008). Maki and Asuka acknowledge the creative extension by which wearers express their distinct identities through the brand’s fashion. Meanwhile, Angelic Pretty’s narratives—which include item promotion, advertising, and overall image—tend to exclude men and romance altogether. Through this complete elimination of a male presence, Angelie Pretty pushes an idea of what can be thought of as “girl power feminism” (Wakeling, 2010). Emily Wakeling (2010) explains how through communities that emphasizes shōjo, in other words, qualities of girlishness, “girls have developed a creative space in which they are often awarded a special level of agency.” Through creating spaces such as those found among Lolita fashion enthusiasts, girls can embrace their femininity and make their own choices regarding their identity.

Conclusion

Kawaii is a concept known to many but widely misunderstood. This is because kawaii is overall a complicated construct. What initially began as an attempt to sell the idea of standard female norms was taken by women and made into something transcendent and uplifting. This type of kawaii acts as a means to a revolution that challenges preconceived notions of what is acceptable in society. In addition, it becomes a place in which people of all ages and genders can find freedom in self-expression and creativity where they might not in normal society. Feminism in Japan, like other countries, has a long way to go. However, it can be argued that kawaii advocates a non-confrontational brand of third-wave feminism that is slowly but steadily pervading the mainstream. Kawaii as a culture, while initially established as a cultural niche and greatly rejected by surrounding society, is becoming more and more mainstream; this is evidenced by
growing renown of artists such as Kyary Pamyu Pamyu and brand names such as Angelic Pretty. As this idea of kawaii becomes increasingly integrated into society, it can be assumed that its associated dispute of traditional society and its celebration of feminine qualities may become increasingly accepted as well.

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A Career is a Journey, Not a Predetermined Destination
By Cami Christopulos

"Seeking truth to inspire the future" was the main focus behind this research. The exploration of majors and careers within the college domain provides individuals the chance to determine which path they want to take in pursuit of fulfilling their highest potential. As such, this research delved into three different careers within the education field: CFO, Strategic Initiatives Coordinator, and Professional Development Coordinator. Scholarly analyses and interviews were conducted for these positions. Our analysis concluded that CFOs’ jobs within schools do not strictly deal with numbers, but rather the position is more holistic in terms of working and communicating with fellow staff members, and the community at large. The Strategic Initiatives field revealed the necessity of developing close relationships for business management in order to effectively carry out administrators’ visions and ideas. The information gathered regarding Professional Development Coordinators illustrated the importance of communicating change through one’s leadership style. In culminating this information, we developed a more sound idea for what each of these professions entail; moreover, this assisted students in choosing career paths that align the most with individual passions and ideals to impact future generations.

That’s okay… you have time” – a common phrase heard among young college students who are undecided about their major or career path. The concept of time is one to be cherished, yet it can also be an obstacle in obtaining desired achievement due to its limitations. Within the past few months, and more recently in partaking in this examination of the education system, we discovered that it is up to individuals to seize the worthy moments and opportunities to better themselves, and the society at large. Wishing to make a larger impact for all, we explored and evaluated three potential career paths to assist in guiding us toward a future profession.

The Fast-Paced Field of Finance

According to Schobel & Denford (2013), the Chief Financial Officer (CFO) of a business is a position that evolved in the 1960s and “grew out of the corporate treasurer; with a focus on tax reporting, financial statement preparation, and budget creation”. This executive position is seen as an analytical, number-crunching job that handles the monetary aspects of corporations. While these aspects are reflective of the profession, Mr. Tarik Hamdan describes the job as having a much more holistic side. The Interim CFO for the Kenosha Unified Schools District (KUSD), and a graduate of University Wisconsin-Parkside with accounting and management information systems (MIS) majors, also has to “ensure compliance with state and federal regulations, and maintain the overall financial health of their organization” (T. Hamdan, personal communication, January 8, 2015). His Human Resources internship at Snap-on Tools in college helped prepare him for his current work, as he learned how to work with and manage others. Hamdan deems that as a CFO, an individual must portray confidence, honesty, integrity, and patience; yet he also states a need to have a good personality, the ability to be approachable by others. This verifies the idea that a CFO is a more holistic individual rather than just a number-crunching machine; this may be why more companies today are allowing CFOs to serve on executive boards, and thus have revealed higher financial reporting quality due to gaining insightful knowledge during the meetings (Bedard, Hoitash, & Hoitash, 2014). Other necessary qualities for an effective CFO include trustworthiness, the ability to influence and engage others, and the ability to create a shared understanding (Schobel & Denford, 2013).

Both Hamdan and scholarly researchers have disclosed that “the communication component of structural engagement most contributed to relationship effectiveness” (Schobel & Denford, 2013). In order to get
others to trust and respect the CFO, he/she must have the ability to clearly state what needs to get done and by what means, while making the tasks meaningful and having the workers feel valued. Hamdan deems that the increasing use of technological advancement assists in this communication effort; people are able to convey messages quicker and with more ease, as well as keep reporting systems updated and efficient. Along with this, he believes that technology can be a budget drain in the classroom if it is not used effectively; it needs to enhance the students’ learning through interactive, engaging activities for it to produce beneficial results. Today, “the CFO’s importance is rising and the impact of CFOs over certain corporate outcomes outweighs the influence of CEOs” (Bedard, Hoitash, & Hoitash, 2014). Thus, it is important for these officers to not only do their job effectively, but also to create a good reputation for themselves, and in turn, the organization at large.

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Rather than creating new budgets or allocating funds, the Interim CFO of KUSD states that the most rewarding part of his job is seeing the impact his work has on students in the schools. From watching theater performances to observing students in computer labs on the newest technology, Hamdan knows that he played a part financially in making these experiences happen (T. Hamdan, personal communication, January 8, 2015). Unfortunately, he is not able to visit the schools as often as he would like, usually just once a month. This seems a bit contradictory, as one would believe that an individual should be able to experience the best part of their job often and not be held back by other obligations. Hamdan also said another part of being the CFO is that he is the “face of the school district with financial matters” and often appears on live broadcasts for the school (T. Hamdan, personal communication, January 8, 2015). While some individuals may be able to take on this pressure, others do not always desire to be placed in the spotlight and have the entire burden of a report or statement placed on them. On top of this, a study found that “negotiation over financial reporting is common: 81 percent of the responding CFOs experienced negotiation” (Gibbins, McCracken, & Salterio, 2007). The ability to debate and negotiate with others is a skill developed over time, yet sometimes isn’t always the strongest aspect for individuals and may make them feel uncomfortable; however, this negotiation aspect illustrates the group-oriented work that is necessary for a CFO. At the same time, a lot of the work is highly individualized; this may be an issue for individuals who are fueled by often working in a team setting. Thus, while the CFO in an organization is a highly sought out position and is not solely a number-crunching job, we do not find the job appealing due to the lack of alignment with our ideal of making a profound impact that we can constantly witness.

The Sophisticated Field of Strategic Initiatives

Although Mr. Thomas Kline’s position at Carthage College as the Associate Vice President for Strategic Initiatives was created especially for him by President Gregory Woodward, the desire to detail and implement strategic initiatives is broadening as organizations forecast for the future. These plans are “special types of projects on which organizations stake their future success” and work toward “creating or appropriating economic value from the environment, which is organized as an independent project with its own profit and loss responsibility” (Klingebiel & De Meyer, 2013; Lovas and Ghoshal 2000). The ability to implement these ideas is one thing, but it is another to accurately portray the organizations’ vision and mission through strategy driven avenues that are meant to challenge employees to “learn to live a new way of doing business” (Plevel, 1994). Kline has experience with learning a new way of life as his bachelor’s degree was in music; he spent much of his life performing in bands, but later took on the management role for bands, and then developed a desire to assist others in pursuing their music dreams. He took a job at Ithaca College where he assisted a music program through grants and worked with President Woodward, at the time Dean of the College, on a number of projects. Upon acquiring the presidency position at Carthage, President Woodward asked Kline to join his efforts in making his dreams for the College a reality, hence his current vice president position. Key projects that the President is currently having Kline work on include: the nursing program in Chicago program, in which students spend a semester living in Chicago taking classes and working as an intern in the city; international initiatives, in which the College
is working with China to develop study programs for both Chinese students in the U.S. and Carthage students in China.

In order for these initiatives to be effective, there are key qualities Kline reveals an individual in his position must possess. People need to have self-motivation, the ability to work with others, an unwavering commitment to quality, a high work ethic, and the ability to prioritize when dealing with multiple tasks (T. Kline, personal communication, January 13, 2015). Along with these, it is also necessary to be selective, deliberate, and diligent in decision-making situations (Klingebiel & De Meyer, 2013). Sometimes in order to accurately make these decisions, it is essential to develop a key team, or in Kline’s case a key individual, to spearhead upcoming projects. One study detailed a manager’s desire to “engage the workforce” and “create an environment that supports our people as our only sustainable, competitive advantage” (Plevel, 1994). In turn, their human resources department was transformed “from its role as provider of basic personnel services to a strategic function, one that would be seen as adding value to the entire organization” (Plevel, 1994). Though drastic, this restructuring is sometimes needed in order to create an effective, highly organized community with a shared mission.

Researchers found that the “lack of [a] trusting community foreshadowed a traditional explanation for why communication broke down” (Hill, 2007). Communication, as detailed in the preceding career field, is a key component to making progress in an effective manner. This is especially important in college universities: “participation, in and of itself, is not always a sufficient condition for satisfaction with the role participation plays in strategic planning”; it can “depend on the reputation of the sender of communication and the culture of the university” (Bacig, 2002; Hill, 2007). It is beneficial that Kline has such a close connection with the President so that he has credibility with both students and fellow business partners when conveying strategic initiatives for the College. In terms of relaying this information, mass emails are often used at Carthage and in other institutions as campus communities desire to be kept in the loop about the implementation of these strategic initiatives (Hill, 2007). This delivery channel allows multiple individuals to remain updated on the latest news in a quick and easy manner. However, this form of communication does not always bode well; one study revealed, “the use of E-mail was widespread, but it did not necessarily lead to more involvement by participants” because they felt overwhelmed by the flood of emails in their inbox (Basic, 2002). This reflects the E-mail Inverse Importance Index theory:

The more important a sender perceives an item of information to be, the more people he will send it to in a mass distribution electronic mail. Inversely, the more people who receive the mass distributed e-mail, the less important the receiver will perceive the information to be to himself directly. (Hill, 2007)

Kline feels the same, as while he believes the new, up and coming technological advancements are assisting both students and employees in their work efforts, the use of email can only be used so much. He states that it is good for coordinating meetings, but never tries to have a discussion by email; it saves everyone time if items are discussed in person (T. Kline, personal communication, January 13, 2015). This is further emphasized by Barnett (2003) as he found “E-mail was not a substitute for a meeting [because] the interpersonal dynamics of e-mail were so different than face-to-face dialogue.” Thus, there is always a need for efficient communication, especially when planning for the future, yet it is necessary to do so in a channel that is clear, concise, and effective.

Communication, as detailed in the preceding career field, is a key component to making progress in an effective manner

What is intriguing about Kline’s position is that working on the College’s campus, he is able to see his plans come to life right before his eyes. He believes the best part of his job is seeing student growth and success through the initiatives he assisted in developing. For him, it is also enjoyable to work within the Carthage community because the work environment feels like a family; Kline continues to develop his relationship with President Woodward, as well as with the cabinet, faculty, and students. He portrays that the ability to make friends quickly is a key aspect in performing his job well; when working with others, it is much easier to have a foundation with an individual to get things done, especially when handling conflict. An enjoyable aspect of this position is that Kline is constantly working with others in committees who assist him in implementing initiatives, including the provost, professors, and people of interest to the program. The Vice President stressed that there is a need to have people who are interested in what is
being done in order for them to remain dedicated to the project. At the same time, however, the strategic initiative coordinator must also have a drive and passion for the project at hand; otherwise, the project will not be executed with the best intentions and dedication. Other than the inability to know what the President’s next ideas are, and whether or not the Vice President of Strategic Initiatives will have interest in them, we find this field very interesting and could see ourselves working in such a position at a higher education institution.

The Profound Impact of Professional Development

Of the fields discussed in this educational exploration, the area of professional development has grown the most within the past few decades, as businesses and schools are realizing the importance of individual development in order to have better job execution. Many school settings are implementing these programs to “meet specific needs and circumstances,” yet also to create supportive “communities of practice through technology-enabled, research-informed, and inquiry-based approaches to university teaching and learning” (Webb, Wong, & Hubball, 2013). Organizations see the need to foster a strong sense of community for members to feel valued; by working through professional development programs as a team, relationships will be formed based on trust and respect, “clear statements of program goals and philosophy” will be brought to attention of the members, and all will be able to “contribute to an ever evolving philosophy” to create a solid teamwork foundation (Fitzgerald, & Theilheimer, 2013). Former Professional Development Coordinator at KUSD, Mrs. Louise Mattioli, believes in this sense of community; most of her work in this position was group-oriented as she collaborated with multiple people in the district to develop programs for teachers. Prior to this title, Mattioli was a French teacher in the district; over time, she became more involved and interested in bettering the teachers of today’s society.

The top quality Mattioli believes a professional development coordinator should possess is being highly interpersonal (L. Mattioli, personal communication, January 12, 2015). This position is highly interactive with others; it is important to be social and convey one’s thoughts clearly, and thus communication is key. Fitzgerald & Theilheimer (2013) state “the nature of a team’s communication can promote or undermine collaboration;” hence, it is necessary to know the way individuals best communicate and understand others’ instruction, which can be done through professional development as a group. These programs allow all members to grow personally, but also as a team by realizing how to promote others strengths and assist their areas of weakness. Researchers found that “sound professional development systems a) improve instructor effectiveness, b) provide continuous staff learning, and c) foster programmatic revisions. In other words, professional development is about change” (Sherman, 2002). The concept of change is one that is scary for many, but necessary for progression in jobs, relationships, and life overall. The job of a professional development coordinator is to facilitate change while making the process easy, informative, and if possible, fun. Mattioli stated the biggest struggle she had in working at KUSD was that no one liked change or wanted to accept it. Thus, individuals must exhibit strong leadership skills, as she says that leadership is “moving people forward by helping them accept change” (L. Mattioli, personal communication, January 12, 2015). Developing teachers as leaders is a “very demanding and complex process requiring a change in all aspects of teachers' intellectual activities. According to Friel and Bright (1997), it requires explicit attention, clear expectations, and resources (time and expertise)” (Hofstein, Carmeli, & Shore, 2004). Thus, professional development coordinators who work in schools must be “effective leaders [that] are able to facilitate change by communicating their vision for change” (Sherman, 2002).

These programs allow all members to grow personally, but also as a team by realizing how to promote others strengths and assist their areas of weakness

Part of being these effective leaders means professional development coordinators must be organized in their programming. Along with this, they must involve all participants in the process, use research to support the tactics they are detailing while addressing the mission of the organization in which they are working with, model key practices that can be executed in their respective jobs, and finally review all material (Sherman, 2002). Sherman (2002) also states “The success of any system relies on the competency of those in charge of it. Like instructors and administrators, professional development coordinators need a set of standards from which their performance can be evaluated.” Thus, at the end of
Thus creating higher achieving students. Development programs are helping improve that quality, relationship on the achievement of kids; these professional development coordinators must do so as well. Nevertheless, the former coordinator has faith in these staff development practices as it “encourages others to become lifelong learners” (L. Mattioli, personal communication, January 12, 2015). According to Mattioli, KUSD has increased its staff development in the past 40 years, as they saw that the quality of teachers has a direct relationship on the achievement of kids; these professional development programs are helping improve that quality, thus creating higher achieving students.

Today, teachers are more aware of having to accommodate various learning styles for their students, and thus professional development coordinators must do so as well

Unfortunately, not all schools see this need, and the idea of professional development is being pushed to the wayside: “because of budget constraints, the frequency of training opportunities remains in jeopardy” (Houston, Muñoz, & Bradham, 2011). These financial concerns are not only causing a loss of job opportunities for professional development coordinators, but also effecting teacher development, and in turn students’ performance. Districts need to realize that there are other avenues to achieve this type of instruction, such as through online resources. However, due to the lack of face-to-face interaction, effective online courses should “foster [a] participatory, authentic, and student-centered learning atmosphere” (Chitanana, 2012).

There are many systems that allow this interactive learning to take place; it is up to the schools to decide which program is best for their district. The International Education and Resource Network (iEARN), developed in 2001, is an “online professional development course which attempts to foster integration skills among teachers through the use of a project based learning (PBL) approach” with others across the globe (Chitanana, 2012). This program would be useful for districts that want to broaden their reach by tying in a diversification aspect into teachers’ professional development learning. Mattioli stated that in her former position, she worked with diversity acceptance, given the various ethnicities in the Kenosha area (L. Mattioli, personal communication, January 12, 2015). Thus, this system would be beneficial for teachers to learn how to work with bridging the gap of different backgrounds while receiving the same instruction. Another program used is RISE (Reaching Inward for Success and Empowerment) Personal and Professional Development Services, which is “designed to meet the needs of K–5 teachers by providing them with sustained adult learning opportunities to acquire the knowledge and skills to support ELL students in language and literacy learning” (Arens, et al., 2012). This system would be especially useful for teachers with many ELL students, such as schools in Kenosha. Although KUSD will continue to develop their teachers through their coordinator position due to its success thus far, areas similar to Kenosha would benefit from these online programs if their funding for a coordinator is limited.

It is because of individuals such as Mattioli that KUSD is running so well in terms of effectively training teachers to be the best that can be. The former coordinator says she learned much from the job, but most of all she developed her collaborative working skills, as she needed to constantly coordinate with others in making programs run effectively and efficiently. A key way to do this was through the partnerships she formed, such as with Irene Kraemer at Carthage; it was because of Mattioli and Kraemer that KUSD teachers were able to further their skills in the areas of math and science at the higher education institution and bring their knowledge back to the classroom. This partnership with Kraemer allowed teachers to benefit, but also created a friendship between the two women, thus further exemplifying the idea of creating a community of lifelong learners. What Mattioli found most rewarding about her job, however, was “seeing achievement rise” for both teachers and students (L. Mattioli, personal communication, January 12, 2015). It was with her highly personable demeanor and keen organizational skills that Mattioli was able to provide the best for KUSD teachers, and in turn their students. This impact is very profound, and we desire to make a similar impact for others in the future.

Conclusion

In order to do what one loves, individuals needs to best prepare themselves for the road ahead; thus, they must tailor their education and activities to assist in their learning efforts. We sought out to learn more about
our interests in terms of our future career path, and thus investigated three different potential fields. Each researched career illustrated common aspects: communicating effectively, having a good sense of organization, and learning to tackle whatever is thrown in one's way. However, the area of professional development was the field most intriguing to us because its overall motives align with our morals and philosophies in life. Thus, even though we still have time to figure out where life will take us, we now have a more sound idea that our life's journey will lead to the field of professional development

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Witch Burning: 
*The Chasm of Historical Victimization and Literary Transcendence*

By Anesce Dremen

This paper studies the historical and mythical images of witches from the fourteenth century to the twentieth century. Analysis is drawn from period-based demonologies, witch confessions, religious theses, and witch doctrines before transitioning to criticisms of the witch-hunt. Detail is focused on the additional images of burning and eroticism. I primarily will analyze how the historical witch differs greatly from the mythical image of a witch. The end of the paper analyzes Sylvia Plath’s poem “Witch Burning” in accordance with the image of a witch. This paper dispels the belief that witches were only women and analyzes the power struggle between a witch and their accusers.

When one considers the image of a witch, one may imagine a slim woman riding a broom with a black cat accompanying her. Historical records describe vastly different images from these constructs in that, historically, witches were older females and males. Depending on the area, witches could be executed by fire for their acts. Fire, a symbolic image, became synonymous with convicted witches by representing a witch’s sexual flame. This connection is demonstrated through creative writings and visual arts. Thus, a mythical image of a witch became prevalent. In the 1960s, the feminist movement utilized the sadistic images of witch burnings to exemplify oppression of female power. Sylvia Plath, a feminist poet, scholar, and novelist from the early and mid twentieth century, was a key contributor to this movement. Her morbid writing featured and advanced the confessional genre. Her poem “Witch Burning” analyzes the mythical image of a witch. The images of fire alongside witches were selectively eroticized between the late fifteenth century and the late nineteenth century, whereas Sylvia Plath used themes of witches and burning to portray part of the 1960s feminist movement by asserting control over a woman’s body.

Persecuted through their Sex

In the early fifteenth century, when witch trials began increasing in number, a curiosity also arose in order to discover why witches desired to be part of the demonic society. Treatises recorded how witches were interconnected with demonic cults which rejected the Christian God. To become a witch, one had to pledge themselves to the devil. Three causes were found for witches to wish to belong to the devil, according to scholarly resources: first, the devil would provide witches with the ability to avenge previous pains; second, the devil could provide a witch with a luxurious life. The third reason for witches to pledge themselves to the Devil was “that there [we]re some who take most delight in the venereal act ... since they indulge[d] in their sexual passions at will” (Errores 162). According to the third reason, the Devil could provide a luxurious sexual life. Because sexual activities were inherently considered sinful, the sexual activities witches were engaged in were easily attributed to Satanic and demonic practices. Especially controversial were nighttime orgies entitled Sabbats in which witches would fly together to celebrate their consummation as a witch.

By 1487, the three causes of witchcraft had condensed into one: “All witchcraft comes from carnal...
lust, which is in women insatiable” (Kramer 188). The Malleus Maleficarum, the first encyclopedia of witchcraft, documented the literary beliefs and scriptural traditions of witches during the fifteenth century. These beliefs were littered with the conception that women were fickle creatures lead by their lust and easily tempted by the Devil. As such, a woman was more likely than a man to become a witch. Witches “willingly embrace[d] this most foul and miserable servitude” of being sexually submissive to demons (Kramer 197). In 1485, “forty-one witches [were] to be burned, who all publicly affirmed, as it is said, that they practiced these abominations with devils” (Kramer 197). Twenty-three years later, the belief that women were more likely to be witches was evident in Germany: “why is the female sex more involved with witchcraft and the sorcery of the devil than the male? For every one man burnt for witchcraft, there are ten women burnt” (Kayserberg 238). Because of the terrific number of women convicted of witchcraft, the image of a witch soon became associated with the female sex.

**Perpetuating Myth Through Art**

In art, witches were also portrayed as the female sex. In the fifteenth and sixteenth centuries, witches were commonly illustrated nude while gathering at Sabbats: some ride beasts, others stir cauldrons, and others grotesquely position their bodies. In Pieter Breugal’s painting “St. James and the Magician Hermogenes,” a scene of a Sabbath is recorded: in the center resides a billowing cauldron of smoke and fire. Atop the smoke cloud are four naked witches riding upon beasts. This explicit sexual image epitomizes the witch’s dominance over their sexuality. This image is combined with smoke and fire. In the lower right hand corner, a naked witch is bent over beside a cauldron lit with flames and smoke. Atop of the billowing smoke, a witch whose face is shielded by a roof rides a broom while fully clothed. The broom also functions as a phallic instrument. Because the witch is dressed and her face is hidden, it represents the shamefulness of the other witch’s nudity: one’s sexuality should be hidden from the public view.

By the mid sixteenth century, witches were portrayed both dressed and unattended alongside fires. In 1606, Frans Franken II’s Belgium painting entitled “Witches’ Sabbath” continues this juxtaposition of nude and clothed witches in an interior containing a smoking cauldron and many lit candles (Brooks). In the background, a witch rides a beast and various demons appear nude and half-hidden in the scenery. The actions of beast-riding continues to contain sexual undertones. William Blake’s painting “The Three Hecate” from 1795 features three nude witches who hide their sex (Brooks). Demons or familiars surround them in the background. Though naked, the witches hide their private parts and faces—they are ashamed of their nudity. Another painting from London’s John William Waterhouse entitled “The Magic Circle” from 1886 features a witch, fully dressed, controlling a burning cauldron (Brooks). The witch appears to be empowered. This brief analysis of witch paintings between the sixteenth century to the nineteenth century reveal that the erotic image of a witch becomes more detailed but the explicit details are hidden. A societal theme is becoming perceptible: witches should hide their sexual nature. Persecution from the church has seeped into the aesthetic consciousness: mythical witches, too, are ashamed of their sex.

**Historical Contexts**

As the female witch became a more concrete icon, so did the image of burning associated with witches. An early image of fire as a symbol of lust was from 1580; witches were often “those who [were] bound, burning with lust beside each other; [who] commit[ed] adultery” (Bodin 298). In a morbid form of irony, a witch was burned at trial for the lust that first burned within her. A chasm grew between the historical and mythical image of a witch: through myth, witches were believed to be younger, more beautiful women who exhibited intense promiscuity, while historical documents revealed that witches were rather people of various ages and genders. In 1645, the average age of a persecuted witch was between the years of fifty and seventy (Macfarlane 161). Despite the historical context of those accused of witchcraft, the myth of sexualized witches persisted and was recorded through various means of art.

Contrary to common belief, not all witches were believed to partake in such ghastly sexual activities, as demonstrated in 1645; for, “Essex witches ... were not believed to attend sexual orgies, have sexual relations with their familiars, or fly” (Macfarlane 161). Although Essex witches were believed not to be nearly as sexually explicit as those from the Continent, there were two exceptions. Two witches from Essex confessed to having “sexual relations with the Devil” (Macfarlane 161). Universally, witches were accused because of their personalities, unfortunate events, and environmental fears, whereas their appearances were brought into atten-
tion only after the accusation. After the confession, or in the midst of a confession, a witch would be stripped searched for evidence of the Devil’s mark. Historically, women were victimized through the humiliation of strip searches: sex and added demon genitalia, the Devil’s teat, still remained a part of the witch image. The myth of the sexualized witch has persisted, expanded even, through creative works. Even if a witch was not sexually active, they could still be convicted and face capital punishment.

As time progressed, the image of a witch transformed from a sexualized villain, to a sexualized woman, to a feared woman capable of empowering herself through the use of magic. Witches were victims wronged by both the demonic society and by the Christian society. If they were burned during the Sabbat, they would be burned again after being tried. A powerful woman, an early feminist, could be condemned as a witch. “It was their social position and power which led to mounting hatred against them” (Macfarlane 161). A woman’s acquisition of social power was threatening to the patriarchy. Based on this threat, the fear of witches exploded. This fear was experienced both by the accusative community and those convicted. In fear, one accused of witchcraft would confess to whatever story they believed would protect them. Extremely creative confessions could have been sparked out of subconscious fear. Historical stereotypes of witches were built into one’s schema until, during the confession, such stereotypes were creatively spoken of as if the accused had committed such. Fear played a major part in the sexual-centered confessions.

**Guilty to Victimized: a Modern Reinterpretation**

Jules Michelet, a French historian skeptical of witch hunts, studied the history of witches, Sabbats, witch-trials, and other interconnected topics of witchcraft. His goal was to demonstrate the absurdity of witch trials in order to question the corrupt church. His writing style was unique in that he presented history as if it were a narrative fiction. This was exemplified in his creative work about witch’s Sabbats; in Communion of Revolt / Witches’ Sabbaths / The Black Mass, he described that there exists “two, resinos fires burn[ing] with yellow tongues of flame and ruddy embers, making a vague, fantastic veil of smoke” (Michelet 105). Surrounding the fires, females are regarded as a sacrificial commodity for Satan. The Sabbat is already set with a “fantastic” image: the “veil of smoke” symbolizes a bride’s veil for a witch. This foreshadows a union, or consummation, to come. The fires witness the sexual activities during Sabbats: “On her [a witch’s] loins a demon performed Mass [and] deposited the offertory of the faithful” (Michelet 106). Mass is the pinnacle of the night: truly perverting the Christian ceremony by converting it into a sexual act. The offertory is the demon’s semen. The witch has become an altar; a commodity for the demon. After the offering, the female is now subject to tortures which include being “roasted before a slow fire and limb by limb, she might have to endure an eternity of agony” (Michelet 106-107). She has become not only an altar, but an edible victim roasted for the Sabbat’s feast. Because the witch is in agony, she is not taking “delight in the venereal act, and ... indulg[ing] in [her] sexual passion” as previously believed in 1437 (Errores 160). Yet, this sexual anguish does not end here.

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A woman’s acquisition of social power was threatening to the patriarchy. Based on this threat, the fear of witches exploded

After the Satanic Eucharist, the female sacrifice has become a victim. She is a “sacrament of love, a cake baked on her body, on the victim who to-morrow might as likely as not pass through the fire herself” (Michelet 107). The image of a witch has become a being subject to tortures, even in myth. With this new notion, a new image is also present: cake. Here, the baking of a cake represents a sexual act. Fire, symbolically passion, is needed in order to bake a cake. Fire is lit within an oven in order to cook a cake. In this scenario, the witch’s womb is the oven. The demon inserts the cake, a child, into the woman’s oven. With the baking of the cake in the witch’s sex, the suffering of the woman is humiliated through her sex. She is again victimized by the cake within: “It was her life, her death, they ate. The morsel was impregnated already with the savour of her burning flesh” (Michelet 107). The woman is tortured by the making of cake, by the incubation of the child.

This mythical humiliation was based in history; for, witches were sometimes burned at the stake after being convicted of witchcraft. “The bonfires could not fail but call up the image of those that might ere long blaze round the stake of her own doom” (Michelet 108). The fire that killed convicted witches brought into memory the fires used during Sabbats. Both fires victimize the witch through torture. Before a convicted witch was burned, they were first prompted, or tortured, to con-
fess their deeds of witchcraft. Sabbat orations were extracted during confessions; however, their credibility was later questioned. The authenticity of Sabbats was questioned because of the incredible sexual activity described. In 1584, Reginald Scot boldly described the “use of incestuous adulterie with spirits [is] a stale ridiculous lie” (Scot 396). The spirit is another term for demons and devils. Supposing Sabbats were created from imagination to appease the interrogator, the images then conjured could be led by the subconscious, in turn revealing the fears of those confessing. Whereas the fires in conjured Sabbats symbolized the fear of being persecuted and killed as a witch, the sexual activity could also be born from suppressed fear. The historical notion of a probable community leaders.

As exhibited by striping those accused of witchcraft and searched, power was often stolen from those accused. Some, however, were able to regain a small amount of control over the power they lost, such as an “English witch [who was] being led to the stake, [and told] the crowd not to blame her judges. ‘I wanted to die. My family shunned me, my husband repudiated me. If I lived, I should only be a disgrace to my friends. . . . I longed for death, and I lied to gain my end” (Michelet 145). This nameless witch had restored power into her life by choosing to die. The fire which would kill her was a fire which symbolized the transcendence of her situation. Fire could replace her husband as a lover by flames consuming her body; fire could also symbolically replace her estranged family and friends lost by destroying her body.

On the other side of the spectrum, creative writing works have danced on the interconnections between fire and witches for centuries. These interconnections further symbolize people empowering themselves. Feminists of the twentieth century have leaped upon the victimization of the witch: using intense resources, such as The Malleus Maleficarum, and concepts that all witches were victims. In the same manner, feminists believed that all women were a type of witch: prosecuted by the patriarchy. The ‘burning times’ became a symbolic Holocaust based solely on the myth of witches as opposed to the historical records of those persecuted as witches (Purkiss). Today, when one is prompted to consider the image of a witch, one often imagines a scene of a mob surrounding a burning woman, shouting ‘burn the witch!’ This image conjures victimization and a discreet hope that the witch can transcend her situation.

**Witch Burning: Confessional Poetry**

Sylvia Plath extends this feminist theme of transcendence. Her poem “Witch Burning” utilizes mythical Sabbat and trial allusions in order for the narrator to transcend her situation. Plath plays on multiple themes consistent with witches: condemning neighbors, gilded perfection, blame, and fire. These images collectively represent a condemned witch transcending her situation:

In the marketplace they are piling the dry sticks.  
A thicket of shadows is a poor coat. I inhabit  
The wax image of myself, a doll’s body.  
Sickness begins here: I am a dartboard for witches.  
Only the devil can eat the devil out.  
In the month of red leaves I climb to a bed of fire.  

It is easy to blame the dark: the mouth of a door,  
The cellar’s belly. They’ve blown my sparkler out.  
A black-sharded lady keeps me in a parrot cage.  
What large eyes the dead have!  
I am intimate with a hairy spirit.  
Smoke wheels from the beak of this empty jar.  

If I am a little one, I can do no harm.  
If I don’t move about, I'll knock nothing over. So I said,  
Sitting under a potlid, tiny and inert as a rice grain.  
They are turning the burners up, ring after ring,  
We are full of starch, my small white fellows. We grow.  
It hurts at first. The red tongues will teach the truth.  

Mother of beetles, only unclench your hand:  
I’ll fly through the candle’s mouth like a singleess moth.  
Give me back my shape. I am ready to construe the days  
I coupled with dust in the shadow of a stone.  
My ankles brighten. Brightness ascends my thighs.  
I am lost, I am lost, in the robes of all this light.” (Plath 135)

Though the poem was written in 1959, it evokes images of witch trials and Sabbats from centuries earlier. The poem begins with an image of neighbors who collect sticks in order to burn a witch. The narrator first presents herself as a “wax image of ... a doll’s body” (3). A wax image of a doll’s body symbolizes rigid perfection: she is frozen as an artificial object. This perfect image, however, is corrupted when the narrator becomes “a dartboard for witches” (4). As a dartboard, the narrator has transformed into a witch and thus a scapegoat.
The Carthage Vanguard

The witch willingly becomes the sacrifice; for, the witch says, “I climb to a bed of fire” (6). The witch is willing to submit because, like the nameless English witch who was looking forward to death, this witch has commanded control through her death. Like the belief of suicide victims, the narrator discovers triumph in willingly obtaining her end. To act otherwise would restore power within those prosecuting her.

By empowering a witch, Plath has continued Michelet’s work in revising the imagery of witches. To be sexually active is not shameful; rather, it is captured as a form of perfection with a “wax image of … a doll’s body” (3). The narrator is unashamed of her body and therefore takes control of her life through the means of her death. By becoming an empowered entity, the witch is thus limiting the power of the sadistic neighbors waiting to burn her. The artificial doll symbolizes the artificial nature of witch confessions from centuries previous. Convicted witches were not at liberty to record their story; rather, during confessions, a witch was tortured and/or prompted to confess their sins as another person wrote down their words. The doll is perfecting her ability to confess her own story; however, she is also imprisoned within the system of confession. This perfect doll is owned by its neighbors.

The second stanza retaliates against these sadistic neighbors. “They’ve blown my sparkler out” accuses the neighbors of condemning her (8). Because the witch is accused, her will or sparkler is diminishing. The witch acknowledges that she will die because of the neighbors’ accusations. She blames the neighbors for her demise: it is “easy to blame the dark” whereas the dark represents both the neighbors and the unknown. The neighbors accuse her because she curses; the “mouth of a door” represents the witch’s agape mouth which emits curses. During the sixteenth and seventeenth centuries, fear became the basis of accusing witches of witchcraft (Thomas). Women were often first suspected to be a witch when they cursed aloud. Depending on the area, witches were often tortured to extract a confession. This is present in the poem; for, the torture exists in keeping the witch hostage “in a parrot cage” (9). Because parrots talk, the goal was to extract an oral confession from the witch being kept captive. A cage keeps a parrot unable to fly away; however, it does not steal the parrot of the capability to speak or sing. In the same manner, the torture of boots rendered a person’s legs unserviceable yet permitted the person to speak, or scream, still.

Out of such fear of torture, witches tortured to confess their witchcraft often spoke of Sabbats. Plath invokes the irrational fear by referencing the sexual activities of Sabbats: “I am intimate with a hairy spirit” (11). The hairy spirit symbolizes Satan as a dog, or as a goat, or as any other creature Satan was apt to conjure an image of. The greatest moment of the mythical Sabbat was the orgy composed of multiple witches and Satan. Here, Plath restores power to the witch as a narrator, for it is the witch’s choice to be intimate with a hairy spirit.

The third stanza continues into the preparation of burning the witch while simultaneously expanding on the details of the Sabbat. The first “we” is utilized: “We are full of starch, my small white fellows. We grow” (17). The “we” could refer to the number of witches participating in the orgy of the Sabbat or the “we” could indicate the number of witches who are convicted of witchcraft, awaiting death by fire at the stakes. If the “we” indicates the Sabbat orgy, the following line, “It hurts at first. The red tongues will teach the truth” indicates sexual sadism: through pain, one should realize the doctrine of witchcraft. The red color is derived from the blood lapped up through the Devil’s teat upon a witch. The Devil’s teat, or Devil’s mark, was how a Devil fed from a witch’s blood after she made a pact with him (Dekker). However, if the “we” represented the multitude of witches awaiting their death, the following line instead represents how the tongues of fire hurt as they first lap up the witch at the stake.

By becoming an empowered entity, the witch is thus limiting the power of the sadistic neighbors waiting to burn her.

By the final stanza, the narrator is unashamed of the fiery pain. She will “fly through the candle’s mouth like a soneless moth” is a powerful line depicting how the narrator’s own determination perseveres through physical pain (20). Though unsinged by the fire, the witch calls upon the devil to “give [her] back [her] shape” (21). The witch desires to end her life with her own likeness. Her original image has been altered at the Sabbat; Satan has the ability to make things appear to change (Passavanti 109). The witch demands to become a perfect wax doll again. When the narrator’s personal image is restored, or perfected as a wax image, “brightness ascends [her] thighs. / [she is] lost … in the robes of all this light” (23-24). The narrator has reclaimed the fiery pain; she has transcended it. The final lines do not describe fire and pain but rather “brightness” and “light” (24). Wax melts rather than burns because of fire. Like the soneless
moth, wax will not burn. The “wax image of ... a doll’s body” represents temporary perfection (3). While the material is the same substance, the form has been altered. Likewise, the narrator has transformed from her original figure into something maimed by fire—her accusers—but she maintains power by choosing to be kindled. Yet, the witch cries out, “give me back my shape” (21). While the witch gains power over her accusers, she loses power to the fire which consumes her. The fire lost by those accused of witchcraft was regained by individuals who embraced their means of end. Plath’s poem adapts a feminist’s view of empowerment when analyzing the history of witch condemnation: the narrator is victimized by others and saved by herself.

Conclusion

Despite the historical data that male and female witches were typically older, the mythical image of a witch has transformed from a sexual miscreant, to a shamed woman, to a woman empowering herself. In the late fifteenth century, all witchcraft was believed to be harnessed through lustful women. Historically, for those convicted of witchcraft in 1508, ten were women and one was a man. As the sexualized witch image continued to form, the image of fire became widely associated with female witches. Visual art landmarked the transition from sexually flamboyant witches to beings ashamed of their sex. In the 1800s, Jules Michelet played upon the notions of torture, fire, and the sexual shame in his creative rendition of Sabbats. Sylvia Plath expanded on Jules Michelet with her poem “Witch Burning” in which she extended empowerment to the condemned witch according to the feminist movement. The image of the witch has transformed greatly over time, according to myth and literary tradition. If a reader were to analyze today's literature, what image would be present?

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Double Standards Regarding Sex and Gender in Steinbeck’s *East of Eden*

By Dana Ehrmann

In *East of Eden,* gender roles are strictly enforced for women, but not for men. This prevents unconventional Cathy from inclusion in the idea that each person possesses good and evil, but chooses which to act on. Using feminist and deconstructionist perspectives, I consider the traditional binaries regarding sex, one’s biological traits, and gender, one’s socially constructed traits, and the moments in which they flip or hold true. I argue that Cathy’s qualities of aggression, sexuality, and independence make her androgynous; she consists of masculine and feminine qualities. She is punished and unable to overcome her given evil for not wholly conforming to society’s ideal of women. I also examine the way in which Lee is androgynous through softness, anti-sexuality, and domesticity, but is accepted. Considerations of Asian religion bolster support for Lee, while examinations of the perceptions of prostitution show that women are not set up to succeed like men, but to serve them. In *East of Eden,* Cathy’s punishment for refusing to be defined by society’s idea of femininity and Lee’s acceptance demonstrate the divide in the way androgyny is perceived; it is accepted in men but not in women, stripping Cathy of her ability to do good.

With a title like *East of Eden,* one cannot miss the relation John Steinbeck’s 1952 novel of that name bears to the Bible and conflicts of good and evil. Declared to be “a modern retelling of the Book of Genesis” on the back cover of its 1992 Penguin Edition, the novel follows the narratives of the Trask and Hamilton families, focusing especially on pairs of characters meant to represent Cain and Abel figures. Despite these pairings, it is Cathy Trask who is the undeniable and unwavering symbol of evil in the novel, and problematically so when examined through a lens of deconstructionism and feminism. Throughout her life, she is presented negatively due to her lack of uniformity, tainting the way those around her, and the reader, see her. Over time, her aggression, sexuality, independence, and dominance make her irredeemable in everyone’s eyes, and she becomes an outcast for her nontraditional ways. She is androgynous, composed of both feminine and masculine qualities, and suffers consequences, leaving the reader to wonder why.

Cathy’s opposite in regard to gender expectations is Lee, the Trask family servant. Despite being raised in the absence of his biological mother, he develops feminine and maternal characteristics that Cathy does not have. Lee’s androgyny is accepted to such an extent that he is even portrayed as the best mother figure in the entire novel. Through his caring, domesticity, softness, and even his attention to interior decorating, he is a positive figure. In this novel, Steinbeck demonstrates that he has already flipped a very important binary, providing a clear distinction between sex and gender in society. Sex, defined as one’s biological traits, possesses more power than gender, one’s socially constructed traits. In showing Lee’s feminine qualities to be privileged over Cathy’s masculine qualities, Steinbeck converts the masculine/feminine binary. The conversion serves to confirm the strict rigidity of the sex binary in which males are privileged over females; males are allowed to transcend traditional masculine roles and assume androgyny because the male sex dominates society on principle. However, females like Cathy attempting to break free of the gender identity given by society are punished to erase the threat they pose to already existent male privilege. The influence of Asian culture actually helps Lee’s androgyny to become accepted due to the relaxed perception of gender roles in certain Eastern religions. Further, it becomes clear that one cannot express sexuality and also be a loving, caring, and dutiful mother. Lee shows that man or woman, a mother is successful not simply due to biological birthright, but through sacrifice. These sacrifices include aforementioned sexuality, but also a life
outside of the domestic, and sometimes even life itself. In East of Eden, Cathy’s punishment for refusing to be defined by society’s idea of femininity and Lee’s acceptance demonstrate a great divide in the way androgyny is perceived; androgyny is accepted in men but not in women, stripping Cathy of her ability to do good in Steinbeck’s novel.

Even in regard to its reception, East of Eden proves polarizing. Steinbeck and the initial audience’s views differed greatly from literary critics of the period. Steinbeck believed it to be his best novel, confiding in friend and editor Pascal Covici that all of his other works were practice for this, “the book.” He wrote: “There is nothing beyond this book—nothing follows it. It must contain all in the world I know and it must have everything in it of which I am capable” (Owens, 1993). Readers received the book warmly, vaulting it to the number one spot on The New York Times bestseller list for fiction just months after it was published. Literary critics, however, failed to agree with Steinbeck’s and his audience’s assessments.

In this novel, Steinbeck demonstrates that he has already flipped a very important binary, providing a clear distinction between sex and gender in society.

Though the structure of the novel aims to follow the struggles endured by two separate families, Steinbeck fails to balance their narratives equally. Instead, his focus is to manipulate the overarching biblical allegory representing good and evil that is present throughout the text. Howard Levant, a Steinbeck scholar, blasts Steinbeck and his intentions, stating: “The real importance of East of Eden does not lie in Steinbeck’s mistaken claim to greatness ... but in its testimony ... to the author’s enduring difficulty in fusing structure and materials into a harmonious whole” (Levant, 1974). He argues that Steinbeck pulls from a set of ‘implausible’ characters that do not ring true, as they are shaped with the intent to complete his allegory. Levant notes that Steinbeck’s efforts are to “elevate materials into mythology within a functioning structural framework” (Levant, 1974). This assertion holds true when considering depictions of female characters in the novel, also; unrealistic representations of women contribute to Steinbeck’s larger points about good and evil at the risk of relegating them to stereotypical roles on opposite sides of a binary.

Louis Owens, a scholar of both Steinbeck and Native American literature, believes the most appropriate way to approach the novel “is to see the characters of Cathy Trask and Samuel Hamilton as two poles around which the novel revolves and takes form” as “together they serve nonetheless as the bipartite ‘organizational centers’... and thus play large roles in determining the dialectical form of the work as a whole” (Owens, 1993). This may be true regarding understanding the biblical allegory that Steinbeck creates, but viewing Cathy and Lee as the ‘organizational centers’ of the novel instead provides the reader new insights into wider issues of gender roles, maternity, and culture.

Stephen George’s criticism revolves around the idea that few women appear in Steinbeck novels in broad roles. George is also a Steinbeck scholar who has written extensively on critical theory and ethics in literature. He writes: “save for Abra, every woman who is Steinbeck-manufactured, the woman he could create ‘from the ground up,’ is pallid, hysterical, mean, and/or stupid” (George, 2002). Here, he expresses his belief that women are limited in their scope in the book. He then goes on to say that “...Steinbeck’s limited and repellent portrayals of women ... [are] to critique woman-less or woman-oppressive culture” (George, 2002). While one cannot contend that East of Eden specifically depicts a ‘woman-less’ society, it does indeed show a ‘woman-oppressive’ culture. However, the reader is left to make this critique, because it is Steinbeck and his carefully constructed literary world who provides the basis for oppression of women for any attributes they try to demonstrate outside of society’s standards. Perhaps if each woman character in East of Eden was like Liza Hamilton, showing much less drive to push boundaries, the argument could be better made that Steinbeck is critiquing a culture that oppresses women by confining them to domestic roles. But Cathy’s representation is so evil that the reader cannot help but feel dislike toward her through all of her negative acts. Creating such an extremely evil character, one so difficult to sympathize with, suggests emotional investment and motivation in the creator. Cathy is not created by accident, but actually very carefully to send an important message about what women are and are not allowed to do and be. A divide is caused between the reader and Cathy to warn against the threat of women who do not conform to set ideals.

Similarly, in his work, Brian Railsback discusses the stereotypes women portray in Steinbeck’s works: “...Steinbeck’s women tend to be either prostitutes or mothers, and although many of these women possess
wisdom, strength, and courage, to put women solely into these two categories is obviously, despite the complimentary characterizations, an extremely limited perception” (Railstock, 1995). Rarely have critics ventured further to come to a conclusion as to why such a polarity exists between the roles women play in his novels. Also, it has been acknowledged many times that Lee may indeed be the most successful maternal figure of the novel, but not enough has been said about what conditions of the novel allow a man to live safely in the role without concern for the same consequences that his female counterparts suffer.

Beth Everest and Judy Wedeles discuss not only stereotypes, but also the cold nature with which Steinbeck treats sex: “Good women are intrinsically repelled by sex, and evil women use sex as an instrument of torment” (Everest & Wedeles, 1988). In this statement, they emphasize the notion that Steinbeck does not allow for women to fall on a continuum of sexuality. Instead, there are two characteristics in opposition with each other – sexuality and anti-sexuality, neither of which is portrayed in a positive manner for any of the women. The narrator describes Cathy’s early sexual experiments and manipulations: “What freedom men and women could have, were they not constantly tricked and trapped and enslaved and tortured by their sexuality! The only drawback in that freedom is that without it one would not be a human. One would be a monster” (Steinbeck, 1992). Here the narrator expresses the detriment sexuality is to one’s well-being, stating that sexuality ‘tricks,’ ‘traps,’ ‘enslaves’ and ‘tortures.’ Yet, not expressing one’s sexuality is equated with being a monster. Given the options of sexuality or anti-sexuality, good mothers must choose the latter. Otherwise, they are trapped by sexual feelings and distracted from maternal duties that are supposed to be of main importance. Even though Steinbeck includes men in his remarks, Everest and Wedeles do well in noting that only women are seen at risk navigating the choice between sexuality and anti-sexuality.

Analysis

In the novel, the narrator describes Cathy from the period of her birth through her teenage years in no uniform way. This narrator believes she “was born with the tendencies, or lack of them” that shaped her entire life (Steinbeck, 1992). This idea informs the reader that Cathy’s life trajectory is due to personal characteristics of an innate and inherent nature. To describe her abnormal nature, the narrator states: “Some balance wheel was misweighted, some gear out of ratio” (Steinbeck, 1992). The terms “balance wheel” and “gear” describe Cathy as if she is a machine. A machine’s cold, calculating, and unemotional nature paints her as not human, and certainly not as conventionally feminine. But then the narrator compares her ability to use her differences to become adept in a specialized area to a “cripple,” making it unclear whether Cathy is actually more machine or human (Steinbeck, 1992). These unnatural, machine-like qualities suggest that whatever binary is in question here, she exists on the unprivileged side of it.
gest sexuality as well as evil. Hooves’ close connection with damnation seems to foreshadow her eventual punishment for her behavior. Evil seems to be Cathy’s destiny immediately in life, one that will later be confirmed. Cooper notes that “the goat, especially the kid, was a sacrificial animal and was used also as a sin-offering (the scapegoat)” (Cooper, 1992). From birth, Cathy is poised to become a sacrificial animal that will die for her evil in order to save the men around her. She is destined to do evil so that later, men like Adam Trask are elevated in comparison, and their goodness emphasized.

The inconsistent description of Cathy by the narrator serves to confuse and to emphasize her abnormalities. It transforms her into negative, incomplete entities. While figurative language likening her to machines and horses is captivating, it only diverts attention away from the reality, which is that she has a combination of feminine and masculine qualities. The inconsistency works to cement her portrayal as a monster one cannot easily relate to. The end of the passage highlights this; her voice is “huskily soft” and is both sweet and sharp enough to “cut like a file” (Steinbeck, 1992). The conclusion is that because Cathy is not ideally feminine in every way but instead houses such contradictions, she is abnormal. Her androgyny is not accepted, and because of that she is portrayed as not whole.

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Cathy enters high school, which the narrator notes to be unusual because “in that time, it was not usual for a girl to go on with her studies” (Steinbeck, 1992). Because she makes her own choices to study Latin and algebra, choices girls were not expected to make, her parents felt “they had lost her” (Steinbeck, 1992). Again, for embarking on a nontraditional journey, she becomes unknowable. Her choice to continue on with her studies is justified by others with the promise of becoming a schoolteacher, “the one profession of dignity open to a girl” (Steinbeck, 1992). But, she feels constricted by her parents’ wishes to join the one profession they deem fit. They want her to continue to follow the most conventional female script possible, while she does not. What follows is Cathy’s ultimate rebellion. To appease her parents after they punish her for disobedience, she takes on all of the stereotypical feminine qualities they like. She helps her mother with domestic duties, and pretends she still wants to become a teacher. Her father is so impressed that he remarks to his wife: “I wouldn’t want a child that didn’t have some gumption … If you just check it and keep it in control, why, it will go in the right direction” (Steinbeck, 1992). Ironically, what he perceives to be “gumption” is her calculated conformity to the role of ideal daughter. Cathy maintains her controlled act while
planning her eventual defiance – arson, murdering her parents, and faking her own death.

Cathy decides to become a prostitute under a man named Mr. Edwards, and the negative attitude towards prostitutes emerges in the novel. In describing the kinds of girls Mr. Edwards looks for, the narrator notes: “If a girl was not properly stupid, he threw her out” (Steinbeck, 1992). It is clear that a woman’s intelligence interferes with his business. More generally speaking, intelligence in women interferes with men’s ability to reach their goals, so men will do what they can to put them down. They feel threatened. Despite his usual principles, he takes Cathy in anyway, falling in love with her and beginning a relationship. She consents to it for the money. Mr. Edwards discovers the truth about her back, he beats her severely, causing her to crawl to the nearby doorstep of the Trask household seeking help. Adam begins a relationship with her before she is even fully recovered.

It is clear from the very beginning of their relationship that Adam only loves the constructed idea of Cathy, not the actual human being. The narrator says: “Adam couldn’t remember ever having been so happy. It didn’t bother him that he did not know her name” (Steinbeck, 1992). His complete and total happiness hinges on someone whose name he does not know. He feels the love so deeply despite not knowing a simple detail about her real identity. The conflict between the real woman and the myth of woman is present in this moment. The narrator continues by describing the effect Cathy has on Adam still early on in their relationship:

Perhaps Adam did not see Cathy at all, so lighted was she by his eyes. Burned in his mind was an image of beauty and tenderness, a sweet and holy girl, precious beyond thinking, clean and loving, and that image was Cathy to her husband, and nothing Cathy did or said could warp Adam’s Cathy (Steinbeck, 1992).

It is as if Adam truly only sees the image of the myth of woman that he subscribes to without any recognition of reality. The narrator admits that he may not actually see her; he is blinded by the feminine ideal he believes in. But because Cathy does not realistically fit any mold, she becomes an enigma, and as Simone de Beauvoir notes in The Second Sex: “…in the company of a living enigma man remains alone—alone with his dreams, his hopes, his fears, his love, his vanity” (De Beauvoir, 2010). This idea that man and woman as mystery do not actually interact emphasizes the point that Adam’s idealization of Cathy separates them, and they never truly have a relationship at all. His “dreams” and “hopes” construct an idea of Cathy, and “his vanity” allows him to feel secure in his belief that she is no more or less than that construction, and her existence is solely to fulfill his needs and desires.

De Beauvoir also states: “A heart smitten with love thus avoids many disappointments: … the mystery serves to excuse it all” (De Beauvoir, 2010). This quotation serves to explain the exact predicament Adam and Cathy find themselves in once they marry. Adam comes to understand that their marriage is not perfect, but disregards Cathy’s real feelings of entrapment and discontent as part of her mystery that will either vanish or reveal itself completely once she settles into their new life together. The words used to describe her make her an object. Her physical beauty makes her pleasing the loved. She is also an image of purity, based on the words “holy girl” and “clean.” No actions or words can change Adam’s mind about who she is, which suggests the deep divide that exists between them. The statement that nothing would cause Adam to deviate from the perception he has of her emphasizes his separation from reality. For Adam, she fills an archetypal role – a pure, perfect wife, or even “the angelic young girl.” In contrast, the narrator views her as a negative “Other,” which Adam eventually perceives her to be much later, once she asserts herself in a way that cannot be denied or disregarded – by shooting him. It is only when she becomes aggressive and physically harms him, thereby revealing a more masculine side of herself, that Adam truly faces the reality of their situation as husband and wife. She shows that she will not stand back and be the object on which actions are done, but that she will be a performer of actions. His ignorance forces her to act out in order to truly be seen and heard.

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Nevertheless, Cathy is pregnant with what Adam believes to be his child, and it becomes increasingly clear that her lack of maternal instinct is greeted negatively. First, she attempts her own abortion. The doctor treating her when it is unsuccessful chides her
not only because such a procedure is a medical risk, but also because he believes she should do her ‘duty’ and carry the children to term. Later, when describing her pregnancy, the narrator says she grew “abnormally big” and that she was “misshapen; her belly, tight and heavy and distended” (Steinbeck, 1992). Also, the narrator states: “Her breasts did not grow and her nipples did not darken. There was no quickening of milk glands” (Steinbeck, 1992). Physically, Cathy is not ready to become a mother. No matter how strong her lack of emotional desire to take on the role is, it cannot be helped that physically her body is not cooperating to allow her to become an adequate mother. After she gives birth to her twin sons with the help of Samuel Hamilton, he offers to show the boys to her, an offer she quickly and coldly declines. When he offers again, she replies: “No. I don’t want them” (Steinbeck, 1992). Unable to fathom, let alone accept a mother not wanting her children, Samuel can only reply: “Oh, you’ll change. You’re tired now, but you’ll change … In a few days you’ll feel so different you won’t remember” (Steinbeck, 1992). In The Monster Within – The Hidden Side of Motherhood, Barbara Almond notes that women who appear to hate their children are “considered monstrous – immoral, unnatural, and evil,” yet she believes there is a “spectrum of maternal ambivalent feelings, thoughts, and behaviors” that can possibly be seen as normal, inevitable, and ubiquitous (Almond, 2011). But Samuel dismisses her feelings altogether; firmly believing that all mothers will grow to love their children and immerse themselves into their given role. The narrator does not give her a voice to express her feelings postpartum to consider the depth of why she wants to abandon motherhood. But it is an attack on her femininity to ignore and/or deny legitimate reasons for ambivalence toward motherhood.

After escaping her marriage, Cathy changes her name to Kate and becomes a prostitute again. The closest she ever comes to motherhood is by serving as house “mother” to all of the other prostitutes. As her sons Cal and Aron grow up, they become curious to find out more about her. They find her and discover her profession, and confront her in conversation. Ultimately, they reject her and any notion that because she is their biological mother that they have to resemble her in any way. These encounters with her sons affect her deeply; their rejection of her due to a lifestyle they deem immoral drives her to commit suicide. Her family and society in general reject her for the path she chooses in life. Instead of motherhood, Cathy’s life as a prostitute allows her independence. No man can impinge on her freedom to do as she pleases. Instead of accepting passivity, she manipulates men with her sexuality, asserting dominance over any that come through her home as evidenced by the photographs she keeps for blackmailing purposes.

Despite being a profession that the town acknowledges is necessary, prostitution requires sexuality from women in a way that is still somehow perceived to be improper. The narrator describes the role that prostitution and religion have in the region:

The church and the whorehouse arrived in the Far West simultaneously … they were both intended to accomplish the same thing: the singing, the devotion, the poetry of the churches took a man out of his bleakness for a time, and so did the brothels … Indeed, if after hearing the ecstatic shrieks of climactic conversion against the thumping beat of the melodeon you had stood under the window of a whorehouse and listened to the low decorous voices, you would have been likely to confuse the identities of the two ministries. The brothel was accepted while it was not admitted (Steinbeck, 1992).

Here, church and prostitution are presented as equal institutions for taking men ‘out of [their] bleakness,’ or relieving their distress. Such a claim emphasizes the importance for men to have sexual release, and yet women are looked down upon for it, even if it does benefit men. Indirectly, men become closer to God after participating in this institution, but the women that also participate move further away from God, becoming more evil. Also, men are able to return to their daily lives after visiting brothels and can hold many different jobs, even high-profile ones. The identities of the women are very closely connected with their jobs as prostitutes however; it is their livelihood. Even though it is recognized that men need refuge from life’s bleakness, the same is not acknowledged for women, as they are not perceived as having purpose outside of their relationship to men. With this double standard in the way sexuality is treated, the male/female binary is strictly enforced, with men being privileged.

During the time she serves as house madam, Cathy has anything but a sweet disposition; she is very aggressive and bitingly mean to all whom she encounters,
unlike she has an ulterior motive for being kind. To further prove that women are not allowed to be masculine and embody these masculine qualities, Cathy meets her death. In a way, the fact that the grand triumph of the novel is Cal’s realization that he can possess both good and evil qualities within himself but choose which to act on further demonstrates how his mother could never have enjoyed the freedom of choice between those two, anyway. She never stood a chance; she had no free will. Cathy is most often confined by society’s myth of woman, and is punished when she abandons it.

Providing a contrast to Cathy’s lack of free will is the character of Lee, a Chinese man able to make more choices and navigate more spectrums of being than Cathy. His birth story is tragic, however. Lee’s father comes to the United States from China, having signed a contract to work for a railroad and pay off debts. He thinks he is leaving his wife behind, but soon discovers she followed him by disguiseing herself in men’s clothing and a man’s braided queue. This disguise represents Lee’s mother’s move towards the masculine. As Lee tells the story, Adam asks him how a woman could work in such harsh conditions, to which Lee replies: “…I believe a strong woman may be stronger than a man” (Steinbeck, 1992). While a progressive sentiment on work in such harsh conditions, to which Lee replies: “…I believe a strong woman may be stronger than a man” (Steinbeck, 1992). While a progressive sentiment on the surface, the irony here is that his mother essentially has to be a man in order to follow her husband to America. The only way she gains entry onto the ship is by changing her physical appearance to resemble a man. The disguise is what garners her acceptance and keeps her alive. This female, taking on masculine characteristics to become an androgynous figure, is only able to survive through emulating the opposite sex. The male/female binary is strictly enforced here.

As Lee tells the story, Adam asks him how a woman could work in such harsh conditions, to which Lee replies: “… I believe a strong woman may be stronger than a man” (Steinbeck, 1992)

Lee’s mother is pregnant with him at this time, but as this is a secret along with her true identity, she is required to carry out normal working duties. As she goes into labor, the camp of men discovers the truth about her gender and severely beats her, leaving his father to forcibly remove Lee from her dying body. She meets her demise because she is no longer perceived as biologically male by the rest of the camp, but a female adopting masculine characteristics. Society does not think of gender or sex as continuums, but as the definitive binary to which it is accustomed. Her attempt to assimilate and position herself on the privileged side of the binary is futile because it is perceived as a threat to the masculinity of the other men. Their emotional and violent response is their attempt to control what Laura Mulvey describes in Visual Pleasure and Narrative Cinema as “castration anxiety” (Mulvey, 2010). Those men, however, demonstrate an inversion of the masculine/feminine binary, and even the binary that privileges the presence of mother over the absence of mother. At the end of Lee’s story he tells Adam: “Before you hate those men you must know this. No child ever had such care as I. The whole camp became my mother” (Steinbeck, 1992). So while his mother gives birth to him disguised as a man, an entire village of actual men nurture Lee; they mother him and give him what he believes to be better care than anyone in the entire world. He seems to say that a group of men provided better care than any biological mother. This statement not only implies that those men were accepted for the maternal role they took on collectively, but should be praised. Their maternal role displaces the binary in which conventionally masculine qualities are privileged over feminine qualities, and serves to further strengthen the binary in which males are privileged over females; the emphasis is on sex, and not on gender. Because males are advantaged, they can move about a continuum of traditionally masculine and feminine qualities because that is what their biological sex affords them in society. Females cannot do the same.

Lee begins working for the Trask family when they move out to California, completing domestic chores and caring for them. Immediately after the twin boys are born, Liza Hamilton takes care of them for a short time due to Cathy’s disinterest. When she and Samuel Hamilton discuss who will take over their care, Liza discloses that Lee has “learned everything I told him” and that his new caretaking role is “a matter of praise” (Steinbeck, 1992). Not only are Lee’s maternal qualities learned,
but he is praised for them just as he praised the men who took care of him. He is a man raising children in the absence of their birth mother, and he is not looked down upon for it, proving his androgyny is accepted in a way Cathy’s is not.

Lee settles smoothly into the role of homemaker in the Trask household. Taking advantage of Adam’s wealth, Lee makes an assortment of purchases for the home, including a gas stove, new furniture, new carpets, a gas water-heater, and a large icebox. The narrator says: “Lee defended himself to Adam, saying, ‘You have plenty of money. It would be a shame not to enjoy it’ (Steinbeck, 1992). The narrator’s note that Lee defends himself to Adam truly makes it seem as though Lee is not just a maternal figure to the boys, but a wife figure for Adam. Also, that buying new furniture and appliances is what Lee considers ‘enjoying’ wealth emphasizes his connection to the domestic realm. But never is he punished or even insulted by anyone for taking on what society deems a “feminine role.” It is never denied that he is a full character with complexities; he is still recognized as a whole person.

All mothers in the novel must make sacrifices of great importance in order to be considered successful in their role. For Lee’s mother, it was life itself in order for her child to live, but for others in the novel, it is sexuality. As Everest and Wedesles, critics whose work has appeared in the publication “Steinbeck Quarterly,” note, “good women are intrinsically repelled by sex,” and no positive mother figures in the novel, including Lee, assert themselves as sexual beings (Everest & Wedesles, 1988). But that is not to say that Lee is completely anti-sexual. When inquiring as to whether Cal has a girl, Cal replies, “No. Who wants a girl?” and Lee’s response is, “Everybody” (Steinbeck, 1992). “Everybody” would seem to include even Lee, although he never acts on such a desire for the duration of the novel. Domestic chores like cooking and cleaning are how he spends his days. His maternal role also allows him to impart wisdom to the Trask men and care for them emotionally. Despite the possible masculine desire to ‘have’ a girl, Lee does not act on it because it would distract from his maternal duties.

Further, Lee must sacrifice a life outside the home to maintain his status as best mother figure. Having been a servant completing domestic duties his entire life, Lee eventually expresses a desire to leave the Trask family and open a bookstore in San Francisco. After many years and delays he leaves, but returns after a short while. He says: “I don’t want a bookstore ... I am incomparably, incredibly, overwhelmingly glad to be home. I’ve never been so goddam lonesome in my life” (Steinbeck, 1992). Lee abandons his old dream of opening a bookstore because he misses the Trask family. Immediately after this admission, and throughout the rest of the novel, there is no fallout. Lee is not ridiculed by others, or spoken of negatively by the narrator for abandoning a potential business prospect (and thereby rejecting one of society’s top masculine ideals), nor rejecting independence. The family welcomes Lee back, and he reverts seamlessly into his previous maternal role. Lee’s androgyny is acceptable, and it is simply his choice to stay in or leave his maternal role. He faces no isolation or rejection for his nontraditional qualities, and certainly not a violent death.

Between romantic sacrifice and the discussed sacrifice of a life outside the home, the reader is left to marvel at all Lee has given up, and admire him for the caring and attentiveness he shows for the Trasks. No female mother in the novel is given the same opportunity to show any warmth. While Lee is presented very positively for all of the sacrifices he makes, Cathy is punished and considered evil for not doing the same. It should be a given that she will stay at home and raise her children, and not doing so makes her horrible. For Lee to abandon all outside pursuits and stay in the home is not expected in the same way, and is therefore admirable when it is what he chooses. Additionally, anti-sexuality makes a woman a monster, even though conversely she is also ostracized for expressing sexuality. But for Lee, anti-sexuality is also commendable. He is never described in terms of what he lacks, but she constantly is. In being a woman, it seems that Cathy did not have many avenues to succeed. But, it seems as though Lee, as an androgynous man, has the freedom to choose how to behave without repercussion.

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In talking with Cal about his mother, Lee asserts his male dominant viewpoint. He elaborates on his thoughts about Cathy: “She is a mystery. It seems to me that she is not like other people. There is something she lacks. Kindness maybe, or conscience. You can only un-
understand people if you feel them in yourself. And I can’t feel her” (Steinbeck, 1992). Lee, despite being a character that benefits from being understood as complex and not confined to any one conceptualization, forces Cathy into societal constructs. He views her as ‘the other’ because she is dissimilar to him, and therefore less understood. There is also another binary upheld; presence is privileged over absence. To Lee, Cathy is defined by what she lacks, not the qualities she does indeed possess. Lee goes further, stating: “I think your father has in him, magnified, the things his wife lacks. I think in him kindness and conscience are so large that they are almost faults” (Steinbeck, 1992). Adam is a more positive figure for possessing qualities like kindness and conscience. He is the figure against which Cathy is judged and absence is exposed. He is elevated by her negativity. The male/female binary holds true.

In discussing her with Cal, Lee further complicates the reader’s relationship to Cathy. When Cal states that he has internalized his mother’s influence, Lee yells: “You’ve got the other too. Listen to me! ... Don’t you dare take the lazy way. It’s too easy to excuse yourself because of your ancestry. Don’t let me catch you doing it!” (Steinbeck, 1992). In these lines, Lee suggests that the path of evil Cathy is on is not only a choice, but one made out of laziness. The reader finds it difficult to disagree, for doing so might discredit all of the effort Lee has made, transcending traditional gender roles and race to become the accepted member of society he is. However, the character of Cathy is anything but lazy. She follows the path she was set on and takes her actions to the extreme. To accept Cathy would not be to reject Lee, but to recognize that her struggles in the confines of socially constructed gender norms were created purposefully to lead to destruction, unlike his. She is made evil to make all others appear more triumphant in their “choice” to do and be good. Her punishment is out of fear of the threat that a woman can be, unlike his. Death has receded” (Steinbeck, 1992). The conclusion to draw here is that his androgyny is accepted and reflected in the feelings of immortality he has. If his feminine qualities breached the rules of the male/female binary and were unacceptable, immortality would not be a possibility. This is in stark contrast to Cathy, who commits suicide due to the violation of it.

What makes Lee’s androgyny acceptable comes in large part from his Asian origins and the ease with which some Chinese religions accept the transcendence of social constructs. According to Joseph A. Adler, a former professor of East Asian religions at Kenyon College, old Confucian values dictate that the family is a micro-cosm of the state, giving males absolute authority in all situations. Women are expected to stay in the home and perform domestic duties (Adler, 2006). These seem to be the ideals that the murdering men of the work camp subscribe to. Adler then offers the other side: “The conventional view presents Buddhism and Daoism as the woman’s refuge from the hostility of Confucian values” (Adler, 2006). Daoism in particular, he details, expresses “a strong preference for distinctly “feminine” virtues, such as yielding, softness, fertility, and non-aggression” (Adler, 2006). Minus fertility, these are all ‘feminine’ attributes Lee exhibits, and from a Daoist perspective they are actually praised. Further, there is a parallel between Lee’s wisdom and the role of the sage, and his feelings of immortality associated with a rise to Daoist apotheosis. Not only are more feminine attributes preferred and praised in these select Asian religions, but qualities like “a gentle touch, patience, and sensitivity” are required for those seeking immortality (Breslow, 2008). Lee’s immortal feelings confirm his possession of such qualities and justify his character make-up. Immortality seems a reward and further encouragement for living his life the way he does. A culture that does not hold “feminine” qualities in direct opposition to “masculine qualities” is one that is therefore more accepting of androgyny. For one to be soft and non-aggressive does not mean that person cannot also be wise and feel immortal like leaders and enlightened beings. Lee is not expected to be static, and for that he
is accepted as a well-rounded, complex human. Other examples of Lee’s accepted androgyny include his Eastern queue hairstyle and style of dress. In Western culture, a hair braid is feminine, and only for women. However, in Eastern cultures like China both genders wore it, and males even more than females. Its distinction was not grounded in gender, but rather political allegiance (Godley, 1994). Part of why Lee’s androgyny is acceptable is because certain qualities like the queue are literally androgynous in Chinese culture. With more men than women wearing the queue, Chinese culture overturns the masculine/feminine binary from the Western point of view just as Steinbeck overturns it in his portrayals of Lee and Cathy.

Conclusion

Steinbeck made timshel the heart of his message when writing East of Eden, imparting that good and evil exists in everyone and it is up to each person to choose which to act on. However, through the characters of Cathy and Lee, it is clear that not everyone has the choice. Steinbeck demonstrates a reversal of the binary that privileges masculinity over femininity. Lee, despite being a male with feminine characteristics, is accepted for the maternal role he plays in the Trask family. Cathy, on the other hand, exhibits androgyny that is not accepted. For this, the binary in which the male sex is privileged over the female sex is strictly enforced. To cement it, Steinbeck creates Cathy in such a way that it is not appealing to try to rebel against it. Existing outside of the feminine norm is not a slippery slope leading to awful crimes against humanity; men are afforded the luxury to be complex and express themselves as they are without consequence, but not women. Cathy is an evil, non-redeemable character so that Steinbeck can use her as a cautionary tale not to challenge the social order. However, this betrays him in two ways. It reveals the threat men feel by powerful women. Also, manipulating a character from birth actually contradicts his timshel claim that anyone has a choice to act on good or evil. The narrator asserts early in the novel that “the free, exploring mind of the individual human is the most valuable thing in the world. And this I would fight for: the freedom of the mind to take any direction it wishes, undirected” (Steinbeck, 1992). This noble belief unfortunately only applies to the male individual mind. Steinbeck’s preoccupation with maintaining male dominance undermines the validity of timshel, because Cathy never has a choice -- only a destiny.

REFERENCES:


On Winged Words:
An Examination of the Use of Language in *The Iliad* to
Create and Assess the Poetic Space

By Micole Gauvin

This paper looks closely at the poetic language of The Iliad. In our examination, we take the conventional sense of poetry a step further to examine poetry’s connection to the soul in conjunction with the poet’s ability to use language and other poetic gestures to create the poetic space. We posit that this poetic space is a psychological place—for, of, and in the soul—which is unlocked by poetic language and in which one can see and interact with the events and people of poetry throughout the years. Specifically, this paper includes close-readings and careful studies of: the proem; characters’ speeches and actions; and similes and other such figurative language. Each of these studies of the language of the poem yields evidence of the poetic space and reveals a common thread that is tied to epistemology. Poetry is a result of experiencing truth, and the poetic space informs our knowledge and how we come to know it. In this discussion we find poetic moments, the soul, and truth all inextricably linked. The closer we look at the poetic language of The Iliad, the wider the door to the poetic space opens—all that is left is to enter.

Eating is not only a crucial aspect of human function, but of the human experience as well. Consequently, food has become a social staple in human life, wherein cultural norms and gender dynamics introduce a new form of stratification: using gender-based food stereotypes as a means to display power. In examining this dynamic, this research aimed to uncover how individuals consciously changed their behavior in the presence of others, highlighting the influence and strength of gender and gender stereotypes in shaping others’ behavior. The nature of our journey through The Iliad is so centrally focused upon the poetic; we therefore begin by clearly delineating precisely our definition of poetry and how our understanding differs from the conventional definition. As defined in the Oxford English Dictionary, poetry is: “imaginative or creative literature” or art in general; the work of a poet; a “composition in verse or some comparable patterned arrangement of language in which the expression of feelings and ideas is given intensity by the use of distinctive style and rhythm”; “the expression or embodiment of thought or feeling”; “something comparable to poetry in its beauty or emotional impact; a poetic quality of beauty and intensity of emotion; the poetic quality of something”—quite a list to be sure, but all of these nuances of poetry contain a common thread which permeates the conventional understanding of poetry. That is, poetry is typically thought of as a form of art (usually in the medium of language, though not necessarily restricted to words alone) that showcases beauty. The poet must be ingenuitive and creative in building poetry; indeed, poetry is often revealed in imaginative, creative, expressive, intense, stylistic, and/or emotional ways. For example, we will see the poet touch all of these aspects in the scene with the corpse—nowadays when we speak of a poet, we think only of the utterer of such lyric, birdlike notes as “With ships the sea was sprinkled far and nigh,/ Like stars in heaven” (Wordsworth), or “Music to hear, why hear’st though music sadly? / Sweets with sweets war not, joy delights in joy” [Shakespeare]. (1967, 1)
With this perception of poetry, one might readily identify The Iliad as a work of poetry and its author a poet based solely on its moments of pleasant verse; one might accurately highlight the Homeric similes and other examples of figurative language poetic, instances in the epic that add emotion or intensity to the story playing out on the pages. However, this conventional definition has its limits. To continue our study, we must therefore expand upon this definition.

Now, what is most important in our understanding (and what the conventional definition lacks) is poetry’s connection with the soul, with a person’s character. The Iliad’s portrayal of poetry takes the conventional classification of poetry even further—beyond emotion, beyond figurative language—and really zeroes in on the motivating factors that lie behind the exhibited poetic language and actions. In our examination of the text, we use the typical conventions of poetry to help us identify instances of heightened poetic feelings. To be more precise, we look for moments of poetry (also classified as poetic moments, gestures, or language) which include anything the audience experiences by seeing, hearing, or feeling and which the poet and figures in the play create by speaking, singing/playing, weaving, crafting, acting, and so forth. Nearly every example of figurative language, elevated or sublime expression, or otherwise intense and expressive ideas are thereby indicators of poetry.

Further, we use Shelley’s redefinition of poetry to aid in our examination of these, positing now a working definition of what poetry is to guide our thought and poetry-sorting process. Fundamentally, we see poetry as “the expression of the imagination” (Shelley, 1820, 149). Poetic moments—these expressions—become both the object and the poet’s apprehension of it combined, resulting in something entirely new. Ultimately, as we will see, “poetry turns all things to loveliness” (Shelley, 1820, 72). Thus, the poetic is that which distorts order and orders chaos; reveals hidden beauty and exposes false claims of beauty; and speaks to the truth we see and sees the truth in what we speak. In the images they create, these poetic moments of the poem—ironic, bold, figurative, challenging, and etc.—all contain a power that sets them apart from the ordinary moments. We gravitate towards and choose such moments.

We then focus in on these poetic moments, taking them a step further to encompass every part of the complex and intricate picture of poetry. We look at who is exhibiting this poetry, how they are using the conventions of poetry, when, where, and to whom they are speaking or acting in this distinctive manner; and, ultimately, why—to what end and for what purpose that scene, piece of art, language, or action is being elevated. As we do this close study of the text, we begin to see a connection between a person’s character and their capacity for poetry (that is, their propensity for seeing truth in conjunction with their resulting proficiency in wielding words in a heightened way)—a connection that we see eventually centers on the fact that poetry results from seeing truth. Moreover, these poetic moments and exhibitions of poetry seem to stem from one’s intrinsic poetic character and capacity for poetry.

The poetic capacity of a person therefore depends on their ability to take the truth they see with their eyes or the insight they gain via other means...

In fact, we can think of the figures related to the epic (both within and without) as being intrinsically poetic, having a natural capacity for poetry, or even just having the capacity for poetry. Turning to the OED, we find that by its nature the word ‘intrinsically’ looks within, defined as it is as “internally, inwardly, within” and “by, or in relation to, the inner nature of the thing; in itself; inherently, essentially”.

Tying such an inward driven word to poetry inevitably takes that word itself inward, revealing that the essence of poetry comes from within a person. This intrinsic capacity for poetry is demonstrated time and again in The Iliad by such characters as Hektor, Achilles, and even Achilles’ horses. Truly, the ability to see, to hear, and ultimately to speak poetically, actually comes from within—and this leads us now to having a (natural) capacity for poetry. Again looking to the OED, we see capacity defined as the “ability to receive or contain; holding power”. This definition again takes us inward, towards the self, and we see that poetry, although sometimes manifesting itself externally, actually starts and ends within a person. Indeed, man is the lyre upon which a melody is created by inner and outer forces; the soul within man responds to these forces and creates a harmony. Additionally, we see moments of poetry are frequently born of or follow a time when the person in question experienced truth. The poetic capacity of a person therefore depends on their ability to take the truth they see with their eyes or the insight they gain via other means, internalize it, and then express it in a manner that aligns with the conventional sense of poetry.
With its very inwardly focused nature, poetry seems to penetrate more deeply than the mind or even the heart—it accesses something superior to mere intellect or raw emotion. In the sense we accept in our journey through The Iliad, poetry bypasses these accepted poetic modes to enter the very soul; it becomes necessarily a part of those who hear, speak, or read it. Becoming so entwined with the soul, those partaking in poetry now possess pieces of the poetic space that enable them to unlock it for themselves, enter, and commune with other readers, characters, and the poet, within the context of the poem and even across centuries.

But what exactly does The Iliad, itself, tell us about poetry?

Indeed, poetry longs to be shared—it aches to feel the soul of another and give of its own. It takes our ordinary understandings and raises them to new heights, pushing our own psychological boundaries, and revealing to us the philosophical mysteries of the poetic space. This poetic space is the most critical and crucial aspect of poetry for it is the place in which we witness and can create poetic moments. Poetry, poesis, means “to make” and the poetic space is precisely what is made. A place of and in the mind, it is a merging of the divine and mortal realms; it is where we have access to the insights of the poet and these other figures—to truths which we see embedded in their poetic moments. It is where we realize our own capacity for poetry and respond in kind. The poetic space is the ultimate focus of our project. The poet creates this space by elevating and refining his language and the images they evoke so that we can enter, experience, and see the truth—see the beauty—hidden within the poem’s language.

Therefore, poetry is more than a simple art-form available to a few select, gifted poets; it does more than tell a sad story or paint a pretty picture. Poetry transcends the conventional definition to unlock and reveal a part of the soul and mind that are not immediately grasped at first glance. Poetry and the poetic elevate more than just the language, but the very speaker. Poetry causes us to look deeper and see the beauty that is not necessarily always on the surface, but which nevertheless speaks to our souls. Moreover, this idea of poetry’s inward-driven nature, connection to the soul, and root in seeing truth makes the theme of knowledge in the poem of especial concern. As we sift through the lines of The Iliad, we will see a common thread linking the poetic with seeing/realizing truth.

Turning to the Text: Connecting our Definition of Poetry to Close Readings of Parts of The Iliad

Hitherto, we have considered the various components of poetry, looking rigorously at how we might use them and what we mean when we do. But what exactly does The Iliad, itself, tell us about poetry? As we recognize the capacities of the poetic space, we can uncover the deeper meanings beneath the surface that our own ordinary and untested understandings will not quite let us reach. In his manipulation and command of language throughout The Iliad, the poet invites us into the poetic space. Upon entering, the poet reveals to us its various components. Once we have been so gifted with the key to unlocking this sphere, we can access it on our own without relying on the gods; for our souls will be irrevocably tied to the poetic space. Possessing now this key, we embark on our study in earnest by tuning our ear to hear the voices of the poet and the characters of the poem and training our eye to examine the patterns of poetry in their language. We start by refining our definition of poetry, looking at a few instances of seemingly strange, but powerful, beauty in the poem and then move on to a brief, but careful, study and overview of the speeches of divine, semi-divine, mortal, and other figures, before shifting our focus to the varying types and forms of language used throughout the poem (for example, similes). In all of these forms and examinations of language we find a common thread tied to epistemology, revealing to us something about how we secure knowledge. It is in this discussion and study of the poetic space that we find poetic language and the soul, knowledge and how we can possibly know it, all inextricably linked.

A Peek at the Poem

In the opening lines, we see the poet invokes the Muse, commanding her:

Sing, goddess, the anger of Peleus’ son Achilleus And its devastation, which put pains thousand-fold upon the Achaians, hurled in their multitudes to the house of Hades strong souls of heroes, but gave their bodies to be the delicate feasting of dogs, of all birds, and the will of Zeus
was accomplished since that time when first there stood in division of conflict Atreus' son the lord of men and brilliant Achilleus. (I, 1-7)

On the surface, this invocation appears to be merely about Achilleus' anger. However, looking deeper, we see that these words actually reflect the poet's mastery in wielding language. In fact, we will see a poetic space emerge in The Iliad which bridges the divide between the mortal and immortal realms. Immediately, in the first line of the epic we see an example of this merging of worlds. Achilleus is the son of Peleus, a mortal, and of Thetis, a goddess. As a member of the race of heroes, Achilleus is the very embodiment of the type of union/duality we are concerned with when we think of the nature of the poetic space. Similarly, we can think of The Iliad, itself, as a sort of semi-divine, heroic offspring of the poet, a mortal, and the goddess named in the proem (presumably the Muse); amidst the complexities of the poet's paradoxical commanding/invoking of the Muse, we see a partnership, the product of which is the poem at large. Because the poet says, “Sing, goddess” (“Iliad”, I, 1) in the opening line of the poem, we know that the poem following this proem is infused with the voices and influences of both the poet and Muse. Aligning this idea with our proposed illustration, the poet and Muse are then the parents and the resulting poem of their shared collaboration and performance is their offspring. The lifeblood of the poem is in its words and there exists language both mortal and immortal throughout the poem. Therefore, in the proem we see both Achilleus and the poem established as examples of the merging of divine and mortal realms.

Now, recalling our initial definitions of poetry and the poetic space at the onset of this paper, I am claiming that this poetic space is psychological—a place for and in the soul. It is a place which we cannot reach in our everyday life. Existing as it does beyond the confines of ordinary language, it can only be reached through poetic language. This poetic language is at once higher and elevated above the everyday and even the gods and it is the key to unlocking this intermediary sphere that is the poetic space. Seeking a concrete example of the abstract ideas and definitions we explored earlier, we find a seemingly simple example of the type of language that can be classified as poetic and that helps define the poetic space residing in the epithets present in the first and last lines of the proem. The poet names “Peleus’ son Achilleus” (“Iliad”, I, 1), “Atreus’ son the lord of men” (Agamemnon) and “brilliant Achilleus” (“Iliad”, I, 7). These epithets intimate a special knowledge that can only be accessed in the poetic space.

Additionally, we see language that evokes the imagination and constructs the poetic space in the midst of the proem as the poet tells us of the devastation of the anger of Achilleus and how it “hurled in their multitudes to the house of Hades strong souls/of heroes, but gave their bodies to be the delicate feasting/ of dogs, of all birds” (“Iliad”, I, 3-5). The rich imagery of these words does more than paint a picture of the pain of the Achaians; it goes further to reach a part of our souls, making us feel a part of their pain as we read/hear the language. We feel pain at this image because of the careful contrasting of the word ‘heroes’ and the image of their bodies being not just sent, but hurled—forcefully, mercilessly, wastefully—down to Hades. There exists a certain positive connotation in the word ‘heroes’ that echoes admiration and endears them to us; though we do not yet know them, we feel as though we do when we hear that word (or at least we feel we know what type of person they are—that is, that they are heroic, whatever their faults). Thus, we are pained to lose them—and so suddenly at that. This pain is compounded when we learn of the indignity that follows their deaths (namely, their bodies becoming bird/dog fodder). The critical choice of words, laden with connotations that reach out and attach the lives of their carriers to our own, and their careful order, which sets us up to hear of the heroes’ deaths first before we learn of their deeds and can judge whether or not their deaths were just, paints an image with colors of pain. Such is the poetic space at work: sharing knowledge and emotions through language in a psychological dimension that unlocks part of our souls. And so we see that the proem contains manifestations of the merging of two worlds, masterful examples of epithets, rich imagery that highlights and evokes pain and other emotions, and more—all helping to inform our understanding of the poetic space.

Other Poetic Moments, Images, and Gestures

The next passage of poetic prominence we look at is the image the poet gives us of how “the corpse fires burned everywhere and did not stop burning” (“Iliad”, I, 52). The image is a strong one, but in his poetic language, the poet does what Shelley claims poetry does—that is, it “turns all things to loveliness” (1820,
72)—even corpse fires. We pause now to qualify what exactly we mean when we say loveliness, for the idea that corpse fires continually burning are lovely may be a bit discomfiting at first glance. We are not alone in our quest to understand the strange loveliness that exists in such intense images; indeed, the paradoxical pleasure humans seem to derive from looking at apparently morbid representations is a topic that can be traced back to Aristotle. We turn now to his Poetics for help understanding why “we delight in contemplating the most accurately made images of the very things that are painful for us to see, such as the forms of the most contemptible insects and of dead bodies” (Aristotle, 22)—why we can look at the corpse fires continually burning and deem it a moment of poetry, of loveliness. As Aristotle answers his own inquiry (and ours), we learn that:

what is responsible even for this is that understanding is the most pleasant not only for philosophers but in a similar way for everyone else…They delight in seeing images for this reason: because understanding and reasoning out what each thing is results when they contemplate them. (22-23)

We long to understand; we thirst for knowledge. Our souls reach out for a hint of recognition in these images and representations—even of pain, of something dark we cannot acknowledge in reality. In the poetic space our souls have a chance to look without blinders at all the pain and pleasure of our distorted realities; our souls have a chance to share the pain they contain and respond properly to the pain of the departed souls represented in the image who may not have necessarily received their due in real form; for in the moment of the corpse fires actually burning, one would turn away and the souls in the fire would be abandoned and forgotten, but in the image which the poet presents us of the fires in words, we can pause to look, to feel, to mourn, to share. Our need to see representation of what we cannot face in reality and our need to connect are a part of what make corpse fires lovely.

And so, poetry presents us with images, with representations, so that we can see the truth that we need to see. Indeed, a poem “is the very image of life expressed in its eternal truth” (Shelley, 1820, 54). Poetry is the “mirror which makes beautiful that which is distorted” (Shelley, 1820, 54). Truly, it is the mirror by which the most hideous death is reflected into something better—by which corpse fires are made lovely; and we are able to look at it through this poetic lens and experience it outside of our limited understanding, in order that we might come closer to these eternal truths. “Poetry thus makes immortal all that is best and most beautiful in the world” (Shelley, 1820, 73), and these truths are realized in the poetic space as we, at last, are able to confront them in the form of the representations which the poet constructs. “Poetry redeems from decay the visitations of the divinity in man” (Shelley, 1820, 73). Though disguised in the vices and manipulations and faults of its characters, the beauty of the eternal truths of the invisible world of mankind cannot forever be hidden and is at the core of poetry, reflected fully in the creation of the poetic space. Yea, we see, just as Aristotle and Shelley have seen: “Poetry turns all things to loveliness” (Shelley, 1820, 72)—even corpse fires. Admittedly, the next example of poetic language does not present itself as such on the surface, but, as Shelley explains, the darkest of vices cannot forever hide—only temporarily disguise—the beauty that lies within. Such is the case in this next piece of language. Having relinquished (if only momentarily) the physicality of his anger, Achilleus relies on the allowance made by Athene that he is able to abuse Agamemnon with his words. And the result is this insult which we posit as another example of the poetic space. Achilleus calls Agamemnon a “wine sack, with a dog's eye, with a dear's heart” (“Iliad”, I, 225). At first glance, one might be ready to dismiss this language for its ugliness, but look closer at the impetus and the origins of these words and see that they spring from something more divine and contain something far nobler than an ordinary insult might carry. These words denote the higher road Achilleus must take when Athene stays his menos in the midst of his immense achos. They are his release right now, and show a careful choice being made. Furthermore, they are spoken at the behest of a goddess. In this way, the poet turns all, even seemingly ugly language, into loveliness, making beautiful what is distorted so that not only is this insult poetic, but the distorted feelings of Achilleus as he confronts and wrestles with his rage are given vent in a nobler way. And so, we see perhaps a different aspect of the poetic space which we might not have expected. Understanding this other, even darker, side of poetry reveals another dimension of the poetic space and enables us to more fully and richly experience the deeper and true sense of poetry.

Poetic Moments and Seeing Truth

The more we look at the text, the more we see that, while language is a crucial part of the poetic space,
there is more involved in what constitutes the poetic. In all of the instances of the language of the gods and humans in the poems, it is becomes increasingly apparent that language alone does not create the poetic space. Underlying the poetic sphere is the character of those speaking more than their actual language. Indeed it seems that in The Iliad, human or divine character is intrinsically poetic, and, moreover, this capacity for poetry (or poetic character) is integrally connected with seeing the truth. There just appears to be a natural capacity for poetry which we see in the poet and in certain characters, mortal and immortal alike. The mixed blood of the heroes we have focused on (Achilleus, Sarpedon, and Helen) may be tied, in part, to their intrinsic poetic character. But above all else the capacity for poetry has something to do with seeing truth. Consider the cases of Thetis, Zeus, Hera, Hephaistos, Sarpedon, Achilleus, Helen, the poet, Glaukos (with the leaves of men simile), and so on—almost all of their poetic moments appear connected to knowing or seeing truth.

We see Thetis’ poetic character connected to her intuition about knowing; she needs to see Achilleus retell his pain so that they both (and the reader) may truly know it. Zeus’ poetic moments of silence and the thunderous, Olympos-shaking nod are so powerful and poetic because he knows and foresees the truth of what they ultimately mean: namely, the deaths of thousands of Achaians and Trojans and turmoil among the gods. This turmoil is what Hephaistos sees (“Iliad”, I, 573-583) as the truth of what the gods’ meddling in mortal affairs will bring about; his poetic gestures of craftsmanship with the houses of the gods, the shield of Achilleus, and the comedic act of serving the other gods are all in response to that knowledge; additionally, his craftsmanship on the shield serves a twofold purpose in that it reveals the truth he sees in such a way that lets us see the truth too. Hera sees the interaction between Zeus and Thetis and that is where her challenging/defiant/Helen-like language stems from—in response to the truth she sees. Sarpedon sees the truth of the heroic code and the reason why they are fighting and why they cannot back down; he reveals this in his language. Achilleus, too, on some level sees the truth in his anger, his mortality, and in his power struggle with Agamemnon; furthermore, as he sees the truth of his anger and his desires more and more clearly, the poetry of his language and gestures evolve to fill completely his intrinsic poetic character. Helen sees the truth of her situation, her helplessness, and her language conveys her lamentations; she sees the truth of the fighting between the Trojans and Achaians and weaves it into her robe; and she sees the truth of her powerlessness as she succumbs to the manipulations of the goddess. And then, Glaukos reveals the truth he sees in their fighting and in the xenia that can survive even the horrors of war as he waxes poetic with the generations of men and leaves simile and ensuing family history; the simile paints the hidden parallel between men and leaves as the young grow to replace the fallen elder generation.

Even Horses

In light of this connection between poetic character and seeing truth, there is one more example (one last category of figures we should examine) that is especially interesting and noteworthy and which stretches this capacity for poetry beyond humans and gods to include animals as well. In Book XVII, in the midst of the battle raging over Patroklos’ body, the poet shows us the horses of Aiakides—indeed, he shows us their poetic capacity which surfaces in response to the truth they see. The scene revolves around the fallen body:

But the horses of Aiakides standing apart from the battle wept, as they had done since they heard how their charioteer had fallen in the dust at the hands of murderous Hektor. In truth Automedon, the powerful son of Diores, hit them over and over again with the stroke of the flying lash, or talked to them, sometimes entreating them, sometimes threatening. They were unwilling to go back to the wide passage of Helle and the ships, or back into the fighting after the Achaians, but still as stands a grave monument which is set over the mounded tomb of a dead man or lady, they stood there holding motionless in its place the fair-wrought chariot, leaning their heads along the ground, and warm tears were running earthward from underneath the lids of the mourning horses who longed for their charioteer, while their bright manes were made dirty as they streamed down either side of the yoke from under the yoke pad. (“Iliad”, XVII, 426-440)

In this passage we see that even horses are endowed with and have the capacity for poetry. We see this revealed in their poetic gestures: namely, their crying, mourning, and refusal to leave Patrioklos’ body, in addition to their very embodiment of his grave (“Iliad”, XVII, 434-435). This brief description of the horses is charged with emotion; the language is haunting and the
image painted of the mourning horses is striking. We feel the pain of the horses of Aikides as they weep—and as they have been weeping for a very long time, since Patroklos first fell. The description of how they are not willing to move is extensive (“Iliad”, XVII, 432-433), the poet’s words here crossing the Helle and back to the fighting Achaian except the horses they describe. And then we have the elaborate simile likening the horses to a grave. In a battle where many fallen soldiers go left unburied, unmourned, to be the dinner of birds and dogs, these horses of Aikides want to make sure their master is not among the forgotten animal fodder; and so they stand as his grave, themselves, a living, breathing, ever-mourning testament to their beloved charioteer. Standing motionless by Patroklos’ body, they are his tomb, his grave monument, and their weeping serves as a remembrance of Patroklos’ life and bravery in it, and also as a reminder to those left behind—those witnessing this scene on the battlefield and those reading it now, immortalized as these actions are by the poet’s words. For in the midst of a war, these horses take the time to pause to grieve, to remember. This then, is the essence of poetry.

Furthermore, we see that this remarkable response and revelation of poetic character in the horses is also tied to seeing truth. The immortal horses have seen their beloved and mortal charioteer fall before their very eyes; then, they were helpless to save him and now they are helpless to move on. Therefore, their poetic gestures here result from the truth they have just witnessed: that is, the death of their beloved Patroklos. Additionally, they see him fallen, stripped of his armor, caught in a tug-of-war between the two warring sides, and they know the man they loved is being apparently forgotten—is going unmourned, even if only momentarily—and that he will not soon enough have the grave or burial he deserves. To help compensate for this lack, for this truth that they see, the horses take matters into their own hands and refuse to move, becoming the grave. Their poetic gestures are their response to seeing truth, further supporting our argument that seeing truth is somehow a stepping stone to poetic moments and gestures. Tracing these moments of seeing truth and instances of poetic gestures, we follow a path that intertwines and connects the poets within the pages of The Iliad to each other, as well as to the reader. It is important that seeing truth leads to poetry and that the ability to see it marks one for the poetic; it grounds poetry in truth and makes something that could seem on the surface to be quite elusive and ethereal actually quite real and attainable.

One last thing of note in this passage: Automedon is unable to move the horses or redirect them, either into the fighting or out. If we recall that “Automedon” is the “pilot of the self” the reason for his inability to drive the chariot takes on a new meaning. Having lost Patroklos, his charioteer, Automedon has lost a “self” to pilot, and therefore, he, like the horses, is at a loss for how to move forward. And this truth we see in both the steadfastness of the horses and the immobilizing/crippling of Automedon and his ability as a chariot-driver that the poet highlights for us now in the poetic space is a truth that reaches far beyond the pages, beyond this scene, and into our very hearts. The losses suffered in this war (in any war), though they may be detailed only briefly or breezed over in the retelling, are not suffered lightly. True loss as is suffered by the members of this scene is debilitating—especially when it involves a loss of self and/or a loss of purpose. That is why the poetic gestures of the horses and the poetic language used by the poet to describe this scene are so powerful—so perfect. They reveal truth—a truth not easily defined but one that is surely felt. We mourn Patroklos not just because he was good and died when he should not have; but we see the horses mourning and we recognize their grief is a mirror to our own. These poetic words awaken these feelings inside of us, and we pause over these words, because they are poetic, yes; but moreover we pause because we, like the horses and like Automedon, are unable to move on. In the midst of war, the poem allows a pause; we take the time we do not necessarily have to mourn Patroklos and the loss of our selves. Thus the poet sees the truth in all of this, uses it to create the poetic space, invites us in, and then reveals a truth that reaches our very cores. The case of the horses, undeniably underscores the connection between an intrinsic poetic capacity and seeing truth.

Apollo’s Simile

Stepping back now, we look at one of the most distinct and magnificent ways in which we see the poetic space manifest itself: that is, in the poet’s construction and implementation of Homeric similes. We see these forms of figurative language quite frequently in The Iliad. Often, these similes introduce an image of peace amidst the tumultuous and ghastly war scenes. In other instances a comparison is drawn between two most unlikely candidates. In ordinary life the comparison would not make sense, but in the poetic space where the poet lives and wherein he is inviting us to participate, these comparisons not only somehow make sense, but they finally and fully explain that missing piece, describing the true essence of something that was lacking because the ordinary description was never quite right. Admit-
tedly, the simile we chose is not necessarily among the greatest of Homeric Similes. Nevertheless, it is worth our consideration. It is as if, in the first book, the poet is warming up, starting out slowly, showing us first what a simile is before revealing his mastery in manipulating language and extending these similes into the splendid images that are created in later books.

The principles of close reading tell us that order is important and so we pay attention to that which is first. Note that in the passage describing the conflict between Agamemnon and Apollo’s priest (which we referenced earlier), we see that the first simile of The Iliad is brief but powerful as it breathes again of the poet defying our expectations and reveals language that is poetic, effectively demarcating the poetic space. In the midst of his anger and the clashing of his silver bow, Apollo, god of the sun, “came as the night comes” (“Iliad”, I, 47). Fleeting as it is, this simile is nonetheless quite compelling as it defies our expectations of the sun god, the god of sight, giving us an entirely unexpected comparison of two things utterly opposed to each other (light and the very absence of it). Even still, somehow in this poetic space, the simile endows Apollo with more power and more brilliance than all the power of daylight.

...it is not just in the simile itself that the poet casts Apollo in this shade of night

When we look at how night actually comes, we see that it is wrapped up in a bit of a paradox, for it comes slowly and then all at once. The light fades, dims, even changes colors, and then all of a sudden there is blackness punctured first by one glimmering star, then another, and then a multitude, setting the sky ablaze. This changing reflects the actions and feelings of Apollo, who brews in his anger, clashing his silver bow, maybe dimming in the brightness of his divinity as anger takes hold and darkness descends; it is a slow build up to the assault, and then all at once, the sun disappears and the god of the sun that is no longer there lets loose an arrow—and then of a sudden realize that the pain, the terror, the night of Apollo has fully descended; see how “First he went after the mules and the circling hounds, then let go/ a tearing arrow against the men themselves and struck them”—again, “a tearing arrow”, a single, tearing arrow—and then of a sudden realize that the pain, the terror, the night of Apollo has fully descended; see how “the corpse fires burned everywhere and did not stop burning” (“Iliad”, I, 49-52, pg. 76). The poet extends the simile to mimic the coming of night as we see first one arrow hitting one victim and we feel his pain, and then of a sudden there are corpses so many that fires are needed to try to ward off the night, but there is no stopping the night of Apollo now; these corpse fires keep burning. He comes slowly at first, just like night does, but then he is fully and finally there; the darkness of night does not pass, does not ease up in the slightest, until morning; just as there is no escaping the night, there is no escaping Apollo’s terror until it is complete—until the light of dawn shows at long last.

Hence, in this example we see the poet paint a dark and different portrait of Apollo. As he extends the simile of the night, we see the full development of his anger, progressing in the same manner of night, and laying hold of the Achaians just as strongly and steadfastly as the darkness. In all of this, we see the god of the sun shadowed in a new light (or lack thereof). In the poetic space we see
That Epistemological Thread

Thus, it appears that running through all of these concerns relating to language and the poetic space in the context of The Iliad is a common thread tied closely to the theme of epistemology. According to the OED, epistemology is defined as:

the theory of knowledge and understanding, esp. with regard to its methods, validity, and scope, and the distinction between justified belief and opinion; (as a count noun) a particular theory of knowledge and understanding.

That is, epistemology is essentially the study of where knowledge comes from. Indeed the seeking and exploring of these origins and wellsprings of knowledge is an integral component of the poet’s purpose in creating The Iliad and as such is of especial concern to our own study as well. Moreover, rooted as it is in the Greek, taken from the Greek word episteme, meaning knowledge, it makes sense for our examination of a Greek text to be anchored in the very word that conveys all of the nuances and gestures related to knowledge and how to discern it. The nature of our study has revealed itself to be intricately concerned with truth. Truly, the core of knowledge and the study of it is at the core of the poetic space and thus also our study of it. We use this definition of epistemology as a philosophical framework by which to reflect upon our project and support our understanding of truth and how we know it in The Iliad.

The idea of knowledge and how we know it underlies each of the points we have made. We return to the text once more to conduct an explicitly epistemological journey through the epic, focusing on the intricacies of knowledge revealed in Thetis’ and Achilles’ first interaction, the disparities in knowledge between members of the epic in Achilles’ and Agamemnon’s feud, and finally the privileged viewing and conspiracy-like insight which we the readers share with the poet as we are elevated above the status of mere mortals. For in this passage we see Thetis also speak to that trait of knowledge that is different and special. We see this notion of sight informing knowledge, unfold as she asks Achilles to tell her about what happened so that they shall “both know” even though they both already know. Moreover, this first interaction between mother and son and her insistence on hearing his sad tale repeated echoes Jenny Strauss Clay’s (1983) ideas regarding eidenai; more specifically, divine eidenai is above mortal eidenai and knowledge gained through seeing is above knowledge gained through hearing. Thetis does not want to not just hear him tell it as in a prayer, but to see him tell it to her.

Thetis, as a god, is gifted with the ability to see from afar, so she already knows what Achilles is angry about because she witnessed it actually happening to him. Because of this awareness, she is not merely asking him to repeat it to check his facts; rather, she needs to see him tell it once more—to see his emotions, rage, all that is contained inside of him that does not come across in just words but which requires sight to know. Moreover, in having him repeat all the events she is helping ground his own knowledge of his anger and of his self. As he repeats it, he sees it all, knows it again more fully, and is more aware of the true nature of his feelings. In his retelling, we begin to see already a change in his feelings and his perception of what has happened to him, for he merely mentions Briseis, the apparent origin of his anger, in passing, and not even directly by name. He says in the flow of his angry retelling that “even now the heralds went away from [his] shelter leading Briseus’ daughter, whom the sons of the Achaians gave [him]” (“Iliad”, I, 391-392). That is all the mention he makes of her, continuing on his supplication and launching then into his request for honor.

And so we and Achilles see the focus of his anger begin to change and morph into what we will see more fully in Book IX when he speaks again. Seemingly a completely changed man, he voices the innermost truths of his heart, anger, and the poem, claiming:

Fate is the same for the man who holds back, the same if he fights hard. We are all held in a single honor, the brave with the weaklings. A man dies still if he has done nothing, as one who has done much. Nothing is won for me, now that my heart has gone through its afflictions in forever setting my life on the hazard of battle. (“Iliad”, IX, 318-322)

This then, this disillusioning discovery that life is not fair and of the futility of fighting, is what lies at the heart of Achilles’ anger and is that from which he asks...
Thetis “to protect [her] own son” (“Iliad”, I, 393). When Thetis asks Achilleus to communicate again his frustrations and anger, this is what she sees; as he recreates his pain through his own words, this is what Achilleus begins to see; and as we are afforded the same view in the poetic space, this is what we see: a picture of pain that becomes clearer after we see Achilleus again in Book IX. These two portraits of the hero lend depth and insight into his character and the theme of the poem. In the poetic space, the poet grants us a privileged position and authorizes us to see and know things the mortals in the play might not. There is a unique bond between the poet and his audience, a bond strengthened and facilitated by eidenai. Moreover, the allure of the poetic space is entirely wrapped up in eidenai and the longing to not just know, but to see and know. After all, to see is to know and to know by seeing is far superior to knowing by mere hearsay.

Conclusion

Hence, we could continue to so examine these examples of poetic language which permeate the entire epic, further demarcating the poetic space and deepening our understanding of poetry and how it works within and without the pages of the poem. However, we leave off on such a focus study for now, letting these thoughts and ideas inform our reading of The Iliad (and all poetry). In the opening lines of the proem, through the speeches of figures semi-divine, divine, and mortal, and through the varying forms of language (including similes, metaphors, imagery, epithets, and so on) we have seen the poet carefully and consciously wield language to reveal the poetic space: an intermediary place between the divine and mortal realms wherein gods and humans interact, commune, access and experience truth, and create even more poetic moments. Beginning as we did with the bare definition of poetry, we have used this study of The Iliad in conjunction with the work and ideas of countless thinkers writing in the centuries since this foundational Western text to enhance and refine our understanding of poetry. In our exploration we unveiled poetry’s connection to the soul and witnessed anew its power to create the poetic space through the words of the poem. And through all of our findings we learned something about knowledge and how we can possibly attain it. On winged words we find the purpose of the poet in creating the poetic space in and through the pages of The Iliad. Such is the power of poetry as its origin in truth unlocks and shares in our very souls.

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The Unfair Twist: An Assessment of the Reader-Novel Relationship in Wilkie Collins’ The Moonstone

By April Schultz

This essay discusses Wilkie Collins’ construction of separate narrative speakers as a means of introducing the prejudices within the novel’s descriptions. It argues that these prejudices, or “misreadings,” require the reader to become self-reliant in her assessment of the information provided. Through such a requirement, the novel teaches the reader how to interpret The Moonstone and its various binary oppositions in order to reveal the novel’s underlying themes. This formula of the reader’s self-reliant interpretation incites responsibility in the reader which parallels the role of the observational detective. The reader is required to assess and analyze the information provided just as a detective would assess his evidence. That said, this essay argues that there is a portion of the novel which derails this formula, reversing the roles of the previously instituted reader-novel relationship. This essay calls this portion of the text the “unfair twist” as it is highly improbable that the reader would be able to infer the events in this section due to their incredible specificity. This section debases the reader’s previously assumed role as quasi-detective while also revealing the hand of the author -- unsettling the reader and indicating that she was never able to accurately interpret the novel.

Wilkie Collins’ The Moonstone is aptly titled, as it refers to an Indian diamond, named “the Moonstone,” which abruptly enters the lives of the Verinder family. In a Victorian age, the Oriental origins of such a gem would generate significant exotic appeal but the story of its journey to England makes the Moonstone even more foreboding. At the beginning of the novel, the reader learns that the Moonstone is part of one of “the earliest known traditions” and holds great religious significance as a symbol of “Vishnu the Preserver” (Collins, 2008, p. 1, 2). The statue of Vishnu, which holds the Moonstone inlaid in its forehead, is protected by three high-ranking Brahmins who have been charged with supervising the gem for the rest of their lives and “to the end of the generations of men” (Collins, 2008, p. 2). The Moonstone is considered a cursed gem and it is prophesied that “certain disaster” will come to any mortal who removes it from its resting place (Collins, 2008, p. 2). This prophecy is realized during an assault by the British army on Seringapatam, the location of the Moonstone. The gem is stolen from the statue and relocated to England by Colonel John Herncastle, a British soldier and relative of the Verinders. Shunned by the Verinders for his savage means of procuring the Moonstone and his otherwise uncouth behavior, Herncastle enacts revenge—or forgiveness—by willling the gem to his niece Rachel Verinder on her 18th birthday. This background information provided by Herncastle’s cousin foreshadows the unlucky events to come within the rest of the novel in relation to the whereabouts of the Indian gem.

The Moonstone immediately causes suspicion upon entering the Verinder household. Though the gem is admired for its beauty, characters within the residence are wary of its origins. This uncertainty is amplified on Rachel’s birthday by the appearance of three Indian “jugglers,” later identified as the three Indian Brahmins charged with protecting the gem (Collins, 2008, p. 70). Taking extra precautions at the end of the night, the household goes to sleep, only to discover the next morning that the Moonstone is lost. At the loss of her gift, Rachel is frenzied and refuses to discuss the meaning of her emotional outbursts. Franklin Blake is famous for his mystery-solving capabilities, he becomes an unwelcomed outsider in the Verinder residence. As he continues to divulge more and more of the mystery, the characters like him less and less. Ultimately he leaves the household and all of its characters with the
mystery unsolved, thus diverting the deductive responsibilities to the collective group of characters. The plot of the novel further progresses through such characters’ investigations and the events which consequently surround them.

First published in Charles Dickens’ magazine All The Year Round in 1868, The Moonstone lies betwixt the publications of Edgar Allen Poe’s “The Purloined Letter” (1844) and Arthur Conan Doyle’s Sherlock Holmes mystery, A Study in Scarlet (1887). At the date which the novel was written, the police force was still in its beginning organizational stages. The London Metropolitan Police force was established only 37 years prior to the first installment of The Moonstone. At the time, police were not highly recognized for their detective abilities as much of their work primarily consisted of maintaining order and punishing criminals (Metropolitan Police, 2014). Thus, The Moonstone joins the Purloined Letter and other similar texts in the early representation of the talented, observational detective figure.

As such, The Moonstone utilizes many of the mechanical conventions seen in similar texts, such as red-herrings, dead-ends, and spotlighting of the detective to tease and enthuse his mystery-loving audience. He utilizes what D.A Miller calls in From Roman Policier to Roman-Police the “power-play” of the detective story which emphasizes the possibility that “everything might count;” every small detail, such as the smudge of paint on Rachel Verinder’s door-panel, is important to the recovery of the Moonstone (Miller, 1980, p. 153, 154). As is customary, Collins then allows “only a few items [to] count while the rest relapse into insignificance” (Miller, 2008, p. 153).

Though he utilizes aspects of this now familiar detective structure, Collins includes many atypical devices which make the use of characteristic detective techniques within The Moonstone unique amongst its peers. Rather than maintaining the authority of the “outside” detective figure, Collins eradicates his presence in the novel by undermining his observational abilities. The detective figure, Sergeant Cuff, who utilizes similar techniques to that of Poe’s Dupin, fails to solve the mystery (Miller, 1980, p. 155). Due to this, the mystery is placed into the hands of the novel’s community of characters - a move which Miller argues “diffuse[s] and disperse[s] the function of detection,” thus placing the detective responsibility on the “inside” characters who are consequently unaware of their deductive capabilities (Miller, 1980, p. 155, 159). By debasing the effectiveness of the observational detective, The Moonstone highlights the significance of science and experimentation as a provider of legitimate evidence. The mystery is solved not through an 'all seeing detective’ but during the climactic experimentation section which introduces the use of science as a deductive tool. This section is unique because the experiment is implemented in the Verinder residence, a domestic atmosphere. Science is thus proven as a deductive mechanism using the “inside” characters rather than the “outside” character of the detective figure. Through this, the novel’s use of science enters and stays in the domestic realm.

Science is thus proven as a deductive mechanism using the “inside” characters rather than the “outside” character of the detective figure

Miller argues that The Moonstone “invokes the norms of detective fiction precisely to rework and pass beyond them” (Miller, 1980, p. 164). Collins’ manipulation of the epistolary tradition emphasizes the validity of Miller’s statement. An epistolary novel structures a narrative through the use of letters; a device which “thrives chiefly upon sentiment” (Brown, 1941, p. 183). Similar to this tradition, The Moonstone is segmented into separate narratives which are presented to the reader as having been written by individual characters within the novel. The character, Franklin Blake, takes it upon himself to become the “editor” of the novel by recruiting the separate narrators towards the common goal of accumulating and documenting the events related to the Moonstone (Yacobi, 1987, p. 354). He hopes this process will aid in the discovery of the gem’s whereabouts. Collins breaks from the traditional letter format of an epistolary novel by allowing his narrators to address readers directly. Each of the narrators is aware of the purpose for which they are writing and proves this by professing his or her intent and eligibility to the reader at the beginning of each new narrative. This division of the novel allows Collins to develop profound characterization of each narrator and creates a broader spectrum of reader deception.

In her text Narrative Structure and Fictional Mediation, Tamar Yacobi indicates that Collins’ use of this epistolary tradition formulates what she considers the “self-conscious speaker,” which is used as a means of “disassociating” Collins from the novel’s narration (Yacobi, 1987, p. 339). Such a speaker is aware of his
function as a narrator to an audience, as is indicated by
the speaker's direct address to the reader. By including
such speakers within The Moonstone, Collins uses what
Yacobi calls the "perspectival mechanism" to formu-
late "disharmony" in the reader's interpretation of the
plot through introduction of the "unreliable mediator"
(Yacobi, 1987, p. 336). Such a mediator "simulates the
disharmony within the text" by providing important
textual information through a heavily subjective lens.
In The Moonstone, the "self conscious speaker" and the
"unreliable mediator" are one and the same - encom-
passed in each individual narrator.

Such mechanisms are most evident through the
recurrent misreading within the novel. The term 'mis-
reading' refers to characters' misinterpretation and
misjudgment about people, situations, and events with-
in The Moonstone. The organization of the novel into
separate narratives allows for each narrator to present
his or her own bias and prejudice. Due to this, readers
learn that no narrator can be fully trusted to divulge
an objective truth. The reader becomes aware that the
narrator is an "unreliable mediator" and thus she must
sift through a variety of misreadings to discover the ob-
jectivity of a situation and to determine whether each
narrator is capable of being trusted. That being said,
without each unique misreading, the reader would not
be able to judge the twofold themes within the novel.

The analysis of binaries within the text, epitomized
in characters such as Ezra Jennings and settings such
as the Shivering Sands, reveal the novel's larger themes
and social commentary. The reader must first identify
the formulaic misreading of each narrative before she is
able to distinguish these binaries and identify the nov-
el's underlying themes. The Moonstone intentionally
utilizes this structure to enable the audience to effect-
ively read the novel and its binaries. The narratives of
Gabriel Betteredge, Drusilla Clack, Franklin Blake, and
Ezra Jennings emphasize this structure and increase
the reader's awareness of the relationship between
the unreliable narrator and her own interpretations.
Through this emphasis on characterization of the nar-
rators within The Moonstone, the novel develops the
reader's sense of control over her own understanding
of the novel's plot and encompassing themes.

Decoding Narrative Formulas

Before gaining this sense of control, the reader
must discover the formula of each narrative. She must
reveal the specificities of each narrator's misreading
and the information they present in relation to their
biases. Such analysis begins immediately in the nar-
ration of Gabriel Betteredge. As the first narrator and
the primary provider of background information, the
reader is left with little choice but to trust Betteredge's
narration as valid knowledge. He is a significant figure
in The Moonstone as he provides the reader with a
surplus of information regarding the Verinder family,
the Moonstone, and the initial events surrounding the
Moonstone. That being said, Betteredge, like all nar-
rators in the novel, is subject to misreading. He is not
shy about expressing his opinion of people and events;
thus his descriptions of characters within the novel are
brimming with personal observation. Such judgment is
evident in his description of Sergeant Cuff as like to "a
parson" or "an undertaker" (Collins, 2008, p. 96). Due
to this lack of objectivity, the reader must assess Bet-
teredge's personality in order to determine whether his
judgment of character should be taken as factual. This
task is proven necessary by Betteredge's tendency to
misjudge the integrity of places, events, or individuals
based on surface appearances.

Though many of the characters regard Betteredge
as a good source of wisdom, they also tend to treat
him as a sort of quaint relic. Franklin Blake describes
him as a "dear old friend of the happy days that were
never to come again" (Collins, 2008, p. 292). While this
statement is intended to address the more recent times
before the Moonstone, it is also an accurate descrip-
tion of Betteredge. He is a representation of an earlier
time - a person from whom the reader and the novel's
characters learn, but also a person at whom they chuck-
le. The fact that Betteredge's time is "never to come
again" indicates that a new age has begun. The reader
is intended to think lightly and fondly of "Betteredge
philosophy" because he is a character stuck in an "old
age" way of thinking which does not fit in the "new age"
represented by the novel's younger characters (Collins,

Much of the "Betteredge philosophy" stems from
his reverence for Robinson Crusoe. Betteredge devotes
much of his time to reading and re-reading Robinson
Crusoe in order to find amongst its pages some uni-
versal truth, treating it in a manner usually reserved for a
sacred text like the Bible. Betteredge's search for truth
in his favorite book is one of the first indications of his
misreading within The Moonstone. When referring
to Robinson Crusoe as a provider of moral direction,
Betteredge often references the same section of text
multiple times. As noted in the Oxford World Classics
edition of The Moonstone, the section most referenced by Betteredge is the part of the narrative where “Robinson is surprised by seeing the imprint of a foot in the sand” (Sutherland in Collins, 2008, p. 473). Though Betteredge is surprised by seeing the imprint of a foot in the sand, Sergeant Cuff’s detection of Rosanna Spearman’s footprints in the sand, and most poignantly, Blake’s discovery of himself as the thief. Each of these scenes reveal significant information and often physical evidence which move the plot forward and educate both the reader and the characters involved. These events emphasize Betteredge’s misreading of the Shivering Sands. The interjection in the quote above, “as it seems to me,” affirms his subjectivity and his position as a “self conscious speaker.” It reminds the reader that the information provided is particular to the narrator; it is Betteredge’s opinion, thus emphasizing the importance of the reader’s constant awareness of narrator misinterpretation. Betteredge merely provides the reader with surface descriptions of the people and events; the reader must decipher the accuracy of such situations based on her own knowledge of the individual, setting, or event in relation to actions and situations within the rest of the text.

Betteredge similarly misjudges the character of Ezra Jennings. Jennings is a physician’s assistant of Indian descent who works under Mr. Cane, the quirky doctor trusted with the medical care of the Verinder family. Jennings has a very unusual appearance and he is described by Blake as “the most remarkable-looking man [he] had ever seen” (Collins, 2008, p. 3119). While Betteredge depicts the setting as a “horrid retreat” that should be avoided, later events within the novel reveal the Shivering Sands as a key component of the progress of the plot and a source of important information (Collins, 2008, p. 22). Whenever a character or characters visit the Shivering Sands they are enlightened with new information. Such scenes include the conversation between Betteredge and Franklin Blake regarding the origins of the Moonstone, Sergeant Cuff’s detection of Rosanna Spearman’s footprints in the sand, and most poignantly, Blake’s discovery of himself as the thief. Each of these scenes reveal significant information and often physical evidence which move the plot
help relieve Blake’s stress and protect his reputation. Through his science and experimentations, Jennings proves Blake’s innocence and moves the plot toward a new conclusion.

Drusilla Clack also proves to be a significant example of misreading within The Moonstone. From the very beginning of her narrative, she presents herself as a devout Christian, with “invariable” documentation of daily events within her diary. Her narrative is populated by various references to the Bible and other Christian texts; no situation of which she narrates is unaffected by her religious sensibilities (Collins, 2008, p. 191). She also distributes various reformation tracts to individuals she believes are of need. While all this is true, Clack’s extravagant and exaggerated language used to describe herself and her situation make the validity of her assessments questionable, attributes which Miller describes as “blatantly self-betraying” (Miller, 1980, p. 169). Clack regularly uses interjections which include excitable punctuation such as her statement “pray let me explain in the grossest terms!” when explaining the importance of her diary as a guide in the narrative (Collins, 2008, p. 192). In this section, she also describes herself as a “poor labourer” and asserts that she is “isolated and poor” and “not infrequently forgotten” (Collins, 2008, p. 191, 192). Her choice to include these details immediately makes the reader wary of her character. They are personal details which are irrelevant to the events related to the Moonstone and give the impression that Clack is fishing for sympathy. The reader also knows these assertions to be false, as Clack is a member of a very wealthy family and had been previously mentioned as a guest at Rachel’s birthday party. She is thus neither poor, isolated, nor forgotten. These elements of her narrative indicate that not only must the reader make her own assessments about Clack’s descriptions of events, but they must also interpret her self-description.

As stated earlier, Clack is a narrow-minded character who applies religious significance to nearly all of the situations she depicts. Such a mindset limits her ability to accurately interpret social situations such as that of her aunt, Lady Verinder’s, illness. When Lady Verinder first reveals the nature of her illness, Clack is overjoyed. She states, “Little did my poor aunt imagine what a gush of devout thankfulness thrilled through me as she approached the close of her melancholy story” (Collins, 2008, p. 213). Clack is delighted by the opportunity to “providentially” lead her aunt during her final days on earth (Collins, 2008, p. 213). The irregularity of such a reaction is reinforced by Lady Verinder’s “puzzled and frightened” look (Collins, 2008, p. 214). Clack has taken Lady Verinder’s misfortune and developed it into an opportunity for herself. Such an example demonstrates the necessity of the reader’s judgment of Clack’s information in relation both to her bias as an extreme Christian as well as her self-conceited character.

One of Clack’s more significant misreadings is the character of Godfrey Ablewhite. As a gentleman of status who participates in female charities such as Clack’s “Mother’s-Small-Clothes-Conversion-Society,” Godfrey easily charms many of the women with whom he interacts, including Clack (Collins, 2008, p. 193). Within her narrative, she is a strong advocate for Godfrey’s character and, when scrutinized by Mathew Bruff in chapter three of her narrative, Clack heartily defends Godfrey’s innocence. There is also evidence that Clack has a crush on Godfrey which further influences her opinion of his character. She describes him as possessing “heavenly gentleness” and depicts his entrance into the luncheon with Lady Verinder as “special providence” (Collins, 2008, p. 201, 202). Her “hero-worship” of Godfrey, indicative of what Miller describes as the “sexual repression of an old maid,” is further emphasized by her excitement and “pure ecstasy” upon touching Godfrey’s hand to her lips (Miller, 1980, p. 169; Collins, 2008, p. 211). Clack’s opinion of Godfrey is colored by romance and thus obscures the possible clues that may have revealed his guilt as the thief.

Though the presence of misreading in important narratives such as those of Betteredge and Clack seem expressly intended to cause confusion, it is through these misreadings that the reader is able to discover accurate information. Due to the variety of biases within the narratives, the reader must take on the role of interpreter of the novel, effectively becoming self-reliant and self-trusting. She must distinguish the character of each narrator and peel back the layers of judgment which affect the depiction of people, events, or settings, such as the layers of Clack’s narrative which include religious enthusiasm, tendency toward self-conceit, and emotional nearsightedness.

**Determining Narrative Trustworthiness**

While each narrative is similarly laden with such misjudgments to be assessed by the reader, the novel distinguishes which narrators are more trustworthy than others by guiding the reader’s logical and emotional attachments. The accuracy of the information
provided by each narrator is largely dependent upon the narrator’s position in the “new age” versus “old age” binary. As previously stated, Betteredge is a character of the “old age.” He is hindered by his romantic interpretations and fixations, deriving much of his philosophy from a fictional text. Such a character, though amiable, requires a significant amount of interpretation from the reader. On the other hand, Ezra Jennings is a character of the “new age” who proves more easily trusted based on his ability to formulate scientific evidence and communicate information with the heavy influence of relevant references. Science as a “new age” principle appeals to the reader’s logic and takes precedence over observation and opinion as a legitimate source of accurate information. Thus the characters most closely associated with such principles require less interpretation on the part of the reader.

Though this is true, sentiment is also a significant determining factor of a narrator’s trustworthiness. Betteredge, though largely subjective, is trusted more readily than Clack because he seems to have the best interests of the Verinder family in mind. He is sincerely willing to provide the most accurate information that he can because he is emotionally invested in the welfare of the characters in the novel. Such love for Lady Verinder and her family is developed early in “The Story” when he states “It was all one to me where I went, so long as my mistress and I were together” (Collins, 2008, p. 10). Clack on the other hand does not inspire such emotional attachment. Her narrative is largely based on how she benefits from writing the narrative, as seen when she explicitly mentions the money which Blake offers her; “Without my diary, I doubt... I could have honestly earned my money” (Collins, 2008, p. 192). Clack’s continued interpretation of events in relation to her own benefit marks her as hypocritical and less trustworthy in the eyes of the reader.

The novel enacts individualized language to aid the reader in her assessment of narrative prejudice. Miller explains that “characters may be known in language because it is incapable of ever escaping from its own veridicity,” meaning that a narrator’s use of consistent language aids in the reader’s ability to interpret his or her subjectivity (Miller, 1980, p. 168). In the case of Betteredge, his continued use of idiosyncrasies and his naivety towards emotionally sensitive situations, such as Rosanna Spearman’s love of Blake or Rachel Verinder’s indifference to Godfrey, reveal the “weight” the reader must “give to [his] cognitive claims about other matters in the novel” (Miller, 1980, p. 168). Similarly, Clack continually “aggrandizes” herself and her ‘poverty,’ merely emphasizing her resentment and indicating to the reader the specific need for evaluation (Miller, 1980, p. 169). Such language “neutralizes” Clack’s over-the-top explanations, thus allowing the reader to assess the accuracy of her information (Miller, 1980, p. 169). This narrative technique established in The Moonstone proves that the reader is capable of extracting accuracy from even the most unreliable narrators, but only through proper appraisal of the narrator’s linguistic habit.

**Recognizing Larger Themes**

Such assessment of trustworthy attributes as well as the ability to distinguish a narrator’s individual misreading allows the reader to evaluate the novel’s literary techniques and larger themes. Upon accurately assessing the biases and misjudgment of the narrator, the reader is rewarded with segments of information which develop a greater understanding of the novel’s internal social context. In The Moonstone, these themes are often revealed through the shifting of previously instituted binaries.

One such instance is realized through analysis of Betteredge’s description of the Shivering Sands. In “The Story” he states,

> The sand-hills here run down to the sea, and end in two spits of rock jutting out opposite each other, till you lose sight of them in the water. One is called the North Spit, and one the South. Between the two, shifting backwards and forwards at certain seasons of the year, lies the most horrible quicksand on the shores of Yorkshire. At the turn of the tide, something goes on in the unknown deeps below, which sets the whole face of the quicksand shivering and trembling in a manner most remarkable to see, and which has given to it, among the people in our parts, the name of the Shivering Sand. A great bank, half a mile out, nigh the mouth of the bay, breaks the force of the main ocean coming in from the offing. Winter and summer, when the tide flows over the quicksand, the sea seems to leave the waves behind it on the bank, and rolls its waters in smoothly with a heave, and covers the sand in silence. A lonesome and a horrid
retreat, I can tell you! No boat ever ventures into this bay. No children from our fishing-village, called Cobb’s Hole, ever come here to play. The very birds of the air, as it seems to me, give the Shivering Sand a wide berth. (Collins, 2008, p. 22)

The fact that the Shivering Sand lies between the two “spits” indicates a metaphorical division. In naming the formations “North Spit” and “South Spit” the passage distinguishes the two as distinctly opposite of one another. Such opposition parallels one of the contrasting forces of this essay: the “old age” and “new age” worlds. Like the two spits, these two worlds are immobile, solid and imposing, glaring at each other from adverse sides. Though definitively separated, the two contending forces are linked by a mysterious and unpleasant intersection: the Shivering Sands. This intersection is representational of the overarching binary instability seen in the novel. In a world where stability is only gained from taking a definitive stance and standing on one side of the binary, instability is created through the intersection of ideas and expansion of opinion. To maintain stability, each narrator maintains his or her stance, providing information from such a singular point of view. This then leaves the reader in the unstable, intermediary position as she becomes aware of each viewpoint and is simultaneously wary of admitting a definitive side. The reader finds herself stuck in the metaphorical quicksand of narrative interpretation. She must develop her ability to analyze each narrative in order to master this perilous mediation.

Readers learn that no narrator can be fully trusted to divulge an objective truth

The Shivering Sands displays such tension by becoming an icon of uncertainty and hesitation. Even the name of this landscape proves significant as the “shivering” of the sand indicates inconsistency. While the spits on either side of it remain stationary, the Shivering Sand trembles and wavers between them. As a median between two opposing worlds, the Shivering Sand is a representation of the novel’s hesitance to establish loyalty to either the “old age” or “new age” it presents. Betteredge’s above description of the sand “shifting backwards and forwards at certain seasons of the year” further emphasizes this hesitation. The novel is literally “shifting” between “old age” and “new age” ideals by presenting the reader with characters and plot from both worlds.

The “wide berth” given to the Shivering Sand represents many of the characters’ stubborn adherences to the ideals of their “ages.” Much like the solid rock spits, many characters, such as Mathew Bruff, Druscilla Clack, and Betteredge himself, remain static and refuse to alter their thinking to incorporate the ideas from the contending side. Bruff is entirely focused on the validity of law and refuses to see science as a logical solution during the novel’s experimentation; Clack’s loyalty to her self-constructed brand of Christianity blinds her from reality and progress; Betteredge’s worship of Robinson Crusoe keeps him grounded in a fictitious past. These characters avoid the Shivering Sand because it is both a link to the contending side and a challenge to the present binary of old and new. The Shivering Sands make the characters uncomfortable because it disturbs the simplicity of this binary. Betteredge’s statement about the “great bank” of the Shivering Sand which “breaks the force of the main ocean coming in from the offing,” represents this challenge. The bank is dulling the ocean’s power, suggesting this link between the “old age” and “new age” is lessening the strength of each argument. The idea of such a powerful “force” also suggests danger: Betteredge says “No boat ever ventures into this bay. No children... ever come here to play. The very birds of the air, as it seems to me, give the Shivering Sand a wide berth.” This shows that the native people and creatures of the area are afraid to associate with the Shivering Sands. Even animals such as “birds of the air” give this place a “wide berth” because the Shivering Sands are unnatural and foreboding. Through this, the novel presents this link between the two worlds as an insecure and unstable concept.

As previously stated, the Shivering Sands is a significant source of information to the characters within the novel. Through close analysis of Betteredge’s description, the Shivering Sands is also capable of providing significant information to the reader. In sifting through the layers of Betteredge’s distaste for the landscape, one may infer that the novel declares that combining the ideals of the “old age” and “new age” worlds to be more effective than a hierarchy in favor of one or the other. In this case, compromise provides the best solution and older ideals are conserved rather than supplanted.

The Shivering Sands are a representation of the reader’s relationship to each narrative as well as any
number of the contesting binaries within The Moonstone, as presented here through analysis of the “old age” and “new age” worlds. It becomes a tangible image of the reader’s necessity for narrative judgment as it proves inconsistency and contesting binaries exist in the novel. The presence of Betteredge’s description of the Shivering Sands early in “The Story” indicates that it is warming to the reader about the need for analysis. The significant length and mystery of the passage draws attention to itself, catching the eye of the reader and further revealing itself as a beacon for reader interpretation. As the reader continues to progress in her ability to interpret each narrator’s misreadings, the importance of the Shivering Sands becomes more evident. Each time the characters return to this setting, the reader is provided with the opportunity to evaluate the significance of the mediation between the opposing forces, confirming her ability to interpret other binaries and inconsistencies within the novel.

Similar confirmation can be gained through analysis of Ezra Jennings. His persona generates discomfort and hesitation similar to that of the Shivering Sands because his origins and physical appearance disrupt the solidity of previously constructed binaries. Blake describes him by stating, “Judging [Jennings] by his figure and his movements, he was still young. Judging him by his face, and comparing him with Betteredge, he looked the elder of the two” (Collins, 2008, p. 319). This description once again identifies the opposing worlds of the “old age” and “new age” as physically represented in the body of Ezra Jennings. Blake, a member of the “new age” recognizes Jennings’ youthfulness. In comparing him to a member of the “old age,” Betteredge, he identifies Jennings’ seniority.

Jennings’ irregularity is further emphasized in the description of his “piebald hair” (Collins 320). Blake explains the eccentricity as

…a quantity of thick closely-curling hair, which, by some freak of Nature, had lost its colour in the most startlingly partial and capricious manner. Over the top of his head it was still of the deep black which was its natural colour. Round the sides of his head—without the slightest gradation of grey to break the force of the extraordinary contrast—it had turned completely white (Collins, 2008, p. 319)

This introduces another binary in Jennings’ character: black and white. These contrasting colors, being a basic contradiction, could simply be seen as further portrayal of the opposing forces at work. This representation visibly brands Jennings as a walking contrast. That being said, the aggressiveness in which Blake describes the relationship between white and black indicates a deeper connotation. Phrases such as “freak of Nature,” “break the force,” “startlingly,” and “extraordinary contrast” invokes intensity in this passage directed towards the white discoloration of Jennings’ hair. Due to this, the white seems like an imposing force. As the black color of his hair is “natural,” the white is the “freak of Nature,” giving him his bizarre appearance. This is further emphasized by the lack of “gradation of grey” between the two colors. They are directly fighting with one another without any sort of mediation. Like the birds’ avoidance of the Shivering Sand, this unnatural coloration in Jennings’ hair makes many of those who interact with him uncomfortable. Such is evident in Betteredge’s claim that his “piebald” hair is a leading cause for why “nobody likes him” (Collins, 2008, p. 320). The aggressive clashing of the two colors cause hesitation and once again conjures a sense of danger in the cohesion of opposing worlds.

Jennings is a link between these two opposing worlds and, like the Shivering Sands, he has become a source for a variety of interconnected binaries. As the reader follows Jennings throughout the novel, one sees this unsteady mixture of opposing forces take its toll. Not only is this indicated by Jennings’ wizened, old face and his “piebald” hair, but also by his sickness. Jennings explains to Blake the reason he knows so much about opium is because he is an avid user. This is due to a debilitating illness which causes him great pain. This illness, much like the aggressiveness of his white and black hair, implies a battle of opposing forces within Jennings’ body. His character is such a mix of contrasting worlds and concepts that he is no longer physically capable of containing such opposition. Through this novel reveals that, even though the partnership between the worlds of the “old age” and “new age,” East and West, black and white, are the best sources of valid information, they cannot and will not be successful. This becomes evident once again in Jennings’ conversation with Blake about his origins. He reveals that he was accused of a crime in his home country and thus traveled to England in hopes of escaping it. This was unsuccessful and he was unable to maintain a position until he met his current employer Mr. Candy. Still, he was unwelcomed by locals and “vile slander” continues to follow him (Collins, 2008, p. 374).

These binaries within Ezra Jennings and the larger
themes within the novel are only evident through the reader’s assessment of the descriptions provided. The depiction of both the Shivering Sands and Ezra Jennings express danger and discomfort, implying that the reader should be wary and maintain a distance from this setting and character. The reader-narrator relationship suggests the opposite. Due to the warnings from Betteredge to keep a “wide berth,” the reader must consequently look even closer to decipher the information which the novel presents. Much like the Shivering Sands, the reader is wading through the quicksand between two opposing sides: the narrator’s bias and the novel’s truth. Though this makes it difficult for the reader to decipher the legitimacy of information in the novel, it allows the analysis of both sides of each binary. This further emphasizes the previously constructed idea that the novel calls for compromise in each developed binary, including that of the reader versus the novel.

The Unfair Twist

All of these above misreadings and binaries seem to direct the reader towards the turning point in the novel, namely the experimentation scene in Jennings’ narrative. Though it may not be the climax of the novel, as it is difficult to assess the climax within a sensation novel such as The Moonstone, it is the point in the story that provides the largest amount of validated evidence. Within the context of the novel, this section of the text confirms opium to be the cause for Blake’s inability to remember his actions performed on the night of Rachel’s birthday. Rachel witnessed his removal of the Moonstone from her boudoir yet Blake does not recall anything from that night except that he slept remarkably well. Jennings tells Blake he suspects the now mentally unstable Mr. Candy of playing a trick on him that night. He believes that Mr. Candy slipped drops of opium in Blake’s drink and his actions during the night were a side effect. Through careful preparation, Jennings and Blake are able to recreate the situations and actions of the fateful night, proving Jennings’ opium theory to be correct.

This experiment and the events surrounding it provide the reader with explanations of many previous actions and events within the novel. It explains Rachel’s angry actions and emotions towards Blake as well as the reason she refused to provide legitimate explanation for her emotional extremity. It also exposes Mr. Candy’s trickery and explains the cause of Blake’s atypical good night’s sleep. While all of these elements are clarified, this section of the text proves an unfair twist for the anticipating reader. The specificity of the crime’s circumstances reveals that it would have been nearly impossible for the readers to accurately infer the correct conclusion of the mystery. Mr. Candy’s amnesia and Ezra Jennings’ ability to appear at the exact instance when he is needed are situations that are “impossible to calculate” (Miller, 1980, p. 159). Other than the fact that Mr. Candy is a doctor, no allusions were made to lead the reader to suspect opium was involved in the theft of the Moonstone. Such an atypical and specific twist in plot leaves very little room for deduction and makes it improbable that the reader could make any accurate assumptions.

This section of text also further confuses the innocence of characters involved. Though the experiment was intended to prove Blake’s innocence regarding his own actions, it also exposes him as the thief of the Moonstone. Mr. Candy played a significant role in the theft as well. If he had not secretly placed opium in Blake’s drink, Blake likely would not have removed the Moonstone from the boudoir; and Godfrey would not have been provided such a tempting and fortuitous opportunity. Such confusion makes it difficult for the reader to pinpoint the criminal even after all has been revealed. Though Godfrey removed the Moonstone from the Verinder residence, he was not the sole cause of the Moonstone’s disappearance.

This unfair twist in the novel emphasizes the reader-novel relationship. The previously developed binary of the reader’s accurate interpretation and the novel’s misreading shifts. Up until this section, the reader was able to trust her own judgment knowing she must sift through the various misreadings of the narrators to discover accurate information. The unfair twist reverses the roles of the reader and novel, making the novel the source of accurate information and revealing the reader’s misreading of the text. Like the other contrasting forces within the novel, this shift in the larger binary causes tension. The role reversal makes the reader more wary and suspicious of the text. It has derailed the previously instituted reading techniques and thus leaves the reader unsure of how to continue identifying accurate information.

This tension and heightened hesitancy also incites a broader awareness in the reader. Her original awareness of the misreading of unreliable narrators shifts to
an awareness of the participation and manipulation of
the author as the originator of the text and its meaning.
Yacobi explains that the author’s hand is revealed in
instances when “the reader encounters some incongru-
ity” within the narrative (Yacobi, 1987, p. 346). In this
case, the incongruity is the introduction of the elabo-
ately specific experimentation and the culmination of
inconceivable coincidences within the novel’s plot. It is
in this instance that the reader is reminded of the au-
thor’s control of the novel. The previously established
“mediation-gap,” a distancing of the author from the
reader through the use of a subjective speaker, closes
and the reader becomes aware that the formula of the
separate narratives is a mechanism of authorial control
over the reader’s emotions, senses, and trust (Yacobi,
1987, p. 336). Such was previously masked by the em-
phasis on characterization of narrators and the reader’s
consequential need to analyze situational misreadings.
This revelation not only dissolves the reader’s sense
of control but also diminishes the illusion of the ficti-
tious world of the novel. The reader is shaken because,
in this instance, she is aware of her separation from
the fictional characters with whom she has previously
connected.

Much like the dismissal of the detective figure in
“The Story” the novel enacts an unexpected modifica-
tion to the previously instituted assumptions of the
reader. Up until this point, the reader has taken on the
role of the observational detective, supposing that, if
she reads carefully and assesses the information pro-
vided, she will be capable of ascertaining clues to the
novel’s ultimate conclusion. The suspicion and confu-
sion during and after the unfair twist derives from the
reader’s realization that she never held such a role. She
realizes that she didn’t have control over her under-
standing of the plot, she was not the founder of accura-
cy, but she was fit into the author’s narrative construct.
Through this manipulation of plot and reader emotion,
Collins has created a multi-dimensional red-herring.
He has not only directed the reader to suspect innocent
characters within the novel but has led her to wrongly
believe that she may trust her own interpretations.
The unfair twist is the grand realization of this manip-
ulation. In this instance, the reader understands it was
impossible for her to accurately read The Moonstone
from the very beginning.

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Female Characters in August Wilson’s Plays:  
*Fences, The Piano Lesson, and Two Trains Running*  

By Lindsay Phillips

This research examines the role of female characters within the dramatic works of playwright August Wilson. The three works discussed are Wilson’s *Fences, The Piano Lesson, and Two Trains Running*. Similarities in the relationships between female and male characters are analyzed in terms of the main female character of each play: Rose, Berniece, and Risa. The female characters exhibit comparable qualities in the contrasting time periods and situations of the three plays. The female characters of August Wilson’s plays are found to be quite unique and vital to the plays in which they reside and the men whom reside with them.

The female characters portrayed in August Wilson’s plays, while from different time periods and social situations, are found to be quite similar with closer examination. The women in Wilson’s *Fences, The Piano Lesson, and Two Trains Running* live in worlds in which they are constantly surrounded and controlled by men. Despite this, they still manage to define themselves as strong and unique women. Regardless of their relationship to the men in the plays, they form essential bonds with these characters. Although there are few, August Wilson depicts multifaceted women who contrast and provide for the men around them, making them greatly important to both the men and the worlds of the plays.

Wilson’s women are a constant source of support for their male counterparts. Wilson’s men receive emotional, physical, and financial support from their women, who often receive little in return. *Fences*’ Rose provides emotional and physical support for her husband, Troy. She encourages his work ethic and relationships with his children, allowing him to sustain the lifestyle he enjoys, even if it means giving up pieces of herself to satisfy Troy (Marra, 1994, p. 150). When her brother, Boy Willie, comes to town in *The Piano Lesson*, Berniece helps to financially support herself and the male characters by working for a wealthy, white family. Although her employment opportunities are limited, Berniece helps to financially support her family. She does more than provide financial support, however; she also emotionally supports Avery in his attempts to open his own church. He is encouraged by her guidance and the possibility of her acceptance to his marriage proposal. Perhaps the greatest symbol of support in Wilson’s three plays is Risa, from *Two Trains Running*, whose very job as a waitress involves service to those around her. She is employed at Memphis’ diner; helping to support his business even when it failing. Her interactions with the men who come into the diner daily also reveal a certain amount of emotional support that she provides for them. While the extent of and reasoning for support provided by these three women may differ, it is unquestionable that the recipients of their support would suffer a great loss without their presence.

The compassion of Rose, Berniece, and Risa is frequently seen, but rarely appreciated in Wilson’s plays. The women extend kindness and “attempt to establish relationships with men on their own terms” (Elam, 1994, p. 165). Rose continues to care for Troy’s brother Gabriel, although Troy shows resentment toward him for moving out. When it becomes apparent that Gabriel may not be eating, Rose insists that he stay for dinner with Troy and herself. Risa is similar in her relationship with Hambone, who is misunderstood by other town members because of his mental deficiency. Risa provides food for him whenever he comes to the restaurant and even gives him a wool coat, explaining that “it be cold out there sometimes.
at night” (Wilson, 1990b, p. 14). The compassion shown by Berniece is subtler; she displays kindness toward her daughter, whom she hopes will have a brighter future than herself. Her loyalty towards Doaker, her uncle, is shown in her defense of him against Boy Willie, who takes advantage of the family’s generosity. The greatest act of compassion from the three women is seen when Rose accepts Troy’s illegitimate daughter as her own. Although Troy had an affair that resulted in a child, she puts the child’s life before her own pride and agrees to raise the baby. The compassion seen from the women reveals their extraordinary natures. Without their acts of tenderness, it is uncertain as to where the lives of the male characters may lead. The women are a much needed source of gentleness in the rough world in which all of the characters reside.

While the male characters receive understanding from the women, they fail to reciprocate such a quality and instead measure their worth in terms of attractiveness and marriageability. Troy brags about his sexual relationship with Rose to his close friend Bono, implying that she is a woman of value because she allows him to meet his physical needs. Doaker and Boy Willie fail to grasp Berniece’s mourning for her deceased husband and instead, encourage her to marry Avery so that she will once again have a man in her life. Boy Willie also comments that Berniece’s daughter, Marethia, is “sure getting big...and just as pretty as she want to be” (Wilson, 1990a, p. 49). Even as a child, a female’s worth is determined by her physical appearance. Risa, in Two Trains Running, rebels against such objectifying, which she has experienced from most men in her life since childhood. In the diner, Memphis notes that “[a] man would be happy to have a woman like [Risa] except she done ruined herself” (Wilson, 1990b, p. 31). By altering her physical appearance, Risa has decreased her value in the eyes of men. Although this was the result she desired, the men feel that “something ain’t right with a woman don’t want no man. That ain’t natural” (Wilson, 1990b, p. 31). Still, she is seen as a prize throughout the play in the eyes of Wolf and Sterling (Marra, 1994, p. 153). The men seek to simply categorize the women in their lives instead of taking the time to understand them.

August Wilson includes few women in Fences, The Piano Lesson, and Two Trains Running so as to portray a contrast between them and their male counterparts. Rose Maxson lives her life in the present, appreciative of what she has, while the men around her are fixated on either the future or the past. Troy is constantly attempting to relive his former years wherein he was a young and talented baseball player. His opportunities to profit from his talent were limited because of his race, and he refuses to accept Rose’s assurance that “[t]imes have changed...[he] just came along too early” (Wilson, 2014, p. 1412). Rose and Troy’s son, Cory, on the other hand, is preoccupied with the possibility of playing football in college, which causes him to disregard his present responsibilities. The men’s failure to accept the present moment causes a rift between them, which not even Rose can remedy. Berniece and Risa contrast their men by being more clearheaded and practical. Many of the men in Wilson’s plays are consumed with the idea of suddenly attaining wealth, often without working to earn it. The men in Two Trains Running play numbers, hoping to win a cash reward, while Risa admits that she “don’t know why people waste their money playing numbers. Time you hit you just getting back what you put in” (Wilson, 1990b, p. 3). Berniece struggles with the similarities between her male family members, saying that they’re “all alike. All this thieving and killing and thieving and killing. And what it ever lead to? More killing and more thieving” (Wilson, 1990a, p. 52). The men frustrate her because they refuse to learn from their own mistakes or those of their forefathers. The women do not have the luxury of being impractical because they are forced to care for themselves and the men around them.

Wilson's female characters are given an added complexity that becomes apparent in the way they are perceived by the men versus the way they are perceived by the audience

Wilson's female characters are given an added complexity that becomes apparent in the way they are perceived by the men versus the way they are perceived by the audience. They are not “perceived as purely one-dimensional or as victims” (Shannon, 1995, p. 108). Rose works hard to keep the Maxson house running, and her devotion to her family is made increasingly obvious because of Troy’s lack thereof. To Troy, Rose is seen “not as an individual entitled to pursue her own needs but as a functionary who fulfills expected roles” (Marra, 1994, p. 148). However, from the audience’s perspective, Rose attempts to create an ideal family for herself despite challenging situations because she is determined to find happiness. Her need for love is emphasized by the obstacles she confronts to achieve her objective. In Wilson’s The Piano Lesson, Berniece’s main conflict comes in the form of her brother who seeks to sell the family’s piano. For Berniece, the piano symbolizes family and is a representation of their personal history. Berniece’s devotion to family is seen in her refusal to sell the piano. She is determined to remember the struggle that her ancestors undertook to better her life and it drives her to better that of her own
child. Boy Willie, however, fails to see the sentimental value in the piano; he is only concerned with the high price for which it can be sold. Risa’s complexities take a physical form in her scarred legs. Angered by men’s obsession with her physical appearance, Risa took drastic action to stop it by cutting her legs with a razor; Risa is very proud and does not rely on a man to support her. As her relationship with Sterling grows, she is conflicted by her feelings for him because of his past and present personality. Risa worked very hard to achieve direction and independence in her life and she worries over the possibility of Sterling ruining what she has accomplished for herself. Wilson’s female characters “defy and yet comply with the orthodoxy of realism” (Elam, 1994, p. 181), making them all the more complex. While the men assume the women are doxy of realism (Elam, 1994, p. 181), making them all the more complex. While the men assume the women are content with their current lives, the audience becomes increasingly aware that they have deeper desires and concerns that go unrecognized by the men.

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Rose’s true strength is seen when she realizes her own worth and refuses to let Troy take advantage of her kindness any longer

Due to the situation of the women in Wilson’s plays, they are forced to abide by the men’s rules. Rose plays the dutiful wife by dealing with all of Troy’s shortcomings. Although Troy may not be the ideal husband, Rose is expected to personify the ideal wife; cooking dinner for him and staying faithful to him (though he does not do the same), often placing herself in the shadow of her husband (Shannon, 1995, p. 107). Rose is forced to continue to live with Troy even after his affair because she has no way to support herself independently. Her life is completely determined by men; Wilson reveals in the stage directions that Rose’s “devotion to [Troy] stems from her recognition of the possibilities of her life without him: a succession of abusive men and their babies, a life of partying and running the streets, the Church, or aloneness with its attendant pain and frustration” (Wilson, 2014, p. 1410). Berniece also owes her living arrangements to a man because she “ain’t got no money…she having a hard enough time trying to get by as it is. If she go ahead and marry Avery…they could do alright for themselves. But as it stands she ain’t got no money” (Wilson, 1990a, p. 58). Whether it be her uncle Doaker or a husband, Berniece is fated to be dependent on a male figure for economic support. Risa must follow the orders of her male customers if she is to survive in the world. The men tell her what to do in terms of her job and life, instructing her on her interactions with Sterling, her legs, and even her religious beliefs. While the women, indeed, rely on the men to survive within the worlds of the plays, their dependency is often the result of outside pressures (Elam, 1994, p. 165). The men’s dependence, on the other hand, ranges from emotional to physical, proving the necessity of the female characters.

Wilson’s Rose, Berniece, and Risa experience drawbacks to living in societies controlled by men; however, their strong and independent qualities are made all the more evident. Rose admits that she will accept Troy’s illegitimate child and she will also uphold the image of marriage, but she refuses to be emotionally tied to him any longer, he is “a womanless man” (Wilson, 2014, p. 1445). Rose’s true strength is seen when she realizes her own worth and refuses to let Troy take advantage of her kindness any longer. Although Berniece is surrounded by the opinion of the men in her family telling her to do otherwise, she makes the decision to defer Avery’s marriage proposal, saying that she may consider it once he has started his own church. Berniece is aware of the advantages she would gain through marriage, but she is also aware that she must be confident in her feelings, showing that she trusts her own opinion over that of others. Risa refuses to submit to society’s standards of beauty and womanhood. She does not feel as though she needs a man and because she does not particularly want one, she remains single until her opinions change. The personal choices they make demonstrate their empowerment (Shannon, 1995, p. 108). All of Wilson’s women show confidence and personal strength despite society telling them to do otherwise. August Wilson’s Fences, The Piano Lesson, and Two Trains Running contain independent women who prove themselves to be vastly important to both their men and their plays.

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Forming A Relationship Through Communication:  
*An Introduction to Knapp’s Stage Model Theory*  
By Lindsay Stephan

*Through the model that Mark Knapp developed in 1978, the process to achieve an increase of commitment through communication to another person is displayed step by step in an elevating staircase formation. This foundation, known as Knapp’s Stage Model, contains a process that a couple or friendship must undergo together to confirm the final product of commitment to one another. There are ten total platforms in Knapp’s stage model. However, when examining how relationships develop and grow, there are only five. These steps include initiating, experimenting, intensifying, integrating, and bonding. Each step builds on the previous stair to progress the involvement and commitment of the relationship. The other five steps downward show how a relationship can dissolve over time though the processes of differentiating, circumscribing, stagnating, avoiding, and finally, terminating. Understanding this process of how a relationship can be formed and ended is crucial throughout one’s life.*

Knapp’s stage model can be considered a dyad due to the two separate components of how a relationship can both evolve and disband. The “rate of movement through the stages seems to depend on such factors as previous interactions with the same partner, the amount of reward as opposed to cost, the amount of time available, proximity, individual needs, and many other factors” (Emmert, Philip, and William C. Donaghy. *Human Communication: Elements and Contexts*) all play a significant role impacting the steps in Knapp’s stage model and overall outcome in a relationship. With these factors in mind, one must realize that the pace and rate of each stage varies completely from one relationship to the next. There are no guarantees of how each step’s outcome will occur or even how long each stage will take to complete. Each step of the escalating staircase depends on the previous interaction of the last stair. In the same context, if the previous platform of Knapp’s model went well, then a couple’s progress may intensify at a more dramatic rate, rather to a couple whose time was spent at a slower pace at the previous stair.

Knapp’s stage model is also an example of an intimate dyad. This assumes that the level of commitment and desire between the two people in a relationship will involve a deep level of understanding with one another. This particular example of a dyad is unique from others due to the fact that it involves two people interacting with each other’s emotions, feelings, and thoughts. It can be considered a sensitive process because Knapp’s stage model can force people to look inside of their own emotional state of mind. With both people willing to do so, however, this process can lead to a satisfying and rewarding relationship.

The first five stages of Knapp’s model are not only for the beginning of a relationship. The model can also apply to those who have been involved in and are currently consumed in a relationship with a significant other. “Over time, couples redefine themselves, moving toward and away from deeper involvement” (Trenholm, Sarah. *Thinking through Communication: An Introduction to the Study of Human Communication*). The model can also serve as a process that can help to rekindle marriages and ongoing relationships by simply starting from the first step, or even starting at a higher level on Knapp’s staircase. The model itself is meant to improve the quality and satisfaction that a relationship is supposed to entail.

The first five steps in Knapp’s stage model follow an organized structure of progression. Through these first five steps, with commitment and care taken through each process, a valuable and intimate relationship can be formed or rekindled by showing an increase of commitment to another person.

Every stair of Knapp’s model is a category of its own. With this in mind, there are five diverse subjects to be explored in the process of improving the quality of a relationship and expressing commitment between two people. Initiating, experimenting, intensifying, integrating, and bonding are the five steps that lead to an increase of commitment to a significant other. Each step can require
a significant amount of effort depending on the couple desiring to obtain a potential relationship. Yet, if Knapp’s stage model is followed correctly, the quality of the relationship could be better than ever.

The beginning of the journey towards an intimate relationship, or first stair in Knapp’s stage model, is the process of initiation. By initiating a relationship, the goal is to have “both people behave so as to appear pleasant and likeable to the other person” (Alberts, Jess K., Thomas K. Nakayama, and Judith N. Martin Human Communication in Society). This first stair can often times be the most intimidating stage in forming a relationship, even though it could potentially be the most brief. This is due to the fear of rejection from another person, as well as having one’s ego damaged. Being “turned down” by another person when trying to initiate a conversation with them can cause hurt feelings, as well as negative emotions. Often times, however, the step of initiation contains extremely lighthearted and nonthreatening topics of conversation. Topics can include discussing the weather, giving or receiving a compliment, or any subject that the two people can relate to or have a similar interest. Knapp’s first step of initiation contains three goals: to create a favorable initial impression; carefully observe each other for cues about personality, attitudes, and willingness to engage in further interaction; and look for ways to open communication channels” (Trenholm, Sarah. Thinking through Communication: An Introduction to the Study of Human Communication). If the initiation step is completed to meet the other person’s desired needs, the first step of showing an increase of commitment to another person is finalized.

The next stage that typically follows directly after the initiating stage, is experimenting. Experimenting is the second step in Knapp’s model that is “the stage of romantic relational development in which both people seek to learn about each other” (Alberts, Jess K., Thomas K. Nakayama, and Judith N. Martin Human Communication in Society). In this stage, both people are interested in one another and search for a common subject, or interest, that they both share. This could potentially become the subject in which their relationship is built upon. Most of the topics discussed between the two people will be considered small talk. This, according to Knapp, is phatic communication that many consider to be unimportant, when in reality, is vital. “Phatic communication uncovers topics for further conversation; gives individual information that reduces their uncertainty about one another; and allows them to reveal their personalities” (Trenholm, Sarah. Thinking through Communication: An Introduction to the Study of Human Communication).

At only the second step, the relationship at this point is extremely relaxed, uncritical, and casual because often times the subject material of the conversation includes names, ages, jobs, family, and so forth. These topics not only provide significant information to the other person, but allow the opportunity for harmless feedback and interpretation. With the information being discussed, the potential couple may find information that they both share in common. This can lead to further conversation leading to a greater interest and excitement with the other person. “Experimenting might also involve the use of secret tests (Baxter and Wilmot, 1984) within the relationship to evaluate the interest or commitment level of the target” (Fox, Jesse, Katie M. Warber, and Dana C. Makstaller. Journal of Social and Personal Relationships).

Yet, if Knapp’s stage model is followed correctly, the quality of the relationship could be better than ever

In this stage, people may have certain standards that the other person must meet before moving to the next stair in the model. In this second step of experimenting, often times by the end of a conversation, two people will either stop communicating, or continue their desire for knowledge about the other person. Often times, this is the step where potential relationships dissolve. However, if both parties are willing, step three in Knapp’s stage model will intensify the commitment level drastically.

Just as walking up a staircase, the third step of Knapp’s stage model becomes more challenging due to insecurities and fear of commitment. In this stage, devotion towards the other person occurs. It is the step in which both people want to surge their connectedness and intimacy. This shows an increase of commitment progressing because “both persons begin to give more and more of themselves in an attempt to blend their own ideas, feelings, personalities, and behaviors” ( Emmert, Philip, and William C. Donaghy. Human Communication: Elements and Contexts). People in the intensifying stage also begin to use the pronouns of “we” and “us” compared to “I” and “me”. This is due to the desire to feel bonded and united as a couple or group. It is this step also where one becomes greatly familiar with the other’s nonverbal and verbal styles of communicating. Intensifying in nonverbal communication may include touching the other person or simply by signing them a gesture. In verbal communication, it can appear as giving the other person a nickname or even finishing their sentences. By providing important information about oneself and receiving valuable content from another person, the intensifying stage can be very rewarding.
The level of commitment continues to rise when a couple chooses to move on to step four of Knapp’s stage model. This is the phase of integrating. Integrating is the “stage of romantic relational development in which both people portray themselves as a couple” (Alberts, Jess K., Thomas K. Nakayama, and Judith N. Martin. Human Communication in Society). This fourth step of Knapp’s model is when attitudes and interests of two people are not only shared, but reflected. It is not uncommon in this stage for individual’s opinions to waver due to their significant other’s beliefs and opinions. In fact, the integrating step is when most people’s social circles combine as well. This means that they are not only getting more familiar with each other, but also with the other person’s friends and acquaintances.

The integrating step can also be identified when a couple appears to combine themselves, as if they were one person. “Each participant begins to develop behaviors and feelings that are quite similar to those of the other and that are different from those of others around the two of them” (Emmert, Philip, and William C. Donaghy. Human Communication: Elements and Contexts). This is when the two people have a longing to feel like they have a special bond among everyone else. The desire of wanting to reflect the other person sometimes even appears noticeable to people outside of the relationship. For example, the couple may begin to talk and act in similar ways. Another way of recognizing the integrating stage is when intimacy trophies are given to one another. “By wearing the other’s ID bracelet or athletic jacket or by displaying the other’s picture, partners signal to the rest of the world their official status as a couple” (Trenholm, Sarah. Thinking through Communication: An Introduction to the Study of Human Communication). It is in this step where couples give and receive most of themselves to one another.

The final step of Knapp’s stage model that shows an increase of commitment to another person is bonding. This is the top step of the model because of the actions portrayed in this category. It is the “stage of romantic relational development characterized by public commitment” (Alberts, Jess K., Thomas K. Nakayama, and Judith N. Martin Human Communication in Society). This is the most formal stage due to the level of intensity and obligation one person demonstrates to another. Bonding is the step in which couples who wish to get married become engaged. The step includes both people deciding to move forward in life, not as an individual, but as a united group and couple. Through the entire process of the past four steps of Knapp’s model, “attraction and liking, communication, commitment, trust, and love” (Vangelisti, Anita L., and Daniel Perlman The Cambridge Handbook of Personal Relationships) were all demonstrated throughout. Bonding is the top level in which a romantic relationship can reach. It is a prize of sorts, displaying the deep level of trust and love between the two people. Overall, bonding is the level that many people in this world strive for in their lifetime; is the ultimate stage of commitment two people can show each other.

Analysis

Every stair of Knapp’s model is a category of its own. With this in mind, there are five diverse subjects to be explored in the process of improving the quality of a relationship and expressing commitment between two people. Initiating, experimenting, intensifying, integrating, and bonding are the five steps that lead to an increase of commitment to a significant other. Each step can require a significant amount of effort depending on the couple desiring to obtain a potential relationship. Yet, if Knapp’s stage model is followed correctly, the quality of the relationship could be better than ever.

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Discussion

In the five steps in Knapp’s stage model, each step is a valuable and rewarding process that demonstrates commitment to another person. Not one stair should be taken for granted, and should be treated with care in order to develop and maintain a healthy and solid foundation for a relationship. The escalating staircase of Knapp’s model is a logical and rewarding process to follow.

Each individual has the opportunity to benefit from assistance in developing a healthy relationship. Many people, especially at the beginning stages, can have questions about how a courtship can blossom into a healthy and intimate relationship. Questions and concerns might also arise regarding the pace and steps in an evolving relationship. Through Knapp’s stage model, many of these questions can be answered. The diagram that Knapp developed can be used as a checklist of sorts to ensure that one stage is completed before moving on to the next stage. This process is valuable for time purposes by seeing if the relationship is moving too fast or too slow. Often times, this in and of itself can grant people a sense of security. By making sure each stair is completed to the best of the couple’s ability, by experimenting, intensifying, integrating, and bonding, Knapp’s stage model can show an increase of commitment to another person by a drastic amount.

Marriage is the final stage often considered in Knapp’s bonding step. This demonstrates the final act or gesture of commitment to another person. However, in today’s day and age, the median age for marriage has increased. “The median age of first marriage has increased from 1970 to 2000 for men and women, 3.6 years for men for 23.2 to 26.8 years, and 4.3 years for women from 20.8 to 25.1 years” (U.S. Bureau of the Census, 2001) (Vangelisti, Anita L., and Daniel Perlman The Cambridge Handbook of Personal Relationships).

This increase in age could be due to the fact that many people do not spend the time evaluating a significant relationship with another person. Through Knapp’s stage model, one can evaluate the important aspects that they desire or wish not to obtain in a relationship. Many people spend a significant amount of time with the wrong person because they do not follow the steps of Knapp’s model, leading to an unsatisfying relationship. The model therefore can also help an individual realize they may be pursuing another person not right for them. This can be shown by the time or level of commitment both people in the relationship are willing to put forth in each of the five steps.

Going through each step in Knapp’s stage model for a developing relationship, one may be able to tell if the relationship holds any potential. This can be observed by the quality of the conversations, the excitement of being together, or even by simple verbal and nonverbal gestures towards one another. It can result in choosing to continue the relationship if many aspects of it are enjoyable, or terminating it if there is not a strong connection between the two people. Overall, Knapp’s stage model is a practical diagram that displays the desire of
wanting to continue the relationship to a deeper level and show commitment.

Engagement

Knapp’s stage model would be beneficial to individuals wishing to enter a long-term relationship. Through the steps of initiating, experimenting, intensifying, integrating, and bonding, Knapp’s stage model is a promising way for a healthy, meaningful, and valuable relationship to form. People have the ability to engage in Knapp’s model by following the building steps and progressing towards the ultimate goal of bonding with another individual. By taking a close observation to the steps to be followed, Knapp’s model is a promising, yet logical, way to engage in a relationship.

The foundation for a relationship can happen almost anywhere. School and work are often times the most common places for a relationship to develop, although it can happen almost anywhere. Through the first two steps of Knapp’s stage model, both initiating and experimenting often happen at the place and time right when the individuals meet. The next three steps of intensifying, integrating, and bonding occur through a greater length of time and value of commitment. These last three steps of the model prove the desire that each person holds towards the other person.

Conclusion

Overall, people can engage in Knapp’s stage model at any time or place. With the five steps that a couple must undergo together, the entire process requires a great deal of time and commitment to another person. However, with the time and commitment, a valuable and life-altering relationship has the potential to form. Knapp’s stage model can be considered a guide to couples through their journey of dating by displaying the rewards of completing each step. Knapp’s stage model shows an increase of commitment to another person; such is accomplished by following each progressing step, devoting valuable time and energy, and being willing to explore emotions and feelings of not only oneself, but a partner as well.

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In Defense of the Counterintuitive:

How it is Just to be Unequal

By Allison Von Borstel

It is common to find justice called on behalf of the unequal to support claims of wanted equivalence. The uneducated man sees inequality as a failure of justice, whereas an educated man sees perfect justice through unequal parts. Though at first counterintuitive, this defense is discovered in Plato’s The Republic where the developed argument supports the idea of ‘thoroughly unequal, but perfectly just.’ Focusing on the arguments and aspects of society that Socrates addresses, it can be said that inequality is just for the greater good of the polity.

In order to discuss the qualifications of what is or is not just, a definition must be developed. Socrates implores a Utilitarian definition of justice where he claims that the happiness and safety of the city outweigh, or are more important than, that of the individual. (Plato, 420b) The view that it is possible to be unequal yet just is multi-faceted and therefore must be supported on multiple levels. The first of which, and the focus of this paper, is at the polity level for the purpose of greater happiness, and the second is the individual level for the health of his soul. The two levels must be argued independently so as not to influence the outcome of the other and so that all details can be understood without consequences intermingling.

When constructing his perfectly just city, Socrates intentionally divides the citizens into classes: commercial, auxiliary, and guardian. Immediately he points out that classes are unequal in terms of knowledge because the guardians possess the wisdom that the city is founded upon. (Plato, 428c) Glaucon extends on this logic by claiming that the guardians should be the rulers of the city, proposing that if “on the grounds of knowledge – which is the single most important thing – (the guardians) come on top...” they ought to rule. (Plato, 485a) In possessing the most knowledge and understanding of the Form of the Good, this ruling class is wiser than the rest and will in somuch have the ability and tools to govern and advise the city. Although classes are thoroughly unequal in terms of knowledge, this is perfectly just because the rulers utilize the knowledge to keep the city safe and content.

Understanding the Form of the Good is a crucial reason why it is perfectly just to be thoroughly unequal. Though Socrates never offers a single definition of the Form of the Good, an example brings better understanding:

In the world of thought the good stands in just the same relation to thinking and the things which can be thought as the sun, in the world of sight, stands to seeing the things which can be seen (Plato, 508c)

Philosophers, who alone can reach this level of understanding, have seen the Form of the Good and have therefore received this elite wisdom of what is inherently good in light of all good things. The wisdom now possessed will aid the philosopher in strengthening the city, therefore justifying this unequal wisdom.

When discussing what is just on the city-level, the happiness of the greater good is the driving force behind justice. Socrates states that a city that has strong defenses is a happy and safe city, and therefore is desired and just. Not only does Socrates create unequal segments of the city, but he extends his take on equality and goes so far as to claim that individuals are innately unequal. Using an analogy of dirt and metal, he tells a story that God used certain types of metal when he made people. If one possessed gold they were fit to be rulers; likewise the bronze child was fit to be a worker, given no pity, and
sent out to the fields. (Plato, 415c) This effectively causes Socrates to tie the majority of producers to the lower class. Socrates then states that most of the time children will follow their parents and so on in each class. (Plato, 415b) With little hope of escape from your birth class, the unequal aspects of the just city cluster together and create a gloom that plagues an ideal. The philosopher however can see the glimmer through the fog as he comments that by having the most proficient class members working together, the society would be most efficient, therefore being a safe and desirable polity.

...equality leads to injustice and therefore inequality lends way to justice

The act of separation into classes ranked by superiority reveals that Socrates acknowledges that some individuals are better than others in some fashion, and are therefore unequal. Socrates proudly admits to the prospect of inequality and does so because he believes it is just. Each aforementioned class has a specific job to accomplish and cannot distract another’s work. Justice, Socrates explains, is a “business of everyone performing his own task.” (Plato, 431b) The commercial class must tend to the farms while the auxiliary class train for strength. This inequality of job allocation is compulsory and is another reason why classes that are thoroughly unequal are just. Socrates elaborates “The ability of the commercial, auxiliary and guardian classes to mind their own business, with each of them performing its own function in the city – this will be justice, and will make the city just.” (Plato, 433c) Yet again we see that Socrates believes that if individuals are performing what they can do best they are acting as a catalyst for society and are therefore perfectly justified to be unequal.

Furthermore, if each person were equal in that they had the liberty to change to whichever profession they chose, disregarding the possession of requisite skill, it would result in an inefficient society (this is seen in contrast to an efficient society in which the job performed was one for which an individual was best suited). If the other classes, such as the commercial class, were to rule, the city would not function as well because they would not be wise enough nor possess the necessary information. Socrates argues anything that causes harm to the city can be considered injustice (Plato, 433c). Therefore, extending this logic, the contrapositive is supported as well: if something does not harm a city, but in fact benefits it, then it is just. Here it is seen that equality leads to injustice and therefore inequality lends way to justice.

One might object that although the unequal parts can be considered just from the city view, from an individual level they are unjust. Citizens do not look favorably on others who receive more since birth, and if a neighbor has more than himself, the feelings resulting from this encounter would not be desirable. The consequences of this chronicle are the deterioration of government from a timeocracy to a tyranny. The hatred that builds in the tyranny gives way to fear in the leader because the subjects wish to overthrow him. However, a close read of The Republic explains that society only reaches this point of injustice when each person is given full liberty and is seen as equal. (Plato, 572e) When individuals are regarded more so as equal regardless of skill they thirst for more goods and care less for society. (Plato, 575a) Through the use of governmental examples, Socrates is able to explain that thoroughly unequal parts of society are perfectly just because the resulting city is safer and the individual is able to achieve happiness and maintain friendships (Plato, 576a). Therefore, the objections of unequal classes and individuals in relation to each other must be mollified as the question on hand contains the argument to the polity and not comparisons between people. The goal of the city is not for each individual to be happy, but rather for the city as a whole to be pleased.

The level and quality of education is unequal but it is justified because the further education of the guardians...

The theme thoroughly unequal yet perfectly just is also seen through education. Socrates prioritizes the education of the guardians, declaring that it is the most important element. (Plato, 376a) The inequality in this regard begins when Socrates elaborates on the age at which individuals are separated for training: children set to be guardians and warriors are given additional education. Whether advanced physical training, tests, or even the experience of observing war (Plato, 413e and 467a), warriors are given preference to the children who will become shopkeepers. The level and quality of education is unequal but it is justified because the further education of the guardians and warriors gives way to a safer polity.

The dichotomy in education is also seen through the education of the philosopher-king. This education, which begins at childhood, is not completed until the age of 50 for it is then when the individual is required to “direct the radiant light of the soul towards the contemplation of that which itself gives light to everything.” (Plato, 540b). Only now, after decades of specialized education can the individual see the Form of the Good. It is necessary and just for education to be thoroughly unequal because it results in the creation on a philos-
opher king (if there were no specialization individuals who were not gifted would desire to become a philosopher-king, which results in the negative perception of philosophers). (Plato, 487c) The unequal form of education is reaffirmed to be just because once the individual has seen the Form of the Good, he is required to go back into the cave (where individuals are not educated and can only imagine) and help other individuals progress to understanding themselves.

Throughout The Republic, Plato sheds light onto the common misconception that equality is justified. Plato argues that justice is to be valued “by anyone who wants to be happy, both for itself and for its consequences.” In order for the polity to be happy, society must be thoroughly unequal. This inequality begins at a young age and is, in some cases, innate to that very being. Because individuals vary in knowledge and wisdom, education must too follow suit. The significance of a philosopher-king is dramatic for a city, as he will bring knowledge and understanding to the remainder of citizens. While individuals might not be pleased to be unequal, the effectiveness and accomplishments garnished from the classes maintain a safe and happy polity and are therefore perfectly just.

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Curcumin Restores the Growth of Beta-cells in Non-obese Diabetic Mice

By Suresh Graf

Curcumin is the active principle of the spice, Turmeric. Curcumin has been shown to have a wide variety of physiological effects through its activity as an antioxidant. The structure of curcumin is classified as a polyphenolic compound, and through its ability to alleviate oxidative stress, curcumin may be the key to activating stem cell differentiation into beta cells. Ultimately producing insulin in non-obese diabetic mice. A curcumin/piperine supplemented diet will be used to stimulate beta cell generation in non-obese diabetic mice. Reactive oxygen species will be determined by flow cytometry. Beta cell growth will be tested through histological staining and examination, function will be tested by administration of an intravenous glucose tolerance test. Blood glucose will be measured continually throughout the study by a blood drop OneTouch Ultra glucose monitor. The non-obese diabetic mice eating a supplemented diet of curcumin and piperine showed beta cell growth at an average number of 90,270 ± 8,839 cells while non-obese diabetic mice not receiving treatment showed an average of 71 ± 185 beta cells grown. The wild type control mice supplemented with curcumin and piperine had an average number of 95,688 ± 4,246 beta cells grow, compared to the wild type mice with no treatment having 96,058 ± 4,121 beta cells grow. For each group n=20 and the only statistically significant different measure was that of the non-obese diabetic mice not receiving treatment. The mice with beta cells that had been regenerated through curcumin piperine supplementation were shown to have beta cells that outperform their wild type counterparts. The data collectively shows that by intervention with curcumin and piperine treatment, beta cells can be regenerated and function to regulate blood glucose by insulin secretion effectively, thus creating a reversal of diabetes in genetically predisposed mice.

Diabetes is a disease which arises from an unregulated blood glucose levels by the pancreas. Diabetes can be subdivided into two major groups, Type 1 diabetes mellitus (T1DM) and Type 2 diabetes mellitus (T2DM). When analyzing these two types of diabetes it is important to note that they are manifested in different ways in the body, however they both relate to beta-cells of the pancreas and controlling blood sugar. Beta cells are cells located in the pancreas, specifically on the islets of Langerhans, beta cells are responsible for insulin secretion which helps manage blood sugar levels. T1DM manifests itself as an autoimmune disease, meaning that the body destroys the beta cells of its own pancreas by signaling the beta cells with antibodies. In contrast, T2DM presents itself as environmental onset diabetes. While there are some genetic factors that play a role in onset, such as Diabetes in the immediate family, most of this disease's risk factors are environmental. Generally, T2DM is characterized by the inability to regulate blood glucose levels due to weight gain, or a sedentary existence, and high intake of carbohydrates.

Diabetes is a disease which currently affects approxi-
Increased oxidative stress has been shown to impair beta cells. Reactive Oxygen Species (ROS), are a big contributor to oxidative stress. Free radicals, also referred to as Reactive Oxygen Species (ROS), are a big contributor to oxidative stress. Increased oxidative stress has been shown to impair beta cell function significantly, mainly through affecting the beta cell mitochondria and subsequently impairing glucose sensing and insulin secretion (Drews et al., 2010). The resultant changes are mainly noted as reduced energy production and damage to DNA (Drews et al., 2010). A large contributor to beta cells having a particular sensitivity to ROS is the reduced ability of beta cells to manage oxidative stress through antioxidant enzyme function (Simmons, 2007).

Curcumin, pictured in Figure 1, is the active principle of the spice turmeric, common throughout Asia. The chemical structure of curcumin is classified as a polyphenolic chemical, meaning that the structure results from modifications to a base molecule of phenol. Curcumin functions as an antioxidant due to the ability of the molecule to donate a hydrogen atom or accept an electron (Barzegar et al., 2011). The phenolic nature of this structure is common across many alkaloids and in a study by Lin et al., (2012), naringenin as well as quercetin were shown to positively preserve beta cells and their function in environments rich in ROS. Naringenin and quercetin also exhibit antioxidant properties and were shown in the study by Lin et al., (2012) to operate through stimulation of the PI3K pathway (Shokoohinia, Yalda, et al, 2014). This ultimately is thought to stimulate facultative stem cells in the exocrine compartment of the pancreas to differentiate into functioning beta cells (Demeterco et al., 2009).

The research question is whether or not the newly regenerated beta cells outperform pre-existing beta cells, specifically how efficient are they at secreting insulin and subsequently regulating blood glucose levels? The rationale for addressing this question is that curcumin has been shown to reduce oxidative stress and because of this reduction in the pancreas, which has a poor ability to regulate reactive oxygen species, the beta cells will be better able to function. The model which this will be tested on will be a non-obese diabetic (NOD) mouse model, which is a genetically modified mouse which develops type 1 diabetes shortly after birth. The mouse contracts diabetes after the immune system spontaneously generates antibodies which signal for the destruction of beta cells. The NOD mouse model has been used in many cases as a model organism for examining biochemical interactions of diabetes. These mice will be divided into two groups...
and one group will receive a diet supplemented with curcumin to promote generation of beta cells while the other group will receive a placebo. This design was created in an attempt to achieve similar results documented by Aziz et al., 2013 in a different organism using curcumin rather than a novel curcumin derivative. Beta cell size and function will be determined through tissue biopsy and intravenous glucose tolerance test respectively. Results will be processed using the minimal model (MINMOD), prandial profile computer software which determines beta cell function. Lastly, the functionality of the beta cells will be assessed again after curcumin treatment has been stopped, to evaluate the long term efficacy of administration of curcumin as a viable method to regenerate beta cells. The purpose of this research is to determine if the newly grown beta cells can regulate blood glucose levels more effectively and determine size difference against normoglycemic mice.

Hypothesis

If beta cell growth occurs in the NOD mouse models with administration of curcumin at 80mg/kg and piperine at 0.8mg/kg body weight per day, then the newly grown insulin producing beta cells will be greater in size and outperform beta cells in normoglycemia individuals. Curcumin administration at 80mg/kg body weight per day is documented in multiple studies involving small model organisms, such as mice and rats. The additional concomitant treatment with piperine serves to increase bioavailability of curcumin in the blood plasma and subsequently throughout the body (Shoba et al, 1998). The reason for this phenomenon lies in the ability of piperine to function as a P-glycoprotein (P-gp) inhibitor; P-gp is a membrane protein which is highly expressed in some cancer cells which confers drug resistance by forcing removal of drugs or foreign chemicals in the body. P-gp is the main reason why curcumin has limited bioavailability when taken alone. (Sharom, 1997)

The antioxidant properties of curcumin will help to reduce the reactive oxygen species which put stress on the system. In turn, this would allow for greater cell size in newly grown beta cells and faster secretion of insulin measured by beta cell function. Curcumin reduces reactive oxygen species by either donating a hydrogen atom or scavenging electrons from intracellular sites using its two large phenolic groups (Demeterco et al, 2009). There is evidence that shows antioxidants having harmful effect if administered at an extremely high dose, so finding a therapeutic dose is integral (Bouayed, Bohn, 2010). As with all chemicals, the difference between a medicine and a poison is dose.

Specific Aim 1

Grow new insulin secreting beta cells in the pancreas by administration of curcumin at 80mg/kg and piperine at 0.8mg/kg body weight per day in non-obese diabetic mouse models.

Working Hypothesis

If curcumin is administered at 80mg/kg and piperine at 0.8mg/kg body weight per day after the onset of diabetes is documented by blood glucose measurements, then beta cells in the pancreas will regenerate via stimulation of facultative pancreatic stem cells by the PI3K pathway and secrete insulin to regulate blood glucose levels and return the mouse to a normoglycemic condition.

Specific Aim 2

Analyze functionality of regenerated beta cells compared to wild type mouse beta cells using an intravenous glucose tolerance test (IVGTT).

Working Hypothesis

Functionality in regenerated beta cells of the curcumin treatment group will be better than functionality of the beta cells in the wild type group.

Specific Aim 3

Determine glucose regulation ability observed in mice taken off curcumin treatment for two weeks, after beta cell regeneration has occurred.

Working Hypothesis

If curcumin treatment is stopped for mice in the curcumin treatment group and mice are returned to a standard nutritious diet, then beta cells that have already regenerated will die and fail to continue to regulate blood glucose levels effectively.

Expected Outcomes

The expected outcomes for specific aims one and two is that beta cells will regrow in individuals lacking beta cells to equivalent cell numbers to that of wild type
mice, and that beta cell function will not be statistically
different from a normoglycemic mouse. For specific aim
three it is expected that individuals taken off of the curcumin
treatment will remain normoglycemic due to the
regrown beta cells maintaining greater size and superior
function compared to pre-existing beta cells in wild type
individuals. Currently, there is limited research which has
been performed on curcumin as it relates to the field of
endocrinology and specifically Diabetes. This study will
provide valuable insight into the effects of curcumin on
diabetes through beta cell regeneration, hopefully providing
evidence which supports positive effects of increasing
curcumin in the diet. Furthermore, this study is signifi-
cant because it examines application of a very cheap, nat-
urally occurring active principle and its positive biological
effects.

Research Design and Methods

**Specific Aim 1: Grow new insulin secreting beta cells in the
pancreas by administration of curcumin at 80mg/kg and
piperine at 0.8mg/kg body weight per day in non-obese di-
abetic mouse models.**

Experimental Design

Curcumin will be supplemented into the diet of 20
non-obese diabetic (NOD-C) mice and 20 wild type (WT-
C) mice at 80mg/kg body weight, or approximately 2mg
of curcumin per day and 0.8mg/kg piperine or 0.02mg
per day per mouse based on an average body weight of
25grams per mouse. There will also be controls for each
group consisting of 20 wild type (WT) mice and 20 non-
obese diabetic (NOD) mice which will receive the same
dose of 80mg/kg and 0.8mg/kg piperine body weight of curcumin and concurrent insulin treatment to
regulate blood sugar levels and prevent death in the mice.
NOD mice without curcumin/piperine treatment will be
maintained by using insulin to regulate blood glucose lev-
els. After 22 weeks of curcumin/piperine diet, a tissue bi-
opsy will be performed on all mice in the study. The mice
will not be anesthetized for biopsy based on findings of a
study by Arras et al., (2003) which found that use of
anesthesia on mice for biopsy created more adverse side
effects than simple local anesthetic at the cut site. Tissue
biopsy will be performed by a small incision on the bel-
ly of the mouse and micro resection of a small section of
pancreas will be performed. After resection, the incision
will be glued shut and the biopsied tissue will be split into
two aliquots, one stained with immunofluorescent stain-
ing against insulin and the other stained and analyzed via
flow cytometry for number of ROS. Concurrent cell counts
will be performed following the method of Bock et al.,
(1999), which requires a small tissue sample and through
repeated fractionation of the tissue, a beta cell count is
performed. This categorization of beta cells not only gives
cell number, but relative cell size as well from histological
examination.

Data Collection

To measure blood glucose levels, the tail vein on each
mouse will be pricked with a lancet and the blood will be
loaded into a OneTouch Ultra blood glucose monitoring
strip and the blood glucose value will be recorded. Upon
diagnosis of diabetes, following three blood glucose read-
ings above 150mg/dL the mice will be put on an exper-
imental diet of 80mg/kg and 0.8mg/kg piperine body
weight of curcumin and concurrent insulin treatment to
regulate blood sugar levels and prevent death in the mice.
NOD mice without curcumin/piperine treatment will be
maintained by using insulin to regulate blood glucose lev-
els. After 22 weeks of curcumin/piperine diet, a tissue bi-
opsy will be performed on all mice in the study. The mice
will not be anesthetized for biopsy based on findings of a
study by Arras et al., (2003) which found that use of
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ing against insulin and the other stained and analyzed via
flow cytometry for number of ROS. Concurrent cell counts
will be performed following the method of Bock et al.,
(1999), which requires a small tissue sample and through
repeated fractionation of the tissue, a beta cell count is
performed. This categorization of beta cells not only gives
cell number, but relative cell size as well from histological
examination.
Specific Aim 2: Analyze functionality of regenerated beta cells compared to wild type mouse beta cells through administration of an intravenous glucose tolerance test (IVGTT).

Experimental Design

One week after tissue biopsy is performed for specific aim one, an IVGTT will be administered and subsequent analysis of the data using MINMOD will yield a numerical value for beta cell function. An IVGTT will be administered to all 80 mice in the study and data will be compared between groups. Basic procedure for an IVGTT is to administer a bolus of glucose which spikes the blood sugar to a reasonably high level. Blood draws are then taken at specified time intervals which allows for a prandial map or profile to be compiled. After this prandial profile has been obtained the results will be processed by MINMOD to obtain a value for beta cell function as well as insulin activity and disposition index. All of these values facilitate a better understanding of how the pancreas and beta cells are working together to control blood glucose levels.

Materials

A 1.5g/kg body weight injection of glucose solution will be administered to the mice at time zero. Blood draws from the tail vein will occur at the 10, 30 and 120 minute mark after administration of the bolus of glucose. After data for the IVGTT has been collected, the data points will be entered into the MINMOD entry form which consists of two columns, the time point and glucose measurement. After data has been entered, the prandial profile and numerical beta cell function value can be assessed.

Data Collection

In specific aim three the mice will be administered a 1.5g/kg body weight injection of glucose and subsequent blood glucose measures will be made, subsequent data processing by MINMOD will be performed to evaluate how beta cell function has changed over time after the body of the mouse subjects have had time to acclimate to a new diet without curcumin.

Ethical approvals for this study will be assessed by the institutional animal care and use committee (IACUC). All guidelines presented by IACUC have been fulfilled in terms of blood draw amount per given period of time as well as biopsy method and sacrifice method.

Anticipated Outcomes

Specific Aim 1: Grow new insulin secreting beta cells in the pancreas by administration of curcumin at 80mg/kg and piperine at 0.8mg/kg body weight per day in non-obese diabetic mouse models.

Cell Growth: Curcumin supplemented into a NOD mouse diet at 80mg/kg body weight will provide conditions in which beta cells can grow. Cell growth is anticipated to occur in 70-95% of the test subjects in the NOD-C group with cell counts anticipated to be equal in number of beta cells. Beta cell growth will be determined through histo-
logical examination of a biopsy from the pancreas in the NOD-C group, confirmed by a normal fasting glucose level below 100mg/dL. Bock et al., (1999) describes a method by which quantification of beta cells in a tissue sample can be obtained by fractionation and continuous counting of cells, the Bock method.

ROS Quantification: To quantify the ROS at different times and in the different groups, flow cytometry will be used with an aliquot from the tissue biopsy and stained using Enzo Life Sciences reagents. It is hypothesized that ROS will decrease with treatment of curcumin/piperine.

Specific Aim 2: Analyze functionality of regenerated beta cells compared to wild type mouse beta cells through administration of an intravenous glucose tolerance test (IVGTT).

The anticipated result when comparing NOD-C to WT-C is that WT-C will have the highest functioning beta cells, NOD-C will have the next highest, followed by WT and NOD. This means that the beta cells are able to return elevated blood sugar levels to normal, faster in WT-C and NOD-C than WT and NOD.

Specific Aim 3: Determine glucose regulation ability observed in mice taken off curcumin treatment for two weeks, after beta cell regeneration has occurred.

The anticipated outcome is that all NOD mice that successfully regenerated beta cells are not able to regulate blood glucose levels efficiently and return to being diabetic after treatment with curcumin is stopped. The reason for beta cell generation occurrence can be explained through use of the PI3K pathway. Curcumin functions to alleviate excessive oxidative stress, when the stress is relieved, PTEN no longer dephosphorylates PIP3 to PIP2 allowing PI3K to generate PIP3. This PIP3 posi-
 activly regulates AKT which subsequently phosphorylates beta-catenin. Beta-catenin has been shown to increase beta cell differentiation in pancreatic facultative stem cells from the Neurog3 cell state to the Nkx2.2 beta cell state. (Campbell, 2013) Subsequently, when treatment is stopped, ROS would increase and beta cell death would occur through activation of the PTEN negative regulator of the PI3K pathway.

Discussion

The research question is about the viability of these newly produced beta cells, specifically how efficient are they at secreting insulin and subsequently regulating blood glucose levels? The experiment outlined serves to answer this question by placing a numerical value on beta cell function and comparing the data across groups tested with curcumin and with a curcumin placebo. For the first aim, it was critical to regenerate beta cells after cell loss due to the onset of type 1 Diabetes in the NOD mouse models. Next, looking at their functionality while curcumin was still being administered as well as analyzing any functional change after curcumin has been removed from the diet.

Curcumin was able to stimulate beta cell regeneration in NOD-C mice and the beta cells were proficient at regulating blood glucose level. The mechanism of action of curcumin is through stimulation of the PI3K pathway, activating AKT then beta-catenin which stimulates cell growth and differentiation. Beta-catenin is the link which is hypothesized to stimulate facultative stem cells existing in the pancreas which can differentiate into beta cells and then produce insulin (Demeterco et al, 2009). The ability of the beta cells to control blood sugar while the mice were maintaining a curcumin rich diet was observed in part due to the antioxidant properties of curcumin which assisted the pancreas in dealing with oxidative stress as it is not normally able to do. Curcumin supplemented at 80mg/kg and piperine at 0.8mg/kg body weight was sufficient to regrow beta cells which maintain high function and serve to effectively regulate blood glucose levels.

The data support the hypotheses stated previously, beta cells were regenerated and effective moderators of elevated blood glucose levels. Ultimately the implications of this finding are that through administration of a naturally occurring chemical found in a spice, the diagnosis of type 1 diabetes in lab mice can be reversed as the incidence of normoglycemia prevails when reactive oxygen species (ROS) are reduced and the PI3K pathway is stimulated. (Lin et al, 2012) The pancreas has been demonstrated to have a very poor ability to regulate ROS. With the help of curcumin, a polyphenolic compound which aids in the absorption of free electrons and donation of protons, as well as stimulation of homeostatic mechanisms in the pancreas to neutralize ROS (Drews et al, 2010), the cellular environment in the pancreas is conducive to regeneration of beta cells by stimulation of the PI3K pathway and differentiation of facultative stem cells in the pancreas. (Demeterco et al, 2009)

Pitfalls of this aim would be beta cell growth not occurring in individuals. Treatment could fail if curcumin fails to reduce oxidative stress by reactive oxygen species. If growth does not occur it could be due to another factor; other than oxidative stress, in which a dose of streptozotocin will be administered to the mice in the NOD-C group to compromise their immune system and remove any possibility of antibodies being present which would hinder the production of beta cells. Subsequently, the water soluble curcumin derivative could be used from Aziz et al, (2013) to regenerate beta cells. Another possible reason for this pitfall occurring would be limited bioavailability of curcumin to the mice, even when high doses are consumed. To counteract this rather significant issue of limited bioavailability curcumin will be administered with a small amount of piperine, which is the active principle of black pepper. Piperine has been shown to inhibit the functioning of P-gp which is a membrane protein responsible for the rapid removal of curcumin from cells thus increase bioavailability by 20 times! (Shoba et al, 1998) (Sharom, 1997)

The beta cell functionality observed in the NOD-C group drastically outperformed the NOD group and maintained better insulin sensitivity than the WT-C and WT groups. This shows that there is a potential effect of reducing ROS in the pancreas to such a high degree that oxidative stress is no longer a limiting factor in how well the beta cells can function. Consequently the regenerated beta cells have not had to endure any oxidative stress and therefore they outperform beta cells in the WT or WT-C groups.

Pitfalls for specific aim two would be that curcumin does not help the NOD mice regulate blood sugar even after beta cells have grown. This could be due to curcumin providing the necessary environment to grow beta cells which are present but do not secrete insulin. If this does happen, or if beta cells are not newly regrown from specific aim one, then a transplant of beta cells will be performed as demonstrated by Jeon et al, (2012) and allowed to grow in the curcumin/piperine environment of the mice and these resultant beta cells would be tested for efficiency.

The data gathered for specific aim three supports the working hypothesis that if curcumin treatment is stopped for mice in the curcumin treatment group and mice are
returned to a standard nutritious diet, then beta cells that have already regenerated will die and fail to continue to regulate blood glucose levels effectively. The mechanism of action for this specific aim is hypothesized to be that when curcumin is removed from the system, oxidative stress returns and the pancreas cannot mediate this stress so beta cell death is observed. Evident through the PI3K pathway stimulation. Pitfalls for this specific aim would be unforeseen complications with beta cell death after regrowth. These complications could be inability of the mouse to utilize facultative stem cells in the future or a massively intensified response to elevated blood glucose levels. The only way to prevent suffering at this point would be to sacrifice the mice which exhibit extreme hyperglycemia or other metabolic complications.

Curcumin and its effects on diabetes are not well documented thus far and so this study serves to reinforce significant findings in the field. Aziz et al., (2013) demonstrated that a novel curcumin derivative that was water soluble, could regenerate beta cells in rats, this study serves to reinforce his findings in mice as well as provide further insight as to the specific functionality of beta cells that have been regrown. There have not been any studies which analyze the functioning ability of beta cells grown from different sources, and few studies have looked at the effectiveness of naturally derived herbal treatments in the fight against type 1 diabetes.

Future directions of this research would lead researchers to explore other polyphenolic chemicals and their effectiveness at reducing oxidative stress. Other research questions which are spurred by this research include, how can endogenous oxidative stress management in the pancreas be improved naturally? Or why does endogenous oxidative stress management in the pancreas differ from the other organs?

This research has bridged a significant knowledge gap in the field of diabetes research through a new proposed mechanism of action based on previous research into the PI3K pathway and facultative stem cells, and has helped to reinforce previous research that has returned conflicting outcomes in the past. The knowledge gap of how curcumin acts on the pancreatic tissue of mice and how that relates to diabetes has been partially bridged for now and the framework for future studies in this area have been laid out. Turmeric, once thought of as a simple botanical that had application as a dye, has now been brought out and is leading the way in natural medicine with powerful antioxidant and anti-inflammatory ability and new application in diabetes, it is truly a wonderful spice.

REFERENCES:


Shokoohinia, Yadla, et al. “Quercetin-3-O-[beta]-d-glucopyranoside, a dietary flavonoid, protects PC12 cells from H.sub.2O.sub.2-induced cytotoxicity through inhibition of reactive oxygen species.”

90


Bacteriophages (phages) are viruses that infect and kill bacteria. Mycobacteriophages specifically infect members of the Mycobacteria clade, and thus have the potential in treatment of Mycobacteria-caused diseases tuberculosis and leprosy. It is postulated that the tail fibers of a phage determines its host range (polyvalency) through the interactions of the tail fiber amino acids with a receptor in the host cell wall. Previous studies observed host range alterations due to mutations in the tail fiber genes, but no such studies demonstrated that without the tail fibers adsorption would not occur or that the mutations themselves were the sole cause of host range alteration. This study investigates the host range determinants of A2 mycobacteriophages, by 1) determining their host ranges, 2) comparing the nucleotide and amino acid sequences of the phages’ tail fiber genes, 3) manipulating the tail fiber genes to demonstrate their role in host range, and 4) recovering phylogenetic trees for each of the tail fiber genes. This proposed work seeks to demonstrate the structure of the tail fibers, the specific roles of their amino acid sequences in interaction with a host cell receptor, and how host range evolved in phages through evolution of the tail fiber genes.

Bacteriophages, commonly called phages, are viruses that infect bacteria(10). There are an estimated 1031 phages on earth, living in environments where bacteria thrive(73). Phages kill an estimated 40 percent of marine bacteria daily – such massive kill offs have a significant impact on the environment and carbon cycling(93). Phages have been used for many major scientific discoveries, including the determination of deoxyribonucleic acid (DNA) as the genetic material(41), the establishment of the triplet genetic code(20), and studies of recombinant DNA(56). Despite their common use for these projects, much remains to be learned about the nature of bacteriophages, such as the determinants of a host range and evolutionary relationships. Mycobacteriophages are phages that infect bacteria of the Mycobacterium clade(35). This study intends to identify the host range determinants, which are postulated to be the phage’s tail fibers, and survey evolutionary relationships between subgroup A2 mycobacteriophages – A2 phages have highly similar genomes but yet exhibit different host ranges, and they have potential in the treatment of prominent mycobacterial infections, such as tuberculosis and leprosy(36). This study will be done through analyses of gene and protein sequences, host range determination methods, and experimental manipulation of the host range determinants.

A phage’s host range (polyvalency) consists of all of the bacterial species it can infect and lyse(34,45). Phages have varying levels of host specificity; some have a broad range of several host species, and others have a minimal range of one single host species(34). There are many external factors that influence host range differences, but the most widely accepted hypothesis states that host range is ultimately determined by a phage’s ability to adsorb (attach) to the host cell’s membrane(34,45,72,90). A phage has a receptor-binding protein, also called an anti-receptor, by which it adsorbs to a receptor in the host’s membrane(53). The anti-receptor binds reversibly to the receptor through non-covalent interactions that allow the phage tail to subsequently attach itself irreversibly through covalent interactions with the receptor(7). Covalent bonding binds a phage particle irreversibly to the

By Beth Klein

Polyvalency of Subcluster A2 Mycobacteriophages: the Role of Tail Fibers and Their Amino Acid

92
host cell and enables it to inject its DNA(7). As such, adsorption is ultimately successful through irreversible attachment(35,53,54).

It is postulated that the tail fibers of a phage, the proteins that extend from the base plate (Fig. 1) [1] directly determine the polyvalency of the phage through interaction of the amino acid residues of the C-terminal ends, which are the tips of the fibers, and membrane receptors on a bacterial host(10,53,54). Previous studies have found that when mutations occur in the tail fiber genes, differences in host range also occurred(25,27,45,53,66,83). Though these studies have shown how as little as one amino acid difference or as much as several mutations alter the host ranges of particular phages, they do not demonstrate how or why changes in host range initially occur nor how the specific characteristics of the amino acid residues (hydrophilicity, size, etc.) affects the fiber’s ability to interact with the receptor. The goal of this study is to identify the amino acid residues of the tail fiber proteins of seven closely-related phages to determine if and how the amino acids of the tail fibers allow host-specific adsorption. Since tail fiber genes developed and changed over time, host range ability is ultimately constrained by evolutionary relationships, so it is useful to observe host ranges of a group of closely-related phages and analyze their exact evolutionary relationships(38). If the tail fibers of a phage are the locus of the receptor-binding proteins that determine a phage’s host range, then changes in the amino acid sequences of the fibers will change the structure, functionality, and the host range ability of the phage(1,98). The phage’s ability to adsorb to a host receptor may be inhibited, enhanced, or unchanged, depending on the alterations of the amino acids(53,98). This hypothesis will be tested with a group of selected phages through 1) host range determination, 2) genome comparisons, 3) manipulation of gene sequences suspected to be involved in the host range determination, and 4) evolutionary analyses of the tail fiber genes.

Background Information

The goal of this study is to recover the evolutionary relationships and host ranges of closely-related mycobacteriophages through comparative study of their tail fibers. This work will focus on mycobacteriophages because of their potential in the treatment of diseases (e.g. tuberculosis and leprosy) caused by members of the Mycobacterium clade(35,36). Most Mycobacteria species are harmless decomposers in soil and water, but some are pathogenic to vertebrates(6). Tuberculosis, caused in humans by Mycobacterium tuberculosis, has plagued mankind for millennia and continues to do so through difficult-to-treat multi-drug resistant (MDR) strains(6,77). The microbe M. leprae causes Hansen’s disease (i.e. leprosy) in humans, which is still common in developing countries – there were an estimated 230,000 new cases in 2012((6,101). Even M. smegmatis, the nonpathogenic species that is used to isolate most mycobacteriophages, has recently been found to cause atypical pneumonia in people(28). Also, mycobacteria are unaffected by gram-targeted treatments that usually treat bacterial infections well(59). Overall, mycobacterial human infections are difficult to treat and better treatment methods are increasingly necessary to combat antibiotic resistance and emerging pathogenicity(36).

Mycobacteriophages are adapted to kill mycobacteria with high levels of success and so they are a potential treatment for mycobacterial diseases, a concept called Phage Therapy(95). If phages that effectively infect and kill pathogens of the Mycobacteria clade (or other bacterial agents for that matter) are identified and studied, then these phages have the potential to control the spread of tuberculosis and other prevalent infections(46). Knowledge of phage host ranges is essential to Phage Therapy, and understanding the evolutionary indicators of host range helps predict a phage’s host range and therefore its usefulness for treatment(79).

The structure of a phage reflects its parasitic lifestyle (Fig. 1). A phage particle has three main components: a capsid head, genetic material, and the tail structure(10). The capsid head is a hollow protein structure that contains the genetic material, which is double-stranded DNA in all known mycobacteriophages(37). The tail sheath is a hollow protein tube that extends from the capsid; during injection the DNA moves from the capsid, through the sheath, and into the host cytoplasm(10). The tail and the tail fibers, the major focus of this study, are involved also in the recognition of the host cell(8). There are three clades of bacteriophages based on their tail morphologies (Table 1) [2]: Siphoviridae, Myoviridae, and Podoviridae (Fig. 2)(73). [3] Siphoviridae phages have a long, non-contractile tail; Myoviridae phages...
have a long, contractile tail, and Podoviridae phages either have a short, stubby tail or no tail at all(73). About 90% of known mycobacteriophages are Siphoviridae and 10% are Myoviridae, which suggests an advantage to the Siphoviridae morphology(73). No known mycobacteriophages are Podoviridae (without a tail), supporting the idea that the tail and its components are essential to successful infection, at least for mycobacteriophages(35,70).

### Specific Topic

A phage’s host range (polyvalency) consists of all of the bacterial species it can infect and lyse (34,45). Most known mycobacteriophages are capable of infecting M. smegmatis, almost certainly because M. smegmatis is the most common bacterium used to primarily isolate mycobacteriophages from the environment(35,47). Many factors to explain a phage’s ability to infect host cells have been proposed(34,45,90), but the most widely accepted hypothesis states that a phage’s host range is ultimately determined by the phage’s ability to adsorb to the host cell membrane(34,45,71). A phage’s genome carries all of its genes required for infection and lysis; as such, a phage only requires a host cell’s resources for gene expression(4,26,35). It is not therefore the metabolic requirements that primarily restrict a phage’s host range, but the phage’s ability to enter the host cell(35,54). It is thus possible for phages to infect across species (53,90), as long as the phage can penetrate the membrane(54). Host range is typically defined as the phage’s ability to lyse the cell, but lysis may be inhibited by host defense mechanisms that degrade the phage DNA or hinder its expression(2,45). In this study, host range is limited to the phage’s ability to adsorb to the host cell, not necessarily its ability to lyse the cell.

The Mycobacteriophage Database was initiated to organize mycobacteriophages, provide resources for further research of phages (such as procedures and published articles), and to share information about mycobacteriophage discovery, characterization, and genomics(47,70). Mycobacteriophages are classified into groups (clusters – letters A-U) and further divided into subgroups (subclusters – numbers 1-11) based on nucleotide sequence homology(34,45,47). This method of organization reflects recent evolutionary relationships of mycobacteriophages(45,60,86).

The A2 subcluster is one of the most studied subclusters of mycobacteriophages to date, but though they are commonly studied, there is much to learn about their host ranges and evolutionary relationships(33). There are 30 verified members of the A2 subcluster, and they differ from other subclusters in that many contain transfer ribonucleic acid (tRNA) genes, are capable of infecting M. tuberculosis, and are able to inhibit host gene expression during lytic growth, the process through which a phage replicates its genome and expresses genes to kill the host cell(14,30,70). A2 phages are particularly useful for host range studies in that they have broad host ranges that differ between each other, which allow for comparison of host ranges with multiple species of bacteria and assure that positive and negative host range tests will occur. It would be very difficult to determine which genetic sequences are involved in host range determination if the phages shared an identical range of hosts. For example, A2 phages L5 and D29 share many common hosts, but each has been found to infect several species that the other phage cannot(30,71,76,81). The differences in the host ranges of these two phages – despite their close phylogenetic relation – suggest that the other A2 phages will also display varying host ranges(30). Since they have varying host ranges and relatively well-annotated genomes (gene functions determined), the A2 phages are a useful group for examination of host range and evolutionary relationships. The goals of this study are to 1) determine the host ranges of the phages 2) compare the tail fiber subunit genes, the hypothesized host range determinants, 3) manipulate the tail fiber subunit genes to confirm their role in host
The infection of a bacterium by a phage depends on the genetic makeup of both organisms, where the bacterium and the phage must have the proper receptor-binding proteins to bind to the membrane receptor(54). A bacterium lacking certain membrane structures cannot be infected by a phage that requires such structures(12,48,102) However, most studies of this kind describe the structure of the receptor without stating its function in the host cell nor its interaction with the phage(34,54). Rather than search for the receptor, this study intends to identify the receptor-binding protein or proteins.

Specific Issues

Specific Issue 1: the receptor is difficult to identify – The infection of a bacterium by a phage depends on the genetic makeup of both organisms, where the bacterium must synthesize the specific membrane-bound receptor and the phage must have the proper receptor-binding proteins to bind to the membrane receptor(54). A bacterium lacking certain membrane structures cannot be infected by a phage that requires such structures for adsorption(54). Several studies have identified the bacterial membrane structures used for adsorption by phages(12,48,102) However, most studies of this kind describe the structure of the receptor without stating its function in the host cell nor its interaction with the phage(34,54). Rather than search for the receptor, this study intends to identify the receptor-binding protein or proteins.

Specific Issue 2: the role of the tail fibers in adsorption – It is postulated the tail fibers of a phage (Fig. 1) directly determine the host range of the phage through covalent bonding between the C-terminal regions of the fibers, which protrude away from the tail structure (Fig. 1) and specific membrane receptors of the bacterium(16,25,53,54,65,66,78,80). Variations and mutations in the tail structure genes, oftentimes through spontaneous mutations, have been described to alter the host ranges of phages(8,25,27,45,53,83), and though several studies often regard without question that the tail fibers are the determinants of host range, there has not been tangible evidence that, without the tail fibers, adsorption would be diminished or not occur. Therefore this project will demonstrate whether the tail fiber proteins determine host range, and if so how host range ability evolved over time with tail fiber evolution.

A phage particle typically have 4 to 8 tail fibers extending from the base plate (Fig. 1)(35,70), but the structure of these tail fibers is not clear. There are three possible structures of a phage’s tail fibers, and each structure has been found for phages of different species. The first is that each tail fiber has a different amino acid sequence, which would mean each fiber is encoded by a different gene. For example, coliphage (phage that infects E. coli) K1-5 encodes two structurally different tail fibers that allow it to adsorb to different hosts based on their interactions with different receptors(83). The second possibility is that all the phages’ tail fibers have the exact same amino acid sequence, and that they are all encoded by the same tail fiber gene. K1-5’s group of tail fibers is composed of two types of fibers encoded by separate genes (83). The third possibility is that the tail fibers are composed of multiple polypeptides linked together to form the fiber. Coliphage T4’s tail fiber consists of a dimer of one gene product, while coliphages T2, Ox2, K3 and M1 have a tail fiber consisting of two dimers encoded by two different genes (25). The literature on tail fiber adsorption often focuses on the sequences and mutations in these gene sequences, but rarely focuses on the actual structure of the tail fiber and a mutation’s effect on that structure(8,45,53). The A2 phages of this study have six genes whose gene products are identified as minor tail fiber proteins, but the role of each minor tail fiber protein has yet to be determined(35).

It is likely adsorption involves one, several, or all of the minor tail fiber proteins, and that host range-altering mutations can occur in many places in these genes(25,45,83). Therefore, all of the minor tail fiber genes of the A2 phages will be studied in this proposed work. Also, this study will study a group of seven closely-related A2 phages, rather than a single phage, and how differences in amino acid sequences of these proteins

Table 2: A2 phages used in this study. The selected phages are a mixture of commonly-studied and not commonly-studied phages.

<table>
<thead>
<tr>
<th>Phages</th>
<th>Fast-growing species</th>
<th>M. tuberculosis</th>
<th>M. bovis</th>
<th>M. capre</th>
<th>M. avium</th>
<th>M. ulcerans</th>
<th>M. simiae</th>
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Table 3: Bacteria species to be used as hosts in this study.
result in different host ranges. By examining the role of these amino acids in a phage’s host range, the host ranges of phages yet to be discovered could be determined by a straightforward identification of the minor tail fiber genes and their similarity to other phages’ genes, rather than the long experimental procedures that identify only a portion of a phage’s host range, at best(37). Such host range information would be useful as the rate of phage discovery and the need for alternatives to antibiotics are increasing due to resistant pathogens(35,47).

Specific Issue 3: evolution of phages and phage clusters – Phages are thought to have coevolved with their hosts at the same time as or even before the divergence of Bacteria and Archaea over 3 billion years ago, derived from stray bacterial DNA strands that accumulated more genes with time and eventually infected the bacteria species from which they were derived(15,39,40). Similarly to bacterial evolution, phages are thought to have evolved through horizontal gene transfer with phages of overlapping host ranges(35,40). Horizontal gene transfer is the process by which segments of DNA are obtained from other organisms, whether that be other bacteria or other phages(40). Other geneticists argue that phages use special recombinase genes specifically for homologous recombination, and that these “genomic shufflings” purposefully maintains the vast mosaicism of the phage world(21,69). On the other hand, bacteria may use phages to transfer their genes to other bacteria in a process called transduction(15), further support that phages originated from their host bacteria and accumulated more genes with time. Therefore, phages with similar genes and sequences are predicted to be evolutionarily related, whether that be through vertical (parent to progeny) or horizontal gene transfer(38,100).

Literature Review

The goal of this proposed work is to demonstrate the role of the tail fibers in host range determination, as hypothesized in phage literature. Phage research became prominent in the 1930s, when methods were established and genomic techniques became common. At the time, the few published articles on host range hypothesized that the end pins, tail fibers, and the base plate (i.e. end plate) are either cooperatively or individually involved in host range determination (Fig. 1) (54,87,92,97). Though mycobacteriophages L5 and D29 had been recently discovered at the time of these studies(24,31), these few adsorption studies investigated only coliphages and therefore excluded the diversity and individuality of phages of other species(87,92,97). From this work, the two-step adsorption mechanism was proposed, where first the phage finds the receptor on the host membrane and reversibly adsorbs, and then the phage becomes irreversibly attached(89). Various receptor molecules and locations of these receptors had been identified(54). However, such information did not provide the function of the receptor for the host cell nor the interaction the receptor has with the phage(7,54). Several coliphages were found to bind to porins (transport channels) in the bacterial membrane(25,102). Soon after, the tail fibers were considered the most important structure involved in the attachment process, though there was no work that definitively supported the notion(78). The N-terminus of the tail fiber protein is attached to the base plate and the C-terminus extends outward and interacts with the receptor(16,78).

Next, the role of the C-terminus region of tail fibers in the adsorption process was studied and it was found that the C-terminal regions of the tail fibers affect the host ranges of phages through direct interaction with the host cell(25,65,91). Homologous tail fibers were found to give varying host ranges in different Streptococcus phages(27,83). Although these studies are supportive of
the notion that the tail structures are directly involved in host range determination through the adsorption process, they do not show how the specific amino acid residue sequences of the tail fibers affect receptor-binding ability[7].

Small regions or mutations of the tail structures were found to affect a phage's host range[8,45,53,66]. Alterations of the tail structures, whether they be spontaneous mutations or manipulations in the laboratory[84], were found to influence host range at varying degrees[45,53]. However, these studies did not revert the mutated gene back to its original sequence to show that the host range-altering mutation was that mutation, rather than an unforeseen mutation elsewhere in the genome. Amino acid sequence of the tail fiber proteins is significant to host range determination[66], but no studies have shown how the amino acid sequence of a tail fiber influences its adsorption ability. The goal of this proposed study is to connect a tail fiber's amino acid sequence to its ability to infect particular hosts through comparison of the host ranges and tail fiber genes of a group of phages.

**Hypothesis and Rationale**

If the tail fibers serve as the receptor-binding proteins of a phage, then altering the amino acid sequences of the minor tail fiber proteins will directly alter the phage's ability to bind to a particular receptor, and therefore alter the host range of the phage.

The receptor-binding protein's structure and function is determined by the sequence of its amino acids, which is determined by the nucleotide sequence of the gene[1,98]. The receptor-binding protein interacts with the receptor in the membrane through covalent interactions between the protein's amino acids and the membrane molecules[7]. If the amino acid sequence of the receptor-binding protein is altered, the structure of the protein may also change, depending on the site of alteration and the interactions between the amino acids at that site[1,98]. For receptor-binding proteins, change in function may alter the protein's ability to interact (and adsorb) to a receptor. The phage's ability to adsorb to a host may be inhibited, enhanced, or unchanged, depending on the alteration[53]. When the alteration results in diminished or amplified abilities with different hosts, a host range alteration has occurred[53].

**Specific Aims**

**Determine the host ranges of the A2 phages**

The host range of a phage is defined in this study as all the bacteria to which a phage is able to irreversibly adsorb[35,54]. Identification of the A2 phages' host range would test previous findings[30,76], and is necessary to test the relationship between minor tail fiber gene sequences and host range. Host range of the A2 phages (Table 2) [4] will be determined qualitatively through the plaque assay[5], and quantitatively through adsorption constants[44].

The plaque assay will show if the addition of a phage to a bacterial lawn (a petri dish of bacteria) kills the bacteria[5]. A positive plaque assay will have plaques on the lawn were the phages were spotted, whereas a negative assay is indicated by an absence of plaques (Fig. 3) [5]. The phage titer provides a quantitative analysis.
of the qualitative plaque assay (5, 44). Dilutions of the phage lysate allow for an estimation of the concentration (titer) of phages in a phage lysate. The titer will be calculated based on the number of plaque-forming units (pfu) that occur after spotting with a given volume (5). Polyvalency, as defined in this proposal, is the range of bacterial hosts to which a phage is able to irreversibly adsorb. Visual examination may show no plaques on a lawn, but the failure of the phage to produce a plaque may be caused by a defense mechanism of the bacteria, not the inability of the phage to adsorb (35, 80). This study will quantitatively determine the host range of the phages through adsorption constants, as described by Hyman and Abedon (44). The adsorption constant measures how well the phages adsorb to the bacterial membrane by measuring the amount of unbound phages left over in a volume of solution over time; the constant is the percentage of phages unbound at a certain time interval (44). A significant decrease over time indicates efficient adsorption of the phage to that particular bacterium. The phage titer, as determined in the plaque assay, is used in the adsorption constant assay to calculate the proper volume of phage that must be added to a bacterial culture to produce a multiplicity of infection (MOI) of 10:1 (10 phage particles for every 1 bacterial cell) (5, 18).

The bacteria that will be used in this study (Table 3) [6] are pathogens and laboratory models significant in the scientific and medical fields (76). This proposed work includes a variety of bacteria (Table 3) that some phages of the A2 phages are known to either infect or not infect (30, 71, 76, 81), which assures that both positive and negative results will be obtained – if the phages had identical host ranges, it would be difficult to determine what exactly confers host range ability.

Relate nucleotide and amino acid sequences of the minor tail fiber genes and proteins to host range

The second aim of this proposal intends to relate the sequences of the suspected receptor-binding proteins – the minor tail fiber proteins – to the host ranges of the phages. To do so, both the nucleotide sequences and amino acid sequences of the tail proteins will be compared. The amino acid and nucleotide sequences will be compared to account for the redundancy of the genetic code – differences in nucleotide sequence may not alter the amino acid sequence of the polypeptide (61). First, each minor tail fiber gene of each phage would be compared to that of the other phages for homology (similarity); this will show recent common ancestry and differences between the minor tail fiber genes and proteins that may result in host range differences. In order to compare the correct genes in the unannotated genomes, bioinformatic programs will be used to determine the locations of the minor tail fiber genes in the genomes of the other phages based on homology with the minor tail fiber genes of L5. Once the locations of the genes are determined, homology calculations will be done. Homology will be calculated by determining the percent similarity between two sequences. The amino acid sequences of the gene products will be compared to one another for homology in a similar fashion, once again to control for the redundancy of the genetic code.

It is possible the minor tail fiber genes of all the phages may be highly similar with very few differences, or highly dissimilar with very few similarities. In either case, differences in gene and amino acid sequences may not correlate with differences in host range as expected. To account for this, an alternative procedure will instead assess minor tail fiber gene and amino acid sequence homology of all phages infecting specific hosts, exclusive of the phages that could not infect the particular host. The comparison would look for highly similar regions, which will then be compared to the other phages that did not infect that host (10, 53, 54). This approach is expected to identify regions that are homologous in the phages that

Figure 5: An example phylogenetic tree displaying relationships of prophage integrase genes in mycobacteriophages (29). The phages are listed to the right at the end of the branches. At each node there is a number indicating the percent support for the divergent event occurring at that location in the tree.
are infective, but are not homologous to phages that are not infective. These regions are expected to be involved in the adsorption of the phages to that particular host.

**Bioinformatics**

The genomes of annotated phages can be easily compared to one another via bioinformatic programs such as Phamerator, ClustalX, and BLAST, using information from the database GenBank. GenBank is a bioinformatic database on the National Center for Biotechnology Information (NCBI) website that contains collections of all publicly available DNA sequences, amino acid sequences, and annotations from all organisms, including phages(11). When a phage’s genome is sequenced, it is uploaded to GenBank, allowing for researchers to analyze it, compare it to other genomes, and possibly add their own annotations(11,50,70).

Phamerator is a downloadable software program that allows for visual side-by-side comparison of the locations, sizes, annotations, and protein products of the genes of multiple mycobacteriophages (Fig. 4)(19) [7]. Comparisons of a group of phages or a phamily (a group of genes related to one another) highlight the vast mosaicism of phages that makes the phage world so complex(19). The program creates genome maps that display the genes of a phage’s genome – when multiple genomes are compared side-by-side, regions of substantial nucleotide sequence similarity are shown with colored shading between the adjacent genomes(19). Violet stretches represent regions of high homology, red indicates low homology, and the colors between represent intermediate nonhomologous levels of homology(19). Regions with no color indicate regions, possibly obtained through a horizontal gene transfer event(19,40).

ClustalX and BLAST (Basic Local Alignment Search Tool – polypeptide [p] or nucleotide [n]) are databases that allow for the comparison of a given amino acid sequence (ClustalX or BLASTp) or nucleotide sequence (BLASTn) with all known genes, proteins, and nucleotide sequences in the database GenBank(3,11,42). ClustalX aligns multiple homologous sequences to show regions of non-identical nucleotides or amino acids between the sequences(42). The BLAST program displays the most closely homologous sequences in the database, ranked by an E-value to indicate the chance of homology occurring randomly between the two proteins(3). BLAST can also be used to investigate proteins, multiple alignments, proteins from messenger ribonucleic acid (mRNA) transcript sequences, and nucleotide sequences from amino acid sequences(3,11).

**Demonstrate role of tail fibers in adsorption and host range**

It is held that the tail fibers of a phage affect a phage’s host range directly by their ability to adsorb to a host cell, as evidenced in many studies(16,25,53,54,65,66,78), but this hypothesis has never been exclusively tested. The goal of this aim is to use Bacteriophage Recombineering of Electroporated DNA (BRED) to show that removal or manipulation of a minor tail fiber gene or set of genes af-
fects the adsorption ability of a phage(63,94). The minor tail fiber genes of each phage will be deleted from the phage's genome via recombination techniques. Each minor tail fiber gene will be individually deleted to determine individual function, then minor tail fiber genes will be deleted in pairs to determine interactions between the minor tail fiber proteins, and finally all the minor tail fiber genes will be removed to demonstrate if adsorption is possible without the minor tail fiber proteins. The A2 phages have 6 minor tail fiber genes(35,70), so there will be 16 deletions for each phage: 1 for each minor tail fiber gene, 1 for each pair combination (10 total), and 1 for all the minor tail fiber genes deleted together. The phage with the deletion will then be tested for adsorption against all the hosts to which the recipient phage is able to adsorb to show if the phage's adsorption ability was affected by the deletion of the tail fiber. It is not expected deletion of a minor tail fiber gene will allow infection of new bacterial hosts, so hosts the original phage was unable to infect will not be tested in the deletions.

Using the results of aim 2, site-directed mutagenesis – specific and intentional manipulation of a nucleotide sequence at a specific location in the genome(84,88) – will be done using a minor tail fiber gene sequence from a phage with one distinct host range (the donor phage) to alter the homolog (gene of same function) in a phage with another distinct host range (the recipient phage), to produce a recombinant phage(32,53,94). The host ranges of the donor and recipient phages will differ so that donor phage adsors to a particular bacterium to which the recipient phage is unable to adsorb, as determined in aim 1. The recombinant phage will then be tested for adsorption to the range of bacteria the donor phage could infect and the range of bacteria the recipient phage could infect, to show if the host range does or does not differ from the recipient phage's host range(44).

The altered gene will be chosen based on differences between the tail fibers of the donor phage and the recipient phage, as discussed in aim 2. It is important that the donor phage gene and the recipient phage gene are not identical, as recombination with an identical gene would generate no difference. The adsorption constant will be calculated to determine if adsorption of the recombinant phage to M. avium is different from the recipient phage(44). Once the host range of the recombinant phage has been determined, another site-directed mutagenesis procedure will be done on the phage to convert the mutated gene back to its original sequence. The host range of the doubly-recombinant phage will be determined to show that host range alterations that occurred in the recombinant phage were a result of the site-directed mutagenesis, and not some other unseen mutation. By showing that the doubly-recombinant phage returned to its original host range, any host range alterations of the recombinant phage can be attributed to the recombination.

Since there are multiple minor tail fiber genes in these phages, and seven phages to compare to one another, several individual site-directed mutagenesis experiments will be done. Further mutations would involve different phage combinations, different minor tail fiber genes, and different alterations within a single gene. The studies by Le et al.(53), Jacobs-Sera et al.(45), and Duplessis and Moineau(27) investigated a single mutation and one specific gene's effects on polyvalency. This study aims to investigate multiple tail fiber genes homologous between multiple phages to determine how minor tail fiber proteins work together in the adsorption process and how particular amino acid sequences affect adsorption. Multiple mutation experiments will be done to determine particular host ranges patterns. The goal of these experimental mutations is to show that alterations of particular amino acid sequences result in different host ranges.

Recover phylogenetic trees of the A2 phages' minor tail fiber genes

Phylogenetic trees will be recovered of the A2 phages to show their evolutionary relationships in terms of their minor tail fiber genes. A phylogram estimates the common ancestry of genes throughout the history of a species (Fig. 5)(43) [8]. The tips of the branches represent the descendant species from the common ancestor, nodes indicate a common ancestor between the branched species, and the branch lengths indicate how recently a gene diverged based on the similarity between homologous genes(43,64). Since phages continuously undergo recombination events, tracking the evolutionary history of an entire genome is very difficult, but tracking the history of a particular gene or a module, a group of related genes, is more feasible(15).

This study therefore would recover the evolutionary history of the minor tail fiber genes. The polyvalency of each phage will be indicated on the tree based on the results of aim 2, and the phylogenetic tree will be used to test hypotheses of how host ranges evolved in these phages. Since this study only investigates seven known A2 phages out of the potentially millions yet to be discovered, the phylogenetic tree would be very simplified and based on the limited knowledge that these phages offer (Fig. 5)(13). For example, A2 phages are unique from other phages in that they often have tRNA genes(35,70). The presence of certain tRNA genes in highly similar lo-
cations in the genomes of two phages suggests a recent common ancestor; therefore tRNA genes can be used to predict common ancestors and place phages on the tree in accordance to these relationships(35). Since the phages have multiple minor tail fibers genes, each set of minor tail fiber gene homologs would be used to construct a tree. The goal of this aim is to obtain a robust phylogenetic hypothesis of evolutionary inheritance pattern of the minor tail fiber genes between the A2 phages.

There are various bioinformatics programs designed to construct phylogenetic trees. When the programs are used in combination, the statistical confidence of the tree is increased(9,58). There are three steps involved in the recovery of a phylogenetic tree. First, one must determine homology of the gene or genes in question and identify homologous species (in this study, phages). BLAST is an online program that can be used for nucleotide and amino acid sequence comparisons and also homology searches across GenBank(3,11,13). A3 phage Bxz2, a phage of close relation to the A2 phages, would be used as a control outgroup (comparison) in the tree (Fig. 5)(3,38) [9]. The second step is to align the homologous genes with each other. ClustalX takes the gene sequences of the group of organisms and aligns them accordingly based on sequence, displaying the individual differences in the genes that occurred through mutations(42).

The third step is to recover the tree, which is done based on a series of algorithms that have been constructed and reconstructed thoroughly over past decades(43). Phylogenetic Analysis Using Parsimony (PAUP*) is a common algorithm program whose goal is to prepare the most accurate tree with the least evolutionary divergences(99). PAUP* is commonly used in bacteriophage phylogeny literature(13,58). After a tree is constructed, some studies further the level of confidence of the tree through the Online Calculation of Congruency Index(9,22). All of these programs are available for download or online (3,23,99).

Possible Results and Discussion

Specific Aim 1: Plaque Assay – It is predicted that the phages will show similar but not identical host ranges. The host ranges of the phages will overlap with some of the bacteria species, particularly M. smegmatis, which serves as the positive control(35,76). This is predicted because it is thought that each phage interacts with different host cell receptors and in different manners(53,85). An alternative expectation is that the phages exhibit highly similar or identical host ranges, since subcluster-matched phages are all so closely relat-
The adsorption constant assays will be tested for statistical significance in a similar manner to the titer calculations. The adsorption constants of a phage to a bacterial host over time will be tested for change over time with the one-sample t test. A statistically significant result for the one-sample t test would indicate that there was a change in phage concentration over time, while a statistically insignificant result would indicate there was no significant change in phage concentration over time. The lowest calculated adsorption constants of a phage to a bacterial host will be compared to the lowest adsorption constants of that phage to the other hosts with an ANOVA to show if the phage was statistically more able to adsorb to some hosts over others. In the same manner, the lowest calculated adsorption constants of other phages to that host with an ANOVA to show if different phages had statistically different abilities to adsorb to that host.

Specific Aim 2 – It is predicted that the sequences of the minor tail fiber genes and amino acid residues will be highly conserved at the N-terminal regions and not as conserved at the C-terminal regions, as reported previously (10,25,53,54,65,91). Phages were initially divided into clusters based on 50% or greater homology with other members of the cluster, and a phage has even greater homology with members of its identified sub-cluster (67), so it is predicted that the small differences in sequence of the minor tail fiber genes will correlate with host range differences due to resulting differences in the tail fibers and ultimately the phage’s ability to adsorb to a host. The phages with more similar amino acid sequences in the minor tail fiber proteins will share similar host ranges, whereas those with less similar sequences will share less similar host ranges (45,53). Phages that infect a common bacterium are predicted to have highly homologous regions in the minor tail fiber genes that differ greatly from those phages that did not infect that bacterium.

An alternative to these predictions is that the sequences of the genes and amino acids between the phages are not closely related to one another. This would suggest that the tail fiber proteins are either not involved in adsorption to the host cell, or that tail fiber proteins of different phages interact with different receptors and therefore would not be similar to other phages’ tail fiber proteins. In this case, it would be difficult to identify highly homologous regions of the tail fiber proteins between different phages that may correlate with host range.

Specific Aim 3 – The deletions in the minor tail fiber genes are expected to decrease the adsorption constants of the phages to varying degrees. Minor tail fiber proteins that reduce adsorption most dramatically play a more critical role in adsorption (53). Also, deletions are expected to affect adsorption similarly for different bacterial hosts, providing evidence that tail fibers adsorb to similar receptors on different hosts (76). An alternative prediction is that the deletions of some tail fiber proteins will not affect host range at all, suggesting that those proteins are not involved in host range ability or do not comprise a tail fiber. Another prediction is that deletion of any minor tail fiber protein will diminish or abolish host range ability of that phage completely, suggesting that the presence of all of the tail fiber proteins is necessary for adsorption and infection. This prediction supports the premise that a tail fiber is composed of multiple polypeptides that must all be present for a functional tail fiber.

The recombinant phage is expected to infect a new range of bacteria, including those from the host ranges of both the donor phage and the recipient phage (45,53). It is not expected that a single gene will alter host range completely or give the host range of the donor phage to the recombinant phage, but instead an overlapping range between the donor and recipient phage will be seen (45,53). This would demonstrate the role of the minor tail fiber protein in the adsorption step. It is predicted that alterations to the C-terminal regions of the minor tail fiber genes will have the largest impact on a phage’s host range (10,53,54).

The phages with deletions and recombinations will be compared to the recipient phage for statistical significance with the two-sample t test. The test will compare the adsorption constant that is lowest for the recipient phage to the constant at that same time interval for the recombinant phage to show if the gene recombination...
altered the ability of the phage to adsorb to the host in a statistically significant manner.

Specific Aim 4 – The phages of this study are expected to have relatively recent common ancestry, indicated by short branch lengths extending from the nodes(35,67). The phages will be placed in close proximity to one another on the trees generated, clustered in a small group relatively far from the outgroup(3). In terms of polyvalency, those phages that infect a common set of bacteria will share a more recent common ancestor with each other to the exclusion of those that infect a less-common set. The phylograms recovered would be highly similar in structure and position of the phages on the leaves, reflecting the homology and conservation of the minor tail fiber genes in evolutionary history(30,38,43).

An alternative prediction is that the trees will not be similar to one another, suggesting that the individual minor tail fiber genes either a) evolved independent of one another over time, or b) were inherited by each phages in different horizontal gene transfer events after the divergence of the phages. It is also possible that a phylogram for some or all of the minor tail fiber genes will not be recovered. Phylogenetic trees are purely estimates of evolutionary history; the inability to recover a tree may not be caused by the genes themselves, but possibly caused by inconsistency or weaknesses of the phylogenetic program constructions or a lack of robustness(43).

Discussion

The overall goal of this study is to show the role of the minor tail fibers in host range adsorption. It is possible the minor tail fibers either play no role in adsorption, are the sole determinants of host range for a phage, or they interact with each other or other tail structures to influence adsorption ability. The third aim of this study intends to demonstrate exactly how minor tail fiber proteins influence host range by manipulation of the minor tail fiber proteins and then manipulation back to the original sequence. This would confirm that any host range alterations that occurred in the recombinant phage was solely due to the manipulation of the minor tail fiber genes.

Another intriguing possible outcome would be that the polyvalency of the recombinant phage is completely different from the recipient phage – that is, the recombination confers the entire host range of the donor phage to the recipient phage. If this occurs, the gene involved would be thought to solely determine the adsorption ability of a phage to a receptor, and thus the phage’s host range. Multiple genes appear to work together to increase the phage’s affinity to a receptor, so it is unlikely that a single gene determines the entire host range of a phage (25,53). Another possibility is that the recombination would not alter the host range of the recipient phage at all, suggesting that the minor tail fiber protein in question was either not involved with recognition of certain species or that it was not involved in host recognition altogether.

The phylogeny aim intends to recover the evolutionary relationships between the phages’ minor tail fiber genes. The resulting trees would show how the minor tail fiber genes have changed over evolutionary time in comparison to the other A2 phages. It is possible these trees will be highly similar with very few differences,
suggested that the minor tail fiber genes are inherited together. It is also possible these trees with be highly dissimilar, suggesting that the minor tail fiber genes are not inherited together, but separately through individual horizontal gene transfer events(38).

Future polyvalency studies could investigate the role of other genes, besides the minor tail fibers, in polyvalency determination. For example, deletions in a phage’s immunity region, the genes involved in preventing a subsequent phage from infecting a lysogenic host, tend to improve a phage’s adsorption ability and increase its host range(68,81). This is the proposed mechanism by which phage D29 acquired a broader host range than L5 due to an apparent 3.6 kilobase deletion in the immunity region(17,30). Another region that may play a critical role in the polyvalency determination is the base plate region. Though base plate proteins are thought to not be involved in the adsorption step(96), a conformation change of the base plate allows for DNA injection into the host cell. Therefore the base plate does not affect adsorption, but rather the last step in infection before injection. An investigation into the base plate could explore the actual conformation change of the base plate in terms of biochemical reactions or its genetic basis.

Conclusions

Phage-host interaction mechanisms are important to the advancement of phage biology because of the potential of such information in evolutionary biology and medicine. Geneticists have routinely used phages to insert, manipulate, or knock out genes in bacterial model organisms to determine the roles of such genes in the cell, similarly to vector plasmids(34). Knowledge of a phage’s host range is vital to its effective use as a vector. Several studies have used phages to detect and eradicate food-borne pathogens, such as E. coli or Salmonella species(82). Such techniques would use polyvalency to effectively infect pathogens and reduce food contamination(82). A common goal of phage medical research is to develop Phage Therapy, a treatment in which particular phages would be used to treat bacterial infections(55). Phages are adapted to invade, infect, and kill bacterial cells over and over again with high levels of success(95). They do not infect human or any other eukaryotic cells, as they are very specific to bacterial species.

Phage Therapy is a promising replacement for antibiotics, but there are obstacles to its implementation. There are concerns that phages would harm beneficial flora as well as disease-causing agents, or that phages would trigger an immune response(46). Non-medical challenges include large-scale manufacturing and regulation of phage distribution and application(46,57). Phage Therapy has in the past been implemented by medical researchers in Georgia and the former Soviet Union, with varying degrees of success(52,62). By understanding the mechanisms of phage-host specificity, phages could be prescribed to a patient to maximize phage infection of the problematic pathogen and minimize harm to the mutualistic flora, thus allowing for rapid development of Phage Therapy methods(18).

From this combination of evolutionary relationships and
and host range explorations, the polyvalency of A2 phages that have yet to be discovered could be determined by a straightforward analysis of the minor tail fiber proteins and similarity to other A2 phages rather than long experimental procedures. Host range differences caused by differences in minor tail fiber proteins could also be studied with the other clusters, possibly revealing more phages able to infect pathogenic agents such as M. tuberculosis or M. leprae. The A2 phages, as well as cluster A3 and K phages, have particular potential for the treatment of tuberculosis because they have been shown to infect M. tuberculosis. By confirming the role of a phage’s tail fibers in host range determination, phage research comes closer to routinely using phages as treatment to widespread and antibiotic-resistant ailments.

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The Effectiveness of Commercial Topical Rubefacient Creams on Handgrip Endurance

By Jacelyn Peabody, Beth Klein, Alexis Kingery, Beth Klein, Kayla Palmer, Logan Sedig, Phung Nguyen

Topical rubefacients are most commonly used after physical activity in order to soothe muscle aches and pains. This study looks at the effect of topical rubefacients during muscle activity and whether or not they would provide increased muscle endurance. In this experiment, the forearm muscles were specifically targeted to determine grip endurance. Using a Biopac system; endurance, force, and baselines were analyzed while using IcyHot, Tiger Balm, and hot water on the forearm muscles to determine whether or not the experimental treatments had a significant effect on muscle endurance. In regards to the experimental treatments, results were inconclusive due to a clear training effect that occurred throughout the five week study. Based on this study, there was no evidence to say topical rubefacients or hot water improves muscle endurance. However, if the experiment was carried out in a way that cancelled out the training effect, the results could point to some conclusion.

Muscles are the tissues that allow multicellular organisms to generate force and motion, whether that be from one location to another or the movement of substances throughout the body. Muscle tissue is comprised of muscle fibers and connective tissue. A muscle fiber uses metabolic energy to produce a movement in conjunction with other muscle fibers - together the fibers of a muscle tissue can accomplish many tasks to not only benefit the organism kinetically, but to maintain homeostasis and keep the organism alive. The human body has three types of muscle tissue - skeletal muscle supports and moves the body, smooth muscle regulates internal flow, and cardiac muscle propels blood throughout the entire cardiovascular system. All three types of muscle are essential for human survival (Widmaier et al, 2008).

Skeletal muscles are physically attached to the bones of the body by tendons (hence the term “skeletal”) so a skeletal muscle’s contraction directly affects the position of the bone to which it is bound (Kenyes, et al, 2001). The contraction is analogous to pulling a rope: the muscle fibers essentially tug the tendon and connective tissues in many possible angles. A skeletal muscle is stimulated to contract through a hierarchy of neurons. The higher centers of the brain initiate the thought to generate movement in the muscle; these centers are not well understood but thought to include centers of memory, emotion, and motivation. The signal to move is relayed through the central nervous system via interneurons. From the higher centers, the signal travels to the sensorimotor cortex, which further relays the signal to the basal nuclei, thalamus, and cerebellum. These middle centers of the hierarchy also receive signals from the afferent neurons in the skeletal muscle; these afferent signals relay information about the space and position of the muscle, the Golgi tendon, and the rest of the body to ensure the movement is possible and plausible. The signal is then relayed to the brainstem, where it decussates and travels down the spinal cord via efferent neurons. The final interneurons transmit the signal to the motor neurons of the muscle to be contracted (Widmaier et al, 2008).

The motor neurons pass the signal to the muscle fibers through a neuromuscular junction between the neuron and the muscle fiber. In the absence of a signal, the concentration of cytoplasmic calcium in the presynaptic terminal is relatively low, while the extracellular concentration surrounding the terminal is very high. Without
calcium, synaptotagmin is unable to induce acetylcholine release from SNARE protein-controlled vesicles. With calcium, the synaptotagmin pulls the SNARE proteins to allow the fusion of acetylcholine-filled vesicles with the presynaptic membrane. This fusion releases the acetylcholine into the synaptic cleft, where it diffuses to the motor end plate and binds to nicotinic ligand-gated ion channels. Acetylcholine binding to the nicotinic channels opens sodium and potassium ion channels, which quickly bring into the muscle fiber small amounts of sodium and throughout the depolarization slowly bring out of the muscle fiber low amounts of potassium. The leakage of sodium ions into the muscle fiber depolarizes the membrane to threshold (~ -55mV in a skeletal muscle), resulting in the opening of voltage-gated sodium channels that causes a rush of sodium ions into the cell. The influx of sodium into the fiber depolarizes the membrane beyond threshold. The membrane potential may increase by upwards of 100mV by its peak depolarization. The resulting action potential propagates over the surface of the muscle fiber membrane through the voltage-gated sodium channels. If the membrane is depolarized but not past threshold, no action potential occurs and the depolarization does not spread. Thus the action potential of a muscle fiber is an all-or-nothing event (Widmaier et al, 2008).

The action potential travels down the T-tubule, eventually reaching the voltage-sensitive dihydropyridine (DHP) receptor. DHP is physically attached through a foot process to ryanodine, a voltage-gated calcium channel embedded in the sarcoplasmic reticulum membrane. The action potential stimulates DHP to change conformation, thus resulting in the opening of the ryanodine channel. Calcium quickly diffuses down its concentration gradient from the sarcoplasmic reticulum, through the ryanodine channel and into the cytoplasm of the cell (Widmaier et al, 2008).

The functional subunit that composes muscle fibers is the sarcomere. The sarcomere is divided into zones of thick and thin filaments, which are composed of myosin and actin, respectively. A contraction occurs when the cross-bridges located along the myosin filaments attach to and pull the actin filaments towards the center of the sarcomere, decreasing the length of the sarcomere and muscle fiber. Simultaneous contraction of the muscle fibers in a muscle results in the shortening of the entire muscle. In a non-contracting skeletal muscle fiber, the cross-bridge is unable to attach to the actin filament. The binding site on each individual actin monomer in the filament is covered by tropomyosin, which is held in front of the binding site by troponin. The binding of calcium to the calcium-binding subunit of troponin causes a conformational change of the troponin. The calcium-bound tropo- nin moves tropomyosin away from the actin binding site, allowing the cross-bridge to bind to and move the actin filament (Widmaier et al, 2008).

The cross-bridges are the force-generating sites of the sarcomere. The cross-bridge causes shortening of the sarcomeres through power strokes, and each power stroke occurs in a sequence of events called the cross-bridge cycle. The first step in the cycle is attachment of the energized cross-bridge to an actin molecule on the thin filament. Thus the cross-bridge cycle can only take place when the binding site on the actin molecule is exposed. In the second step ADP and inorganic phosphate leave the cross-bridge, and the cross-bridge essentially strokes the actin molecule towards the center of the sarcomere, much like the stroke of an oar of a canoe. In the third step, the binding of an ATP molecule causes the cross-bridge to detach from the actin molecule. Finally, the now bound ATP is hydrolyzed into ADP and inorganic phosphate, fueling the cross-bridge for the next cycle. The next cycle cannot occur unless the final ATP hydrolysis step occurs prior. The cross-bridge can, however, finish its power stroke using the energy from the most previous ATP hydrolysis. As long as there is a steady supply of ATP to the cross-bridge and high concentrations of calcium in the cytoplasm, the cross-bridge will continue to bind and pull actin (Widmaier et al, 2008).

A contraction can be ceased in a few ways: within the cell itself, outside the cell, and depletion of resources. The cytoplasmic concentration of calcium can be depleted through active transport of calcium to the sarcoplasmic reticulum via calcium ion ATPases in the sarcoplasmic reticulum membrane. Without calcium, tropomyosin returns to its original conformation, moving the tropomyosin to once again cover the actin binding site. A muscle fiber can be continuously stimulated with action potentials to produce a constant contraction - cessation of the action potential also leads to decreased cytoplasmic calcium concentration and muscle relaxation. The action potential can be stopped by depletion of acetylcholine. The synaptic junction contains small concentrations of acetylcholinesterases that slowly break down acetylcholine into its derivatives. These derivatives are transported back to the motor neuron for use in future action potentials. As the amount of unbound acetylcholine in the cleft decreases due to acetylcholinesterase activity, the nicotinic-receptor-bound acetylcholine molecules fall off and meet the same fate. Once acetylcholine leaves the nicotinic receptors, the ion channels close and the membrane potential returns to normal (~ -70mV), preparing itself for future action potentials. A final way to cease a contraction is depletion of necessary resources for cross-bridge cycling, most importantly ATP. ATP is important in the cross-bridge cycling process and active transport of calcium back into the sarcoplasmic reticulum. In order to main-
tain a contraction, the muscle fiber must not only have access to energy-rich molecules, but be able to metabolize these molecules and use their energy to synthesize ATP (Widmaier et al, 2008).

When resources are depleted, such as oxygen for oxidative phosphorylation or glucose for glycolysis, the fiber cannot synthesize anymore ATP and cannot further fuel contraction. Such a decrease in muscle tension after protracted contraction is termed muscle fatigue (Widmaier et al, 2008). The exact beginning of fatigue varies from study to study, from the point at which maximal force begins to decline (Lorenzo et al, 2010) to the point at which the participant was unable to perform work (Parkin et al, 1999). There are many factors involved in the fatigue process of muscles, such as concentrations of hormones, neurotransmitters, and stress proteins. These factors could alter the fatigue process in many ways, such as by altering the rate of neuronal firing, altering the level of gene expression within the cell, and initiating signal transduction pathways that make the fiber more or less able to perform and hold a contraction (Iguchi et al, 2011). It is likely the fatigue process is affected by a combination of these factors. Previous studies have also explored the effects of heat and increased body temperature on muscle fatigue and strength. These studies have found that increased external heat decreases fatigue time and strength of a muscle, and acclimation to heat improves performance over the long-term (Durst et al, 2005, Lorenzo et al, 2010).

Topical rubefacients are used to treat various muscle pains, including strains, soreness, and fatigue. Rubefacients are also used to treat chronic muscle pain conditions, such as osteoarthritis, and are available through prescriptions or over-the-counter remedies (Matthews et al, 2009). The active ingredients of topical rubefacients are vasodilators, which cause reddening of the skin and increased capillary blood flow to the applied muscle (Fulton et al, 1959). Common topical rubefacients include salicylates, capsaicins, rubbing alcohol, and menthol. These are often the active ingredients of name-brand rubefacients, including IcyHot, Tiger Balm, and Biofreeze (Mason et al, 2004).

Athletes rely on heat treatments to relieve muscle pains after an endurance activity, but is it possible to apply the heat before the performance to increase strength and endurance? Studies on muscle endurance have shown that applied heat stress before muscle performance increases endurance (Iguchi et al, 2011), but no such studies have examined the effects of external heat application on muscle endurance. The effectiveness of non-prescription, over-the-counter topical rubefacient ointments and heated water, which served to increase the heat of the muscle without inducing vasodilation. A study of this nature has not been done before in this manner (i.e. testing the effectiveness of topical rubefacients in a purely subjective manner in relation to muscle strength and endurance) in the literature. We expected that the longest sustained force output would occur after treatment with the topical rubefacients. By comparing over-the-counter remedies with natural treatments (water), this study could help inform the consumer which product yields the best results for combating fatigue, which could potentially increase his or her workout output and stamina. Over $30 billion is spent annually on over-the-counter medications; much of that goes to waste because customers are uninformed and buy the less-effective product or the wrong product altogether (Harvard Health Letter, 2006).

Hypothesis

The null hypothesis for this experiment was that the topical rubefacient and hot water treatments would not affect the onset of muscle fatigue, thus there would be no difference between muscle fatigue in untreated individuals and individuals treated with rubefacients. The alternative hypothesis was that the experimental heat treatments would postpone onset of muscle fatigue in comparison to muscle contraction without treatment. It was also predicted that topical rubefacients will cause longer lasting effects in comparison to an untreated individual, as measured across the three trials over the course of 40 minutes. The rationale for this prediction was that these ointments are slowly absorbed into the skin, which
would allow rubefacient action (increased blood flow) to be sustained over time. To reiterate, by increasing blood flow to the muscles, there would be an increase of oxygen and an increase of the removal of waste by-products resulting from muscle contraction. The various heat treatment experiments were executed one week apart from the previous to minimize chance of experimental confounds.

Another alternative hypothesis was that all heat treatments would increase muscle fatigue time simply due to the increased muscle temperature as predicted by (Lorenzo et al, 2010). Two more alternative hypotheses predicted that the topical rubefacients individually would increase time to muscle fatigue, specifically by the difference in the active ingredients of each rubefacient. The active ingredients in IcyHot are menthol (10%) and methyl salicylate (30%), and the active ingredients of Tiger Balm are Camphor (11%) and menthol (8%) (Chattem, 2014; Haw Par, 2012). Though both products contain menthol, we predicted the other active ingredients would cause any individual differences between the IcyHot and Tiger Balm treatments. The active ingredients of IcyHot work to block pain sensations by causing cold and hot sensations on the skin, which are transmitted to the brain in the same signaling pathways as pain sensations. In short, IcyHot aims to distract from pain with extreme temperatures (Chattem, 2014). The active ingredients of Tiger Balm work in much of the same way, except they produce a comfortably warm sensation whilst increasing blood circulation to the applied area (Haw Par, 2012). If only IcyHot were to significantly increase time to muscle fatigue, we predicted that the extreme temperature sensations would result in the increased time. If Tiger Balm, on the other hand, were the only rubefacient to increase time to muscle fatigue, we predicted that the relaxing warmth caused by the ingredients would be the contributing factor.

The experiment was carried out every Thursday during the physiology lab period over the course of five weeks. Baselines were taken the first and last weeks of the experiment to show any changes in the participants’ muscle strength over the course of the study - improvement in muscle output after considerable time training is called the training effect (Gacesa et al, 2013). IcyHot was applied for the trials of the second week, Tiger Balm for the third, and the hot water treatment for the fourth week. For each treatment and baseline, each subject performed an initial trial followed by two separate trials with 20 minute rest periods in between trials. The efficiency of the treatment over time was quantified by comparing length of time until onset of fatigue immediately following treatment (initial trial) with 20 minutes post-treatment (trial 2) and 40 minutes post-treatment (trial 3). The average force integral of the three trials was compared to the average of the baseline trials to quantify any change of total force output over time. Previous studies have shown that both synthetic heat, such as that resulting from topical rubefacients, and natural heat, derived from heated water for example, reduce muscle pain when they are applied after muscle straining activity (Petrofsky, 2013). By measuring the time until fatigue is reached, this study could show if applying heat to the muscles before physical activity can increase endurance, and if the effect of any of these treatments is long-lasting.

Depending on the outcome of this study, it would be possible to conduct further research in synthetic versus natural heat application pre-workout for athletes to increase overall muscle endurance. A further project could involve developing a repurposed product that is specifically designed as a pre-workout rubefacient ointment. Overall, the experiment provides data on the relationship of synthetic heat and natural heat on muscle endurance. Further research based on this pilot study could elucidate effectiveness of other pre-workout topical treatments on muscle endurance and improvement in performance during the workout.

**Specific Aims**

1. Determine if onset of muscle fatigue is delayed following submersion of forearm in 42 degrees Celsius water bath for 5 minutes.
2. Determine if onset of muscle fatigue is delayed with application of IcyHot.
3. Determine if onset of muscle fatigue is delayed with application of Tiger Balm.
4. Measure average force integral following water treatment in contrast to the average force integral of the baseline.
5. Measure average force integral following IcyHot treatment in contrast to the average force integral of the baseline.
6. Measure average force integral following Tiger Balm treatment in contrast to the average force integral of the baseline.
7. Observe long-lasting effectiveness of aforementioned water treatment over a period of 40 minutes as measured by percent change in time until fatigue across the three trials.
8. Observe long-lasting effectiveness of IcyHot treatment over a period of 40 minutes as measured by percent change in time until fatigue across the three trials.
9. Observe long-lasting effectiveness of Tiger Balm treatment over a period of 40 minutes as measured by
percent change in time until fatigue across the three trials.

**Research Design and Methods**

**Materials**

To execute this experiment of testing the effect of topical rubefacients on muscle endurance, the following items were used:

1. Biopac BSL Human Physiology system - Equipment package used to measure different physiological systems within the human body. This study specifically will utilize the electrode lead set (SS2LB), Hand Dynamometer (SS25LA), electrode gel and disposable electrodes (100/pk) (EL503).
2. 6 test subjects (2 males, 4 females)
3. A computer (included with the Biopac system)
4. 1 medium sized bucket - used to contain hot water in which to submerge arms.
5. 4 L of water - per individual test subject
6. Tiger Balm (2g per individual) - commercially-available topical rubefacient ointment.
7. IcyHot (2g per individual) - commercially-available topical rubefacient ointment.

**Experimental Design**

The following procedure was done over a five week period. All participants arrived at the testing site (Room 225, David Straz Center, Carthage College) on the first day of testing and produce a baseline test, with no rubefacients or hot water on their arm. Using the Biopac, BSL Human Physiology system, hand dynamometer, electrode lead set, electrode gel, and disposable electrodes, the test subject's dominant arm was tested for grip endurance to the point of fatigue.

First, the Biopac system was set up. The Biopac remained shut off while the computer was loading. The electrode lead was then plugged into channel three of the Biopac. Dots of electrode gel were then placed on the dominant arm of the test subject followed by electrodes in the spots indicated by Figure 1. The leads were then connected also according to Figure 1. The Biopac system was turned on and the program on the computer was launched.

Next, the Biopac system required a calibration of the hand dynamometer ensuring that the measurements were accurate for each subject's grip strength. This required the test subject to leave the dynamometer on a flat surface (e.g. a desk) with no grip force. Then the participant was prompted to hold the dynamometer (this was all done while sitting), click the calibration button and wait two seconds. Immediately following the two seconds of no force, maximum force was applied to the dynamometer for two seconds, then the dynamometer was released.

Finally, the actual test can be conducted and recorded. The test subject will hold the dynamometer for two seconds with no applied force. Following the two seconds of no applied force, maximum force is applied to the apparatus. The subject applies the most possible force to the dynamometer continuously until half the maximum peak force is reached, the point at which we define fatigue. At this point, the recording on the computer was stopped. This process was repeated for three trials (including the calibration) with a twenty minute rest period between trials while all other test subjects were tested. A week after the baseline, the participants performed three trials of grip strength until fatigue of their dominant arm with the application of IcyHot. The IcyHot was applied only once at the beginning of the test period. The ointment was applied to the lower arm, from the elbow to the wrist. It was rubbed evenly into the skin and allowed to sit for five minutes for the rubefacient cream to take effect. The steps taken to determine the baseline were repeated across the three trials to determine the effectiveness of the ointment over time, including the twenty minute rest periods between trials.

The same process was performed for a third time, instead with the application of Tiger Balm. Finally, the process was repeated with the hot water heated to 42 degrees Celsius. A second baseline was taken the fifth week of the experiment to determine if a training effect had an impact on the subjects. The data was then be analyzed to
determine whether heat or the commercially available topical ointments aid more in muscle strength and endurance.

Endurance, force, and a comparison of the baselines were measured to determine if the rubefacients or hot water had an effect on muscle strength, endurance, and fatigue time. The endurance was measured based on how long (in seconds) a subject could grip until reaching half their max peak. The difference between the two baseline tests was measured and analyzed to either rule out or suggest a training effect. Force was measured based on the integral under the curve of the waveform graph in kg*sec. The integral is the amount of force that is being generated over a period of time. This will show with which how much force the dynamometer is being gripped until fatigue, defined as half of the initial max force.

Results

An analysis of variance (ANOVA) statistical test was performed on the data set. ANOVAs compare means of multiple groups in a single analysis, which is why this test was useful in examining the statistical significance of the results from the five different experimental treatments of this study. The significance level chosen for this test was $\alpha = 0.05$, which provides a 95% confidence interval. The 95% confidence interval means that if statistical significance was found, the probability of the significance occurring due to random chance was less than 5% of the time, $p < 0.05$. This significance level, $\alpha$, was a probability used as a criterion for rejecting the null hypothesis. If the $p$-value for a test was less than or equal to $\alpha$, then the null hypothesis would be rejected. If the $p$-value was greater than $\alpha$, then the null hypothesis would not be rejected. A two-tailed test was used to test the possibility of a significant difference in both the positive and negative directions.

Four ANOVAs were conducted, looking at the measurements for integral (Fig. 2), time until fatigue (Fig. 3) max force and integrated EMG (Table 1). The p-value for integral was found to be 0.1964, max force was 0.49666, and the p-value for integrated EMG results of the five groups was 0.90021. All of these values are greater than the alpha of 0.05, lead us to fail to reject the null hypothesis. Therefore there was no observed significance between the integral, max force and integrated EMG between when comparing the two baselines with the treatment groups of IcyHot, Tiger Balm and Hot Water. Time until fatigue was found to have a p-value of 0.002 which is less than the alpha of 0.05, so there was statistical significance.

![Compiled Integrals](image1.png)

Figure 2: Graphical representation of compiled integrals (generated from area under the force curve until time of fatigue) for all experimental groups. No statistical significance found by ANOVA.

<table>
<thead>
<tr>
<th></th>
<th>Integral</th>
<th>Time</th>
<th>Max Force</th>
<th>Integrated EMG</th>
</tr>
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<tbody>
<tr>
<td>ANOVA between all treatments</td>
<td>$P = 0.1964$</td>
<td>$p = 0.002^*$</td>
<td>$P = 0.49666$</td>
<td>$p = 0.90021$</td>
</tr>
</tbody>
</table>

Table 1: Statistical results for ANOVA of baselines and treatment group with regard to integral, time, max force, and integrated EMG. * denotes statistical significance.

![Compiled Time](image2.png)

Figure 3: Graphical representation of compiled time until fatigue for all experimental groups. Statistical significance found by ANOVA.
We observed that graphically, however, baseline 1 seemed to be significantly lower than baseline 2 in integral (Fig. 2) and time (Fig. 3). This was problematic because the two baselines were meant to serve as a reference point against which each treatment group was measured. If baseline 2 was higher than baseline 1 for total integral and time measurements, then the baselines were not valid controls due to confounding factors such as a training effect (see discussion). A paired t-test was ran comparing baseline 1 with baseline 2 for integral (Fig. 4), time (Fig. 5), max force, and integrated EMG (Table 2). A t-test was useful to compare the means of two independent groups and determine if there are any significant differences between the samples. The significance level chosen for this test was be $\alpha = 0.05$, which provides a 95% confidence interval.

A two-tailed test was used to test the possibility of significant difference in both directions. The t-critical value is the number that the test statistic was compared to that allows a null hypothesis to be rejected. The t-critical value depends on $\alpha$-value, the sample size ($n$), and if the test is one-tailed or two-tailed. For this particular statistical test, the t-critical value was 2.57 because $\alpha = 0.05$, df = 5, and the test was two-tailed. If the calculated t-value was further from zero than the critical value (away from center in a normal distribution curve), then the null hypothesis would be rejected. The t value was found to be 2.110, which is less than the t-critical value of 2.57, and the p-value was found to be 0.02114, which is less than the alpha value of 0.05. This showed that baseline 1 and baseline 2 integrals were statistically different. A second t-test was used to compare the averaged time and the t value was 4.159 while the p-value was 0.0001. The results from the t-test show that there was significance between base baseline 1 and baseline 2.

![Comparison of Integrals between Baseline 1 and Baseline 2](image1)

**Table 2**: Statistical results for t-tests comparing means of baseline 1 and 2 with regard to integral, time, max force, and integrated EMG. * denotes statistical significance $p<.05$.

![Comparison of Time between Baseline 1 and 2](image2)

![Graphical representation of baseline 1 and baseline 2 integrals (generated from area under the force curve until time of fatigue) across trials. Baseline 2 is statistically higher than baseline 1.](image3)

![Graphical representation of baseline 1 and baseline 2 time until fatigue across trials. Baseline 2 is statistically higher than baseline 1.](image4)
Discussion

An analysis of variance (ANOVA) compares means of multiple groups simultaneously in a single analysis. An ANOVA was used to statistically examine the results from the five different variable groups of this study. The alpha value was set at 0.05. This significance level, $\alpha$, is a probability used as a criterion for rejecting the null hypothesis. If the p-value for a test is less than or equal to $\alpha$, then the null hypothesis is rejected. If the p-value is greater than $\alpha$, then the null hypothesis is not rejected.

Four ANOVAs were conducted, looking at the measurements for integral, time until fatigue, max force and integrated EMG. The p-value for integral was found to be 0.1964, max force was 0.49666, and the p-value for integrated EMG results of the five groups was 0.90021. All of these values are greater than the alpha of 0.05, leading us to fail to reject the null hypothesis. Therefore we observed no statistically significant difference between the integral, max force and integrated EMG when comparing the two baselines with the treatment groups of IcyHot, Tiger Balm and Hot Water. Time until fatigue was found to have a p-value of 0.002, which is less than the alpha of 0.05, so there was statistically significant difference.

However, there was significance discovered between baseline 1 and baseline 2 for integral and time. A t-test was used to compare the average integral between the two baselines that were taken during week 1 and week 5. The t value was found to be 2.110 while the p-value was found to be 0.02114; showing a significance between the two. A second t-test was used to compare the averaged time and the t value was 4.159 while the p-value was 0.0001. The results from the t-test show a statistically significant difference between baseline 1 and baseline 2. There was no significance for max force and integrated EMG. The integral increased, but since the two components of integral are time and force output, and overall force did not change, time is the key factor for integral. Only the time until fatigue was increased as observed by integral and time significance.

The significance discovered between the baselines is due to the training effect, which involves changes being made to various body systems that serve to improve performance in response to endurance or resistance training. These results did not match the predicted outcome. It was hypothesized that the topical rubefacients will cause the greatest increase in grip muscle strength and endurance. When the hypotheses were formed a training effect was not taken into consideration; our knowledge of physiology was not as broad during the creation of this experiment. The possibility that testing grip endurance once a week could increase the efficiency of the motor neurons and activate forearm muscles (training effect) was not taken into consideration.

Previous studies examining heat training used trained athletes (Lorenzo et al, 2010), which likely decreased the likelihood of the training effect since athletes have already reached a plateau level with their intense workout regimen. Our results suggest a weekly handgrip training session could alter the forearm muscle fiber composition of six college students, based on the statistically significant differences between the baselines.

This significant difference is believed to be due to the training effect. After being trained to grip a dynamometer three times once a week, the body likely adapted by increasing the number of blood vessels in the area, also increasing the efficiency of the blood vessels to import and export gaseous materials, and increasing the efficiency of the motor units to activate muscles. Previous studies state that it is clear that the processes that regulate blood vessel development can also enable the adult to adapt to changes in tissues. These changes can be elicited by exercise, aging, injury, or disease (Udan et al 2012). This study shows a change that was evoked by exercise and modeled by handgrip testing.

There was no significant difference, however, between max force, integral, integrated EMG or time between the three different treatment types (IcyHot, Tiger Balm, and hot water). The topical rubefacients were believed to cause dilation of the blood vessels within the area of application, leading to increased blood flow and allowing for more oxygen to be supplied to and for more metabolites to be removed from the area. This would allow for increased muscle endurance through increased ability to break down energetic molecules (oxidative phosphorylation and glycolysis) and dispose of wastes that may hinder a cell’s ability to perform.

Future Directions

An unexpected training effect overshadowed the predicted outcome of this study. A future direction would be to conduct further research in synthetic versus natural heat application pre-workout for athletes, whose training would decrease the training effect, to increase overall muscle endurance. The topical rubefacients model synthetic heat while the hot water treatment serves as the natural method. This study focused on these heat applications but the results are clouded with the training effect that occurred during the five weeks of testing. This study could be modified and and the new results analyzed after the training effect was accounted for. If this study was conducted after the training effect was
taken into consideration, it could show the actual effect rubefacients have on muscle endurance. Eventually the training will reach a plateau: at some point the integral and endurance will no longer be able to increase with the weekly training session (Gacesa et al, 2013). The rubefacients could be applied after the plateau is determined and then the actual effects of rubefacients on endurance fatigue can be measured.

Another experiment could use one person or a group of people as a control. The control person or group would not receive any topical rubefacient treatments to observe the true effects of training over a five week period. This control will show how the integrals and times of a person or group who is not receiving the treatments compares to the people or groups that are receiving the various rubefacient treatments.

Overall, future experiments would provide data on the relationship of synthetic heat and natural heat on muscle endurance. This study provided a foundation for future research and raised many other possible questions involving heat treatments for muscle endurance. Further research based on this pilot study could elucidate effectiveness of other pre-workout topical treatments on muscle endurance and improvement in performance during the workout could be measured using much the same methods as those used in this pilot study. This pilot study could lead to further research that could involve developing a repurposed product that is specifically designed as a pre-workout rubefacient ointment. This product could then be used specifically to increase muscle performance pre-workout and so be much more effective than topical rubefacients not originally intended for that purpose. It is still postulated that treatment with the ointments after training will yield a greater increase in muscle endurance over time after training, than the heated water treatment. This is due to the method through which the ointments are applied and their active ingredients induce their effects. The ointments are rubbed into the skin and so are present and active for a long period of time post-application. This long period of activity would enhance muscle performance for a long time after the initial application. The benefit of the heated water treatment will most likely wear off over a short period of time, due to the transient nature of the treatment. Once that area is removed from the water, then it will quickly return to its normal state.

Given enough time and resources, we would redo this experiment with a larger sample size to gain a more accurate representation of the population. It would also be worth while to isolate the main active ingredients in the topical rubefacients and run an experiment with those main active ingredients only. This will allow for the removal of the possibly confounding variables of all of the inactive ingredients. We could also venture in using a rubefacient that does not have an odor, as smell could also be a confounding variable. If at all possible, our experiment treatments give no indication as to what they are. This would not only take away the placebo effect, but would also allow for a double blind study and minimize confounding variables.

Conclusion

During the time span of this experiment, we found that the topical rubefacients were not able to increase handgrip endurance due to inconclusive results caused by a training effect. The vasodilatation that was predicted to occur either did not occur rapidly enough to relieve the fatigue of the forearm muscles or did not occur at all. Regardless of the case, across the experimental treatments, we did not see a significant effect other than the training effect. After the five week trial, there was a significant increase in handgrip endurance due to simply exercising the forearm muscles in a manner that increased proficiency for gripping. Future studies should focus on eliminating this confounding variable along with others that were previously mentioned.

REFERENCES:


Three Mantis Species Adopt More Cautious Hunting Behavior When Facing Dangerous Prey

By Logan Sedig

Praying mantises (order Mantodea) are generalist insect predators found across many regions of the globe. Praying mantis hunting behavior in general is well-studied: they are ambush predators but have also been known to actively pursue and attack prey. The aim of this study is to determine how the hunting behavior of three different species of mantis changes when hunting dangerous prey compared to non-dangerous prey. Using wild-caught mantises in an experimental enclosure, it will first be observed using an overhead Sony FS700 series camera how the subjects from the three mantis species - African mantis (Sphodromantis viridis), Giant Asian mantis (Hierodula membranacea), and European mantis (Mantis religiosa) – hunt a non-dangerous prey item (lubber grasshopper). Then the same mantis subjects from the three species will be observed in the same enclosure hunting dangerous prey (tarantula). Behavior will be measured in relation to mantis approach velocity to the prey as well as strike distance. The results will then be compared using statistical analysis. The results suggest that mantises recognize and react in a significantly different way to dangerous prey compared to non-dangerous prey. This information can be used to further not only entomological knowledge about Mantodea but also the agricultural and civilian markets as natural pest killers.

Praying mantises (the common name for the insect order Mantodea) are generalist predators that date back to the cretaceous period (Yager and Svenson 2008) and are still found across many different terrestrial environments. Being a generalist predator means that praying mantises can live in a wide range of habitats and also eat a large variety of prey. They are often bitrophic, meaning that mantises occupy both the third and fourth trophic levels (made up of carnivores and other predators) in a given ecosystem. Mantises have indiscriminate diets that are mainly constrained by prey size and availability, ranging from small nymphs and larva up to mice, birds, and small snakes. The size of the prey that is hunted is dependent on the size of the mantis (Fagan et al. 2002): a larger mantis has larger grasping forelegs (also called “raptorial” legs) and so can capture and hold onto larger prey than a smaller mantis with shorter forelegs. The adult size of the mantis is determined by its success at hunting prey as a nymph as well as what instar (life stage) the mantis is in (Eisenberg, Hurd, and Bartley 1981). Mantises naturally grow large through multiple molts from the time they hatch to adulthood, and furthermore more successful mantis nymphs (those that obtain the most food) grow larger than less successful nymphs by the time they complete their final molt. Mantis nymphs hatch in high densities in the spring, followed by rapid growth during the summer; and then maturation and egg laying in the fall. These eggs then last through the winter after the adults die off to repeat the process the next year (Fagan et al. 2002).

Mantises often use crypsis, or camouflage, to hide themselves while hunting and from predators. This camouflage includes both similar coloration between the mantis and its surroundings and also textural mimicry.
This means that the mantis is colored the same as its environment and looks like it as well. Different mantis species have evolved to look like leaves, twigs, and flowers. For example, the Orchid mantis uses crypsis to impersonate an orchid flower and capture incoming pollinators (O’Hanlon, Holwell, & Herberstein, 2014).

Mantises are predominately ambush predators which capture prey items using their specialized, raptorial forelegs. Praying mantises first track their prey predominantly through vision (Rilling et al. 1959). The mantis makes use of rapid saccades (quick movements) of its head (Mittelstaedt, 1957; Lea and Mueller, 1977; Rossel, 1980) to center the prey binocularly within specialized regions of its compound eyes (Levin and Maldonado, 1970; Rossel, 1980). This allowed the mantis to estimate the distance to the prey through binocular triangulation (Rossel, 1983, 1986). While the head saccades are occurring, subtle body movements allow the mantis to orient itself relative to the prey prior to the attack (Rilling et al. 1959). The attack occurs through rapid foreleg movements, termed the ‘strike’ (Roeder, 1959), and rapid movements of the middle and hindlegs as well, termed the ‘lunge’ (Maldonado et al. 1967). The mantis lunges forward towards the prey as the strike is occurring, and the prey item is captured between the forelegs. The mantis then eats the prey from either the head down (if it struggles) or from the midsection outward (if it does not struggle).

The majority of what is unknown about praying mantises has to do with phylogeny (Yager and Svenson 2008). The phylogeny of praying mantis species has so far been based solely on physical characteristics to differentiate species. Other characteristics, such as different behaviors during hunting, mating, and predator evasion, have not been studied in order to further individualize the different mantis species. A few recent studies have attempted to address this issue, such as the study performed by Grimaldi (2003), in which Grimaldi attempted to create a phylogenetic hypothesis for the mantid fossil taxonomy. Another study performed by Svenson and Whiting (2004), was conducted in which gene analysis was used to create a phylogeny of the Mantodea order based on molecular characteristics. Many other studies have been performed to address different aspects of this generalist predator, such as the evolution of the mantis auditory system (Yager and Svenson 2008), mantis chemical cues to other predators (Wilder 2004), and motor control during the mantis attack strike (Corrette 1990). There were also studies investigating how mantises hunt unmoving prey (Nguyen and Maxwell 2008) and the risk taking behaviors of mantises (Sherratt 2003). However, there is still a knowledge gap regarding selective predation, specifically how these predators react to and hunt prey that could pose a threat to the mantis.

More dangerous prey, such as a scorpion, will pose a greater threat to the mantis and so a different approach may be necessary to successfully hunt a scorpion as compared to a beetle or grub. This would be to ensure that the mantis can attack and kill the prey organism while sustaining little or no damage to itself. This study looks to focus on praying mantis predation behavior so as to further differentiate between the different mantis species and offer more insight into their predatory habits as a whole. This could come to fruition through uses in pest control agriculture, such as using mantises as an alternative to chemicals for keeping pest species that could be harmful to crops in check as well as within the civilian sector for protecting against pests dangerous to humans, such as venomous spiders. Also, this study will offer insight into mantis neurological processes that will be important in the planning of future studies, such as further investigating how the ventral base nervous system works in insects.

**Hypothesis**

The hypothesis of this study is centered on how a praying mantis would alter its hunting behaviors when hunting prey that could pose a threat to the mantis. A prey item is considered dangerous if it has the capability to injure the mantis. For instance, the scorpion can sting the mantis or grip it in its pincers to defend itself, whereas a grasshopper can do little damage to the mantis. It is hypothesized that the mantis will approach at a significantly slower rate and attack from a significantly shorter distance when hunting dangerous prey, while approaching more quickly and attacking from a farther distance when confronted with the non-dangerous prey, which would act as the baseline for the study. This is so that the mantis spends as the smallest amount of time vulnerable possible, as attacking at the last second from close proximity will give the prey minimal time to react. This is in contrast to the less dangerous prey which the mantis will attack and kill more quickly and without the need to stay hidden for as long due to the lower threat posed by the prey.

This study operates under the assumption that mantises are capable of differentiating dangerous prey from non-dangerous prey. Though there is no literature currently to support this, it is believed that this is a safe assumption due to the well-developed eyesight of mantises, as well as previous studies showing that mantises are capable of differentiating between poisonous and nonpoisonous prey based on coloring (Rilling, Mittelstaedt, and Roeder 1959; Sherratt 2003). Because the nature of this study looks to show the mantises react differently to different prey items, it can also be used to show that mantises can indeed recognize and differentiate prey items.
based on prey threat. This will be a secondary objective in this study.

**Specific Aims**

Praying mantises are able to move in to new environments easily and in doing so can affect the local ecosystem through predator displacement and feeding habits (Hurd & Rathe, 1986). Praying mantises most often use an ambush style hunting method, in which they stand still until the prey item comes within reach followed by a strike to grab and restrain the prey. After restraining the prey, the mantis begins to devour it while holding the prey in its forelegs. Praying mantises have also been seen to actively approach prey that comes within a certain distance as well, before following the same strike and devour procedure (Prete et al., 2011).

Previous studies have addressed the mantis visual (Kral 2013), interspecific competition (Hurd and Eisenberg 1990), and mantis predator evasion techniques (Yager and Svenson 2008) among other characteristics. However, there is currently a knowledge gap involving mantis phylogeny in regards to different behaviors, such as predatory behaviors. Although much is known about hunting behaviors in regards to unmoving or non-dangerous prey, it is still unknown how praying mantises hunt prey that poses a threat.

The central hypothesis is that the mantis will approach at a significantly slower rate and attack from a significantly shorter distance when hunting dangerous prey, while approaching more quickly and attacking from a farther distance as compared to non-dangerous prey. These strategies would most effectively minimize the danger posed to the mantis while ensuring that the prey is captured for ingestion.

The central hypothesis of this study will be tested by pursuing the following specific aims:

1. Determine the hunting patterns of the praying mantis subject species (European, Giant Asian, and African mantises) based on approach time and strike distance on non-dangerous prey as a baseline.
   a. Working Hypothesis: Observing the different mantis species hunting non-dangerous prey will provide a baseline for predatory behavior to which the predatory behavior exhibited while hunting dangerous prey will be compared.

2. Determine if the approach velocities and distances of strikes exhibited by the mantises change when faced with dangerous prey items.
   a. Working Hypothesis: Mantis hunting behavior will change significantly based on the above criteria when hunting dangerous prey.

The expected outcomes for this study are that the different mantis species will show a more cautious hunting behavior when hunting a dangerous prey item as compared to a non-dangerous prey item. This will be judged in relation to the two criteria detailed in specific aim 2: approach velocity and strike distance. More specifically, mantises hunting the dangerous prey item will approach more slowly and will strike from a shorter distance away when compared to mantises hunting non-dangerous prey. The positive impact of this study will be the further delineation of the different mantis species and therefore the refinement of mantis phylogeny in regards to predatory behavior. These findings could then lead to further studies in the predatory behaviors of other mantis species and from there possible applications in the field of pest control without the use of chemicals and generalist predator research.

**Research Design and Methods**

*Specific Aim One: Determine the hunting patterns of the praying mantis subject species (European, Giant Asian, and African mantises), based on approach velocity and strike distance on non-dangerous prey as a baseline.*

The overall goal for this specific aim is to create a baseline to which the results from Specific Aim 2 will be compared.

To achieve this, the mantises will first be starved for five days prior to testing to ensure that they are hungry and willing to hunt, though they will be given water ad lib over that time period. Because mantises are primarily diurnal, testing will occur between 12:00pm and 3:00pm. The specimens will be placed one at a time into the experiment enclosure with a non-dangerous prey item through two separate tubes on different sides of the enclosure. The mantis will be dropped in first so as to acclimate to the hunting environment, and five minutes later the prey will be dropped into the enclosure. Using an overhead Sony FS700 series camera, the predator-prey interaction between the mantis and the prey item (specifically hunting behavior of the mantis as judged by the two criteria listed in the specific aim) will be observed, recorded, and interpreted for comparison against the other trials. The recordings will be interpreted by the Corel Draw 9.0 computer program. The trial will end after either the mantis has made its attempt at killing and eating the prey item or one hour has passed, at which point the mantis and any prey left will be removed using safety gloves and nets.
followed by the enclosure being cleaned of any leftover prey debris and reset for the next trial. Each mantis will run three trials spaced by five days between each trial for both the non-dangerous prey and the dangerous prey.

The African Mantis (Sphodromantis viridis) (Figure 1B), the Giant Asian Mantis (Hierodula membranacea) (Figure 1C), and the European Mantis (Mantis religiosa) (Figure 1A) will be the mantis species used for this study. These species are native to Africa, eastern Asia, and Europe respectively. These species in particular were selected due to their large sizes, aggressive demeanors, and ease of care. There will be 10 wild-caught subjects from each species; 5 adult males and 5 adult females in their final instar. The non-dangerous prey to be used in the study will be the lubber grasshopper (Romalea guttata), due to its ease of attainment and large size. The aposematic defenses of the lubber grasshopper should be made null by the pre-trial starvation period.

A testing enclosure will be constructed of PVC pipe frame covered with netting around the sides and top, which will have a zipper for access to the inside of the enclosure. Each enclosure will be 1 meter on each side. The bottom of the enclosure will be covered in short vegetation (e.g. twigs, sticks, short shrubbery) so as to provide the mantis subjects the ability to camouflage into the enclosure. A Sony FS700 series camera will be placed in the roof netting to record the mantis-prey interactions.

Data collection will be performed using the recordings from the overhead camera, based on the procedure used in a study by Bartos, Szczepko, and Stanska (2013) on sexually dimorphic jumping spiders. The recorded distances and velocities will be measured using the computer program Corel Draw 9.0. Measurements will be made using the different screen captures made by the camera. Approach velocity is defined as the time it takes the mantis to travel the distance from the location that it was in when the prey item was dropped into the enclosure to the prey location. Velocities will be calculated based on the distance measurements and camera recording speed, and distances will be measured using the millimeter scale. Statistical analyses will be performed with SPSS (specifically two-sample homoscedastic t-tests and ANOVA's) to compare these results to those obtained from the dangerous prey trials in order to find any statistically significant differences between trials, as detailed in the Specific Aim 2 section.

Specific Aim Two: Determine if the approach velocities and distances of strikes exhibited by the mantises change when faced with dangerous prey items.

The overall goal of this specific aim is to test if there is a significant change in hunting behavior in relation to the two criteria listed in Specific Aim 2 between mantises hunting non-dangerous prey and dangerous prey.
(the secondary objective is to determine if the assumption that mantises can differentiate between prey items based on threat level is safe to base this study on). This will be shown by mantises showing significant differences between hunting behaviors (i.e. significantly different approach velocities and strike distances) while hunting dangerous prey and non-dangerous prey.

The mantises will be run through the same procedure for dangerous prey trials as they were for non-dangerous prey, with the exception that the prey item used will be the tarantula (class Arachnida, order Araneae, family Theraphosidae). This prey item was chosen due to its wide variety of habitats that matches those of the three mantis species being used in this particular study (National Geographic 2014), as well as its formidable defenses (e.g. venomous fangs). Tarantulas will be matched according to size to each mantis, so that there are no disparate size differences between predator and prey that might affect hunting behavior; as well as fed crickets and given water ad lib to minimize the risk of tarantulas preying on the mantises.

Data collection will also follow the same procedure as in Specific Aim 1, with the camera recording serving as the basis for all data. This data will be analyzed using the SPSS statistical analysis program. Specifically, two-sample homoscedastic T-tests will be run on the data taken from both dangerous and non-dangerous prey trials for each mantis species to determine if there is any difference between the two. Then, ANOVA tests will be run to compare the data between the different species to determine if the hunting patterns change significantly between them.

Ethical approval will be sought from the Carthage IRB concerning this study so as to ensure that all ethical obligations are met and there are no unnecessary sacrifices being performed for this study.

**Anticipated Outcomes**

**Specific Aim One**

The three mantis species will be tested against non-dangerous prey based on two criteria: approach velocity (Figure 3A) and strike distance (Figure 3B). The Giant Asian Mantises will have recorded averages of 0.092 +/- 0.0022 meters per second (m/s) and 4.25 +/- 0.2677 centimeters (cm) respectively. The African Mantis’ averaged readings will be 0.081 +/- 0.0026 m/s and 3.06 +/- 0.2797 cm respectively. The European Mantis will have average readings of 0.065 +/- 0.0029 m/s and 2.17 +/- 0.1889 cm respectively. These readings will act as baselines to which behavior against dangerous prey will be compared. One potential pitfall with this aim is the possibility that the capture and enclosure of the mantises will lead to a change in their hunting behavior as compared to mantises in the wild, and so skew the baseline data to which everything is compared. In this case, the study can move forward by either observing mantis hunting behavior in the wild without capturing them, or using captive-bred mantises that would then be tested against mantises hunting in the wild to ensure accuracy before moving forward with the testing.

**Specific Aim 2**

The three mantis species will be tested against dangerous prey based on the same two criteria from before: approach velocity (Figure 4A) and strike distance (Figure 4B). The Giant Asian Mantis’ new recorded averages will be roughly 0.053 +/- 0.0079 m/s and 2.52 +/- 0.3667 cm respectively. The African Mantis’ new averaged readings will be 0.052 +/- 0.0065 m/s, and...
2.04 +/- 0.2833 cm respectively. The European Mantis will have new average readings of 0.043 +/- 0.0056 m/s and 1.47 +/- 0.3606 cm respectively.

The above results were statistically analyzed using the Microsoft Excel 2010 program. Individual species results were compared using two-sample homoscedastic T-tests. The results will be as follows in Table 1:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>African Mantis</th>
<th>Giant Asian Mantis</th>
<th>European Mantis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach Velocity (m/s)</td>
<td>2.7667676767</td>
<td>0.8890909091</td>
<td>3.987777778</td>
</tr>
<tr>
<td>Strike Distance (cm)</td>
<td>9.7707070707</td>
<td>0.8890909091</td>
<td>1.311311311</td>
</tr>
</tbody>
</table>

Single factor ANOVA's will also be run to compare the differences in responses between mantis species according to the two criteria being tested in this study so as to show any behavioral differences between the three species. The results will be as follows in Tables 2 and 3:

<table>
<thead>
<tr>
<th>Table 2: Single Factor ANOVA results for Interspecies Variation in Relation to the Approach Velocity Criteria</th>
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<tbody>
<tr>
<td>Groups</td>
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<tr>
<td>AM</td>
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<td>EM</td>
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<table>
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<th>Table 3: Single Factor ANOVA results for Interspecies Variation in Relation to Strike Distance Criteria</th>
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<tr>
<td>Groups</td>
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<td>EM</td>
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for the Giant Asian Mantis species, and EM stands for the European Mantis species.

One potential pitfall with this aim is that the mantises will not attempt to eat the prey, due to inadequate hunger or disinterest for instance. To address this potential issue, the starvation period pre-trial could be elongated or the experimental enclosure size could be decreased so as to put the mantises and the prey into closer contact with each other.

**Discussion**

The question that this study set out to address is if they are faced with dangerous prey (e.g. something that poses a legitimate threat to the mantis such as a scorpion or wasp), will praying mantises change their hunting behavior compared to when they are hunting non-dangerous prey (e.g. a grasshopper). Furthermore, this study investigated whether or not there is a difference between species of mantises in regards to this change in hunting behavior.

The anticipated results of this study showed that praying mantises - or at least the three mantis species tested in this experiment - do significantly change their hunting behaviors in relation to the two criteria of approach velocity and strike distance when faced with dangerous prey. All three mantis species decreased their approach velocities when faced with dangerous prey compared to the non-dangerous prey baselines. All three species also significantly decreased their strike distances when faced with the dangerous prey as well. The question of whether different species of praying mantis react differently was addressed as well.
and it was shown that the three mantis species tested did react in significantly different ways according to approach velocity and strike distance.

Two-sample homoscedastic t-tests will be used to compare the average readings for each criterion within each species between dangerous prey and non-dangerous prey. A critical value of 0.05 will be used to judge significance for this study. All values found using two-sample homoscedastic t-tests were less than 0.05, and so there is a statistically significant difference between the average readings of mantises against non-dangerous prey and against dangerous prey, for all three species tested.

These values show that European mantises, Giant Asian mantises, and African mantises all approach dangerous prey more slowly and strike from a shorter distance than they do when confronted with non-dangerous prey. This supports the reasoning that mantises recognize and react to the danger posed by potential prey by adopting alternate hunting behaviors to ensure successful capture and ingestion of the prey without injury to the mantis. However, these results could be affected by need as well, in that mantises that are starved may attack more cautiously (e.g. slower approach velocity and shorter strike distance) so as to ensure a successful hunt and capture of prey than mantises that are well-fed, regardless of prey danger.

These t-test results also support the assumption made by this study that mantises are able to tell the difference between dangerous and non-dangerous prey. The observation that mantises react significantly differently to dangerous prey when compared to non-dangerous prey shows that they are able to recognize a fundamental difference between the two and adopt different hunting strategies to combat that difference. This recognition most likely has its basis in the mantis’ vision, as this is the mantis’ main resource for taking in and analyzing the world around it, including the acquisition and tracking of potential prey items (Yamawaki & Toh, 2003). Further research needs to be done to investigate what aspects of the prey item cause the mantis to define it as dangerous or not.

The single-factor ANOVA results comparing the predatory behavior changes from non-dangerous to dangerous prey between the different species also showed that approach velocity and strike distance varied significantly between species. The critical value is again 0.05, and so the ANOVA results for interspecies variation for approach velocity and strike distance are \( p = 0.015473 \) and \( p = 1.02E-06 \) respectively. Both of these values are below the 0.05 critical value and so there is significant differences between the data being analyzed. The F-values for both criteria are 4.883951 (F-crit = 3.354131) and 24 (F-crit = 3.354131) respectively. Both being larger than \( F = 1.0 \), there is a much greater variation between the three species than there is within the species themselves.

Average readings for each mantis species showed the same patterns across the two criteria: against dangerous and non-dangerous prey, the Giant Asian mantis consistently approached more quickly and struck from the farthest distance compared to the other two species. The African mantis had the second highest readings in both approach velocity and strike distance, and the European mantis had the lowest readings of the three species. This pattern could also be in relation to the size of the different mantis species. The Giant Asian mantis has the largest size on average of 10 centimeters, and so may be less “intimidated”, or less likely to perceive the prey as a legitimate threat, by prey of larger size than the smaller mantis species, leading to a more aggressive approach and strike. The female mantises, as the larger of the two sexes within the different species, would ostensibly then be the more aggressive gender as well compared to the smaller males. However, male and female data was not analyzed separately in this study and so would need further investigation to support this prediction.

These results show that the different mantis species have all developed different hunting behaviors in response to dangerous prey compared to non-dangerous prey as well. This could be due to a number of reasons, such as the different prey types found in each mantis species’ region. For instance, one species may have a variety of large, well-defended or aggressive prey in their region, while another has a variety of smaller prey to choose from. The species that has the variety of larger prey to hunt may develop an overall more cautious hunting style to counter the danger posed whereas the mantises with smaller prey have less reason to be cautious and so have adopted a more aggressive hunting style overall (e.g. faster approach velocity and shorter strike distance).

These results are complimented by other studies that have been performed on mantis predatory behavior, especially studies that exhibit mantises adapting their predatory behaviors to ensure hunting success. A study performed by Sherratt (2003) used a novel dynamic programming model to predict how a mantis would react to defended prey items if undefended prey was readily available. The program predicted that mantises would go for the undefended prey item so as to minimize the risks of hunting. However, when the mantis is in energetic need, it will take the most beneficial route while trying to gain nutrients but also avoid harm, much as the mantises in this study were...
predicted to do. Another study, performed by O’Hanlon, Howell, and Herberstein (2014), detailed how the Malaysian orchid mantis (Hymenopus coronatus) uses mimicry to most effectively capture prey. Specifically, the orchid mantis mimics a flower and replicates the color so well that it draws pollinators in at a higher rate than the actual flowers do, and the mantis then captures these pollinators for ingestion. These past studies along with this current study show different hunting behaviors that are universal to all mantis species but also unique hunting behaviors that various mantis species exhibit as well.

There are numerous future directions that could be taken from this study. One would be to explore the various underlying neurological systems in these specific mantis species so as to determine what systems in the mantis “brain” are responsible for the differing reactions in hunting behavior that were exhibited by the mantis subjects. Another would be to expand the variety of mantis species used in this study to differentiate between a larger variety of mantis species. This could lead to further phylogenetic differentiation across the Mantodea order and a greater knowledge of individual species as well. Finally, studies could also be performed that bolster the findings here by addressing any pitfalls found within this study, such as any effects the pre-trial starvation might have had on mantis hunting behavior.

Conclusion

In conclusion, this study has shown that praying mantises, at least the African, Giant Asian, and European varieties, are able to not only identify but also employ hunting behaviors different from those they would use on non-dangerous prey to hunt and take down dangerous prey. These differences can be seen not only between prey types, but also between species as well. These differences open up a world of opportunities, from the furthering of phylogenetic differentiation of the species of the Mantodea order to agricultural to civilian applications as natural pest and bug removers, that should be of great use to science in the future.

REFERENCES:


O’Hanlon, J. C., Holwell, G. I., & Herberstein, M. E.


The Façade of Food Consumption

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Many stereotypes exist around food consumption, predominantly from culturally determined stereotypes. This research aims to determine how gender and its stereotypes affect a person’s choices regarding food. Participant observation allowed for objective data collection regarding what a person eats in the presence of different genders, exploring how group dynamics versus individual dining differ in regards to the presence of different genders. Interviews were conducted in order to understand the motives behind a change in food choices and eating habits. Individuals and those dining in single gender groups defied common gender stereotypes, while those dining with different genders altered their eating habits and acted in stereotypical ways. This allows for further examination on how gender further stratifies society by influencing personal, everyday behavior, such as food consumption, and how this stratification can be used as a grounds to examining gender as it plays out in other aspects of societal function.

Eating is not only a crucial aspect of human function, but of the human experience as well. Consequently, food has become a social staple in human life, wherein cultural norms and gender dynamics introduce a new form of stratification: using gender-based food stereotypes as a means to display power. In examining this dynamic, this research aimed to uncover how individuals consciously changed their behavior in the presence of others, highlighting the influence and strength of gender and gender stereotypes in shaping others’ behavior.

Establishing Stereotypes

Prior to observation, interviewees, male and female and of various ages, were asked to explain the stereotypes they believed were prevalent in society regarding how different genders consume food. The stereotypes identified were centered around females eating smaller quantities of food that were healthier, such as fruits and vegetables, where males ate larger quantities of meat-based or less nutrient-dense foods, such as anything processed or high in calories. By recognizing the stereotypes that exist, this provides a standard to see how people will change their habits in the presence of another gender.

Participant Observation

In order to see how people would eat on a “typical” day, we observed participants during lunch and dinner-time in dining halls on campus. From this, we observed what people chose to eat and with whom each person dined. When looking at those who dined alone, those individuals tended to choose foods that contradicted the aforementioned stereotypes. Males, on an individual basis, ate their meals with fruits and vegetables, and ate limited amounts of meat. Examples of this included a young man eating pasta with a side of green beans and another young male eating a large, heaped bowl of fruit in addition to a burger stacked with added vegetables. Females also contradicted the stereotypes, as a young female was observed eating an entrée with four sides, showing the uncharacteristic quantity of food. Given individual agency to choose from a variety of food options, most people did not follow common stereotypes.

Examining groups constituting of individuals of the same gender exhibited similar behaviors. One of the most notable illustrations is observing a group of eight, muscular males eating either salad or pasta as a main dish with bread or vegetables as a side. Only two of the males in the group had a dessert such as a cupcake
or ice cream. This directly contradicts the commonly-perceived stereotypes of males as predominantly meat eating, calorie-consuming powerhouses. Similarly, females also defied the stereotype, as two females were observed consuming only fried foods, such as burgers, burritos, rice bowls, grilled cheese sandwiches and pulled pork. By comparing those dining by themselves to those dining in groups, this showed how individuals exercised their free agency in choosing foods, and thusly, how they continue to defy the stereotypes that exist.

While single-gendered groups retained their agency to choose the foods as they wished, the addition of a different gender into the groups had a more striking effect. These were the instances where individuals would gravitate towards fulfilling common gender stereotypes. The most notable example of this is seeing a young male eating a pulled pork sandwich, and an accompanying young woman eating a salad. Additionally, other groups of mixed genders exhibited similar patterns even in larger groups, where the females ate significantly less than the male counterparts dining with them, and fulfilling the stereotype. From this, it is evident that the presence of another gender has the power to change one’s eating behavior, given the fact that each individual in the mixed-gender group still had the same free agency to choose what to eat as individuals or those in single-gender groups. The only difference was the gender in the dining partners, showing how gender is an influential factor in food choices.

Insight from Emic Perspective

Despite the fact that these observations gave us a semi-objective, etic perspectives of human behavior, we were still limited in our observation because of a lack of understanding behind the motives of these behaviors. In an attempt to eliminate any misinterpretations, individual interviews were conducted. These introduced an emic perspective and allowed for more comprehensive analyses of people’s motivations behind eating. Though it was clear from our observations that groups had different eating dynamics than individuals, conducting interviews allowed for a better understanding behind these discrepancies.

Underlying Influences

When examining why gender has the influence in food behavior, it is critical to understand the reasons why it would change in general. One interviewee cited that she changed her eating habits upon coming to college, substituting her large-meals with smaller, more nutritious meals, primarily to fit in with college culture and gender stereotypes. As many interviewees stated, one reason that gender would have a role would be to impress someone in order to start a romantic relationship, and many also admitted that they were trying to impress someone in order to maintain a romantic relationship. One interviewee stated that he, in an attempt to please his girlfriend, limited the amount of fast food and empty calories he consumed. At the beginning of dating her future husband, another interviewee felt that it was necessary to change how she ate, that, as she stated “I just thought, that at that time, that that’s what I should do, that you know, I shouldn’t be seen like wanting to eat too much.” She also stated that men do not need to show the same degree of control that women need to when regarding food.

...the presence of another gender has the power to change one’s eating behavior...

However, not all individuals felt the need to give up the sense of agency to choose foods, as a 19-year old female stated that her habits do not change regardless of other genders present when she dines. What this shows is that there has been a difference in personal beliefs to eating habits, and how one should choose foods differs between each person. This could be translated as variance in enculturation, as these individuals have apparently shown to perceive what it means to “act accordingly” in terms of gender stereotypes. Because of the dissimilarity in enculturation, it also indicates how each culture portrays the power that each gender. In relation to the observations, this provides reasoning to understand why those observed reacted the way they did.

Discussion

While there was extensive data collected about the way people behaved, this research did face a plethora of limiting factors. This study does not address gender as a continuous spectrum, but rather a binary function, and it was difficult to determine each participant’s gender based on appearances, a paralanguage, and other mannerisms. If this research were able to incorporate
the breadth of the gender spectrum, then more conclusions could be drawn about the power each gender identity holds in society. In addition, there are also unspoken individual circumstances, hindering a complete understanding of each individual’s situation.

...men do not need to show the same degree of control that women need to when regarding food.

One interviewee noted that many people are forced to eat unhealthy foods simply because they cannot afford to have more options. In future research, analyzing the intersectionality between class and gender would give a more refined look into understanding how gender enculturation affects food behavior depending on socioeconomic class. Despite these limitations, the information obtained still provided a strong basis for answering this research question.

Conclusion

Regardless of how prevalent or scarce common stereotypes are in society, it is apparent that even the most basic of human functions are held in leverage by personal factors such as gender, and shows that one's free agency is vulnerable. By allowing for personal choices to be left to the hands of a culture, it indicates the values of a society in the enculturation process, as these inherent forces show the values a society holds, and provides a clearer window to understand how a culture and its given society function. In being able to understand the ways gender controls something as simple as food consumption, this develops a groundwork which allows for an understanding of the fundamentals as to how a person chooses to manage eating habits, and to what a degree a person decides to stay in control of their decision.

REFERENCES:


The Short-Term Effects of Hatha Yoga on Mood States

By Samantha Heyne

The present study examined the short-term effects of Hatha Yoga on mood states. Participants were male and female adult yoga students. On a weekday evening before yoga class, participants completed a pretest survey that included the Semantic Differential Feeling and Mood Scale (SDFMS), a measure of mood states. The participants were guided through an hour-long Hatha Yoga practice followed immediately by the SDFMS posttest. The independent variable was the time the SDFMS was taken (Before/After), and the dependent variable was the change in SDFMS score for five subscale conditions: Depressed/Elated, Anxious/Relaxed, Confident/Unsure, Energetic/Fatigued, and Good-Natured/Grouchy. The results supported the hypothesis that each of the five subscales scores was significantly more positive after the yoga practice than before the yoga practice.

In recent years, the effects of yoga on the human mind have become a subject of serious psychological study. Hatha yoga specifically, which is a relaxing form of yoga that brings attention and focus to individual poses (asanas), has been studied along with its psychological effects (Hewitt, 1977). Hatha yoga is often thought to be a physically engaging branch of yoga, more so than some of the other branches (Iyengar, 2001). It involves slow movement, holding and sustaining poses while breathing according to a specialized technique, as well as focusing awareness on the body and its present state (Brisbon & Lowery, 2011). Previous research has shown that Hatha yoga may be an effective technique for decreasing stress levels, perceived stress, and negative affect while enhancing mindfulness and increasing overall mental and physical health (Brisbon and Lowery, 2011; West et al., 2004).

The practice of yoga is not simply one of physical exercise. Hatha yoga combines physical and meditative practice to strengthen the physical body (prakriti) and the soul (purusha) (MacHovek, 2005). There are eight limbs of yoga—the first four of which relate to dealings with external factors, while the second four are more self-reflective (MacHovek, 2005). While yoga originated in the East, specific branches of yoga, specifically Hatha yoga, have increased in popularity in the West as a means for a healthier mental and physical lifestyle (MacHovek, 2005).

Researchers have explored many possible benefits, both long and short-term, surrounding yoga practice. Several studies have examined the effects Hatha yoga may have on depression and found encouraging results (Uebelacker et al., 2010). Other research has found that yoga may be effective in improving the moods of psychiatric inpatients (Lavey et al., 2005). Those who practice yoga long-term may experience reduced cardiovascular activity in stressful situations (Shelov, 2008).

The present study will focus on mood due to its deep connection to emotions, which have been highly affected by yoga practice since ancient times (Feuerstein, 2013). Ancient yogic literature such as the Bhagavad-Gītā attributes divinity and freedom with positive emotions, while negative emotions are said to lead to bondage (Feuerstein, 2013). Patanjali’s teachings in the Yoga-Sūtra emphasize the importance of controlled emotional states (Feuerstein, 2013). If these emotion-related concepts are so deeply embedded in yogic practice, then how might that translate into mood? Ekkekakis (2013) describes the relationship between emotion and mood. He argues that both are interwoven in an individual’s core affect — the constant state of feeling an individual experiences, most obvious in emotion and mood but always consciously accessible (Ekkekakis, 2013). Emotions are short-lived, intense, and rarely present. Moods, on the
other hand, last longer than emotions and are typically less intense, and they are almost always present (Ekkekakis, 2013).

**Literature Review**

Mood can be found as a dependent variable in many psychiatric studies that are relevant to the present yoga research. For instance, Grodner, Braff, Janowsky, and Clopton (1982) examined the effects of art and movement therapy on the elevation of mood and found that, at least temporarily, art and movement therapy improves mood and social interactions. This therapy combined art and movement by guiding participants through activities that emphasized nonverbal communication that conveyed feelings symbolically, through art and dance. While the Grodner et al. (1982) results cannot be attributed strictly to art or dance alone, the close integration between the expression of the mind and body in the art/movement therapy seems similar to the relationship between the two in yogic practice.

There has been some research on the effects of Hatha yoga on mood, but there is a need for further studies to deepen psychologists’ understanding of the relationship between the two. One study examined the effects of Hatha yoga, swimming, fencing, and body conditioning on mood enhancement and stress reduction in college students (Berger & Owen, 1988). Specifically, they tested the effects of these exercises on six negative mood states: tension, depression, anger, vigor, fatigue, and confusion. In this study, yoga was identified as a form of exercise that was not aerobic or competitive, but was predictable and repetitive/rhythmic. Students participated in their events (yoga, swimming, fencing, and body conditioning) for 40-minute intervals on three separate occasions. Results revealed that the Hatha yoga students were significantly less anxious, tense, depressed, angry, and confused after the yoga session than they were before (Berger & Owen, 1988). This study is largely influential for the psychological study of yoga because it found such significant evidence for the positive influence yoga may have on mood states and stress reduction (Berger & Owen, 1988).

Another important study by Berger and Owen (1992) explored the difference in the short-term change in mood between aerobic exercise and exercise that is not primarily aerobic, represented by swimming and Hatha yoga, respectively. This study used the same mood scale as the former—testing tension, depression, anger, vigor, fatigue, and confusion. The results revealed a decrease in tension, depression, anger, and confusion scores after a single yoga session—a change that showed significantly greater mood improvement in those who did yoga in comparison to those who swam. The Berger and Owen (1992) study is important to the present research because it found that aerobic exercise may not be necessary to facilitate mood benefits.

This study will examine the short-term effects of Hatha yoga on mood using an in-depth mood scale called the Semantic Differential Feeling and Mood Scales (SDFMS). This 35-item scale, developed by Lorr and Wunderlich (1988), assesses mood and feeling states through the evaluation of five mood factors: Depressed/Elated (D/E), Energetic/Fatigued (E/F), Good-Natured/Grouchy (GN/G), Confident/Unsure (C/U), and Anxious/Relaxed (A/R). The SDFMS uses a continuum that takes into account the bipolar nature of language and mood, and is therefore fit to be administered as both a pre-test and a post-test (Lorr & Wunderlich, 1988). The symmetric response format of the scale aids in eliminating most response bias (Lorr & Wunderlich, 1988). The present study aims to deepen the scholarly community’s understanding of the effects of a single Hatha yoga practice on an individual’s mood state using the SDFMS.

**The results revealed a decrease in tension, depression, anger, and confusion scores after a single yoga session**

Past studies have examined the effects of Hatha yoga on negative mood states (Berger & Owen, 1988; Berger & Owen, 1992), but none to date have examined its effects using the SDFMS, measuring mood on five different subscales that range from a positive mood to a negative mood. The theory that can be gathered from the previous research as discussed above is that a short-term Hatha yoga session may result in mood states that are less tense, less depressed, less angry, less fatigued, and less confused (Berger & Owen, 1988; Berger & Owen, 1992). Because this trend seems consistent in previous psychological studies, it may be deduced that moods, in addition to becoming less negative, become more positive with a single yoga session.

The hypothesis surrounding the present study is that Hatha yoga will have a positive effect on mood. More specifically, the scores are predicted to become more positive after the session of yoga (more cheerful, energetic, good-natured, confident, and relaxed). The independent variable is the time the SDFMS is taken. There are two conditions of the independent variable: before the yoga session and after the yoga session. The dependent variable is the change in SDFMS score. The conditions of the
dependent variable are the five mood factors: Elated/Depressed, Energetic/Fatigued, Good-Natured/Grouchy, Confident/Unsure, and Relaxed/Anxious.

Method

Participants

Participants were volunteers from either the Mixed or Level 2 Hatha yoga classes at Peace Tree Yoga in Burlington, Wisconsin on either a Monday or Wednesday evening (5:30pm or 7pm). Mixed Level class is fit for any level yogi. It offers basic yoga poses for beginners as well as the opportunity to try more difficult poses for those who are more advanced. The Level 2 class is offered for experienced beginners who have some familiarity with the poses and the flow of breath. Before both classes, the yoga instructor and the researcher explained the nature of the experiment. The yoga students were asked to raise their hands to indicate if they would like to participate, and those that did were handed a survey and assigned a number for keeping track of the pretests and posttests.

A total of 36 people volunteered, but only 28 were included in the data analysis. Those that were not included in the data analysis were left out because either they did not complete one of the surveys in its entirety, or because they filled it out incorrectly, making it impossible to score (placed multiple Xs in one row, skipped rows, etc.). There were a total of 5 male and 23 female adults included in the study whose ages ranged from 27-74 years. The procedure was approved by the Carthage Institutional Review Board and informed consent was obtained from each participant.

Materials

Yoga sessions and the administration and completion of the SDFMS survey took place inside the Peace Tree Yoga studio in the Community Art Technology Health Education (CATHE) Center on a weekday evening. The yoga studio within the CATHE Center is a large empty theater with dim lighting, a wood floor, and a stage. The yoga class takes place on the large, open floor at the foot of the stage. Participants used mats, blankets, and yoga blocks to aid in their poses during the practice.

The surveys administered in order to assess the changing of mood states before versus after the yoga practice consisted of the Semantic Differential Feeling and Mood Scale (SDFMS), which was originally developed by Lorr and Wunderlich (1988). For the present study, the SDFMS was obtained from the Measures for Clinical Practice and Research Sourcebook (Fischer & Corcoran 2007). The pretests included some additional questions about the participants so that the researcher could gain a clear idea about the nature of the population sample. The SDFMS pretest and posttest are included here in the attached Appendix.

Design and Procedure

Before yoga class, participants were given pretest surveys to complete. They were first assured their anonymity and then instructed to answer the questions in complete honesty. They were told to complete the SDFMS as quickly and accurately as possible. It was emphasized that they should indicate how they are feeling in the exact present moment, not in general or at any other moment in time. Following the completion of the surveys, yoga class began. For one hour, the yoga instructor led the yogis through postures and movements that incorporated balance and the flow of their breath. Upon the conclusion of the practice, the volunteers were administered a posttest survey. Once again, it was emphasized that they should fill out the SDFMS quickly, indicating their mood in the exact present moment.

The procedure was a within-groups design. It included one independent variable with two conditions and one dependent variable with five conditions. The independent variable, Before/After, was manipulated by obtaining SDFMS scores for its two conditions: before the yoga session and after the yoga session. The dependent variable, SDFMS score, was measured by collecting individual SDFMS scores for each of the dependent variable’s conditions—the subscales: Elated/Depressed, Relaxed/Anxious, Confident/Unsure, Energetic/Fatigued, and Good-Natured/Grouchy.

Results

A t-test for dependent groups was conducted for each of the SDFMS subscales, and each revealed significant results. For the Depressed/Elated subscale a t-test for dependent groups revealed that the mean SDFMS score before yoga practice (M = 3.54, s = .70) was significantly lower than the mean SDFMS score after yoga practice (M = 4.14, s = .56); t (27) = -4.19, p < .001, one-tailed. The average mood score was significantly more elated and less depressed post-yoga practice than it was pre-yoga practice.

For the Anxious/Relaxed subscale, a t-test for dependent groups revealed that the mean SDFMS score before yoga practice (M = 3.38, s = .83) was significantly lower than the mean SDFMS score after yoga practice (M = 4.54, s = .38); t (27) = -8.34, p < .001, one-tailed. The average mood score was significantly less anxious and more relaxed after the yoga session than it was before

134
the yoga practice.

For the Confident/Unsure subscale, a t-test for dependent groups revealed that the mean SDFMS score before the yoga practice (M = 2.56, s = .68) was significantly higher than the mean SDFMS score after yoga practice (M = 2.04, s = .55); t (27) = 4.88, p < .001, one-tailed. The average mood score was significantly less unsure and more confident post-yoga practice than it was pre-yoga practice.

The t-test for dependent groups for the Energetic/Fatigued subscale revealed that the mean SDFMS score before the yoga practice (M = 3.13, s = .90) was significantly higher than the mean SDFMS score after yoga practice (M = 2.22, s = .66); t (27) = 4.52, p < .001, one-tailed. The average mood score was significantly less fatigued and more energetic after the yoga practice than before the yoga practice.

The t-test for dependent groups for the Good-Natured/Grouchy subscale revealed that the mean SDFMS score before the yoga practice (M = 1.45, s = .46); t (27) = 6.19, p < .001, one-tailed. The average mood score was significantly less grouchy and more good-natured post-yoga practice than it was pre-yoga practice.

**Discussion**

The results of all five of the SDFMS dimensions supported the hypothesis of the present study. As predicted, for the Depressed/Elated subscale, posttest scores were significantly higher than pretest scores. Participants were more elated and less depressed after yoga practice than they were before yoga practice. Similar results were found for the Anxious/Relaxed subscale, where posttest scores were also significantly higher than pretest scores. Participants were more relaxed and less anxious after yoga practice than they were before yoga practice. Results also revealed that, as predicted, the Confident/Unsure, Energetic/Fatigued, and Good-Natured/Grouchy scores decreased after yoga practice. Participants were significantly more confident, energetic, and good-natured and significantly less unsure, fatigued, and grouchy after yoga practice than they were before yoga practice.

The findings of the present study support both the theory that short-term Hatha Yoga results in mood states that are less negative, as well as the hypothesis that it results in mood states that are more positive. Just as Berger and Owen (1988; 1992) found that a single Hatha Yoga session may result in mood states that are less depressed, led tense, less angry, less fatigued, and less confused; the present study similarly found not only that participants were less depressed, unsure, fatigued, grouchy, and anxious after yoga practice, but additionally that they were more elated, confident, good-natured, energetic, and relaxed. Based on these results, a new theory arises: short-term Hatha Yoga has a positive effect on mood states.

These results prompted a closer look at the correlations between the post-test scores. A Pearson r analysis revealed a significant positive correlation between the Anxious/Relaxed and Depressed/Elated subscales: r(26) = + .346, p = .036, 1-tailed; between the Energetic/Fatigued and Confident/Unsure subscales: r(26) = + .484, p = .005, 1-tailed; between the Good-Natured/Grouchy and Confident/Unsure subscales: r(26) = + .555, p = .001, 1-tailed; and between the Good-Natured/Grouchy and Energetic/Fatigued subscales: r(26) = + .370, p = .026, 1-tailed. The analysis revealed a significant negative correlation between the Confident/Unsure and Depressed/Elated subscales; between the Energetic/Fatigued and Depressed/Elated subscales: r(26) = -.812, p < .001, 1-tailed; between the Good-Natured/Grouchy and Depressed/Elated subscales: r(26) = -.537, p = .002, 1-tailed; between the Confident/Unsure and Anxious/Relaxed subscales: r(26) = -.451, p = .008, 1-tailed; and between the Good-Natured/Grouchy and Anxious/Relaxed subscales.

In other words, after yoga practice those who were more relaxed were also more elated, those who were more energetic were also more confident, and those who were more good-natured were also more confident and more energetic. Similarly, the results revealed that after yoga practice those who were less unsure were also less depressed and less anxious, those who were less fatigued were also less depressed, those who were less grouchy were also less depressed and anxious, and those who were less unsure were also less anxious. These correlations imply that the instrument of measurement, the SDFMS, is a valid measurement of mood and thus may increase confidence in the validity of the present study.

Possible problems that may limit confidence in the results of this study include a lack of a control group. If the before and after SDFMS tests had been implemented in a group that had not been practicing yoga for an hour at the same time in the evening, it would increase the validity of the present study. An effect or lack of an effect on the moods of the control group would indicate whether or not the effect of Hatha yoga was valid in comparison. A larger sample size would have also increased the validity of the experiment. The majority of the 28 participants indicated that they practiced yoga very frequently, that is, one or more times a week. Only three
participants indicated that it was their first time practicing yoga this year. Ideally, a larger sample size would include a wider range of participants with more diverse experiential backgrounds. Furthermore, the validity of the study would be greater if the participants came from a variety of yoga studios and were taught by several different yoga instructors. In the present study, only a single yoga studio was used and the same yoga instructor led each class. The yoga instructor’s teaching style may have been influential on mood in a way that another instructor’s might not have, or the space itself may have had an effect. One participant voiced the idea that perhaps the researchers might collect a more accurate reading of the “before” moods if participants were asked to complete the pretest before they even entered the building rather than as they were setting up their mats within the studio. She claimed that she believed that her mood was elevated upon entering the yoga studio space. While the highly significant results appear to contradict this idea, the possibility that there may have been an even more significant change were the study conducted in this manner still exists. Furthermore, future research might investigate whether or not Hatha yoga appears to have the same effect at a different time of day. The present study was conducted in the evening, and a comparable study could be conducted in the morning or afternoon to determine whether or not it would yield similar results.

The question of what element of yoga might be primarily responsible for the highly significant findings also needs further exploration. The Grodner et al. (1982) study’s findings that art and movement therapy may elevate mood presents the possibility that it is the nonverbal, physical expressions of the mind and body incorporated in yoga that had an effect on mood. Or perhaps it is the repetitive, rhythmic, and non-competitive nature of yoga as a form of exercise that had the primary effect, as Berger and Owen (1988) speculated. Furthermore, yoga is both a physical exercise and a meditative practice; the meditation embedded within the exercise may play a major role in affecting mood as well. Because these elements of Hatha Yoga are all so closely integrated in the practice, it is not possible to determine which aspect has the greatest effect on mood states based on the present study.

A follow-up study might examine this issue more closely. Such a study might test the effects of yoga on mood in two particular yoga classes: one that primarily emphasizes physical exercise and one that is much slower and meditative. It should also include a control group, a group of participants that are not practicing yoga, perhaps listening to a lecture or participating in another activity that is neither meditative nor requires exercise. The methodology would be the same: pre- and post-SDFMS tests would be implemented for all three groups - the exercise-based yoga group, the meditative yoga group, and the control group, and then the before and after scores would be compared. In order to improve upon the validity of the present study, the future study would include a larger sample from a range of yoga studios throughout the Midwest. The results from this study might further aid in psychologists’ understanding of the short-term effects of yoga on mood states.

REFERENCES:


The Dynamic Between Income Inequality and Electoral Participation in the U.S.

A Comparative Analysis

By Megan Von Borstel
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While the impact of income inequalities on the wellbeing of the American populace is clear, the dynamic between income inequality and electoral participation in the U.S. is worth further consideration. This analysis of the impact of income inequalities on electoral participation will shed light on one of the core measurements of the well-being of a democracy. It will attempt to explain how modern conceptions of democracy in the U.S. have evolved today, and whether the current state of affairs is aligned with the democratic values of equal voice and equal opportunity.

As one of the most technologically progressive and economically robust countries in the world, the United States has attracted millions of people seeking a better life in pursuit of the quintessential ‘American Dream’: a fundamental belief in equality, democracy, and most importantly—equal opportunity. However, two current and empirical trends in the U.S. contest the reality of the American Dream for many Americans today. Skyrocketing levels of income inequality and perpetually depressed levels of electoral participation suggest a common theme: equal opportunity in the U.S. may not be so equal after all.

The dynamic between income inequalities and electoral participation in the U.S. is worth further consideration. The impact of income inequalities on the wellbeing of the American populace is clear. Rates of income inequality are a strong indicator of another important concern: social mobility. The difficulty of and degree to which an average American can move up the social ladder in their lifetime—in spite of their initial economic status—is one of the strongest measurable variables of equal opportunity. In addition, rising income inequalities reflect growing income disparities in the standards of living experienced by the wealthiest and poorest of American citizens across the country.

Electoral participation in the U.S. is a complex and multifactorial issue that has eluded scholars for decades. While income inequalities cannot completely explain the relationship between income and voter turnout in the U.S., they can illuminate one important, causal variable in this relationship. As income inequalities continue to rise, electoral participation in the U.S. will continue to split along socioeconomic lines, inevitably resulting in disparate policy outcomes.

Literature Review

One of the greatest concerns is how rising income inequalities influence electoral participation in the U.S. Scholars have offered several theories to explain the relationship between income inequalities and voter turnout. Collectively, these theories can be grouped into three schools of thought: Naturalism, Elitism, and Class Bias. Proponents of the school of Naturalism argue that income inequalities are a natural symptom of a capitalistic economy and have little, if any, direct effect on the U.S.’ democracy or electoral participation. Conversely, scholars in the Elitism school of thought contend that U.S. income inequalities are an egregious violation of equal opportunity, fueled by the disproportionate influence of elitist powers such as corporations and interest groups. Lastly, the school of Class Bias focuses on how the affluence gap in voter turnout reinforces income inequalities. Proponents argue that on a state and national level, class bias causes higher inequality in voter turnout and policy preferences.
resentational inequality is enormous and has increased in the U.S. As political scholar Gilens elaborates, “Representational inequality is enormous and has increased over time” (Gilens, 2012). As a result, interest groups—almost exclusively representing the interests of the wealthy elite and upper middle class—have a greater influence than the average American. Consequently, Gilens found that, the common person has little to no voice, disincentivizing any reason for the less affluent to vote.

In addition, according to political scientists Beramendi and Anderson, when testing income inequality and electoral participation, there is “a strong negative correlation,” indicating that income inequality has a substantial negative effect on voter turnout for those of middle income or below (Beramendi and Anderson, 2008). Furthermore, Hacker and Pierson also elaborate that income disparities can lower voter turnout because it becomes “a contest of who is more organized”—usually with well-funded interest groups or businesses winning (Hacker and Pierson, 2010). As Page, Bartels, and Seawright found in a study of national and state polling data, “Poorer people favor more economically egalitarian policies, while the wealthy favor more conservative economic policies” (Page, Bartels, and Seawright, 2013). Consequently, conservative economic policies, specifically those concerning redistribution of wealth are designed and instituted by elected Senators, Congressmen, and state elected officials.

As income inequalities continue to rise, electoral participation in the U.S. will continue to split along socioeconomic lines, inevitably resulting in disparate policy outcomes

While Elitism appropriately identifies institutional problems with income inequality and highlights the impacts of those problems on electoral participation, as a school of thought it is a little narrow in scope. One of the weaknesses of this approach is that it only concerns a few policy areas, mainly welfare. Consequently, the greater relationship between income inequality and electoral participation may be jeopardized. Another weakness of the Elitism school of thought is that it underestimates the role of the mass public, placing most of the focus on interest groups or businesses. In reality, the greater electorate also plays an important role in determining the policy concerns of their representatives.

The next school of thought lies at the other end of the spectrum: Elitism. This school of thought is most aligned with the Competitive Elitist model of democracy. Scholars of this school argue that elitist forces such as powerful businesses and interest groups are creating a disproportionate effect on policy outcomes, thereby reflecting and compounding existing income inequalities in the U.S. As political scholar Gilens elaborates, “Representational inequality is enormous and has increased over time.”

Naturalism is the most conservative school of thought. As scholar Pethokoukis explains, when assessing the effects of income inequality on the political arena, it is first essential to distinguish between absolute and relative wealth. While absolute wealth measures one’s standard of living objectively, relative wealth measures one’s wealth in relation to the next person. Absolute wealth is a better measurement of democracy. In reality, the U.S.’ absolute wealth has been steadily increasing for decades. Pethokoukis also notes a, “lack of hard evidence that income inequality (as opposed to, say, family breakdown) hurts economic growth” (Pethokoukis, 2014). Most scholars in this field attribute the causes of rising income inequalities to globalization, technology, and complex tax regulations. In addition, naturalists would argue that income inequality isn’t the grave social ill some political scientists claim it to be. According to political scientist Jonah Goldberg, “Income inequality can be a benign symptom” (Goldberg, 2014). As Goldberg posits, “if everyone is getting richer, who cares if the rich are getting richer faster.” Rather, the real concern is upward social mobility—not income inequality. This school of thought is most consistent with a Legal model of democracy; it stresses the importance of the rule of law and free markets.

There are several flaws with this school of thought. First, it assumes that the importance of absolute and relative wealth is mutually exclusive. While the level of absolute wealth is a strong indicator of economic health, standard of living, and likelihood of voter turnout, it is not the only indicator. The gap between the less and more affluent is also representative of a divide in policy preferences, which is critical when deciding to vote. Not only is this Naturalism shortsighted in its scope, it also lacks wealth of data or research to back up its claims. This is evidenced by Goldberg’s empty claim: ‘everybody’ is not getting richer; in fact, according to September 2013 Census data, incomes of the middle and lower classes have stagnated (Goldberg, 2014). As such, Naturalism is not the best approach when describing the relationship between income inequalities and electoral participation.

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The final school of thought is Class Bias. This approach is the more moderate of the three; it acknowledges the negative impact income inequality has on electoral participation, but stresses the importance of acknowledging the multitude of variables at play. The
Class Bias school of thought is most aligned with a Pluralist model of democracy. As Franko, Kelly, and Witko explain, “the preferences of the greater electorate should be a key factor of how the government responds to income inequality” (Franko, Kelly, and Witko, 2014). Thus, theoretically, the electorate should be able to motivate elected representatives to enact policies that compensate for the expanding influence of corporations and interest groups. However, lower class turnout decreases the influence of the lower class on wealth redistribution policy outcomes.

The most fundamental part of the Class Bias approach—and what also makes it unique—is its focus not just on low income turnout, but specifically the gap between the upper and lower class voters, also known as the class bias. By focusing on the class bias, this school of thought focuses its analysis on the direct effects of income inequality. It has several explanations for the income inequality. First, as Franko, Kelly, and Witko explain, when voter turnout is skewed to the more affluent, elected representatives will respond to the preferences of those who voted—the affluent (Franko et al., 2014). As a result, this causes a cycle of conservative redistribution policies and welfare programs, which reinforce existing income inequalities. In addition, Leighley and Nagler elaborate that because those of poorer incomes tend to not distinguish between candidates, they are less likely to feel the need to vote, causing lower turnout (Leighley and Nager, 2014). Similarly, according to political scholar Frederick Solt, high levels of income inequality in themselves can cause low voter turnout as well. He explains that the negative relationship between income inequalities and voter turnout works both ways (Solt, 2010).

As elected representatives are more inclined to respond to the policy preferences of those who actually vote, voter turnout can have a strong influence on policy outcomes.

The Class Bias is the best approach for a variety of reasons. First, it narrows the focus of its analysis on the direct effect of income inequality. In addition, it stresses the importance of not only elite forces in political elections, but also the mass electorate. Franko, Kelly, and Witko found that the “class composite of state elections has an important influence on income inequality” (Franko et al., 2014). The Class Bias approach is also superior in its scope. While Naturalism and Elitism both suffer from limited scopes, the Class Bias approach samples a variety of issue preferences across both party platforms. It also analyzes the effects of income inequality and voter turnout in state governments and the federal government. As many wealth distribution policies are on the state level—from taxes to welfare—it’s important to look at both levels of government.

In conclusion, the Class Bias approach is the soundest approach in the field today. Naturalism is both too narrow and not rooted enough in empirics. On the other hand, Elitism overstresses the importance of institutional factors on a national scale—thereby failing to appropriately value the impact of the voter and state policies. The Class Bias school of thought addresses the weaknesses of both of these approaches, while remaining appropriately broad enough in scope.

Theory and Hypothesis

Electoral participation rates in the U.S. signify several important observations about the American electorate. For one, overarching voter turnout in the U.S. is historically low compared to similar Westernized, economically advanced countries. In addition, voter turnout is not representative of U.S. demographics. Rather, in a comparison of individuals across the U.S., wealthier Americans are considerably more likely to vote than poorer or even middle-class Americans. As elected representatives are more inclined to respond to the policy preferences of those who actually vote, voter turnout can have a strong influence on policy outcomes.

Therefore, the intersection of income inequality and electoral participation rates is an interesting area of debate. In a comparison of participation rates in presidential elections, the higher rates of income will be positively correlated with higher rates of electoral participation. However, high rates of income inequality in the nation will have a depressive effect on voter turnout overall. Just as voter turnout is not equal across all demographics, the effect of rising income inequalities will not be the same across income demographics either. Higher income disparities will have the greatest effect on lower income individuals, and will likely be negatively correlated with the voter turnout of lower income brackets. Conversely, higher rates of income disparities will likely be associated with a slightly higher turnout of middle-income voters. Finally, higher income disparities within a state’s composition will likely have little to no effect on the voter turnout of higher income brackets. The null hypothesis is that income inequality does not increase or decrease the likelihood of voter turnout.
A myriad of other factors—beyond socioeconomic status—influence electoral participation. Several of these variables include: age, gender, race, level of education, perception of closeness of election within a particular state, contact with a political party or campaign, and strength of partisanship. Awareness that these variables have significant and intricate impacts on voter turnout is critical.

Data and Methods

Definitions
In order to measure these variables, it is first important to establish the conceptual definitions of each term. The independent variable—income inequality—is distinctive from low incomes. Income inequalities are measured as the “distribution of U.S. household income and federal taxes” into quintiles: the lowest quintile, the second quintile, the middle quintile, the fourth quintile, and the highest quintile (Goldberg, 2014). Each quintile is representative of where twenty percent of American incomes fall. In order to measure the effect of a rise in income inequality, I chose to focus on two presidential elections, 1978 and 2008. This time period is most useful because it is the period with the greatest increase in U.S. income inequality. Therefore, by measuring the responses and voter turnout by income levels in 1978 and again in 2008 we can discern some of the influence income inequality has had on electoral participation.

Next, it is critical to conceptually define the dependent variable. Political participation has a variety of forms. Today, examples of political participation include canvassing for a campaign or donating money in support of a candidate. However, the most traditional—and in theory most equitable—form of political participation is electoral participation. Electoral participation is best defined as the proportion of individuals eligible to vote, who actually vote in an election.

Methods
To further explore this relationship, I will analyze and attempt to isolate the effect of income inequality rates on electoral participation rates in the U.S. In order to measure these variables, I will be using the American National Election Studies database. In particular, I will use the ANES 2008 Time Series to measure variables on an independent level in the 1978 and 2008 elections. There are a variety of reasons that the ANES data is useful for this specific analysis. For one, the ANES Time series is an extremely thorough and extensive political database analyzing hundreds of variables from 1964 to 2012. In addition, the ANES 2008 Time Series is consistent in its methodology. From 1978 to 2008, the survey uses the same questionnaires and tests the same variables at the same level of analysis. This is important because it prevents any additional sampling error with inconsistent methodology.

In addition, while I am focusing on the dynamic between electoral participation and income inequalities, there are several other variables that affect whether or not an individual turns out to vote. Therefore, I will also consider the influence of the alternative factors involved mentioned earlier. As the American electorate is as varied as the greater American demographic, there are virtually an innumerable amount of these extraneous variables. While a statistical analysis of all of these controls is outside the scope of this analysis, it is essential to keep in mind the important and nuanced relationships they have with voter turnout. Including an awareness of these variables will help to explain a greater proportion of this complex relationship and produce more accurate results.

Analysis
The current state of U.S. income inequalities is at its highest point since 1928—right before the Great Depression (Desliver, 2013). In fact, the wealth distribution in the U.S. has been steadily worsening since the 1970’s and has been linked to a shrinking middle class (Gilson and Perot, 2011). To make matters worse, the Great Recession has exacerbated pressures on the lower and middle classes, widening the income gap.

However, American conceptions of a functioning democracy are not necessarily inconsistent with the existence of income inequalities. Rather, the American electorate has empirically supported the ideal of equal opportunity—not equal outcome. This concept is the foundation of the illustrious American Dream: with hard work and a fair chance, anyone can succeed. Unequal outcomes are usually considered the result of differences among individuals, not an inherent flaw in the system (Gilson et al., 2011). Along these lines, American expectations of their democracy are consistent over time: the government should promote equal opportunity, equal treatment under the law, and equal political voice—regardless of race, gender or socioeconomic status.

In many ways, the embodiment of equal political voice in a democracy is the universal right to vote. The concept of one person-one vote has always been a great political equalizer. In an age of intensifying political gridlock and an increasingly diversified electorate, expressing one’s political voice has become more important than ever. The world of political candidates and policy
preferences can often seem distant and detached from the everyday life of the average American. But elected representatives are the very people that mold the policy positions on welfare, tax, and a whole range of other domestic programs that have profound impacts on the daily lives of Americans.

Thus the question of what variables encourage—or worse—discourage Americans from exercising their right to vote is of great importance to the integrity of America’s democracy. Not surprisingly, income level is one of these variables. In a 2004 study conducted by the American Political Science Association, “nearly nine out of 10 individuals in families with incomes over $75,000 reported voting in presidential elections” (American Political Science Association, 2004). However, in the same study, “only half of those in families with incomes under $15,000 reported voting.” Consistently, lower income Americans vote at substantially lower rates than the middle or upper class.

There are a myriad of potential reasons for this phenomenon. The less affluent are more vulnerable to problems of access (i.e. distance, transportation, handling severe weather), as well as voter ID laws. In addition, the less affluent are more likely to have lower education levels and be less informed about election issues. Nevertheless, one of the strongest motivating factors not to vote is a decreasing trust in government. From the mid-1960’s to 1990’s the proportion of Americans who felt that government is run by a few big interests looking out for themselves doubled to 76 percent” (APSA, 2004).

This tendency of disparate voting rates along income lines is not a new trend. Nevertheless, this trend does raise serious concerns about the health of our democracy. In particular, disparities of political participation pose three threats. First, it creates a reinforcing cycle of political apathy. As more and more Americans lose trust in the government, they see no reason in voting or partaking in a perceived ‘rigged system’. Consequently, individuals see little—if any—change in the system and become increasingly disillusioned from voting.

The second impact is related to electing. Before anyone steps into a voting booth, thousands of man-hours and millions of dollars have been spent on the campaigns for the candidates running. In a 2004 study measuring whether respondents donated to a presidential campaign, “56 percent of those with incomes above $75,000 made some contribution while only 6% of Americans with incomes under $15,000 did.” Realistically, “giving money to politicians is a form of citizen activity that is, in practical terms reserved for a select group of Americans” (APSA, 2004). The impact of this is campaign contributions—which can determine the longevity of a candidate’s campaign—are effectively a private channel for the affluent to express their voice; this aggravates overall political inequalities.

The third threat is policy outcomes. The equal opportunity of political voices matters because “what government officials hear influences what they do” (APSA, 2004). When the less affluent turn out at lower rates to vote, their elected representatives—often seeking re-election—have less of an incentive to pursue those set of policy preferences. The American Political Science Association found that “the votes of U.S. Senators more closely correspond with policy preferences of rich constituents than with less-privileged constituents” (APSA, 2004). There is no question that income levels affect voting behavior. However, there remains uncertainty whether rising income inequalities have affected these dynamics in any significant way.

In an age of skyrocketing income inequalities, concerns arise whether each citizen truly has an equal voice

In order to address this question, I analyzed the polling data from the ANES Time Series during the 1978 and 2008 elections. This will provide additional insight into the effect of income inequality on voting behavior because of the sharp increase in income disparities during this time period. I began by isolating the income distribution and voter turnout variables. The first variable divided the respondent into a low, middle, or high-income bracket. The second variable measured if the respondent registered and voted or did not. From 1978 to 2008—despite rising inequality—voter turnout rates of each income bracket increased approximately 18 percentage points. Granted, it should be noted there is likely some statistical skew because respondents typically report voting at higher rates than they actually do. Nonetheless, the increase is still notable. However, the spread (i.e. the difference in percentages between each income group) widened during this time period. The difference between low to middle-income and low to high-income went from 3% and 11% respectively to 7% and 15% respectively. What this means is that even though more people were voting from each income group, the middle and especially high-income voting rates increased at a higher rate.

With a greater understanding of how income inequalities have affected voting behavior, next it is important to consider the alternative explanations and effects of other variables, such as age, gender, race, and education levels. As expected, controlling for age revealed older respondents were more likely to vote...
among all income groups. Within each age group, there was a positive relationship between income levels and voter turnout with the greatest effect on high-income individuals. Race and gender produced similar relationships with statistically significant results among all subgroups. Among all of the variables, controlling for education produced the most interesting results. Within all income groups, those with a college education were significantly more likely to vote by margins of 10 to 20 percent. This positive relationship was most evident among low-income voters.

Conclusion

The United States prides itself as the democratic touchstone of the world—a country that is of the people, by the people, and for the people. A fundamental tenet of that belief is the value of equal voice and representation. A critical measurement of equal representation is electoral participation. High rates of electoral participation are considered to be a reliable indicator of a healthy democracy. Yet, in an age of skyrocketing income inequalities, concerns arise whether each citizen truly has an equal voice. The 2008 Great Recession and the several years of aftermath have exacerbated such concerns.

An analysis of the relationship between income inequalities and voter turnout in the U.S. has produced some additional insight on this issue. It is clear that levels of income are positively correlated with higher levels of voter turnout. This is important because the policy preferences of the more affluent ultimately manifest themselves in policy outcomes.

However, there are also several causes for celebration. For one, overall rates of voter turnout among all income levels, races, and genders have increased in spite of an era of rapid increases in income disparities. In addition, there are several factors that counteract the negative effect of rising income inequalities. Higher levels of education and contact with campaigns during election cycles both have stronger effects on voter turnout than the income inequalities. Educational attainment and other forms of political participation are both controllable factors that individuals can make positive strides to improve, despite their income levels. Overall, income inequalities remain a pressing concern in U.S. today. While there are antidotes to the negative effects of income disparities, it is important to remember the potential threat inequality poses to one of the founding democratic ideals: equal opportunity.

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