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Message from the Faculty Director of the McNair Program

It is my pleasure to present Volume XI of the McNair Scholars Journal of the University of California, Davis. The McNair Scholars Program is named after Dr. Ronald E. McNair, the African-American physicist and astronaut who died in the 1986 Challenger space shuttle accident. As a memorial to Dr. McNair, the United States Congress established funding for this program in his name as a means to provide opportunities and encouragement to underrepresented and low-income undergraduate students who might otherwise not consider graduate study as an option. Funding for this program is provided through a grant from the U.S. Department of Education to assist students in attaining an advanced academic degree and a chance to succeed as exemplified by achievements of Dr. McNair. A significant component of the McNair Scholars Program at UC Davis is an individual, mentored research experience for each scholar. The research articles presented in the Journal are the culmination of a year's study and research conducted by the undergraduate students of the McNair Scholars Program. In addition to these papers, many of the scholars have presented their work at conferences and symposia throughout the country. We are justifiably proud of each of the McNair scholars whose research is presented in this journal. You will find that the papers cover a broad range of academic topics that the scholars have pursued using methodologies appropriate to their fields of study. However, the papers share a common theme in the way they exemplify the hard work, creativity and dedication that McNair scholars bring to the pursuit of their goals.

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Abstract

With a focus on the environmental processes that influence phenotypic expression of disease, the emerging field of epigenetics is predicted to become the next scientific breakthrough in the study of human cancer etiology. Using breast cancers as a lens through which to focus analysis, this study argues that modern epigenetics cancer research may marginalize the complex social, economic, and even environmental aspects of the condition in favor of descriptions, which situate the problem of cancer in the molecular realm. This presents a contradiction because epigenetics seeks to inform research about hereditable changes independent of genetic mutation – that is, changes in the external 'environment' like those responsible for biochemical alterations induced by synthetic chemicals. As the incidence of breast cancer increases as a function of industrial expansion, this conceptualization reveals the inadequacy of most efforts to address the condition. Political Ecology may help broaden this understanding because of its emphasis on political economy, environmental change and the politics of scientific thought and interpretation.

Background: from ancient Egypt to modern America

Breast cancer is an ancient condition. Historically, its earliest reference is found in the *Edwin Smith Papyrus*; a 3,500 year-old Egyptian medical text that describes surgical treatments for a variety of wounds and traumas like head injuries and broken bones (U.S. National Library of Medicine, 2012). Remarkably, these texts reveal that the methods for treating breast tumors in ancient Egypt mirror the way we deal with the problem today: localize the tumor, remove it, then treat the surrounding tissue(s). In Egypt the early surgeons would burn this tissue; today we apply radiation or douse the entire body with chemotherapy agents. Most importantly, this ancient medical text shows cancer did not begin with the Industrial Revolution. However, it is now a major part of industrialization because one of the most profound consequences of the industrial movement (besides unprecedented levels of production/consumption) has been an increase in overall life expectancy particularly for those of us who live in the so-called industrialized world (Clark, 2007).

The process of oncogenesis itself is thought to unfold slowly, encompassing many years for a malignant cell to develop. However, when one such cell divides, it tends to cascade rather quickly—leading to death from organ failure if left untreated (Meade, 2010). As a result, older

age has been universally correlated with the onset of cancer—and breast cancers in particular for women. For example, in the United States the median age at diagnosis is 61 years of age (NCI's SEER Cancer Statistics Review, 2012). At the moment, about one in every eight American women will develop an invasive breast tumor (National Cancer Institute, 2012). Furthermore, the literature demonstrates that a woman's chances of developing (and dying) of breast cancer depends on genetic inheritance plus the complex social, economic, and environmental factors that determine our lives.

Social, Economic, & Environmental aspects of the condition

Although breast cancer epidemiology research indicates that the incidence of breast cancer in America is higher for older Caucasian-American women, more African-American (Newman, 2005) and Hispanic women will die as a result of the condition. For example, a 2012 review of cancer in U.S. Hispanic populations published in the journal of Cancer Prevention Research finds that Hispanic women are 20% more likely to die from their breast cancers compared to non-Hispanic women (Haile et al.). Scholars like Paula A. Braveman from the University of California, San Francisco have attributed this paradox to the fact that Caucasian-American women are positioned at an overall higher socio-economic status compared to their African-American and Hispanic counterparts (2011: p. S152). As noted in University of Michigan professor Lisa A. Newman's study of African-American breast cancers: "poverty rates, likelihood of lacking medical insurance, and likelihood of relying on public insurance such as Medicaid are twice as high for African Americans compared with Caucasian Americans" (2005: p.7). As a result, Caucasian-American women are more likely to be diagnosed (and treated) at earlier stages of the condition.

Geographically, research indicates that incidences of breast cancers display a particular spatial trajectory. For example, a 2009 report published in the *International Journal of Health Geographics* finds that breast cancers are clustered spatially in America with statistically significant clusters of counties with high incidence rates in the Northeast, Midwest, and northern and mid Pacific West regions of the United States (Takesh et al., 2009). Most striking are studies on immigrants, which suggest breast cancer risk increases for certain women *after* migration. According to social epidemiologist Nancy Krieger, second-generation Latinas and Japanese women in the United States "are at higher risk for breast cancer than first-generation immigrants despite similar reproductive histories" (1989: p. 214).

Although the driving force(s) behind these spatial patterns remains unclear, Krieger in 1989, hypothesized that breast cancer risk is: "primarily determined by exposures to exogenous genotoxic carcinogens and secondarily influenced by epigenetic factors" (p. 218). She writes,

> The extent to which a society is industrialized affects not only the types and amounts of carcinogens present, but also people's dietary patterns and relative contribution of female and child labor to a family's survival; simultaneously, its social relations determine which women are most likely to be exposed to these carcinogens (whether at work or at home)… (pp. 208-9).

As inferred by Krieger in 1989, the study of epigenetics is thought to hold great promise in regards to cancer etiology because of its implications on the 'external'-- environmental factors that are thought to influence cellular development and tumorigenesis. Since Krieger's prediction, numerous scientific studies have been published, textbooks written, academic journals founded, and medical therapies invented; more recently, the "epigenome" itself was mapped by a team of European scientists. However, the literature shows that the all-important socio-economic and environmental factors which are said to determine human epigenetic change are mostly overlooked in favor of what University of Edinburgh virologist Nessa Carey calls the "molecular description" (2012: p. 7).

Cancer epigenetics studies

The most common definition of epigenetics found throughout the literature describes it as the science behind the inheritance of DNA activity independent of the naked DNA sequence (see Allis et al., 2007; Carey, 2011; Craig et al., 2011; Esteller, 2008; Francis, 2011; Gilber & Epel, 2009; Kanwal & Gupta, 2010; Kiaris, 2006; Tollefsbol, 2009). On a molecular level, this "activity" involves the tightening and relaxing of the chromosome structure due to biochemical alterations such as those resulting from DNA methylation (explained below) and histone modifications, which in turn "change the ways genes are switched on or off, but which don't alter the genes themselves [sic]" (Carey, 2012: p. 7). It has been further hypothesized that these microscopic changes are induced by "external" environmental stimuli such as changes in temperature, nutrition, pressure and gravity, light, dangerous conditions (Gilber & Epel, 2009: p. 13), and even maternal nursing behavior (Skinner et al., 2010). Lastly, as noted by Lawrence Harper, Professor of Human and Community Development at the University of California, Davis, epigenetic change may also result from social injustice. For example, oppression (or a sudden change in relative status or access to resources)"is another recurrent, if unpredictable and often long-term event that also meets the criteria" for epigenetic transmission (Harper, 2005: p. 350).

Since the discovery of altered patterns of gene methylation in —C—phosphate—G— sites (or CpG) in cancer during the early 1980s (Feinberg & Tyco, 2004), the study of cancer epigenetics has grown slowly but surely. In the preface to University of Alabama biologist Dr. Trygve O. Tollefsbol's edited text *Cancer Epigenetics (2009),* it is claimed that the field "is now the focus of many of the most exciting and significant advances in cancer research" (p. ix). According to Scott F. Gilbert and David Epel in *Ecological Developmental Biology: Integrating Epigenetics, Medicine, and Evolution,* the field has gained notoriety because epigenetic accounts of oncogenesis inform (and challenge) the classic somatic mutation hypothesis which holds that cancers are caused *exclusively* by mutations in the primary sequences of DNA (2009: pp. 273-4). As Gilbert and Epel explain, "In these epigenetic hypotheses a cell is regulated by its tissue environment through epigenetic signals…any agent that disrupts tissue organization or DNA methylation has the potential to initiate a tumor" (2009: p. 274). "DNA methylation," notes Dr. Tollefsbol, "has long been associated with cancer and it is now apparent that alterations in DNA methylation are not only intimately involved in tumorigenesis but also diagnosis, prognosis, and therapeutic approaches relating to DNA methylation are on the horizon" (2009: p. ix). Although DNA methylation is not the only mechanism thought to be involved during oncogenesis (e.g.,

histone modifications), at the moment it is the most researched epigenetic event. What do these studies show in regards to the onset of breast cancers?

DNA Methylation and breast cancer

Although scientists believe the overall effect of DNA methylation (the addition of a methyl group to the DNA molecule) is to *suppress* the expression of the gene to which it is attached (Francis, 2011: p. 46), recent cancer studies suggest that the process may also *activate* the expression of other genes. In the 2006 text *Understanding Carcinogenesis*, Greek Professor Dr. Hippokratis Kiaris reveals that irregular patterns DNA methylation are the most common alteration in human cancer, surpassing in incidence other events like DNA base substitutions and chromosomal alterations (p. 49). However, the pattern of DNA methylation in cancer is very aberrant because opposing alterations such as *hypo*- and *hypermethylation* have been reported in the same cancerous cell (Hon et al., 2012: p. 246; Kiaris, 2006: p. 52). Breast cancers are no exception. Adding to the somatic mutation theory described above, recent studies suggest altered patterns of methylation may lead to the inactivation of 'good' genes that suppress tumors while at other times 'bad' genes that promote cancers proliferate (Gilbert & Epel, 2011: p.274-5). For example, Gilbert and Epel (2011) describe epigenetic studies that show *hypermethylation* (an increase in methylation) leads to the inactivation of "tumor suppressor genes encoding *BRCA1* (which restricts cell division) and *E-cadherin"* (p. 274). The latter, for instance, is thought to increase proliferation, invasion, and metastasis in breast cancers if expression and function is suppressed (Yang et al., 2001). While those genes experience an increase in methylation, genes for growth promoting factors such as cyclooxygenase-2 simultaneously experience a decrease known as *hypomethylation* (Gilbert and Epel, p.275).

Overall, genome-scale studies have revealed *global hypomethylation* and *focal hypermethylation* as hallmarks of hormone-dependant cancers like those of the breasts and colon (Hon et al., 2012: p. 246). Interestingly, global hypomethylation is thought to progress with age and has been proposed to contribute to genomic instability while the mechanisms behind the hypermethylation of specific loci remain unclear (Kiaris, 2006: p. 51-2). For example, the estrogen receptor (ER) gene is unmethylated in normal breast tissue while some researchers have found it to be methylated in approximately 50% of unselected primary breast cancers they examined (Komninou & Richie, 2010: pp. 212-3). In summary, epigenetics cancer research suggests the process of carcinogenesis is more complex than just the mutation of specific genes. DNA methylation—a process thought to be regulated by environmental change—plays a substantial role in gene expression before and after the onset of cancers.

The problem of environments

As noted above, the study of breast cancer epigenetics is concerned almost exclusively with the science behind the tightening and relaxing of the chromosome structure. This presents a contradiction because epigenetics—unlike genetics—is dependent on the 'external' factors associated with cellular development other than the DNA sequence itself; i.e. the environmental information, which an organism inherits via processes like DNA methylation. As a result of this inadequacy, the complex problem of cancer remains situated in a microscopic world—in the region between 10^{-6} and 10^{-7} centimeters. Therefore, this approach will deliver solutions that

address the complex problem of cancer exclusively on the molecular level through treatment rather than prevention. While changes at the microscopic scale deserve much public health attention, they fail to address the more fundamental questions relating to cancer etiology. In the words of Meredith Turshen (1989): "Health and disease are products of the way society is organized, of the way subsistence is produced as well as surplus, and of the way subsistence and surplus are distributed among the members of a society" (quoted in Singer & Baer, 2012: p. 227). Political Ecology may help ameliorate this inadequacy because of its emphasis on political economy, environmental change and the politics of scientific thought and interpretation.

Towards a Political Ecology

According to University of Arizona geographer Paul Robbins, political ecology is a not a method or a theory, nor even a single perspective. Instead, it is a type of argument that unites a global community (2011: p. viii & 20) around the complex topic of environmental change. In 1987, Harold Brookfield and Piers Blaikie framed this type of argument in the context of political economy: "Together [they encompass] the constantly shifting dialectic between society and land-based resources and also within classes and groups within society itself" (Blaikie and Brookfield, 1987: p. 17). As University of California, Davis geographer Diana K. Davis reminds us, "Although criticized as both too atheoretical and too theoretical, this general definition of political ecology has been used by a great many political ecologists since it was written" (2009: p. 287). To many, the epistemological shortcomings referenced by Davis nevertheless serve to strengthen political ecology overall. For example, in a 2008 commentary published in the journal of *Environment and Planning*, a group of geographers led by Thembela Kepe argues: "As geographers, we feel that the strength of political ecology lies both in its ability to attract diverse students and in its ability to clarify environmental issues through its open-minded perspective" (p. 2542). "Similarly," they write, "students are attracted to political ecology…precisely because of its attempt to explain the complex processes of environmental change by drawing on diverse theories and practices that bridge social and natural science" (p. 2542). In summary, a political ecological approach to the topic of environmental change is valued by researchers because of its ability to unite students from a variety of disciplines including history, science, and the social sciences.

Why political ecology?

In her book *Weighing In: Obesity, Food Justice, and the Limits of Capitalism (2011)*, Professor of Community Studies, Julie Guthman, from the University of California, Santa Cruz, employs a political ecological argument to analyze the modern condition of obesity. She writes, obesity "is an ecological condition that, like global warming, requires…that we pay attention to the broader political-economic and cultural context in which individual decisions affecting ecologies—even internal, bodily ecologies—are made" (p. 9). Breast cancers are no different and this paper takes the position that cancers are similarly ecological conditions that have shaped the human experience for millennia. Likewise, this conceptualization of breast cancer as an ecological concern compliments other modern ecological concerns like oil spills and global warming in two main ways. First, they are highly influenced by our global economic activity (e.g. oil is a commodity traded daily) and secondly, they are informed by scientific facts constructed by researchers using advanced methods (see Demeritt 2001). Scientific research into the epigenetic

events surrounding breast cancers is one such line of inquiry. However, it is a line of inquiry whose solutions may further dismiss the many things that simultaneously influence a woman's chances of developing and dying as a result of a breast tumor. Ironically, they are the very processes hypothesized to govern epigenetic events like DNA methylation. As a result, a further look into the political-economic and cultural context in which epigenetic knowledge is produced is warranted because it is a line of research that attempts to explain the complex process of environmental change.

As noted by Paul Robbins, an effective way to understand political ecology is to contrast its arguments with "apolitical" interpretations of ecology. For Robbins, "apolitical" ecologies are the dominant contemporary forms of scientific inquiry about environmental change, accounts largely presumed to be objective representations of nature. The problem with these interpretations, claims Robbins, is that any form of research about the environment is inherently political (2011: pp. 11-19). As noted in Guthman's 2011 book *Weighing In*, "…scientific discovery and reporting take place in social contexts, so knowledge of health and environmental problems necessarily reflects the manifold social relations that affect science: from grantor funding priorities to peer review to personal friendships" (p. 13). Political ecology is no exception, claims Robbins, rather it is "simply more *explicit* about its normative goals and more outspoken about the assumptions from which its research is conducted [italics in the original]" (Robbins, 2012: p.19). This paper finds that contemporary epigenetic breast cancer research may further reinforce an "apolitical" interpretation of cancer etiology. While the nascent field of *environmental epigenetics* attempts to address cancer etiology, it nevertheless situates the condition within molecular boundaries (e.g. Cortessis, 2012; Guerrero-Bosagna, 2012; Manikkam, 2012; Reamon-Buettner, 2008). Relatively few articles or books have been published that employ a political ecological argument in discussions about cancer—much less from the important perspective of epigenetics research which implicates environmental change in its discourse.

Problems and solutions

In *The Lie of the Land: Challenging Received Wisdom on the African Environment* (1996), political ecologists Melissa Leach and Robin Mearns argue that the way complex environmental problems are framed influences their solutions (pp. 2-3). In their example of the African 'woodfuel crisis,' the authors argue that conventional interpretations of deforestation articulated the problem of local people felling trees for firewood as a 'crisis' by emphasizing a supply gap revealed only after comparing woodfuel consumption with current stocks and annual growth of trees. According to Leach and Mearns, the logical solution to this problem was implicit from its starting assumptions: as a result of interpreting the problem to be one of supply and demand, it would be logical to theorize solutions which address the supply and demand of fuel wood. "Namely," they write, "to plant trees on a colossal scale to close the woodfuel supply gap, and to introduce more efficient cooking stoves to reduce demand" (pp. 2-3). This approach, as noted by the authors, failed to consider more fundamental questions like those addressing the socio-economic livelihoods of the people accused of felling trees for fuel.

Similarly, conventional epigenetics cancer research conceptualizes cancers as challenges that could be met only by more research and further capital investment. By employing molecular

descriptions, which situate the complex (ecological) problem cancer in microscopic terms, solutions are likewise given in microscopic terms in the form of technologies such as biomedicines and advanced therapies. In some cases these medicines are reported to work. For example, the drug *Vidaza* has been approved by the U.S. Federal Drug Agency to remove methyl groups from DNA in acute cases of myeloid leukemia. "By defining what is acceptable as evidence," argue Leach and Mearns, "certain privileged methods also act to exclude other sorts of data… It is in this way that certain questions remain unasked, and certain types of evidence are ignored or dismissed as invalid" (p. 14). Although well intended, contemporary epigenetic approaches to the problem of breast cancers ultimately dismiss the broader 'external' factors that are believed to drive epigenetic change. In the spirit of genetic determinism, these factors are reduced to mere 'triggers' that occur subtly outside our cells (Meade & Emch, 2010: p.332) and therefore treatment, rather than prevention, is stressed.

Pesticides

In recent years, numerous studies have been published which suggest epigenetic alterations can be induced by exposure to 'xenobiotic' environmental toxins like pesticides (e.g. Anway, 2005; Irizarry, 2009; Jones, 2007; Markowitz, 2009). Additionally, research has shown a strong correlation between pesticide exposure and epigenetic events leading to oncogenesis in laboratory specimens (e.g. Manikkam, 2012; Stouder, 2010; Zhang, 2012). Of particular interest is the work of a group of researchers led by Xiao Zhang from Northwestern University who provide direct experimental evidence linking pesticides associated with increased cancer risk in humans (including breast cancer) with changes in DNA methylation. Zhang's study *DNA Methylation Alterations in Response to Pesticide Exposure in Vitro* (2012) is a genome-wide analysis of DNA methylation preformed on DNA samples from Human K562 cells exposed to three common organophosphate pesticides: Fonofos, Parathion, and Terbufos. Their results identified altered patterns of methylation in over a thousand CpG sites with over a thousand genes, respectively, involved in each case. In other studies, the fungicide/endocrine disruptor vinclozolin (used on a variety of crops like strawberries and grapes) has been shown to induce adverse epigenetic effects in living organisms. For example, the study Endocrine Disruptor Vinclozolin Induced Epigenetic Transgenerational Adult-Onset Disease (2006) published in the journal of *Endocrinology*, Matthew D. Anway et al. found that vinclozolin exposure in the F1 generation of adult rats led to the development of transgenerational conditions including immune system abnormalities, testis abnormalities, and breast tumors in each of the four subsequent generations examined. As noted by the researchers: "The potential that an epigenetic (*i.e.*DNAmethylation) transgenerational background may influence disease susceptibility, premature disease onset, and/or development of disease, is a factor in disease etiology not previously appreciated" (p. 5522).

Although it is important to establish a molecular basis for adult onset disease conditions, a strict adherence to this approach to public health dismisses the broader social, economic, and even environmental realities that epigenetically shape the onset of cancers in human bodies. For example, it marginalizes the lives of those who face the highest risk of occupational poisonings relating to pesticide exposure: farmers and farm workers (Galt, 2012). In the United States, for instance, people interact with pesticides as a result of many factors including poverty, immigration, and the demands of an industrial agriculture which value high input, labor-

intensive, and cosmetically perfect produce. As noted by Guthman (2011): "…a farmer's decision to use toxic pesticides is often a matter of economic survival to ensure against crop loss since prices offered by buyers are notoriously low…" (2011: p. 10). In California, for example, the organization of agricultural economics has in the last thirty years led to the emergence of powerful food retailers like Wal-Mart who now drive the production circuits of fresh fruits and vegetables rather than the growers themselves (Carman et. al, 2002). In *Global Shift* (2011), economic geographer Peter Dickens argues: "…these industries depend fundamentally on a huge floating labor force of workers who are employed only when the producer needs them and who are often organized by subcontractors" (p. 284). In California, once again, a recent report by the state's Department of Pesticide Regulation indicates that pesticide use has increased after a four-year decline with more than 173 million pounds of chemicals applied statewide in 2010. According to the report, the vast majority of these pesticides were used in the Central Valley on high-value foods (HVF) like strawberries, almonds, sweet potatoes, carrots, and table and raisin grapes (DPR online, 2011). Since less than 0.1% of pesticides applied for pest control reach their target pests (Pimentel, 1995), higher rates of application will continue to have deleterious effects on public health / the environment. Nevertheless, with an increasing global demand for high-input, labor-intensive HVFs, the use of pesticides will surely increase along with the number of workers needed to produce those commodities.

By framing the problem of pesticide toxicity in molecular terms, conventional epigenetics cancer research further fails to address more essential questions like *why* epigenetic change occurs and for whom. Instead, deleterious conditions thought to be associated with pesticide exposure (like breast cancers) are conceptualized as problems amenable only to technological solutions—the fantasy of solving occupational health risks with the right mix of chemical compounds and protective gear. This approach to public health indeed saves lives, but like medical geographers Melinda S. Meade and Michael Emch wonder: What about the things that threatened those lives in the first place? (2010: p. 333). According to medical anthropologists Merrill Singer and Hans Baer, theories that question the political-economic and environmental factors associated with cancer etiology receive little attention from health-policymakers and funding agencies "largely because addressing them would require major social structural changes that ultimately would require transcending the existing global economy" (2012: p. 227). In *Manmade Breast Cancers* (2001), feminist scholar Zillah Eisenstein describes some of the structural relations that reinforce the modern breast cancer establishment:

> Corporate America and its ties to global capital structure the artifices of disease in the twenty-first century. The frames of reference that embrace excessive wealth, blame the poor for their lot, seek to limit the public responsibilities of government and corporations alike, and continue to boast of the deregulation and takeover of once public spaces by private corporations define the environments in which the breast cancer establishment now operates. (p. 100).

The strength of Eisenstein's argument is further illustrated with her observations that many of the same circuits of capital which contaminate environments also produce the drugs that are supposed to prevent malignancy; she writes, "Zeneca manufactures pesticides at the one end and markets [the hormonal therapy agent] tamoxifen at the other" (p. 124). Similarly, the German chemical company Bayer makes products like Parathion (noted above) at one end and also funds

researchers to analyze complex epigenetic modifications in tissues with aims at a "better disease understanding and therapeutic options" at the other (Bayer Pharma AG, Berlin online job posting). These examples highlight the powerful institutional arrangements—held together by global circuits of capital—that define environmental problems like breast oncogenesis and likewise influence the ways it is researched, understood, and addressed. Sadly, these arrangements may also influence *why* people get sick to begin with.

Conclusion: Winners and Losers

Since the industrial revolution, higher life expectancies together with the proliferation of xenobiotic industrial toxins have strongly influenced the human breast cancer regime. Epigenetics, the newest and most advanced line of research into tumorigenesis, does an excellent job identifying the biochemical processes that challenge genetic determinism by suggesting there is more to life than the sequences of genes encoded onto the DNA molecule. Epigenetecists claim that the way our genes are expressed is just as essential. As a result, thousands of articles have been published in the last couple decades that illuminate this hypothesis by highlighting the role of DNA methylation—a hereditable, biochemical process determined by our bodily responses to the broader social-economic environmental realities which we live by. Nevertheless, modern epigenetics cancer research frames the ecological problem of cancer as an apolitical technical challenge that can only be overcome by more research and further capital investment. This approach to public health has clear winners and losers. According to medical geographers Melinda S. Meade and Michael Emch: "The academic researchers gain reputations; the pharmaceutical companies and the manufacturers of medical research tools profit; the hospitals fill their beds and coffers; and the manufacturers of the dangerous chemicals themselves, of whatever kind, continue with their growth, profits, and dividends" (2010: p. 333).

Whereas epigenetic cancer research could potentially be used as a powerful argument which further questions human exposure to pesticides, it follows instead in the footsteps of a genetic determinism which marginalizes the complex social, economic, and environmental factors behind cancer etiology. "So many are benefited—except the millions of better-treated human beings, who perhaps did not need to be afflicted at all," conclude Meade and Emch (p. 333). These studies may further inform the molecular basis of arguments advanced by the geographic scholarship on environmental justice (Guthman & Mansfield, 2012) by including quantitative evidence of transgenerational disparities in its critique of toxic exposures. To illustrate, it is an injustice to progeny that pesticide toxins can become encoded in the human epigenome and recycled across generations. Because of its emphasis on political economy, environmental change and science studies, Political Ecology is a powerful argument for evaluating epigenetic research. The latter point is of particular interest since, "In general, environmental health and justice approaches have been less concerned with the politics of disease knowledge and interpretation" (Guthman, 2011: p. 12).

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Childhood Behavior Problems and the Early Onset of Criminal Offending

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Abstract

Previous research indicates a strong link between early onset of delinquent behaviors and repeat offending in adulthood (Farrington, et al., 1990; Nagin & Farrington, 1992) supporting the need for early intervention and treatment of criminal offenders. This study explores the link between childhood behavior problems and adolescent and young adult criminal offending to identify at-risk populations. It is hypothesized that childhood behavior problems and poor academic performance will lead to an earlier onset of criminal offending compared with the absence of these characteristics. Data came from the National Longitudinal Survey of Youth – Children and Young Adults, in which children and their mothers are interviewed every other year concerning a variety of life experiences. Survival analysis was employed to examine whether early delinquent behaviors and poor academic achievement predict the timing of later criminal offending. Results indicated that early behavior problems and low reading scores (measured before age 7) were associated with earlier first offenses. Results of this study identify factors predictive of early criminal offending and may help identify high-risk populations.

Introduction

Each year over 92,300 juveniles are arrested for committing violent crimes (Snyder & Sickmund, 2006). In his famous birth cohort study, Wolfgang and associates (Wolfgang, 1983; Wolfgang, Figlio, & Sellin, 1972) found that of the juveniles who commit crimes, roughly 6% are responsible for 60% of the reported crimes, and these results have been replicated in several subsequent studies (e.g. Moffit, Caspi, Rutter, & Silva, 2001). With such high rates of offending by such a limited number of juveniles, it becomes important to identify those who are likely to commit a large number of crimes and determine what early childhood influences are predictive of high rates of offending.

These 6% of offenders identified in Wolfgang et al.'s (1972) study were considered chronic offenders because they were convicted of crimes at least four times in their lifetime. In an entire birth cohort, 18% were considered chronic offenders by age 18, and 31.4% were considered

chronic offenders by age 30 (Wolfgang, 1983). These early chronic offenders, who had committed four offenses before their eighteenth birthday, committed an average of 14 offenses whereas late chronics, who commit four offenses by the age of 30, committed an average of nine offenses throughout their life-course. Based on these findings, it is clear that an early onset of chronic offending is associated with a higher rate of offending.

Early onset delinquency has been shown to be associated with chronic offending in adulthood (Farrington et al., 1990; Nagin et al., 1992), which means that if a child begins offending in early adolescence, he or she is more likely to become a chronic offender responsible for many subsequent crimes (see Wolfgang et al., 1972). It is important to note that when it comes to the timing of the onset of criminal offending, adolescent onset offending per se does not predict how the course of offending will develop thereafter. Moffitt et al. (2001) identified a two-category taxonomy of offenders that distinguishes between life-course persistent offenders and adolescent-limited offenders. Life-course persistent offenders begin offending in adolescence, peak in number of offenses in young adulthood, and slowly decrease in offending afterwards. Adolescent limited offenders peak in number of offenses during adolescence and do not offend in later phases of the life-course. According to Moffitt et al. (2001), when offenders are identified in adolescence, it is not possible to distinguish who will become life-course persistent offenders from those who will prove to be adolescent offenders. Life-course persistent offenders, or childhood-onset criminal offenders, can be characterized as having an abnormal level of childhood risk factors including behavior problems, poor academics, and poor home environment. Adolescent-limited offenders do not have these same childhood risk factors. Because of their relatively healthy childhoods, adolescent-limited offenders eventually desist from crime and develop into healthy, non-offending adults.

The existing literature indicates that the onset of criminal behavior can begin at any point in the life course, and the timing of the onset determines the progression of criminal behavior throughout life (e.g., Farrington et al., 1990). Research on chronic offenders and life-course persistent offenders indicates that an early onset of criminal offending is associated with more violent and chronic offending throughout the life-course. Childhood factors associated with an early onset of criminal offending, such as home environment, prenatal care, and parents' criminality have been identified for children as young as 2 to 3 years of age (Glueck & Glueck, 1966). The following sections review research that has examined the associations between the variables that were examined in the present study – academic outcomes and behavior problems – and the onset of delinquency.

Literature Review

Delinquents tend to have poorer academic outcomes in school than their non-delinquent peers (Sampson & Laub, 1993). Research finds that low reading levels are consistently and strongly correlated with criminal offending (Flemming, Harachi, Cortes, Abbott, Catalano, 2004; Rhodes & Reiss, 1969; Silberg & Silberg, 1971). Additionally, reading problems are an important risk factor for reoffending (Paalman, van Domburgh, Stevens, & Doreleijers, 2011). Furthermore, chronic offenders have been found to have lower mean IQ scores than non-chronic and non-offending populations (Wolfgang et al., 1972). Similarly, Moffitt (1990) found that low IQ and

low neuropsychological test scores (Moffitt et al., 1996) were associated with life-course persistent offending and were not present in adolescent-limited offenders.

Behavior Problems

Behavior problems such as post-traumatic stress disorder (Allwood, Bell & Horan, 2011), antisocial behavior (Moffitt et al., 2001), and bipolar disorder (Stoddard-Dare, Mallett, & Boitel, 2011) have all been associated with a greater likelihood of aggressive offending in adolescence. Moffitt et al. (2001) found that the early onset of antisocial behavior problems was the single best predictor of chronic and violent adult criminal offending. Additional factors associated with chronic and violent criminal offending were hyperactivity (Moffitt, 1990), impulsivity, psychopathy, and callousness (Moffitt et al., 1996), which were present in childhood for life-course persistent offenders but not for adolescent-limited offenders.

These previous studies on childhood academic performance and behavior problems lack generalizability because they analyze offending rates from specific county or state law enforcement agencies. There is an abundance of data on reading scores and IQ scores and their influence on the onset of offending, but there is a knowledge gap when it comes to research on math scores and their influence. Studies on behavior problems and offending focus primarily on aggressive behavior problems (e.g., bipolar disorder, psychopathy, antisocial behavior) but the literature is short on studies of the wide range of behavior problems that might be associated with the onset of criminal offending. The present study examines how reading scores, math scores, and a variety of behavior problems are associated with the onset of criminal offending. I expect that low reading and math scores and childhood behavior problems will be associated with the early onset of criminal offending. I hope that by using a national sample I can support or refute claims based on studies with smaller and less nationally representative samples. If this study can determine who is more likely to become a chronic offender by looking at childhood factors related to an early onset of criminal offending, psychologists and social-service providers can target prevention and treatment programs to the youth where these efforts will have the most important effects.

Methods

Data

Data for this study came from the Bureau of Labor Statistic's National Longitudinal Survey of Youth – Children and Young Adults (NLSY-CYA) which contains data collected on children from 1986 to 2010 (N = 11,495; Race: 19.21% Hispanic, 27.73% Black, 53.06% non-Black, non-Hispanic; Gender: 51.07% Male, 48.93% Female; Age range [0, 35.12]). The NLSY-CYA began by collecting data on mother's pre- and post-natal care of their children. Information was typically supplied by mothers and school principals regarding the child's development until the child reached 10 years of age, when they were deemed old enough to fill out their own self-report measures. The NLSY-CYA examined various socioemotional factors such as children's home environment, schooling, relationships, religion, health, and substance abuse.

Measures

To evaluate the effects of childhood behavior problems and academic performance on the timing of first conviction, three specific measures were used from the NLSY-CYA: the Peabody Individual Achievement Test (PIAT) Reading Recognition scores, the PIAT Mathematics Assessment, and the Behavioral Problems Index (BPI). Data from the PIAT and BPI tests were in standardized form, so that each distribution had a mean of 100 and a standard deviation of 15.

Peabody Individual Achievement Test (PIAT)

The PIAT measures the academic achievement of children aged five and above on a wide range of skills. For the purposes of this study, only the Reading Recognition and Math tests were used. Children were only administered the Reading Comprehension test if they received a score of 19 or higher. Participants scoring 18 or lower on the Reading Recognition test were assigned a score of 18 on the Reading Comprehension test. Therefore, Reading Recognition scores were used instead of Reading Comprehension scores to allow for better variability among reading scores during data analysis.

The PIAT Reading Recognition test contains 84 items, increasing in difficulty, that measure word recognition and pronunciation ability. This test examines the essential components of reading achievement. The PIAT Mathematics assessment also contains 84 items increasing in difficulty. It is designed to measure a child's attainment of mathematics as taught in mainstream public schools.

Behavioral Problems Index (BPI)

In the NLSY-CYA the BPI was filled out by mothers regarding observations of their child's behaviors in the previous three months. This 28-item questionnaire was then divided into six subscales used to assess the presence of antisocial behavior problems, anxiousness/depression, headstrongness, hyperactivity, dependency, and peer conflicts/social withdrawal. Higher scores on the BPI indicate an increased presence of behavior problems. For this study, childhood behavior problems were measured as BPI scores of children when they were between the ages of 4 and 7.

Conviction

In the present study, the age of onset of criminal offending was measured by examining the occurrence of a conviction other than a minor traffic violation. Every other year from 1994 through 2008, participants filled out a survey regarding a variety of criminal behaviors, including the following items: "Ever been convicted of charges other than a minor traffic violation?" and "Age of respondent when first convicted" (see Table 1 for number of respondents per year).

Data Analysis

Data Preparation

Once a participant answered "yes" to the question asking if he or she had ever been convicted of an offense other than a minor traffic violation, any following response was disregarded. This method was used because this study focuses only on the timing of first offense in this study and not the frequency of offending. A participant's age at first offense was determined by looking up the response to "age of respondent when first convicted" question for the year when he or she first answered "yes" to ever being convicted of a crime other than a minor traffic violation. This age of first offense was the focus of subsequent data analysis.

Survival Analysis

Survival analysis was used to determine how behavior problems and academic performance reported in early childhood were associated with the timing of first conviction. Survival analysis is a type of regression analysis that models the duration of time until an event occurs (e.g., first criminal act) and allows for the examination of possible predictors of the timing of the event. During the period of data collection (1986-2010), age of first conviction or the age of the participant when he or she last participated in a survey was recorded. In addition, the behavior problems and academic performance of participants were recorded during the period when they were 5 to 7 years old. Survival analysis yields an odds ratio where an odds ratio of 1.050 for a given BPT test, for instance, would indicate that for every unit change in BPI there is a 5% increase in the odds of offending at any time given a first offense has not yet occurred.

Results

Of the participants who committed their first offense during the observation period from 1986 to 2010 (N = 408), the mean age of first offense was 19.32 years (min: 10.00 years, max: 30.17 years; see Figure 1 for proportions of participants per year who have had their first offense). Of the behavior problems analyzed, there was a significant negative association between age of first offense and antisocial behavior problems (Odds Ratio = 1.183; $p < .001$), headstrongness (Odds Ratio = 1.013; $p = .007$), hyperactivity (Odds Ratio = 1.014; $p < .001$), and peer conflicts/social withdrawal (Odds Ratio = 1.012; $p = .003$). No effect was found for anxiousness/depression (Odds Ratio = 1.006; p = .150) or dependency (Odds Ratio = 1.003; p =.482). For academic outcomes, there was a positive association observed for Reading Recognition scores (Odds Ratio = 0.986; $p = .010$) but there was not a significant effect for math scores (Odds Ratio = 0.990; p = .073). The effects found for antisocial behavior problems and hyperactivity were particularly strong because they had a less than a 0.1% likelihood of being due to chance (see Table 2 for detailed results).

Discussion

The results of this study indicate negative associations between age of first offense and antisocial behavior problems, headstrongness, hyperactivity, and peer conflicts/social withdrawal, which means that the higher a child's score is on any of these behavioral ratings, the more likely it is that he or she began offending at a younger age. The associations found between antisocial behavior problems and hyperactivity and the age of first offense are consistent with previous findings (Moffitt, 1990; Moffitt et al., 2001) and have now been replicated with a national sample. The associations found for headstrongness and peer conflicts social withdrawal provide new data linking these individual behavior problems with the age of first offense. There were no

effects found for anxiousness/depression and dependency, which may be due to the internalizing and less aggressive nature of these behavior problems. If a child with an internalizing behavior problem is more likely to respond emotionally to stress, then it follows that they are less likely to react in a violent or criminal manner.

A positive association was found for Reading Recognition scores where a higher reading score was associated with the likelihood of having one's first offense at an older age. This replicates the findings of the many previous studies conducted on reading scores and onset of offending (e.g., Rhodes et al., 1969) with a national sample. There was no effect for math scores found which may be due to the fact that for children younger than 7 are just learning basic math principles and have not had time to really diverge in math skill level. Perhaps if math scores were recorded in early adolescence when more difficult math skills start being taught (i.e., long division, algebra) and variability between math test scores increases, then math scores may be found significantly more associated with the age of first offense.

Though the goal of this research was to identify factors associated with the early-onset criminal offending, in hopes of preventing chronic offending, it is important to note that these results are associations and not definitive causal relationships. This research is meant only to identify early warning signs and increase efforts to offer positive help with problematic behavior and poor reading skills before a pattern of criminal offenses begins. Teachers, school psychologists, and other professionals already seek to correct poor reading skills and behavior problems because of their many undesirable effects. The associations found in the present research make clear that chronic criminal behavior may be one of those undesirable effects, further supporting the need to assist children with poor reading skills and behavior problems.

Limitations

The major limitations of this study are a result of the way US law enforcement agencies make convictions. Conviction rates are not a completely accurate measure of the number of crimes that occur. Not all crimes are reported by victims or police. Of the crimes that make it to court, only a fraction make it through all of the phases of trial and lead to a conviction. It is important to note that any observed group differences in crime rates could be due to actual differences in offending behavior, or could be affected by systematic discrimination by judges and police (Moffitt et al., 2001). Although it is useful to know the timing of first convictions because of the impact police and court contact on a juvenile's life, the timing of first conviction may not be completely indicative of when a juvenile first becomes involved in criminal activity.

The NLSY-CYA could have been improved by asking participants when they first became involved in various criminal activities, rather than asking them when they were first convicted by courts. The NLSY-CYA already utilized self-report measures to eliminate the error that would have occurred had the researchers asked mothers about their children's criminal behaviors. Since the researchers already use self-report measures, adding questions concerning criminal activity, rather than convictions, would be relatively easy. The results, based on the NLSY-CYA, may not be completely generalizable, despite the large sample size, because the children studied in the NLSY-CYA were disproportionately born to teenage single mothers. These teenage single

mothers were often from disadvantaged backgrounds, not well educated, and members of minority ethnic groups, making their children a high-risk sample to begin with.

Future research

Future research should address first self-reported criminal activities, rather than officially reported criminal behavior, to eliminate the error and biases that come from the US Juvenile Justice System. In addition, future research should also examine other possible behavior problems associated with the onset of offending and seek explanations for these associations. In continuation of the current study, a future study could examine measures of childhood home environment, including child maltreatment, and its associations with the timing of first offense. Childhood maltreatment has been found to be associated with an earlier age of onset of criminal offending (Gold, Sullivan, & Lewis, 2011; Maxfield & Widom, 1996; Rivera & Windom, 1990). A study by Ford, Elhai, Connor, and Frueh (2010) found that even when PTSD, depression, and addiction symptoms are not clinically significant, suggesting that victimization alone has important effects on criminal offending in juveniles.

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Appendix

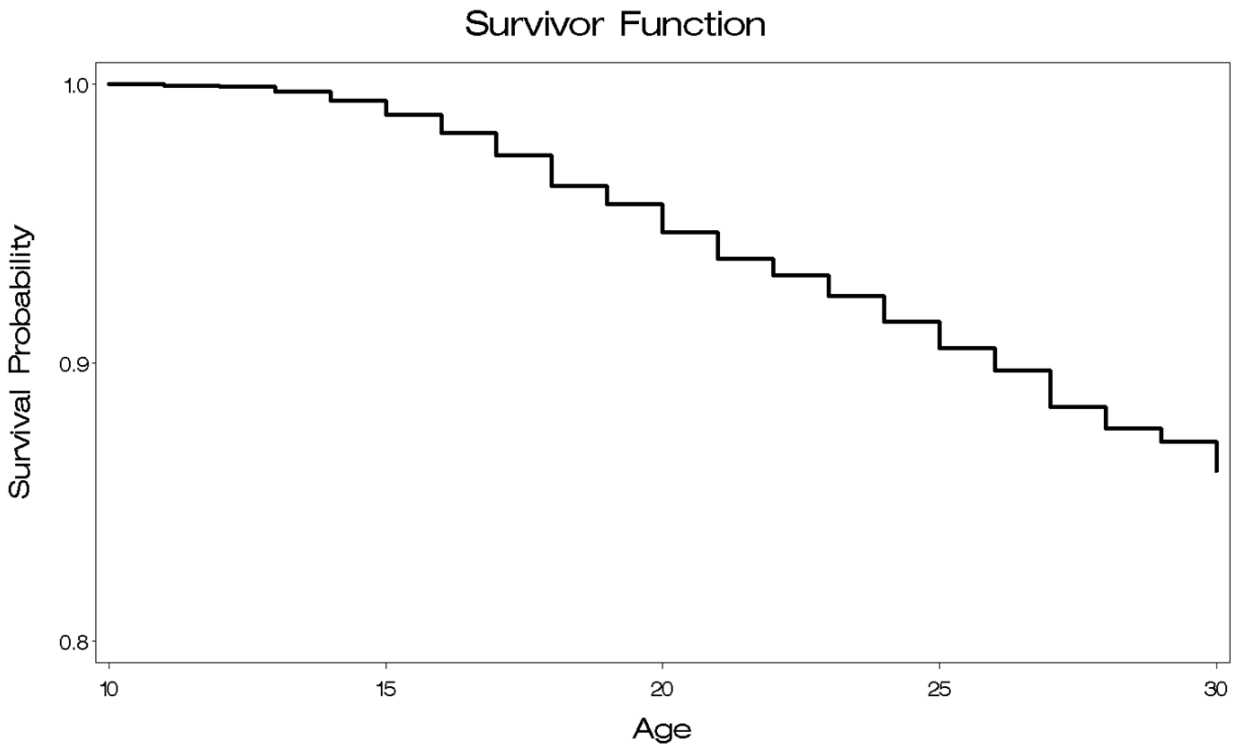
Table 1
Number of Respondent to Conviction Survey Questions

Q1. Ever been convicted of charges other than a minor traffic violation?									
Year	1994	1996	1998	2000	2002	2004	2006	2008	2010
Number of Respondents	886	1536	1978	3024	4236	5016	5796	6256	6047
Q2. Age of respondent when first convicted.									
Year	1994	1996	1998	2000	2002	2004	2006	2008	2010
Number of Respondents	97	257	322	211	318	280	330	334	257

Table 2
Results

Variable	Parameter Estimate	Standard Error	Odds Ratio	P Value
Antisocial behavior problems	0.01810	0.00416	1.18264	<0.0001
Anxiousness/depression	0.00620	0.00431	1.00621	0.1449
Peer conflicts/social withdrawal	0.01199	0.00396	1.01206	0.0025
Dependency	0.00296	0.00426	1.00296	0.04875
Headstrongness	0.01250	0.00462	1.01258	0.0068
Hyperactivity	0.01371	0.00403	1.01380	0.0007
Reading Recognition Scores	-0.01461	0.00570	0.98550	0.0104
Math Scores	-0.00982	0.00547	0.99022	0.0726

Figure 1. *Survivor Function by Age*



Notes: This graph plots the proportion at each age of participants who have not yet had their first offense. Survival probability indicates the proportion of respondents per year who have not had a first offense. A survival probability of 1.0 indicated 100% of respondent have not had their first offense. Every step down thin this function indicates the relative number of participants who have had their first offense that year.

Te Miki Tay Tupal: A History of Survivance

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Native American Studies

Introduction

A resurgence of the fight for indigenous rights and recognition in El Salvador originated after the 1992 Peace Accords were signed. The Salvadoran nation-state regarded the Nahuat-Pipil people as a terminated[i] people during and after the 1932 massacre that occurred in Western El Salvador, where about 30,000 people were executed. Much of the scholarly work done on this indigenous community focuses on the effects that this massacre had on the Nahuat-Pipil identity, and they simply seem to speak of this community as victims of state-sponsored terrorism and not look at the contemporary experiences of these people. My project analyzes the trauma experienced by this indigenous community due to the 1932 massacre and the 1980s civil war, in order to make sense of the present-day indigenous fight against the Salvadoran government to gain recognition as an autonomous nation. Even though this paper focuses on the impact of these events on the Nahuat-Pipil community, I will also show how these events were influenced and impacted by this community's proactivity.

Methodology

My goal in writing this research paper is to provide scholars with a new perspective on who the Nahuat-Pipil are and create a new way of conducting research with this community without portraying them simply as a "vanishing" indigenous community or as "victims" of state-run oppression. I attempt to create this new framework by making use of written and archival materials, anthropological data, as well as Nahuat-Pipil oral narratives, and my own personal reflections, as an outsider of this indigenous community. By making use of various sources and applying the concept of "relational accountability"[ii] towards this indigenous community, I hope to create a new way of viewing this community and the research that needs to be done to help this community with their battle for their rights as an autonomous nation. It is important for scholars to understand that although the Nahuat-Pipil community has constantly fallen victim to the Salvadoran government, it is still a strong community that has resisted against all the injustices committed against them.

Understanding Nahuat-Pipil History

According to archaeologist Kathryn Sampeck, the Nahuat-Pipil people of Rio Ceniza Valley in Western El Salvador were the descendants of the Nahuatl communities in northwestern Mesoamerica (today's southern half of Mexico and much of Central America). It is claimed that

the Nahaut-Pipil were a part of the Nahua diaspora and that they were one of the later settlers, arriving in today's El Salvador around 1250 A.D. She is not the only Euro-American scholar who has made the claim that the Nahuat-Pipil are not native to El Salvador. Swedish anthropologist, Carl V. Hartman, conducted anthropological research in Costa Rica, Guatemala, and El Salvador from 1896-1899. During his fieldwork with the Pipil community, he named them the "Aztecs of El Salvador" based on the language spoken in this region. [iii] Therefore, the Nahuat-Pipil community has always been labeled, by Westerns scholars, as descendants of the Aztecs from central Mexico, which diminishes the authenticity of their aboriginal identity and creation story of being born out of an earthen pot in Cushcatan (western and central zones of present-day El Salvador), their traditional homeland.[iv] Despite these claims, the Nahuat-Pipil has always had a strong sense of identity and unity, which helped them when the colonizers arrived.

In 1524, Pedro de Alvarado, one of Hernan Cortes' lieutenants, arrived in western El Salvador and encountered a large and stable community of the Izalco Pipil people. They had a strong cacao production and trading system in place and were very successful with it, which later led to the Spanish colonizers' exploitation of this community due to its high agricultural productivity.[v] Despite the Spaniards' attempts to conquer this Native population, the Nahuat-Pipil's territory remained largely intact. During de Alvaro's first attempt to enter Pipil territory, the Native armies fractured his femur, which left him crippled for life. It took over 15 years for the Spanish colonizers to establish any permanent settlements in El Salvador because the Nahuat-Pipil refused to be defeated.[vi]

After the colonization of El Salvador, the Nahuat-Pipil's social structure drastically changed because they were no longer allowed to use their traditional landholdings called *altepetl* and *calpolli*.[vii] The colonizers viewed communal landholding as an unproductive way of living because it did not allow for anyone to own individualized private property, a European concept. However, the Nahuat-Pipil did not simply accept the changes that were occurring within their community. There are many instances of resistance throughout the Salvadoran history that portray the strength of the Pipil community and its survival as an independent political entity within the nation-state. Some instances of resistance include the rebellion of 1898, the 1932 uprising, the 1980s civil war, and the current existing political fight for recognition within the Salvadoran nation-state.

In the present-day, the Nahuat-Pipil community still inhabits the western land of El Salvador, particularly in the department of Sonosonate. Despite the inter-generational trauma that this community has had to deal with since their contact with the colonizers, they have endured and have kept their language and traditions alive. Although the Nahuat-Pipil language is considered to be in danger of extinction, Native speakers have taken action and have established language revitalization programs through their communities. Also, they have established many organizations and programs in order to preserve their cultural identity and to fight back against the repressive nation-state that for so long claimed to be "Indian-free." The Nahuat- Pipil community has always been proactive in order to save its ways of living and viewing the world despite of the state-sponsored terrorism that has haunted them for centuries.

Historical Background

The root causes of the economic and identity crises that exist in El Salvador are economic inequality and the lack of social justice that exist in that country. These crises can be traced back to the 19th century, when indigo, the major export of El Salvador, lost its importance on the world market. Soon coffee replaced indigo and became El Salvador's main source of income. In 1880, the Salvadoran government passed a series of land tenure laws that would abolish the *ejido* system[viii] and it encouraged coffee cultivation by large landowners. Also the law, which protected communal Indian lands "and thus favored land ownership by poor people," was changed by the government.[ix] This allowed for huge concentrations of land to be transferred over to a few elite families, and by the end of the century, the vast majority of the Salvadoran population remained landless.

By the twentieth century, fourteen elite families dominated the entire national economy; they controlled most of the land and coffee. Wage labor came into use, and it created a semi-feudal system, where the landowners "paid wages in script which could only be used at the plantation store."[x] Also, the mainstream population created banks and capitalist relations became more common, and this led to the furthering exploitation of the rural proletariat—which consisted of mostly indigenous populations. Since the coffee oligarchy practically owned everything, it is hard to imagine how the peasants survived through such tough economic times.

Resistance Prior to the 1932 Massacre

The resistance of rural workers—mainly indigenous men—against the oppression of the coffee oligarchy in El Salvador began prior to the 1932 massacre.

> Since the 1820s, Indians from Izalco had established important precedents by participating in the wars and statewide politics that characterized nation-state formation in El Salvador. These alliances ranged from support for Guatemala's frequent invasions of western El Salvador to participation in efforts to remove presidents from power. In the period just before the 1898 revolt, Indian militias from Izalco had participated in the successful overthrows of Presidents Zaldivar (1885) and Ezeta (1894).[xi]

Their activism also extended in order to protect their traditional homelands and culture. On the night of November 14, 1898, indigenous people conducted an uprising in the indigenous community of Dolores Izalco due to the resentment that the Pipil had towards the judges that had dissolved their communal lands. Because this indigenous community supported itself through subsistence agriculture, it "came into conflict with the agro-expert elites and their repressive state" and soon a violent confrontation erupted.[xii] Their targets were the judges, in particular Simon Moran, and they punished him and others by severing their hands, which they had used to measure and distribute their lands. Moran, a former administrator who had been responsible for partitioning the communal lands, was killed along with members of his family, but he has been attributed for having his hand chopped off during this uprising.[xiii]

Despite this rebellion, there were still intense ethnic rivalries in towns such as Dolores Izalco, where the wealthy ladino families exploited their indigenous rural workers. By the 1890s, many more people began to self-identify as "ladino", even those who were had formerly identified as

Indian. This created even more tension between ladino landowners and judges and the indigenous population. After the privatization of their communal lands, the organization and the sovereignty of the indigenous communities of Dolores and Asuncion were drastically challenged and undermined. The Nahuat-Pipil's sense of identity shifted from land ownership to actual kinship and political ties. Also, after the 1920s, the two indigenous towns were no longer allowed to elect Indian mayors or council members, which led to the dissolution of the sense of community that had previously existed. Throughout the first decades of the twentieth century, the town of Asuncion still carried much weight in the political arena of El Salvador, and it generated electoral support for presidential candidates that could potentially support their community, but their autonomy for political and military mobilization had been eliminated.

Continuity of Resistance

Finally on January 22nd, 1932, tired of the constant repression, some of Izalco's indigenous leaders would create an alliance with some communist leaders to rebel against the economic and social injustices being committed against their people. This uprising is another example of the Nahuat-Pipil's independent mobilization. Led by Farabundo Marti, who was at the time the head of the Salvadoran Communist Party, "the peasants finally staged a rebellion to escape from these terrible conditions."[xiv] This uprising did not last very long because the Martinez's presidential military regime suppressed it with a brutal massacre in which more than 30,000 people—mostly Nahuat people—were killed within a two month period.[xv] What began as a protest and uprising against the few elite families and the military dictatorship of General Martinez soon became the ethnocide of indigenous people.

During this time, the ethnic rivalries between Ladinos and Indians intensified, and this led to the loyal support of Ladinos to kill all the Indians. The Salvadoran government used the media to dehumanize the indigenous population; they portrayed Indians as "infuriated savages" and "virus infested" and called their activism a "mortal sickness."[xvi] These portrayals of Indians helped Ladinos feel confident in going out to round up indigenous people and massacring them. Juan Velasquez, a Ladino child of Los Arenales in 1932, remembers the fear and hatred that his family felt towards the indigenous population. He witnessed his grandfather killing hundreds of Indians and telling him that he killed them because "otherwise they would have killed us."[xvii] There was also a Ladino landowner from the town of Juayua who during the 1932 uprising wrote in his diary, "The United States did the right thing: exterminating Indians before they could impede the progress of the nation."[xviii]

Despite this colonialist agenda that Ladinos had, the Nahuat-Pipil still held on to their traditions and language. Even if it were in the privacy of their home and communities, many Pipil people would still hold on to their traditional clothing and traditions. Some informants—who were children in the 1930s—remember how their parents would use their indigenous work clothes and as soon as they would approach the outskirts of town they would change into ladino clothes.[xix] Although the wearing of traditional *refajos*, *coton*, and *caites*, which are all clothing items, became worn less frequently by most Nahuat-Pipil for many years, this community resisted against losing these cultural markers.[xx] This resistance shows the perseverance of the Nahuat-Pipil community; despite the massacring of 30,000 people and the poverty that they were forced to live through, their fight against oppression did not end during in 1932.

The Nahuat-Pipil's Civil War

After the 1932 massacre, the conditions worsened for the Nahuat-Pipil. The Martinez regime helped the elite families sustain the exploitation of peasants and indigenous people. Also, after the massacre, any type of trade union activity was considered to be communist and was repressed. When peasants or the indigenous people wanted to organize themselves, they had to keep it in secret or come up with different names—anything but trade union—in order to avoid persecution. After five decades of the military dominating the nation, the United States encouraged El Salvador to create opposing political parties and urged land reforms through the "Alliance for Progress."[xxi] The elite families and the military rulers opposed this reform, and soon they created death squads, which began to assassinate anyone who held any anti-government protests or activities. In response, civilians created small guerrillas groups because they believed that they no longer had an option but to take arms. A coalition of five guerrilla groups came into existence and they called themselves the Frente Farabundo para la Liberacion Nacional (FMLN)[xxii]. The FMLN was mostly comprised of Nahaut-Pipil youth who wanted to fight against the oppressive military government that had created such disparities between their community and the Ladino population of El Salvador.

Even though much of the scholarly work written about the Salvadoran civil war avoids the issue of ethnicity, I believe that it is central for scholars to look at the role that the Nahuat-Pipil had on this war and how that differed from the Ladino experience. The 1932 massacre and the state-sponsored terrorism of the 1980s created a culture of fear, which discouraged indigenous people to participate in anything political. Many of the Nahuat youth who joined the guerrilla movement would be disowned by their families because many of the Nahuat families feared getting involved with governmental and political issues; they sought to avoid another massacre scenario. In the documentary, *Cicatriz de la Memoria*, many Nahuat individuals who were a part of the 1980s civil war speak of their experiences of being involved with the guerrilla movement despite of their parents' disapproval. For example, Rosa Hernandez speaks of how her mother and sisters all discriminated against her because she decided to go fight alongside the guerrillas, yet she became involved because she wanted to provide her family with a better life.

Unfortunately, many of the Nahaut-Pipil parents had a correct intuition when they advised their children to not join the movement. Many of these parents had survived the massacre of 1932 and had never truly had time or a safe space to heal. Therefore, the inter-generational trauma that this community had to endure through for decades only worsened when many of these Nahuat elders lost their children during the 1980s civil war. Manuel Asensio Perez, an elder, shares how similar the 1980s civil war was to the 1932 massacre. His town, El Carrizal, was attacked during the 1980s and 45 youth were massacred, including one of his sons.[xxiii] Many instances like this occurred throughout El Salvador, particularly in areas where there was a large concentration of indigenous people, since they comprised most of the members of the guerrilla groups.

In her painting "Timeless Warriors," the Nahuat-Pipil artist, Alicia Maria Siu, portrays the importance and influence that Nahuat-Pipil youth had during the Salvadoran 1980s civil war.

> There was a 12-year war in El Salvador and it's stereotyped to be a war of the leftist movement against the rightist oligarchy of El Salvador and the military. However, there was a lot of influence of Native resistance and so this piece is about that. To show that the leftist guerrilla had a lot of indigenous elements…they used their dreams and intuition to foresee if the enemy is close and to know what to do. He also told me about nahualismo, which is a Native belief in animal spirit protectors.[xxiv]

The youth knew that they had to join the movement because many of the issues that had been the cause of the 1932 massacre had not yet been resolved. They took it upon themselves, as descendants of Nahuat-Pipil, to make the changes that needed to be done for the better of their community. They lost the fear that many of their families still had, and they joined the guerrilla movement that followed the same principles that Farabundo Marti had set during the 1932 insurrection. But they never forgot their culture, traditions, and worldviews; they fought courageously with their arms and traditional beliefs.

The Reorganization of the Community

The 1992 Peace Accords ended the Salvadoran civil war, and it marked the beginning of a dialogue and safe space for the indigenous people of El Salvador to demand their rights. After the signing of the 1992 Peace Accords, El Salvador began to receive increased international attention due to the many human rights violations that it was found guilty for during the 1932 massacre and its 1980s civil war. Also during this time, throughout Latin America, there was a Pan-Indian movement, which stirred many indigenous communities to fight back against all the injustices that they had had to struggle with since the colonizers' arrival. The Nahuat-Pipil community became motivated by this movement and began to try to regain their traditional homelands throughout the Northwestern regions and began many programs to revitalize their language and culture. This movement has only become stronger and now many organizations exist throughout El Salvador to support its indigenous people and their rights as aboriginal inhabitants of that land.

One of the most popular and controversial organizations is La Asosiacion Nacional de Indigenas Salvadoreños (ANIS), which was founded in 1954. Indigenous people created it with the intentions of maintaining the customs, ceremonies, and languages of Maya, Lenca, and Nahuat people of El Salvador.[xxv] It soon became a politically involved organization that dealt with more than just preserving the cultures of these indigenous groups. In the 1970s, it created an indigenous farm cooperative, *Las Hojas*, in Sonsonate and it was meant to bring together the indigenous community, in order to create a stronger entity that would fight back against the oppression of the government. Led by the Nahuat-Pipil spiritual chief, Adrian Esquino Lisco, this cooperative blossomed, and it was very successful with its agricultural production and in bringing back Native traditions and art.

On the night of February 23, 1983, an army-led attack killed 74 members of *Las Hojas* cooperative. The conflict is said to have arisen due to a land dispute between a large landowner who disliked the fact that the ANIS organization had bought a large territory next to his land. This Ladino landowner continuously harassed the people from the cooperative and would

trespass the territory that belonged to ANIS. According to Mr. Esquino Lisco, the landowner and the government were the ones responsible for the death of the 74 individuals because they had sought out for the army battalion to intimidate this indigenous community. This issue was not only over a land dispute, but also about ethnicity and discrimination; the landowner wanted to get rid of the indigenous farm cooperative. But Mr. Esquino Lisco did not remain silent; he made sure that this atrocity was known on an international level. On January 27, 1989, the Inter-American Commission on Human Rights received a petition that requested that the individuals guilty of *Las Hojas* massacre be prosecuted.[xxvi]

This petition, along with many others, was due to the activism of Adrian Esquino Lisco. During the 1970s, he participated in various worldwide conferences of indigenous peoples and created connections with many Native American communities throughout North America. He believed in the adaptation of other indigenous cultures and ceremonies, in order to begin the healing process for the Nahuat-Pipil community. Although there was much controversy over his leadership as a Nahuat spiritual leader— because he did adopt many practices from other Native cultures—he continued his work to support the indigenous groups of El Salvador. One of the main practices that he adopted from the North American Lakota Tribe was the sweat lodge. The Nahuat-Pipil community incorporated this practice into their other religious practices and ceremonies.

The Leftist Party and Indigenous Salvadorans

In 2009 the voters elected, Carlos Mauricio Funes Cartagena, the first leftist president in Salvadoran history, under the Farabundo Marti National Liberation Front political party. This is extremely significant for the indigenous population of El Salvador because he has done more for them during his presidency than all the previous presidents combined. He was the first Salvadoran president to ever apologize to the indigenous population for the oppression that they have suffered through for the past five centuries.

> The government that I lead wishes to be the first government that in the name of the Salvadoran state ... makes an act of contrition and begs the pardon of the indigenous communities for the persecution, for the extermination of which they were victims for so many years. From this day forward we officially terminate our historical denial of the diversity of our peoples and acknowledge El Salvador to be a multiethnic and multicultural society.[xxvii]

On October 12, 2010, in remembrance of the 518th anniversary of Columbus' arrival to the Americas, Mauricio Funes inaugurated the First National Indigenous Congress of El Salvador. He established this congress with the idea that representatives of each of the Salvadoran indigenous groups would come together and formulate public policies specific to the indigenous population of El Salvador. Funes claims that with the creation and work of this congress, his government is taking another step towards acknowledging the rights of indigenous Salvadorans.

Although Funes has made progress in the Salvadoran society by acknowledging the existence of indigenous people in that nation, the majority of the Salvadoran population still has a long way to go. In the documentary, *Herederos de Cushcatan,*[xxviii] when citizens were asked of who their

indigenous people consisted of, many of them reply that no true Indians exist anymore in El Salvador. More commonly, some claimed that the Indians had gone extinct after the 1932 massacre. Yet, there were others who would romanticize the indigenous population and would claim that all Salvadoran citizens were descendants of the Nahuat-Pipil—which denies the existence of the two other indigenous groups of El Salvador. Also, when asked about what people thought of the ceremonies and traditions of the indigenous people, all the interviewees called them superstitions or pagan acts; some women even took the responsibility to go teach the indigenous people about Christianity. They referred to the indigenous people as innocent children who needed to be taught the "correct way of living."

The indigenous populations of El Salvador have a strong sense of identity and they have been fighting for centuries for their rights to remain a distinct people. Despite all the perceptions that the general population of El Salvador has about them, the indigenous Salvadorans have done everything in their power to preserve their languages, cultures, and traditions. For example, in 2012, the Universidad de Bosco and the Ministry of Education of El Salvador launched the Cuna Nahuatl program to preserve the Nahautl language. This program is a daycare for children of ages three to five and they are immersed in an environment where only Nahuatl is spoken. Elders, who are native speakers of the language, are the instructors of this program; they use their method of oral tradition in order to transmit the language to the newer generations of Nahuat-Pipil.[xxix] Through this and many other revitalization programs and activism, the Nahuat-Pipil community is exercising its rights as an autonomous nation.

Conclusion

It is important for scholars to create a bridge between academic scholarship and community involvement when working with the Nahuat-Pipil. The work done regarding this community should contribute to the revitalization movements of this community and to the healing process that is much needed. The focus of research done about the Nahuat-Pipil needs to shift from simply analyzing the past. Although it is important to have a good understanding of history in order to understand the experiences of the present-day Nahaut-Pipil, the past should not be the focus. The present-day Nahuat-Pipil community is directly connected to the Nahuat-Pipil community of the past—they are not separate—but this culture has been altered since contact with the colonizers. Since culture is not static, it is unfair to place the burden of proving their authenticity as indigenous people on this community. Therefore, scholars need to focus on what the Nahuat-Pipil are currently doing in order to preserve their culture, language and traditions.

Although the hostile environments that have existed in El Salvador, particularly during the massacres and the civil war, are no longer prevalent, many Nahuat elders still fear speaking about their experiences or simply passing down any traditional information to the younger generations; the state-sponsored oppression that has been so prevalent in Salvadoran history is preventing the Nahuat community from healing, but the revitalization movements continue. Despite this fear, the younger generations of Nahuat-Pipil have taken the revitalization movement into their hands, and they have become politically active in order to fight for what is rightfully theirs. The proactivity of these young indigenous leaders has brought about much change for their communities in these past two decades. Coming from a culture that has a strong

history of resistance and survival, these indigenous youth will continue to persist until they have created justice for their people.

As Adrian Esquino Lisco once said, "Today, the white world wants to pretend that the Nahuatl, the Lenca, the Maya and all the aboriginal nations have been defeated and that a few white nations are now the masters of Mother Earth. But we still have our voices. And a few still know how to speak in our mother tongues. And no-one is the master of Mother Earth."[xxx] As long as this community continues with their legacy of resistance and survival, the Nahuat-Pipil cannot be portrayed as mere victims or as "vanishing Indians" because as their guiding philosophy says, "Te Miki Tay Tupal"—what is ours will never die.

Endnotes

i. Termination for the Nahuat-Pipil does not mean that they were politically dissolved as an autonomous nation within the Salvadoran nation-state; rather, it refers to being stripped away from their culture and identity as an indigenous community due to the violence and oppression of the military dictatorship of General Maximiliano Hernandez Martinez.

ii. "What is more important and meaningful is fulfilling a role and obligations in the research relationship—that is, being accountable to your relations." Shawn Wilson, Research is Ceremony: Indigenous Research Methods (Manitoba: Fernwood Publishing, 2008), 77.

iii. Alicia Maria Siu, "The Coloniality of Violence in the 1932 Massacre of the Pipil and Art for Healing" (M.A. thesis, University of California-Davis, 2010), 26.

iv. In the present-day, it is known as Cuscatlan. In the Nahuat language, the name Cushcatan means, "Land of the Jewel." In Maria Eugenia Aguilar Castro, "The Teachings of the Nahuat Pipil (El Salvador)," Biodiversity 3:3 (2002): 10.

v. Kathryn E. Sampeck, "Late Postclassic to Colonial Transformations of the Landscaped in the Izalco Region of Western El Salvador," Ancient Mesoamerica 21 (2010): 262.

vi. Siu, "The Coloniality of Violence." 4.

vii. For many Nahua communities throughout Mesoamerica, their communities were divided in to various ethnic states, the altepetl, and then divided into smaller communities, the calpolli, that inhabited certain regions of their altepetl.

viii. Communal ownership of land.

ix. Interview with Salvador Cayetano Carpio, "Marcial" in Listen, Compañero (San Francisco: Solidarity Publications, 1983), 12.

x. Ibid., 13.

xi. Aldo Lauria-Santiago, "Land, Community, and Revolt in Late Nineteenth-Century Indian Izalco," in Landscapes of Struggle: Politics, Society, and Community in El Salvador ed. Leigh Binford (Pittsburgh: University of Pittsburgh Press, 2004), 32.

xii. Ibid., 17.

xiii. Ibid., 18.

xiv. Listen Compañero, 13.

xv. Any male over the age of 12 or any individual who looked Indian would be massacred.

xvi. Siu, "The Coloniality of Violence," 41.

xvii. Jeffrey L. Gould and Aldo A. Lauria-Santiago, To Rise in Darkness (Durham: Duke University Press, 2008), 122.

xviii. 1932, Cicatriz de la Memoria. Prod.and dir. Jeffrey L. Gould, 53 min., Icarus Films, 2003, DVD.

xix. Gould, To Rise in Darkness, 122.

xx. Refajos is the women's traditional, colorful skirt. The coton is the traditional outfit of the men and the caites are their sandals.

xxi. "Enemies of War," PBS, <http://www.pbs.org/itvs/enemiesofwar/elsalvador1.html> (3 June 2012).

xxii. Marti had been the leader of the Nahuat-Pipil and he was well respected amongst this community; therefore, it is clear why the—mostly Nahuat-Pipil—guerrillas created a front that was named after this leader.

xxiii. Interview with Manuel Asensio Perez in Cicatriz de la Memoria (2003).

xxiv. Alicia Maria Siu (artist), interview by Rebeca Figueroa, May 6, 2012, interview 1, transcript.

xxv. Adam Bernstein, "Adrian Esquino Lisco, 68, spiritual chief of indigenous Salvadorans," Washington Post (Boston, MA), 20 Sept. 2007.

xxvi. "Masacre Las Hojas v. El Salvador," (Case 10.287, Report No. 26/92, Inter-Am.C.H.R., OEA/Ser.L/V/II.83 Doc. 14 at 83, 1993).

xxvii. Funes' inauguration speech in "El Salvador's President Apologized to Indigenous Peoples," Tico Times (San Jose, CR), 13 Oct. 2010.

xxviii. Herederos de Cushcatan. prod. and dir. By CCNIS, 47 min. 21 sec. Centro Cultural de España, 2011. Online documentary.

xxix. "Salvando el Nahuatl," Vanguardia, 30 Jan 2011.

xxx. Don Lee, "The Pain of Mother Earth," New Internationalist, December 1991.

Comparison of Exited State Dynamics of P3HT H- and J-aggregate

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Chemistry

Abstract

In this study, femtosecond transient absorption spectroscopy was used to explore ultrafast dynamics in P3HT J-aggregate nanofibers in solution. The excited state dynamics of the P3HT J-aggregate were investigated. The J-aggregate nanofibers exhibited delayed recombination of the inter-chain charge transfer state in comparison to other aggregates. This suggested that J-aggregate nanofibers allow for more efficient polaron delocalization in comparison to the H-aggregate. The ratios of polaron pair formation to delocalized polaron formation were also shown to differ substantially between the H- and J-aggregate. This indicates the delocalized polaron formation is very sensitive to the ordering of chains. Understanding how and when these states form is important for understanding how efficiencies of solar devices can be improved.

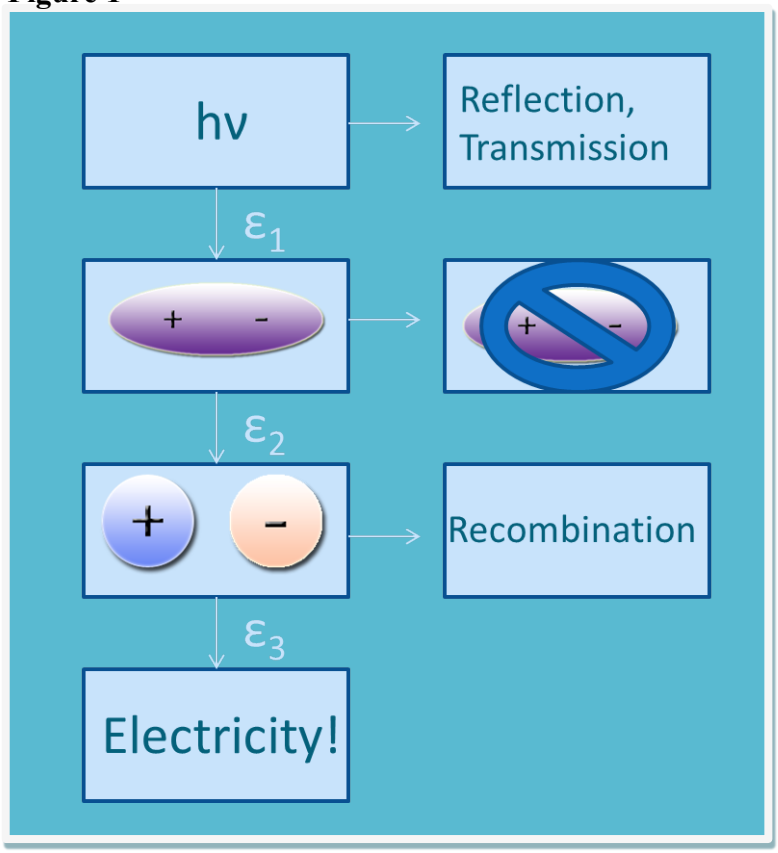
Introduction

With the continuing rise of awareness about energy consumption, alternative energy sources are being thoroughly investigated, and those that are renewable and environmentally friendly are extremely attractive. Solar energy is not an exception and has the potential to provide more than enough energy to satisfy daily demands.[1] Polymer-based solar cells have been studied in the past decade due to their relatively inexpensive synthesis and easy roll-to-roll installation.[2]

Solar devices normally use doped n-type and p-type semiconducting materials with a junction separating the materials. Organic thin film cells mimic the properties of a band-structured material. Photoexcitations can create bound electron-hole pairs, which are referred to as excitons. One difference between normal semiconductor solar cells and organic solar cells is that the light-absorbing material is not especially conductive unless an electron-accepting material is present to drive dissociation of the charges.[3] The organic electron-accepting and electron-donating materials create a junction similar to one seen in inorganic solar cells in that the exciton is created and charge separation occurs between the junction. One often-used system is with the electron-donating semiconducting polymer Poly-(3-hexylthiophene) (P3HT) and the electron-accepting fullerene [6,6]-phenyl C61-butyric acid methylester (PCBM).[4-6] The P3HT:PCBM system allows for rapid dissociation of excitons, efficient transport of separated charges, and a large interfacial area that is known as the bulk heterojunction.[7] Efficiencies in the P3HT:PCBM systems have exceeded 8.3%, which is improving but still lagging behind other technologies.[8]

There is still room for improvement in the efficiency of these devices. The processes that occur in solar cells have been reduced to elementary steps and described below. Fig. 1 models these steps. First, the substance can absorb, transmit or reflect light. If the substance absorbs light, as is desired in a photovoltaic device, an exciton may or may not form. With exciton formation, charges can either separate or recombine. Separation of charges is ideal as this would lead to the ultimate goal in a solar cell: generation of electrical power.

Figure 1



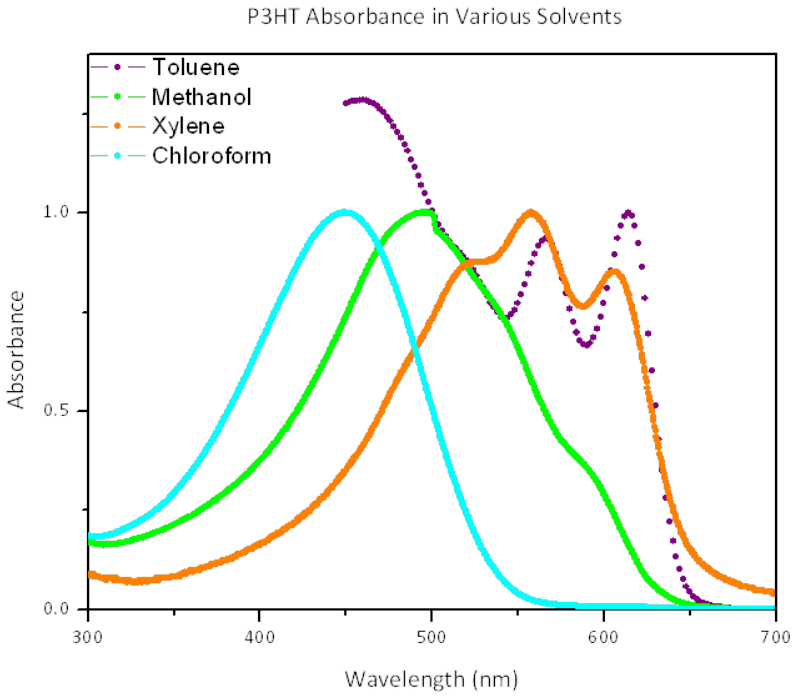
Notes: Flowchart demonstrating how the efficiency of each process can dictate the overall efficiency. The formations of the second and third boxes on the left side, which represent polaron pairs and delocalized polarons respectively, occur on ultrafast timescales that can be resolved with ultrafast laser spectroscopy.

Since the overall efficiency of the device is dictated by the product of the efficiency of each process, it's important to consider every process when designing a solar cell. Exciton formation and charge separation occurs on sub-picosecond timescales and, thus, the processes can be resolved by using ultrafast laser spectroscopy.[9] Ultrafast laser spectroscopy involves probing the excited state of a sample with a laser with the power to resolve femtosecond events. The sample absorbs all wavelengths of visible light and an optical property, such as absorption, is measured. Then, the sample absorbs light of enough energy to promote particles into the excited state. After a time delay, the absorption of the entire spectrum is measured again. Since there is a population of particles in the excited state, the measurement after the time delay will show properties of the excited state. Since Beer's Law states that concentration is related to absorption, the

concentration as well as the decay dynamics of the excited state can be resolved. This makes ultrafast spectroscopy the perfect tool for measuring exciton and polaron dynamics in materials involved in photovoltaics.[10]

Previous work has examined the ultrafast dynamics of P3HT and its properties as a photovoltaic material.[11-17] Recently, Moule et. al demonstrated J-aggregate behavior of P3HT upon dissolution in toluene. The J-aggregate characterization refers to the order of the side chains of the polymer. In the J-aggregate, the side chains are co-planar. The previously seen form of aggregation, H-aggregate, does not exhibit this co-planar property.[18] Spano and co-workers demonstrated that the planarity of monomers within chain segments could be determined by the optical spectra.[19] Low planarity leads to optical spectra in which the higher energy transition is less intense compared to the sideband transition. An example of the way optical properties are affected by the aggregation can be seen in Fig. 2.

Figure 2



Notes: The ground state absorption of P3HT in various solvents. P3HT exhibits J-type aggregation in toluene and H-type aggregation in methanol and xylene. It is amorphous in chloroform. It is important to note that a change in morphology can impact the absorption.

Investigation of P3HT J-aggregate using ultrafast spectroscopy, henceforth referred to as transient absorption spectroscopy (TAS), may provide insight into the processes that occur at ultrafast timescales. The J-aggregate is a novel aggregate of the material P3HT, which is commonly used in photovoltaic devices. Therefore, investigation of the ultrafast processes of P3HT J-aggregate in solution may clarify the correlations between chain packing and planarity on exciton/polaron relaxation and recombination dynamics. TAS comparisons on H- and J-

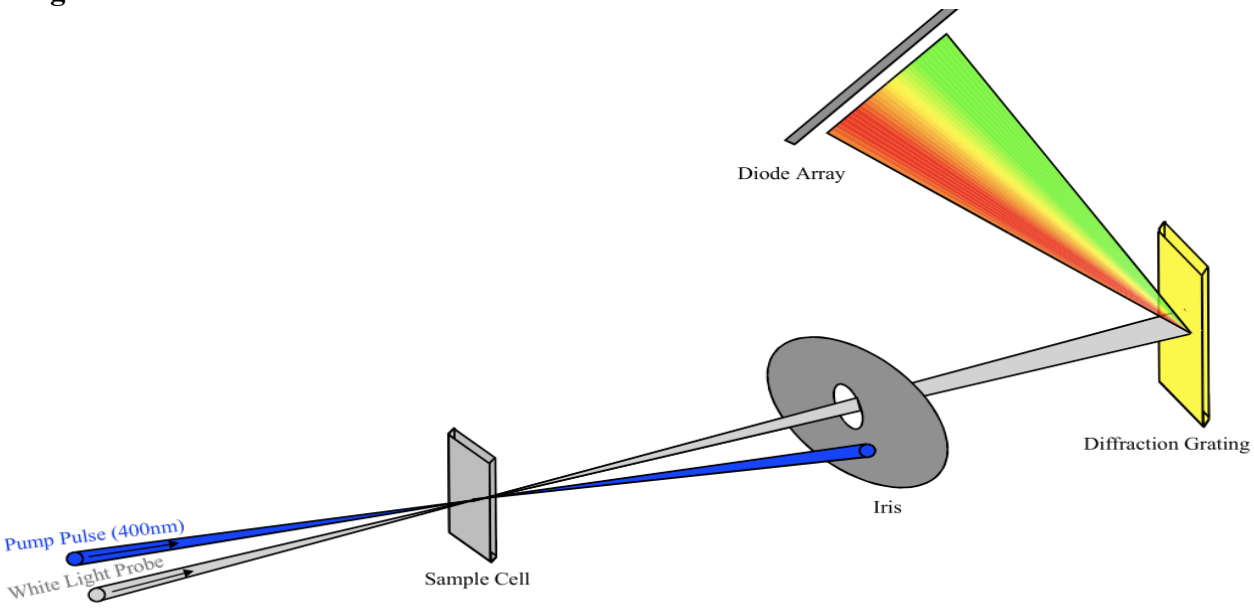
aggregate P3HT reveal very little difference in the exciton recombination dynamics but show significant differences in polaron yield and polaron recombination dynamics.

Methods

The P3HT nanofibers were prepared in various solutions according to procedures previously reported by Moule et al.[18]

For the analysis of the materials, transient absorption spectroscopy (TAS) was utilized with a two-pulse pump-probe technique. This involved exciting the sample with a pump pulse of 800 nm using a Ti:Sapphire (Newport) fundamental and chopping the pulses at 500 Hz (Thorlabs MC100A). The absorption before the pump pulse arrived at the sample was measured with a probe pulse generated by a CaF_2 disc. The pump pulse excited the sample and the probe measured the absorption again after a time delay, which was mechanically generated by a computer-controlled translational stage (Newport IMS600LM). The probe light was measured by a 256 pixel silicon diode array detector (Hamamatsu S3901-256). The change in absorption, ΔOD, from before and after the pump pulse and time delay is recorded in order to resolve various population states. More details on the experimental set-up can be found in previous studies.[20] Fig. 3 illustrates the pump-probe action.

Figure 3



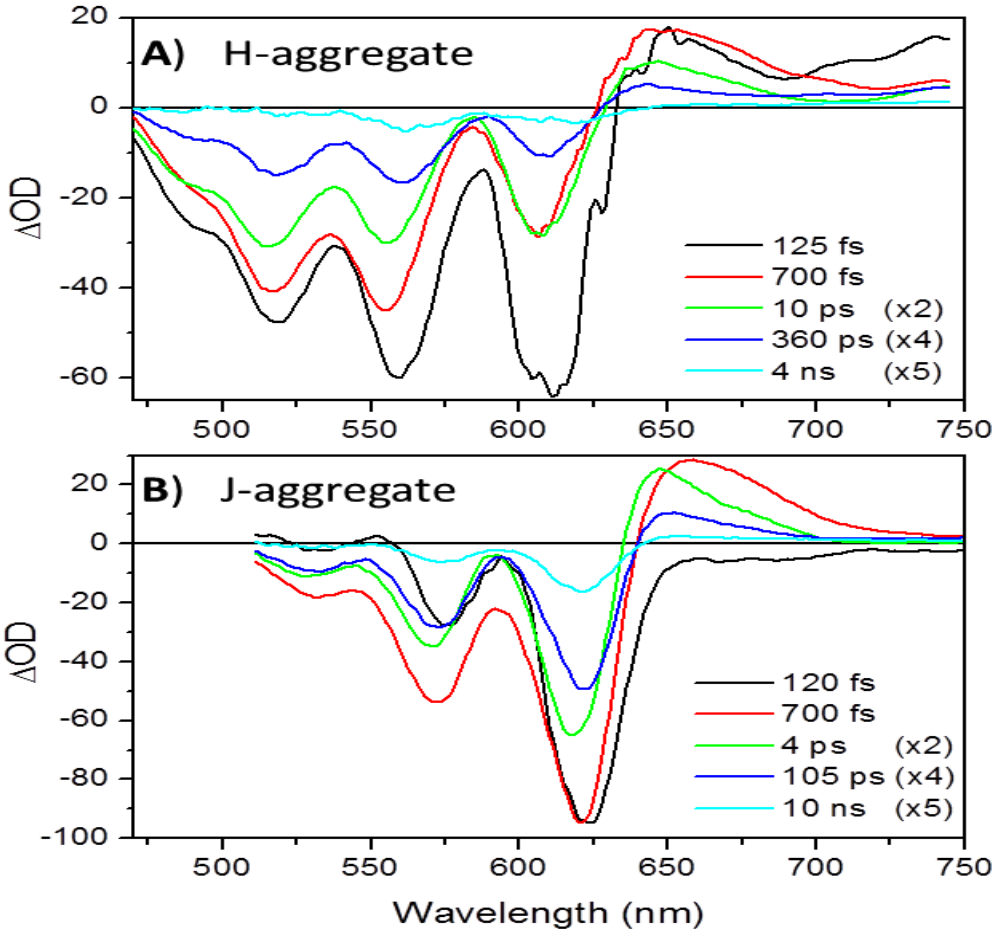
Notes: Schematic of pump-probe spectroscopy.

Results and Discussion

Ultrafast transient absorption studies demonstrate how the H- and J-aggregate nanofibers (NF) in solution differed. TAS was conducted with the P3HT NF in solution, which allowed for direct analysis of the ultrafast relaxation and recombination dynamics of excitons and polarons of the

H- and J-aggregates. TAS comparisons on H- and J-aggregate P3HT revealed very little difference in the exciton recombination dynamics but showed differences in polaron yield and polaron recombination dynamics. TAS data show H-aggregates produce higher polaron yields as well as faster recombination dynamics.

Figure 4



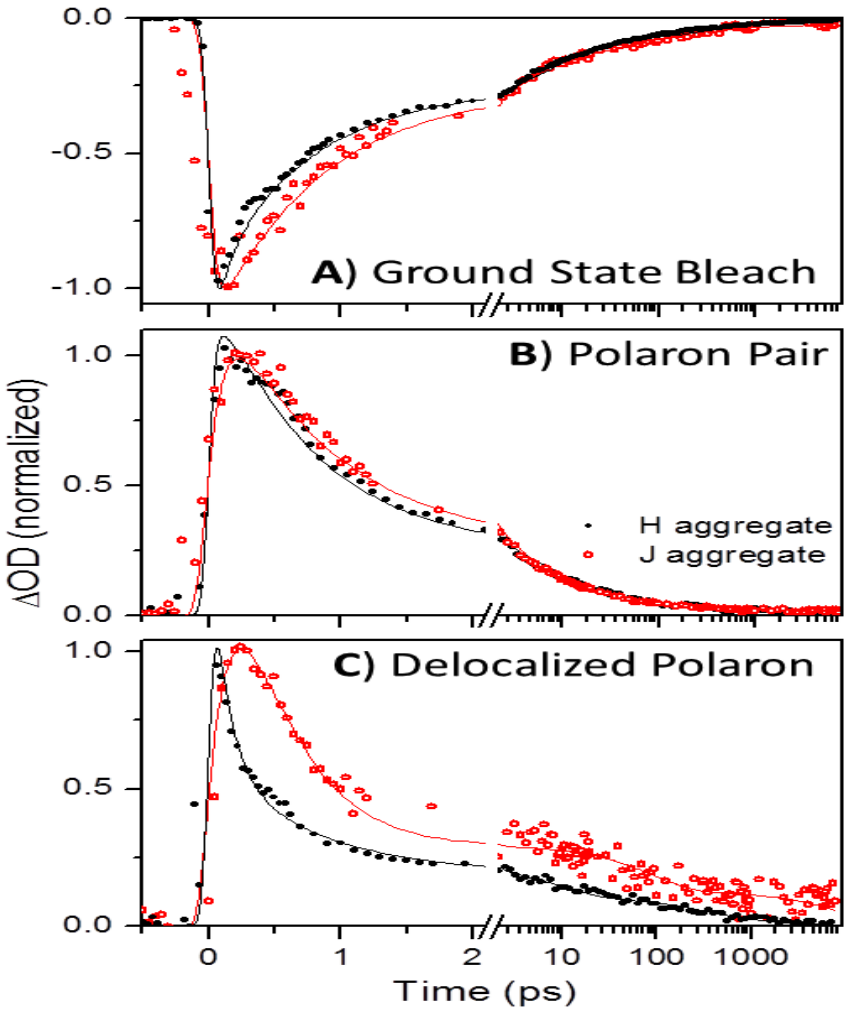
Notes: EADS of A) P3HT H-aggregate and B) P3HT J-aggregate. Each EADS spectrum represents the state of the polymer at the associated timescale.

The data was analyzed using a sequential global analysis framework, which has been shown to be a sufficient modeling system.[21,22] The framework yielded the Evolution Associated Difference Spectra (EADS, Fig. 4) and the kinetic fits (Fig. 5). The kinetic fits show how the change in absorption evolves over time. EADS can be used to represent the spectra of the material after a specific time delay.

The analysis of the spectra follows. Previous experiments have demonstrated that solution phase P3HT aggregates yield transient absorption spectra showing structural relaxation processes[23,24] and auto-ionization[24,25] Due to the degree of crystallinity of P3HT nanofibers, auto-ionization and the recombination of charges are the primary processes that contribute to the transient absorption data. Three primary signals are observed in Fig. 4. There is a negative ground state

bleach (GSB) at λ < 625nm, polaron-pair (PP) at λ=660 nm, and delocalized polaron (DP) at λ > 725 nm. The GSB spectrum can be compared to the absorption spectrum shown in Fig. 2 to demonstrate how it is representative of the ground state absorption of the excited population. The PP peak is representative of an intra-chain state in which two oppositely charged carriers are loosely bound on the same polymer chain. The DP peak is representative of an inter-chain state due to the formation of separate and delocalized charges transferred to an adjacent polymer chain.

Figure 5



Notes: Normalized transient absorption spectra.

Since the polaron pair (PP) state is intra-chain, it is not expected to be dependent on inter-chain coupling. However, it is observed that the PP state is sensitive to intra-chain order. This can be seen when comparing the inter- and intra-chain coupling yields. The normalized PP formation and recombination kinetics, shown in Fig. 5, are nearly identical when comparing H- and J-aggregates, which indicates that the change in intra-chain coupling may affect PP formation yield, but does not determine the formation and recombination of the intra-chain state. The normalized delocalized polaron (DP) kinetics, also shown in Fig. 5, shows that recombination is significantly slower in J-type nanofibers. The J-aggregate exhibits improved intra-chain

coupling, which allows the inter-chain polarons to migrate along their chains and improves stability of this state. This delays recombination.

DP formation is an inter-chain charge transfer process and thus would not be expected to differ between the two nanofiber aggregates. Both the H- and J- type would be expected to have similar inter-chain spacing. However, the formation of the DP state is also dependent on the formation of the PP species. If it is assumed that the extinction coefficients for the DP and PP states are identical for each aggregate, then the relative height of the PP peak and DP peak would demonstrate how inter- and intra-chain coupling is affected between each aggregate.

The relative height of each peak was compared to give a PP:DP peak height ratio of 1.5:1 and 10:1 for the H-type and J-type aggregate respectively. This demonstrates that, while the formation and recombination kinetics are not impacted by the structural deviation resulting from the J-type aggregation, the initial yield between each aggregate is impacted by nearly an order of magnitude. Previous studies have indicated that polar generation predominately occurs at the interface between ordered and disordered P3HT chains.[26] Since the J-type nanofibers are nearly completely crystalline and ordered, there would be very little interface area between ordered and disordered P3HT chains. This would explain the relatively low charge transfer yield (i.e., the formation of the delocalized polaron) of the J-aggregate.

Conclusion

In summary, the TAS data indicate how structural differences in H- and J-type P3HT nanofibers affect polaron formation. Polaron pair formation and recombination kinetics are not significantly altered by the change in aggregation. Delocalized polaron formation and recombination kinetics are slowed due to the improved ability of polarons to stabilize along the chain within J-aggregate nanofibers. The ratio of PP:DP formation yield appears to be vastly impacted by the crystallinity of the J-aggregate. This has been attributed to a low interaction between ordered and disordered P3HT chains. Among other applications, understanding these processes allows for researchers to develop a better understanding of the materials in order to improve the efficiency of photovoltaic devices.

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Greater Love Hath No Man: Death and Dying in the American Military

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History

"When I go home people ask me, 'Hey Hoot, why do you do it man? Why? You some kinda war junkie? I won't say a goddamn word. Why? They won't understand. They won't understand why we do it. They won't understand that it's about the men next to you, and that's it. That's all it is."[1]

"Greater love hath no man than this, that a man lay down his life for his friends." John 15:13 (KJV)

The idea of having what one can call a good death is not anything revolutionary. Ancient Sparta had the maxim "return with your shield or upon it," while Imperial Britain used *Dulce et decorum est, pro patria mori* to motivate its soldiers.[2] The United States and its population are no different. There is an idea of how one can have a *good death,* but how civilians view dying well and those in the military see it differ radically. For the civilian population, a *good death* is one that is invisible. For those in the military, however, a good death means someone died saving, or attempting to save, another's life.

Those in the military did not always hold this idea of a *good death*, nor did they view dying any differently than the civilian population from whence they came. In this article I argue that there has been a marked shift in how Americans view death and dying in the last 150 years. The first section of this article will discuss what those in the American military view as a *good death*. In order to determine this, primary sources such as Medal of Honor citations, newspaper articles, and quotations from those on active duty in the military were used. The second section will briefly sketch how the values that those in the military hold are reflected on to the civilian population by popular media and why this study of death holds is important.

The third section delves into how those during the American Civil War viewed death and dying. This is done in order to demonstrate the similarities between the military and the families on the home front during that conflict. For this I have relied on secondary sources like historian Drew Gilpin Faust's *This Republic of Suffering*, historian Susan-Mary Grant's article *Patriot Graves*, and historian James McPherson's *For Cause and Comrades*. The final section explores how *contemporary* American civilians understand what, exactly, a *good death* entails. This is

[1] Eric Bana, *Blackhawk Down,* directed by Ridley Scott (2001; Revolution Studies/Columbia Pictures, 2002.) DVD.
[2] Trans: it is both honorable and sweet to die for your country.

important because it shows how the majority of the American population views dying and how it contrasts with the focus of this article, American military personnel. For this I used two works by historian Philippe Ariès, *The Hour of Our Death* and *Western Attitudes Towards Death*.

How the Military Views Death

Based on analysis of primary sources, a *good death*, for contemporary military society, is one in which the person dying either sacrifices, or is willing to sacrifice, his or her own life in the attempt to save another's. It may be something as drastic as jumping on a hand grenade or mine in order to have his or her body absorb the blast and shrapnel or it could mean an air crew on a rescue helicopter is shot down in the attempt to air lift a wounded soldier out of an area under enemy attack. Examples of the latter are the US Army's Dustoff Helicopters: Medavac helicopters used initially during Vietnam and still seeing service in Iraq and Afghanistan.

One is able to ascertain the way a death can be glamorized by looking at sources such as medals awarded, speeches and press releases by those in charge of the military, pictures taken by combat photographers, and even films which portray either the military directly or have military-like subtexts.[3] The best way one could determine how the military views a good death is to study the citations for those being awarded the Medal of Honor. The Medal of Honor is studied because the medal itself is seen as the pinnacle of the pyramid of honor. At the top sits the Medal of Honor, the second layer sits the various distinguished crosses, the third has the Purple Heart, and so on down the line. In order to be awarded the Medal of Honor one must commit actions that "should not be the simple discharge of duty, but such acts beyond this that if omitted or refused to be done should not justly subject the person to censure for shortcoming or failure."[4] In other words: the action must be above and beyond the call of duty. In addition, the simple fact that one was awarded the Medal of Honor post-Korea meant that one had a high chance of being killed in action: of all the Medals of Honor awarded since 1960, 63% have been awarded posthumously.[5]

The high prestige, rigorous vetting process, and likelihood of being killed in action, shows the importance that the military places on the Medal of Honor. Military personnel are awarded for not just heroic actions, but also for actions that demonstrate the values that those in the military hold, and according to Medal of Honor citations, the best way one could die would be in service of another. When looking at the 247 Medals of Honor awarded during the Vietnam Conflict (1965-1975) 55% were awarded for actions that were self-sacrificial. The citations themselves speak of jumping on grenades, jumping in front of incoming bullets, et cetera. In the post-Vietnam era, however, which encompasses actions in Grenada, Panama, Kuwait, Somalia,

[3] Though it does not happen often, there are surviving letters from the fallen extolling self-sacrifice. One such is from Sergeant First Class Paul Ray Smith, in a letter to his parents. In the letter he said, "There are two ways to come home, stepping off the plane and being carried off the plane. It doesn't matter how I come home because I am prepared to give all that I am to ensure that all my boys make it home." He was awarded the Medal of Honor after he was killed in Iraq on 4 April 2003 while holding back an enemy attack in order to let the wounded evacuate the hostile area. Quoted in Dwight Jon Zimmerman and John D. Gresham, *Uncommon Valor: The Medal of Honor and the Six Warriors Who Earned it in Afghanistan and Iraq* (New York, NY: St. Martin's Press, 2010), 8.

[4] Quoted in Zimmerman and Gresham, *Uncommon Valor*, 59.

[5] There have been 254 Medals of Honor awarded since the start of the Vietnam war. 162 of those were awarded posthumously. "Medal of Honor Statistics." *Center of Military History, US Army*, last modified June 27, 2011, http://www.history.army.mil/html/moh/mohstats.html.

Afghanistan, and Iraq, the proportion of Medals of Honor awarded for self-sacrifice has risen dramatically: 75% of the twelve awarded are for saving another's life, not just American.[6] For example, the United States Government awarded Corporal Dakota Meyer, of the United States Marines, his Medal of Honor for rescuing American military personnel and Afghani allies engaged in a firefight with enemy forces.[7] The reason as to why there has been a shift is a topic that will be addressed in a later project.

We also see this praise for self-sacrifice in press statements by high ranking military officials. When enemy forces shot down an Air Force Combat Search and Rescue helicopter in the Helmand Province of Afghanistan on June 9, 2010, Chief of Staff General Norton Schwartz (USAF, RET) said, "Faithfull to the rescue motto 'That others may live,' these airmen were courageously and selflessly flying in support of joint and coalition teammates."[8] The words lauding the actions of these airmen who put themselves at risk so that "others may live" reinforce the importance that self-sacrifice holds in the military.

It is not just the upper levels of military rank that hold this view, but also enlisted personnel fighting. In personal communications with military personnel via a listserv for those deployed to Iraq in 2007, there was a forwarded email that contained a picture of a memorial service. Superimposed on the picture were pictures of Sergeant Jonathan B. Shields and Specialist Jose A. Valez, two killed on November 27, 2004 while rescuing others. In addition to the pictures is the text that states, "The enemy has no response for sergeants that risk everything to rescue their injured comrades only to immediately return to the fight. The enemy has no answer to soldiers standing over their buddies, even when it means their own lives, so that others may live."[9] Here is another example of the upper echelons in the military praising self-sacrifice, but one can also witness the enlisted men themselves seeing self-sacrifice as something worthy of praise; the enlisted forwarded the email to their comrades-in-arms and agreed with the sentiment expressed in the statement.

It stands to reason that those in the military see dying for another as the epitome of honorable action when one takes into account the esprit de corps prevalent throughout the services. According to a journalist who has worked and written extensively on military culture, Michael Sledge, in order to properly understand the bond between soldiers one must combine "the camaraderie of a football team, the dedication to task accomplishment of a dot-com startup workgroup, the sense of separation of a cult, the unit preservation of a police department, and the love of a family" and one would still come up "short of the ties that bind military members together."[10] This strong bond between military personnel leads them to strive to return a dead brethren's body to friendly lines, even at great personal risk to themselves. About the risks, author and U.S. Marine Lt. Philip Caputo has said, "Two friends of mine died trying to save the

[6] *Center of Military History, US Army*, last modified June 27, 2011, http://www.history.army.mil/moh.html.
[7] "Afghanistan," *Center of Military History, US Army*, last modified June 27, 2011, http://www.history.army.mil/html/moh/afghanistan.html.
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[9] "These are my credentials." Date accessed Sept 19, 2012. http://www.slideshare.net/jacko91/these-are-my-credentials.
[10] Michael Sledge, *Soldier Dead: How We Recover, Identify, Bury, & Honor Our Military Fallen,* (New York, NY: Columbia University Press, 2005), 15.

corpses of their men from the battlefield."[11] American military personnel are willing to die to retrieve a body, so it is of no surprise they are willing to die to protect each other's lives. During the heat of battle, with death and destruction all around them, Sledge says, "soldiers fight for their lives and for those of their comrades – they do not fight for causes."[12]

While the strong morale is understandable and beneficial, there is a danger to those who, for whatever reason, were not able to save their comrades. Survivor guilt occurs when a veteran feels guilty after either surviving a situation that cost the lives of their comrades, or when they feel as if they had not done enough to save another's life.[13] Most sufferers end up placing themselves in a "hierarchy of suffering," at which point help is not sought due to thinking another, usually their fallen comrade, "had it worse."[14] When we have self-sacrifice held as the epitome of an honorable death there are numerous veterans who had not been able to reach that lofty, often unattainable goal, post-war suffering can become great. We see veterans suffering because they had not been able to die an "honorable" death with their friends.

The Media and the Military

One can also see this praise for willingness to self-sacrifice in modern film, in particular, films that are targeted towards 18-24 year old men, a key demographic for the United States military. In 2001, Colombia Pictures released *Blackhawk Down* in theaters. The film tells the true story of a failed mission to capture a Somali warlord. In the film, as what happened in real life, Somali militants shot down two U.S. UH-60 Army Blackhawk helicopters, trapping U.S. Army Rangers and Delta Force in the midst of thousands of hostiles. Two Delta Force Operators, Sergeant First Class Randy Shughart and Master Sergeant Gary Gordon, voluntarily landed in order to protect a downed pilot, Chief Warrant Officer Michael Durant. Both Operators were killed in the process and both were awarded the Medal of Honor posthumously.

It is not just films that are based on historical military events that praise self-sacrifice. In *Spiderman 2* (2004) Doctor Octavius must sacrifice himself to both save New York City and redeem himself for his past crimes. In *The Dark Knight* (2008) in the ending scenes Batman sacrifices his reputation as the hero in order to keep Gotham's hope alive. In *Captain America: The First Avenger* (2011) Steve Rogers shows his heroism by willingly jumping on a grenade in order to protect others. Another character threw a fake grenade as a "test of heart" and Roger's passed. Recently in *The Avengers* (2012), Captain America berates Tony Stark because he sees the latter as someone selfish, someone unwilling to make the necessary sacrifices for the good of the planet. By the end of the film, though, Tony Stark proves his heroism by personally flying a nuclear missile at the enemy, putting his life in great danger. These examples, which are not all-inclusive, show that contemporary American films portray the hero as someone willing to sacrifice for others. In fact, self-sacrifice is deemed a requirement. It is the same as the good death for the military—that is, dying to complete an objective or to stop an enemy is something honorable and brave, but self-sacrifice is at the pinnacle of achievements. These films act as a

[11] Quoted in Sledge, *Soldier Dead,* 16.
[12] Sledge, *Soldier Dead,* 27.
[13] Matthew Tull, "PTSD and Guilt," *About.com Guide,* last modified November 7, 2008, http://ptsd.about.com/od/relatedconditions/a/guilt.htm.
[14] Jonathan Shay, M.D., PH.D, *Odysseus in America: Combat Trauma and the Trials of Coming Home*, (New York, NY: Scribner, 2002), 79.

mirror to those in the military, and civilians looking at military culture, and reflect the values that the military hold in regards to death, which should come as no surprise, as the Department of Defense and Pentagon work closely with video game developers for games and with Hollywood with films such *Ironman* and *Top Gun*.[15]

Civilian society and the military had not always had these separate outlooks towards dying. Up until relatively recently, these two spheres shared ideas on how to die, even during America's first modern war, the Civil War. The following sections will illustrate the similarities between civilian and military during the Civil War then discuss why these shared outlooks began to diverge.

The American Civil War: Last of the Old Model

The American Civil War (1861-1865) ushered in the modern era of warfare. In the four years of fighting the American army went from fighting in rows and columns used since Napoleon's time to what can recognize as trench warfare and small-unit tactics.[16] It also brought about the concept of "total war." Historian James McPherson said that the war itself "mobilized human resources on a scale unmatched by any other event in American history, except, perhaps, World War II." He continues, "For actual combat duty the Civil War mustered a considerably larger proportion of American manpower than did World War II." [17] With the great amount of death and destruction wrought by these new modes of killing other humans and the ushering in of modern warfare, one cannot be astonished that this cataclysmic war also tested the nation's view on death.

Up to and during the Civil War both the civilian and military populace shared views on what a good death entailed. This shared cultural belief did not occur organically or by happenstance, but by design. The *ars morendi* (art of dying) was the collective name for religious tracts that had been circulating since the fifteenth century detailing how one should die.[18] In the mid-nineteenth century these lessons were ubiquitous throughout American culture, both in the North and in the South. No longer relegated to religious tracts, by the time of the Civil War the lessons and importance of dying well was being preached from a myriad of places, from the pulpit to medical texts to popular culture.[19]

These instructions directed the family and friends to surround the dying man on his deathbed. While he lay the dying would confess any sins, give any last directions, and prepare to die.[20] Of those three actions preparing to die was of the greatest importance. How he acted at the "hour of his death," says historian Philip Aries, was seen as a final punctuation mark to his life. If the dying could face death with fortitude, calm, and grace, he could "erase at once all the sins of his

[15] Roger Stahl, *Militainment, Inc: War, Media, and Popular Culture,* (New York, NY: Routledge, 2010), 46.
[16] Dr. David Hickman in lecture at the University of California Davis (Davis, CA), November 29, 2012.
[17] James M. McPherson, *Drawn With the Sword: Reflections on the American Civil War* (New York: NY, Oxford University Press, 1996), 67.
[18] Sean A. Scott, "Earth has No Sorrow that Heaven Cannot Cure," *Journal of Social History,* 41, no 4 (2008), 850.
[19] Drew Gilpin Faust, *This Republic of Suffering: Death and the American Civil War* (New York, NY: Vintage Books, 2008), 7.
[20] Faust, *This Republic of Suffering*, 10.

life" or conversely, "cancel out all his good deeds if he gives way" to his fear.[21] There are still remnants of this belief in contemporary American society. For instance, before someone dies it is said their life flashes before their eyes and their actions during this biography determined their eternal fate.[22] Because society believed that the dying's actions at the moment of death determined the soul's eternal destination, family and friends surrounded the dying not only to witness them entering into glory but to also offer spiritual encouragement and strength. Historian Drew Gilpin Faust says. "Kin would use their observations of the deathbed to evaluate the family's chances for a reunion in heaven."[23] Therefore, if the dying acted brave during the hour of death, they would have been able to assure their families that they would be reunited in the afterlife for eternity.

The Civil War made it nearly impossible for a soldier to achieve the classical model of a *good death*. Battles raged from Virginia to parts of New Mexico, not allowing for people to die at home. Joshua Lawrence Chamberlin, one of the most famous soldiers in a war replete with famous soldiers, commanded the 20th Maine, a unit from his home state. Although he was from Maine he fought in battles at Gettysburg and Appomattox, two places far from home. He is an example of how a soldier did not have an expectation to die at home, but on a battlefield many states away. Had Chamberlain been killed in battle, and if his family could afford the expense, his body could have been recovered, as body recovery was a possibility to those who were officers or had families of means.[24] But for the average soldier these niceties were not possible. The invention of photography in the 19th century enabled the civilian population on the home front to witness the carnages of war taking places hundreds of miles away for the first time. Especially due to the work of gallery owner Matthew Brady families near family could not pretend that their dead died well or had a proper Christian burial. Those reading newspapers could see their dead at Antietam lying where they had been slain days after the battle. Witnessing the little dignity given to the dead whose family could not afford the great expense of returning the body home affected the Northern population. It did not help that when battles returned to an area that witnessed a battle years prior, such as the 2nd Battle of Manassas, soldiers reported seeing the bones and other remains of those who had fought there previously.[25] This obvious disparity in the treatment of the dead added insult to the pain of already having lost a loved one in battle. As historian Susan-Mary Grant says, "In a war fought in the name of republican values, distinctions in death were not an option."[26] One of the reasons that the Civil War was so culturally devastating was that it robbed the fallen of the chance to have a deathbed at home — an integral part of the good death — and broadcasted this failure to achieve the vital moment across the nation in the form of newspaper articles and photographs.[27]

Soldiers fighting would take actions to alleviate some of the spiritual pain dying away from family and home would cause. One of the methods of doing such involved the dying holding

[21] Philippe Ariès, *Western Attitudes Toward Death: From the Middle Ages to the Present*, trans. Patricia M. Ranum (Baltimore, MD: The Johns Hopkins University Press, 1974), 37.
[22] Ariès, *Western Attitudes Toward Death*, 38.
[23] Faust, *This Republic of Suffering,* 10.
[24] Susan-Mary Grant, "Patriot Graves: American National Identity and the Civil War Dead," *American Nineteenth Century History*, 5, no. 3 (2004): 76, DOI 10.180/14664650420003020773.
[25] Susan-Mary Grant, 84.
[26] Susan-Mary Grant, 86.
[27] Faust, *This Republic of Suffering,* 9.

photographs of their family in an attempt to breach the great distances between the battlefield and home. This action allowed the photograph to stand as a surrogate of the family at the side of the deathbed. Although the family was not at the side of the dying physically, it allowed the dying the chance to, at least in their own mind, communicate with their family one last time, and at least assure themselves that they were doing all in their power to take the steps necessary to reunite in heaven.[28] As one Georgian soldier wrote, "if I have to die on the battlefield, if some kind friend would just lay my Bible under my head and your likeness on my breast with the golden curls of hair on it, that would be enough."[29] Though they could not be together in time and space in reality, they attempted to have some semblance of togetherness that the old model of the *good death* necessitated.

Another way soldiers compensated for the distance from home and the sudden, violent deaths that made the good death difficult to achieve was the use of condolence letters sent home. Because the belief was so widespread, friends of the fallen, chaplains, nurses, and others took it upon themselves to write to the fallen's family and describe how their loved had died well. "These letters," says Drew Faust, "sought to make absent loved ones virtual witnesses to the dying moments they had been denied, to link home and battlefront, and to mend the fissures war had introduced into the fabric of the Good Death."[30] Those writing knew that there was no greater solace to the families left behind than knowing their loved ones died as well as possible.[31]

If those writing to the families could not honestly say that the fallen died with their souls forgiven, they would then link dying bravely for the country as the actions of a good Christian, thereby circumventing the previous model of a good death in order to reach heaven and being reunited with family. The line between duty to God and duty to Country blurred because dying bravely for the country became a requirement for a *good death*.[32] If one died for the country then they died doing the Lord's will. And it continued to blur for both those in the civilian world as well. "Life is fleeting, uncertain, unsatisfying," said the parents of one of the fallen in a letter their son's commanding officer, "To die in the service of one's country and to die a Christian is all that in life is worth striving for."[33] When civilians in the Union saw the broken and bloody bodies of Matthew Brady's work, the pictures did much to reinforce the righteousness of their cause for those back home. "The large numbers of young northern soldiers slaughtered on the fields of battle," says historian Gary Laderman, "became evidence of Union patriotism and virtue."[34] What a Good Death meant for both the civilian population and those in the military would not remain in agreement for long, however. With changing medical technology and religiosity, beliefs would no longer run concurrently.

Thy Death and the Divergent Military

[28] A famous example of this was Amos Humiston, a Yankee killed at the Battle of Gettysburg. His body was found clutching a photograph of his three children. This find set off a sensation across the country to identify the fallen soldier and praise his devotion to his children. Faust, 11.
[29] Quoted in Faust, 11-12.
[30] Faust, *This Republic of Suffering,* 15.
[31] Faust, *This Republic of Suffering,* 14.
[32] Faust, *This Republic of Suffering,* 25.
[33] Quoted in Scott, "Earth has No Sorrow that Heaven Cannot Cure," 859.
[34] Quoted in Susan-Mary Grant, "Patriot Graves," 84.

In the decades after the Civil War there was a slow shift away from the previously long-held view of a good death due to a growth in hospitals, smaller family sizes, and greater societal secularization.[35] People were no longer concerned about their own deaths as much as they were the deaths of others. This preoccupation with the welfare of others, *thy death*, lead to the contemporary version of a good death in civilian society: an invisible death.

This came about because the family and friends of the dying wanted to spare the dying from the knowledge of their own impending death. As Historian Philippe Ariès says, "there is the love of the other, the fear of hurting him and depriving him of hope, the temptation to protect him by leaving him in ignorance of his imminent end."[36] In other words, it was the duty of family and friends to protect the dying from their own mortality.[37]

This move towards what one historian calls *thy death* occurred during the same time period as the rise in hospitals. Due to great advancements in medical care and a scientific intrusion into a population's private life, people no longer died at home, but in hospital beds. Because hospitals not only allow for greater care by professionals but also enable family members to delegate caretaking responsibilities, these families are able to live as normal lives as possible. Hospitals have "become a place of the solitary death." [38] With this greater expectation of a quiet, solitary death, the idea of a *good death* has now become that of an *invisible death*. The best way one could die is to act like they are not dying. American civilian society wants death to be hidden. [39] This runs parallel with the use of morphine to ease one's passing. Morphine serves the dual purpose of easing pain and keeping a patient sedated. Patient sedation allows hospital personnel the ability to pretend the patient is not dying and spares them from a patient's screams and fears. Sedation also prevents the patient from having a bad death, one in which the patient knows he or she is about to die. [40]

We can hear this strive for an invisible death in the words used when describing someone's passing. The first that comes to mind is the phrase "passing on." But there are many more: "he's with Jesus," "he died in his sleep," "it was quick," "he bought the farm," "he kicked the bucket," "he woke up dead" (for the humorously inclined), et cetera.[41] When a medical journal illustrated the modern concept of a good death they had a picture of a woman lying on a bed in a hospital. The woman does not look afraid, but happy, if slightly tired. She is surrounded by her family and friends. There are signs on the wall that say things like "we love you" and "goodbye." While at first glance this seems like the old model of the deathbed, it is not, as the picture itself seems one of happiness. If the picture did not accompany an article about death, then the view would not be amiss to assume this woman is going on a vacation instead of to her grave. All it would take is to

[35] Ariès, *Western Attitudes Toward Death*, 87.
[36] Philippe Ariès, *The Hour of Our Death: The Classic History of Western Attitudes Toward Death Over the Last One Thousand Years,* (New York: NY, 1981), 561.
[37] Ariès, *The Hour of Our Death*, 562.
[38] Ariès, *The Hour of Our Death*, 571.
[39] Ariès, *The Hour of Our Death*, 587.
[40] Ariès, *The Hour of Our Death*, 587.
[41] Ariès, *The Hour of Our Death*, 587.

add a "bon voyage" and the scene would be borderline festive.[42] This is the ideal death for today's society. Contemporary society also wishes to have death hidden even during funerals. It is expected of mortician to attempt to do all in their power to make the dead look as lifelike as possible, such as putting blush on cheeks, lipstick for women, and so on. The concept of embalming is done in order to maintain the façade of life for as long as possible. This is done in order to protect the living from having to face death and mortality.[43]

Conclusion

The invisible death is impossible for a member of the military to achieve. Due to the nature of their chosen profession, a military member's sacrifice is one that is visible. In addition, Americans do not expect their sacrifice to go unnoticed nor pretend that death is not an everyday occurrence, while those in the military do not expect to be surrounded by family and friends confessing their last sins, as did those in the Civil War. The model from the Civil War is outdated and the civilian model does not pertain to those in the military, and so, beliefs shift. The reason for change may be a natural evolution in culture or brought about by a cataclysmic war. Despite the reasons why viewpoints towards death change, it is important to understand what the viewpoints entail. Knowing how those who fight view death enables a greater understanding into a culture and society as a whole. And with fewer proportionally serving in the military, it is of even greater importance to understand how this small subset of the American population sees a fundamentally human experience.[44]

[42] Micaela Hays, MD, "The Good Death," *Brown Medicine*, http://brownmedicinemagazine.org/view/article.php?cw=cGFnZTE0MTU9MSZlbnQxMzE1ND1QQUdFJmVudDk0PTUzJmNudHBhZ2UxMzE1PTEmaXNzOTQ9NA==.

[43] Ariès, *The Hour of Our Death*, 599-600.

[44] Sabrina Tavernise, "As Fewer Americans Serve, Growing Gap is Found Between Civilians and Military," *The New York Times, Nov 24, 2011. Date accessed Sept 19, 2012.* http://www.nytimes.com/2011/11/25/us/civilian-military-gap-grows-as-fewer-americans-serve.html.

Straddling the Margins: A Snapshot into the Educational Experiences of the Children of Poor Mexican Immigrants

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Abstract

Scholars studying the integration and experiences of post-1965 immigrants from Asia and Latin America have reached different conclusions of immigrant's assimilation into the United States. Classical assimilationists argue that over time, the children of immigrants will eventually assimilate into white middle class America (Alba and Nee, 1997). Others expand on this theory, pointing to factors such as a bifurcated labor market and racialization to argue that immigrants and their children are segmented into different sectors of the American society. Segmented assimilation theory emerges from the complex interplay between endogenous and exogenous factors to identify three possible pathways of immigrant integration: the traditional integration into the middle class over successive generations, downward assimilation into the underclass, and economic success within an ethnic economy (Portes and Zhou, 1993). It is unclear however, whether these segmented paths apply to all members in a group, or whether there is variation among groups as suggested by some (Telles and Ortiz, 2008). In this study, I focus on education as an indicator of assimilation, examining variation in educational outcomes among a homogeneous group of socioeconomically poor, second-generation Mexican American middle school students. Survey data and ethnographic observations suggest that a sense of belonging is crucial for educational achievement among middle school students who are otherwise socioeconomically disadvantaged. Factors influencing a sense of belonging, and, hence, educational outcomes include: parent and teacher support, extra-curricular and cultural activities, church, and positive mentored relationships. This paper illuminates the concept of belonging for explaining intra-group variations in educational outcomes and assimilation.

Introduction

The history of America intersects with that of immigration and spatial mobility. However, far from being an old process, immigration continues to transform and shape civil society. Today, first and second generation immigrants make up 20.5 percent of the U.S. population, making them the fastest growing segment of the U.S. population (Portes and Rumbaut, 2001; Suarez-Orozco, Suarez-Orozco and Todorova, 2008). The Mexican-origin population is by far the

largest immigrant group in the United States (Portes and Rumbaut, 2001). The size and growth of immigration poses a significant challenge for the successful integration of immigrants and their children.

Scholars studying the integration and experiences of post-1965 immigrants from Asia and Latin America have reached different conclusions of immigrant's assimilation into the United States. Classical assimilationists argue that over time, the children of immigrants will eventually assimilate into white middle class America (Alba and Nee, 1997). Others expand on this theory, pointing to factors such as a bifurcated labor market and racialization to argue that immigrants and their children are segmented into different sectors of the American society. Segmented assimilation theory emerges from the complex interplay between endogenous and exogenous factors to identify three possible pathways of immigrant integration: the traditional integration into the middle class over successive generations, downward assimilation into the underclass, and economic success within an ethnic economy (Portes and Zhou, 1993). It is unclear however, whether these segmented paths apply to all members in a group, or whether there is variation among groups as suggested by some (Telles and Ortiz, 2008). In this study, I focus on education as an indicator of assimilation, examining variation in educational outcomes among a homogeneous group of socioeconomically poor, second-generation Mexican American middle school students. Survey data and ethnographic observations suggest that a sense of belonging is crucial for educational achievement among middle school students who are otherwise socioeconomically disadvantaged. Factors influencing a sense of belonging, and, hence, educational outcomes include: parent and teacher support, extra-curricular and cultural activities, church, and positive mentored relationships. This paper illuminates the concept of belonging for explaining intra-group variations in educational outcomes and assimilation.

Background

A large amount of research shows that, on average, Mexican Americans are less likely than other immigrant groups to do well in school (Portes and Rumbaut, 2001; Massey, Charles, Lundy & Fischer, 2003). In California, Hispanics are one of the two lowest groups on measures of academic performance, including the state academic performance index and Math Exit Exam (California Department of Education). Instead, children born to Mexican immigrants and later generations have a high non-enrollment dropout rate of over 40%, while nearly 40% of Mexican American youth fail to advance beyond high school (Hirschman, 2001; Portes, Fernandez-Kelly and Haller, 2005). Given the ample amount of research that shows education to be the surest path for mobility, these negative educational trends for Mexican Americans depicts a future with limited opportunities (Suarez-Orozco, Suarez Orozco and Todorova, 2008; Telles and Ortiz, 2008). The fact that as of the 2011-12 academic school year, 52% of students in California public schools were of Hispanic origin makes this more than an issue of academic interests; it is an indication of the character of future civil society.[1]

Research on the educational experiences of Mexican Americans, generally expressed as group averages, tends to provide evidence for segmented assimilation theory (Hirschman, 2001). However, in spite of the structural constraints encountered by socioeconomically disadvantaged Mexican American children, not all may come to experience a downward trajectory into the

[1] Data retrieved from California Department of Education

underclass. The experiences of those students whose actions defy the odds and are able to attain upward mobility are important for understanding the factors that counter structural constraints and promote an upward trajectory. The experiences of middle school youth reveal the complex realities immigrant children face in their lives. For some students, the adversity of their lives results in an all too common trend of low academic achievement and failure. Meanwhile, others are propelled by forces that promote their academic achievement in spite of the host of challenges that threaten that achievement. It is this group of outliers that this study seeks to gain a better understanding of. What accounts for why some poor, second generation Mexican American middle school students achieve academically, while so many do not?

To understand intra-group variation in educational outcomes, I draw from the factors identified in segmented assimilation theory that point to the reasons why some groups have been able to fare better than others. These factors are not independent from each other. Instead, these factors are highly interconnected and translate into further disadvantages. Below I describe these factors followed by my research methods. I finish with a discussion and conclusion of my findings.

Segmented Theory: Factors that explain variation in educational outcomes

Racialization

Racialization is a social process that categorizes and ranks people based on their race and ethnicity. This process builds racial boundaries on the basis of cultural or physical markers, which are seen as inherent indicators of people's abilities (Portes, Fernandez-Kelly, and Haller, 2005; Winant, 2000; Omi & Winant, 1986). Children of Mexican immigrants are vulnerable to discrimination because race is an inheritable physical feature that designates societal perceptions and treatment of the immigrant group (Portes and Rumbaut, 2001). This negatively affects the children of immigrants, whose identities are defined by the native society through the stereotype and high visibility of Mexicans as labor migrants. The discrimination that occurs based on physical and cultural differences is a persistent challenge to the upward mobility of Mexican American youth, whose social identities and social interaction are shaped by racial stereotypes (Portes, Fernandez-Kelly, and Haller, 2005; Telles and Ortiz, 2008). Segmented assimilation generalizes that all immigrant minorities respond to racial and structural constraints in the same manner.

Social Context

In segmented assimilation theory, Portes and Rumbaut (2001) conceptualize the context of reception encountered by an immigrant group as "modes of incorporation." This concept illuminates how contextual factors such as immigration laws, nativist attitudes, and community networks (or lack of) work to determine immigrant integration in the United States. Mexicans are shown to have a negative reception by the U.S. due to racialization and exclusive immigration policies that signal to co-ethnics and natives their marginalization through the groups association with illegal status (Telles and Ortiz, 2008). This negative context of reception for Mexicans has resulted in limited occupational mobility, and thus low socioeconomic status. Consequently, these interrelated factors create an impoverished context where the children of immigrants are disposed to underfunded schools, and confront behaviors such as gang membership, drug use,

and dropping out of school (Suarez-Orozco and Suarez-Orozco, 1995; Portes, Fernandez-Kelly, and Haller, 2005; Wilson, 1987). Exposure to these negative contexts promotes behaviors that are inimical to successful integration and leaves immigrant children susceptible to a path of downward assimilation (Portes and Rumbaut, 2006; Portes and Zhou, 1993). In this study I control for local social context such as economic conditions, and neighborhood conditions by focusing on one school in one community. This study looks to expose the factors that help a group of socioeconomically disadvantaged students attending a poorly funded school to excel academically.

Social Class: Financial Capital, Human Capital, and Social Capital

One of the most documented factors affecting the educational experiences of Mexican Americans and their assimilation is social class. There are, however, several interrelated notions of social class. The first measurement is parental human capital, defined as the skills, abilities, and knowledge that parents possess (Massey, Charles, Lundy & Fischer, 2003). Immigrant parents with high levels of education generally have more knowledge of the education system and are thus, better able to guide and create opportunities that are amicable to their child's education (Portes, Fernandez-Kelly, Haller, 2005). Mexican immigrants and their children, however, have lower than average levels of human capital compared to other groups.

These low levels of human capital transpire and are relevant to parents' financial capital. Mexican immigrants with low levels of human capital are far less likely to be employed in high earning occupations.[2] Hence, meager earnings combined with a lack of information about schooling leave Mexican immigrant parents less able to invest in their children's education compared to economically secured families. Under these conditions, Mexican American youth are far more likely to attend poor schools and to receive less intellectual stimulation inside and outside of school (Portes, Fernandez-Kelly, Haller, 2005). Hence, Mexican American youth are disadvantaged compared to children whose family have the economic flexibility to provide a privileged context, purchase private tutoring, and extracurricular activities that stimulate students' intellect (Massey, Charles, Lundy & Fischer, 2003; Lareau, 2003; Portes & Zhou, 1993).

Research Method

The research design of this study is qualitative, drawing from exploratory surveys, individual and focus group interviews, diary correspondence, and ethnographic observation. The questions for the survey instrument were drawn from those used in the Longitudinal Immigrant Student Adaptation study (Suarez-Orozco, Suarez-Orozco & Todorova, 2008). The LISA study focused on describing the experiences of first generation immigrant youth from various sending countries. This study, however, focuses on a group of socioeconomically disadvantaged, second generation, Mexican American youth in seventh and eighth grade.[3] The sample included 48 middle school students living in a small community in Northern California. Among these forty-

[2] In the CILS study, Mexicans had mean incomes in the mid-$30,000s, compared to Asian Americans with average incomes over $57,000 (Portes and Fernandez-Kelly, 2008)
[3] As is standard, second generation refers to those born in the United States with at least one parent born in another country

eight students, some were excelling academically, while others were failing. Studying a socioeconomically and ethnically homogenous group of students with different educational outcomes was the foundation of the research project, which intends to understand what accounts for differences in educational outcomes among second-generation Mexican-American children.

The data were collected over a continuous period of seven months during a full school year. The majority of this period was spent observing and interviewing students from different educational trajectories. For this study, students were grouped into three different categories with a grade point average criterion. In total, there were fifteen low achievers with a grade point average of less than 2.01, twenty-one academic achievers with a grade point average of between 3.5 and 3.83, and twelve super achievers with a 4.0. I used students' eligibility for free lunch as an indicator of low socioeconomic status.

In the fall of 2011, I was granted permission to conduct this qualitative study in a middle school located in Northern California. The middle school was an ideal context for this study.[4] The school's population was sixty-three percent Hispanic, a figure higher than the fifty-two percent found in California public schools. Across several academic indexes measuring curriculum test scores, students in this school measured average scores far lower than those averaged in California middle schools (California Department of Education). The dissimilarity between state and school academic measurements enhanced the analysis, showing that even among a less than average school context, some disadvantaged students are still able to achieve academically.

Discussion

An analysis of student narratives reveals that student's experiences are differently intertwined with student identity, which in turn, is linked to their academic experience in school (achievement vs. non-achievement). Low achievers tended to isolate their experiences to the stereotypes and racism directed towards Mexican Americans, adopting an adversarial stance towards dominant society that opposes and rejects mainstream institutions such as education. High Achievers, on the other hand, were more likely to be involved in caring mentored relationships, cultural activities, and with extracurricular cultural activities, which promoted their sense of belonging to their own culture and to the dominant society. Hence, Super achievers sensed pride and remained optimistic about their life chances as Mexican Americans, which they played out by doing well in school. The attitude of students with this bi-cultural identity was, "Mexicans aren't what you perceive us to be. Watch me." Meanwhile, a "third way" of identity formation occurs for students who do well in school by rejecting a Mexican American identity. However, this response and form of identity deprives students not only of the bi-cultural skills that are amicable for competing in today's global world, but are also less inoculated from the negative stereotypes and racism that they encounter (Portes and Fernandez-Kelly, 2008; Suarez-Orozco and Suarez-Orozco, 2001).

When students were asked the survey question, "where do you see yourself in ten years?" answers varied but some general responses included either being a college student or working as a professional. However, a snapshot of divergent educational outcomes in middle school suggests that not all students will see their goals turn into reality. What forces can explain these

[4] These figures were taken from the California Department of Education website for the academic year 2010-2011

differences? Is it merely motivation and merit that shape these differences? In *Outliers* (2008), Malcolm Gladwell does a magnificent job showing how success is not predicated by mere inherent skill, but rather, that the difference between those who rise to the top and those that fail depends on the *opportunities* that are carved along the way. The same can be said for explaining divergent educational outcomes. A comparison of student narratives reveals that it makes a significant difference whether youth within marginalized conditions- low socioeconomic status, low parental human capital, underfunded schools, and racialization- are equipped with various forms of support promoting students' academic achievement. Ultimately, as the experiences and realities of these students reveal, these forms of support, described below, determine whether one's dreams are nourished or starved.

Positive Mentored Relationships

Positive mentored relationships help to circumvent the socioeconomic disadvantages encountered by marginalized youth. For Julia and Annabelle, both "super achiever" students, this crucial from of support came primarily from teachers but also from parents. Julia's teacher, Mrs. Burns, not only helped her with school work, but acted as a life guidance mentor, helping to bridge her goal of attending college by organizing campus tours with nearby colleges. Another teacher, Mrs. Green, eased Annabelle's transition to the new school by assuring that she was enrolled in the appropriate classes and helping her forge relationships with peers. The criterion for a person to become a positive influence in youth's life, however, is not exclusive to teachers. Rather, forging a positive mentorship relationship can come from anyone who is well informed about the necessary steps needed to reach the students' goal and who desires to motivate the student to do so. For other "super achiever" students, this mentored relationship came from a coach, a family friend, or an older relative. These significant relationships help youth circumvent disadvantaged conditions and promoted students' academic engagement, creating opportunities and increasing the life chances of marginalized youth (Suarez-Orozco & Suarez-Orozco, Todorova; 2008, Portes and Fernandez-Kelly; 2008).

Church, Cultural and Extracurricular Activities

There are many advantages associated with participating in cultural and extracurricular activities. For youth, it allows them to expand their social networks, harness their skills, and learn how to work as a team. These activities also encouraged behaviors that promoted academic achievement. Less explicit, however, is the role that these activities have for promoting a sense of "belonging" to their own culture and or the larger society. For Julia and Annabelle, dancing *baile folklorico,* participating in church activities, and playing for the schools soccer team helped improve their skills, and gave them a sense of belonging that "low achiever" students generally didn't have. Julia describes her experience dancing *baile folklorico* as making her "proud," and of church activities as a place where she felt "welcomed." For Annabelle, being the co-captain of the soccer team made her feel "really good (…) like I'm a representative of the school." As high achiever students reported, the camaraderie of these activities help sustain student's sense of self, a crucial form of social support and guidance that circumvents the realities plagued by economic adversity (Suarez-Orozco & Suarez-Orozco, 2001).

Conclusion

The margin of error for socioeconomically disadvantaged children of Mexican immigrants to achieve academically is small. Research shows that the odds are against these marginalized youth. In fact, it is of extreme rarity, less than one percent and only fifty individuals out of 5,262 cases in the CILS study, for students to overcome their disadvantages and receive a college degree (Portes and Fernandez Kelly, 2008). Thus, while research shows that at an aggregate level, disadvantaged Mexican American youth are most likely to experience downward assimilation, it also shows that a small minority of students is able to attain upward mobility. These students are true outliers and are an important group to study for understanding what forces help outliers overcome their dire disadvantages. I focus on education because prior research finds education the surest path for mobility. (Portes and Fernandez Kelly, 2008; Telles and Ortiz, 2008).

The experiences of Mexican American youth reveal that their family's poor conditions are filtered into their own realities. Students often lived in less desirable neighborhoods where the prevalence of gangs and drugs persist. Their parents are often forced to work several jobs, depriving them of the flexibility that financially secured families have for promoting their children's schooling. In addition, their low human capital affects their ability to help with their child's education. Students from poor socioeconomic households are disadvantaged on many of these fronts and therefore walk a fine line for school achievement, and hence, their life outcomes. For most of these students, the only form of support comes from their parent's ambition and encouragement to do well in school. However, parental encouragement is not always enough to circumvent the disadvantages and marginalization that conditions the realities of poor Mexican immigrant children. This study finds that students *need* support from multiple sources—parents, teachers, church, extracurricular activities, and cultural activities—in order to achieve their ambitions. Fostering these forms of support in education is critically significant because education has a direct affect on shaping opportunities and mobility (Portes and Fernandez Kelly, 2008; Telles and Ortiz, 2008). For these marginalized youth, education is literally of high-stakes importance, determining their integration into American society and their life outcomes. This research paper captures some of these vital, potentially life changing factors in a few words. However, they should not be read merely as abstract words or ideas, because for these students, these forms of support make a world of difference to their life outcomes.

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Investigating the role of the ubiquitin E3 ligase BRIZ in seed germination

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Introduction

The ubiquitin pathway is a protein modification system that attaches the small and highly conserved protein ubiquitin to substrate proteins and plays an essential role in all eukaryotic organisms (Vierstra 2011). The regulation of several important processes such as the cell cycle and signal transduction in all organisms and hormone signaling in plants are dependent on this pathway. In the ubiqutin pathway, ubiquitin undergoes a series of reactions involving three enzymes that assist in attaching ubiquitin to its substrate. The first enzyme (E1) is known as the ubiquitin-activating enzyme. It forms a thioester bond with the ubiquitin in an ATP-dependent manner, before passing it along to the second enzyme called E2, or ubiquitin conjugating enzyme. The E2 also forms a thioester bond with ubiquitin and interacts with the third enzyme E3. E3, also called ubiquitin ligase has an important role in substrate specificity. The E3 brings ubiquitin and the substrate together by binding to both the substrate and the E2 that carries ubiquitin, thereby helping to catalyze ubiquitin transfer.

The attachment of ubiquitin to a substrate protein can affect the substrate's activity, abundance, or change its sub-cellular location. In the model plant *Arabidopsis thaliana*, proteins BRIZ1 and BRIZ2 form a heteromeric complex demonstrated to have ubiquitin E3 ligase activity, although only BRIZ2 protein binds ubiquitin. BRIZ1 and BRIZ2 proteins work together to catalyze the attachment of ubiquitin to substrate proteins (Hsia and Callis 2010). The BRIZ E3 ligase is important in plants because mutations that inactivate either gene result in plants that either fail to germinate or ones that germinate slowly and arrest growth as small white unexpanded seedlings. However, we do not know BRIZ's substrate or the pathway in which it functions.

Arabidopsis Thaliana, called Arabidopsis for short, is used in these studies because of its small size, short generation time and low maintenance requirements. There are also many genomic tools available for use of this model plant such as a well-annotated genomic sequence, a large number of cDNAs characterized and many insertional mutants.

One way to understand the function of a gene is to inactivate it and observe what phenotypic changes occur. In Arabidopsis, genes can be inactivated by insertion of bacterial DNA called T-DNA into the plant chromosome. Arabidopsis is diploid, meaning that it has two copies of each chromosome. When T-DNA is placed into either the *BRIZ*1 or *BRIZ2* genes, seed that is

homozygous for the insertion either never germinates or the embryo emerges from the seed but soon stops developing and never turns green. Since homozygous plants are not viable and cannot be grown to produce seed, a pure population of homozygous mutant seed cannot be obtained and therefore seed from heterozygous plants must be used for experiments.

Abscisic acid (ABA) plays an important role in a plant's response to stress and subsequent growth. If basic environmental conditions are not met for a plant's survival such as it being too cold or dry, ABA production is increased to prevent seeds from germinating until proper growing conditions are met. Previous research has suggested that ABA response is somehow connected to BRIZ function because the *briz* mutants resemble wild-type plants that are treated with ABA. This resemblance could be due to one of three things: 1) the *briz* mutants could possibly produce too much ABA, which arrests growth; 2) the mutant plant could perceive that there is a lot of ABA present, meaning that it is hypersensitive to ABA; or 3) ABA plays no role in growth suppression and the wild-type plants just happen to look like mutants. Previous research has shown that *briz* mutants contain the same amount of ABA as wild-type (unpublished), so we are left with the possibility that perception of ABA is affected or that there is no relationship to ABA.

The use of mutants affected in ABA biosynthesis and ABA responses have been useful for understanding the role of ABA in plant growth, and especially useful for this study are mutants insensitive to the growth inhibitory effects of ABA (Finkelstein 2013). One such mutant was utilized in this study. The abi1-1 is a mutation in the ABA INSENSITIVE 1 locus, encoding a protein phosphatase. The abi1-1 mutation does not eliminate enzyme activity, but affects the proteins response to ABA. The wild-type protein is inhibited by ABA. A wild-type plant in low ABA has active phosphatases, such as ABI1, that dephosphorylate and inactivate SnRK kinases. SnRK kinases autoactivate by self-phosphorylation and once phosphorylated, in turn activate transcription factors that mediate transcription of genes required for the ABA response, inhibiting growth. In low ABA, ABI1 keeps SnRK kinase activity low by removing the activating phosphates, preventing SnRK from activating transcription factors and the ABA response. In wild-type cells, high ABA levels inhibit the phosphatases, including ABI1, preventing them from de-phosphorylating their substrates. This allows SnRK kinases to remain phosphorylated and then to phosphorylate the ABF transcription factors at the sites needed to activate them to then activate genes that inhibit growth. Thus wild-type plants in high ABA levels do not grow.

In contrast, the abi1-1 protein remains active even in high levels of ABA. Plants that are homozygous for the abi1-1 point mutation grow even in high ABA levels because the abi1-1 phosphatase is not inhibited by the high ABA levels. Thus, the SnRK kinase is not stably phosphorylated, and is not able to activate downstream transcription factors and growth inhibitory processes do not occur. Such plants are ABA-insensitive, hence the name of the phosphatase, ABA-INSENSITIVE 1.

Despite the lack of growth, vitality staining of the *briz* mutants has shown that they are alive for at least 30 days after plating (unpublished). *briz* seeds test positive when stained with the vital stain fluorescein diacetate (FDA) that only stains live cells. The seeds failed to stain with FDA when they were boiled and killed which confirmed that the seeds were alive. *briz* seeds did not stain with sytox orange, which only stains dead cells. However, after boiling seeds were stained

with sytox-orange, confirming that the stain worked as expected. Thus we conclude that the BRIZ proteins are required for normal vegetative growth and they seem to negatively regulate a process that blocks growth, but not cell death.

The goal of these experiments is to resolve two main research questions:

1. Does the *briz* mutation affect cell division in seedlings? If so, where in the cell cycle are they affected and how does the pattern differ from wild-type?

2. Does placing the mutant *briz* in various genetic backgrounds affect its phenotype?

Methods and Materials

Plant Lines

All plant lines were assigned a unique number in order to keep track of them. The five-digit number indicated the family number. The number following the dash is the individual plant number. Plants with the same family number were derived from the same parent.

Identifying *BRIZ/briz* heterozygous plants

Seed heterozygous for T-DNA insertions in the *BRIZ1* or *BRIZ2* genes were obtained from the Arabidopsis stock center (Columbus, OH). These lines contain a T-DNA insertion, which is a ~8kb piece of bacterial DNA, inserted in the coding region of the gene. Homozygous *briz* seed/seedlings were obtained after selfing heterozygous plants. Whether a plant was heterozygous for a *briz* mutant allele was determined in one of two ways. A self-fertilizing heterozygous plant contains two types of gametes. Half of both the male and female gametes are mutant. When these gametes combine, 25% of its progeny possess only the mutant genotype. Therefore, if the individual plant is heterozygous for the mutation, it is expected that it will have a 3:1 ration of wild-type: *briz* phenotypes. Chi square goodness of fit tests were performed on a subset of seed from an individual plant to determine which seed exhibited the expected 3:1 segregation ratio and upon plating or additional seed from that same parent would yield mutant seedlings for study.

Heterozygous plants were alternatively identified by a PCR-based method on a leaf material called DNA genotyping. Genotyping is performed by placing 2-4 small plant leaves into a tube with 2 beads and 300 ml of 2x CTAB. The tubes are placed in a mini-beater for four minutes releasing the DNA from the leaf cells. The tubes are then incubated at 55° C for 1 hour and then cooled to room temperature. 300 ml of chloroform are then added to each tube and are then vortexed and centrifuged at 13,000 rpm for 1 minute. In separate tubes, 200 ml of isopropanol is added. The supernatant of each old tube is removed and placed in the corresponding new tube. The tubes were inverted a few times and then placed in the centrifuge at 13,000 rpm for 10 minutes. The tubes are then emptied leaving only the pellet. 1000ul of ice cold 70% ethanol was placed in each tube. The tubes were then inverted a few times and centrifuged at 13,000 rpm for 10 minutes. The resulting supernatant was dumped in the waste and the tube containing the DNA

pellet was placed upside down on a drying rack overnight. After drying, 40 ml of vortexed 1x TE buffer was placed in the tubes. The DNA was stored at 4°C until use.

The DNA was used as a template for PCR using primers corresponding to the gene and a primer whose sequence matched one end of the T-DNA. Reactions were placed in a thermocycler and the reaction was repeated 35 times. DNA was visualized after agarose gel electrophoresis and staining with ethidium bromide. A picture of the gel was taken.

Visualizing the cell cycle in *briz* plant*:*

In order to visualize whether there is a difference in cellular activity between wild-type and *briz* mutant seeds, a transgenic plant line expressing a cell cycle marker protein called DB-GUS (beta-glucuronidase) (Masubelele et al., 2005) was crossed with a heterozygous *briz* mutant plant. The double mutant F1 plant was allowed to self-fertilize and F2 seed was collected. The F2 seed was planted to produce F2 plants, and at least 30 plants from a single cross were allowed to self to produce F3 seed. The F3 seed from each individual was collected separately. In order to identify plant individuals that are both heterozygous for the briz mutation and homozygous for the GUS-expressing gene, 50 seeds from each individual F2 parent plant (stored in a seed packet) were plated on germination media (GM) after being sterilized. Approximately 1 mg of seed from each individual was sterilized by submerging them in 1 ml of 30% bleach and 1 ml of 0.1% Triton-X/ml for 10 minutes. The solution was then drained from the seed and the seed are rinsed three times with sterile de-ionized water making sure the seed are swirled so that they are properly cleaned. 50 seed were plated and then placed under lights for 5 days. Wild-type seedlings from plates with a 3:1 ratio for wild type: *briz* were then removed from the plate with forceps, and laid on top of another GM plate. An X-gluc staining solution was placed on the root tips with a pipette, and the plate was incubated for 24 hours at 37 degrees C. The 0.1 M X-gluc solution is dissolved in N,N-Dimethyl Formamide. The GUS solution is the prepared by combining 500 ml of the 0.1 M X-gluc solution, 500 ml of 1 M NaPO4 at pH 7, 100 ml of 0.5M EDTA and 50 ml of 10% Triton-X-100. 3850 ml of sterile de-ionized water is added to bring solution up to 5 ml. Once the stain is added to the plated, the number of seedlings with blue staining at the root tip was counted. A parent plant that is homozygous for GUS gene exhibits blue staining at the root tip and in the cotyledons in 100% of the seedlings. If the parent plant is heterozygous, then 75% of the seedlings will stain.

***abi1-1 briz* material**

To address the question of how the *briz* phenotype changes in various genetic backgrounds, I tested the *briz* mutant phenotype in an *abi1-1* background. The material for this study was seed from a plant homozygous for the point mutation *abi1-1* and heterozygous for a *briz* mutation. The seed's surface was sterilized, plated on GM plates, and allowed to grow at room temperature under lights for 5 days. The number of *briz* and wild type seed were counted.

Results

The cell cycle in *briz* mutant embryos and seedlings

To study the effect of loss of the BRIZ protein complex on cell division, the first goal was to obtain plants heterozygous for a *briz* mutant locus, either briz1 or briz2 and homozygous for the cell cycle marker gene, CYCB1;1::DB-GUS consisting of a plant promoter, followed by DNA encoding a cell cycle regulated protein sequence, cyclin in- frame with the GUS protein. This marker gene will allow us to identify cells that are in the mitotic phase of the cell cycle. The encoded cyclin amino acids contain a destruction box (DB), which targets the DB-GUS fusion protein for degradation at the end of mitosis and throughout the G1 phase. Thus GUS stain is only present in cells actively dividing. The presence of the GUS protein is detected by an *in situ* activity stain, where cells expressing DB-GUS turn blue in the presence of GUS's substrate, X-gluc. GUS is only present and hence can only be visualized during the G2 phase of the cell cycle because the DB-GUS protein is degraded in all other phases of the cell cycle. Thus, only cells actively dividing are stained blue. In wild-type cells, strong staining was localized to both the root apical meristem and the shoot apical meristem where most cell division activity occurs during the seedling stage.

To obtain the necessary material, *BRIZ/briz* heterozygous plants were crossed to plants homozygous for the CYCB1;1::DB-GUS gene. The F1 plant was grown and selfed. F2 seed was planted and F3 seed collected. The F3 seed was plated and the number of *briz* embryos counted. One F3 seed packet for each gene (9845-10, for *briz1-1* and 9850-3 for *briz2-1*) gave 3:1 segregation wt:briz. F2 plant 9845-10 gave rise to F3 family 12790 and F2 plant 9850-3 gave rise to F3 families 12434 and 12925). Approximately 30 individuals of these two families were grown and seed collected. I screened seed from individuals of these two families were grown and seed collected. I screened seed from individual plants for whether they segregated for the *briz* phenotype and whether they were homozygous for the GUS gene as described in Material and Methods. Table 1 reports the results from the 12790 family. Table 2 reports the results from screening seed from family 12434. Individuals from the family 12925 are reported in Table 3.

In the first set of experiments, two individuals from 12434 (-33 and -35, Table 1) were identified as being possible *briz* heterozygote for the *briz2-1* mutation. The seed however, was in short supply and not germinating well. The decision was made to start over for *BRIZ2* from an individual that was shown to segregate for the mutation (9850-3) and for GUS staining, indicating it was a double heterozygote. Screening is currently being conducted on family 12925 that contains the *briz2-1* mutation and is showing segregation patterns of being heterozygous for the mutation (TABLE 2).

Two individuals containing the *briz1-1* mutation from family 12790 (-5 and -16) were identified. These individuals exhibited both segregation and staining patterns consistent with being heterozygous for *briz* and homozygous for the cell cycle marker GUS. A summary of the individuals screened is shown in Table 1. These two individuals were transplanted to grow plants to maturity to obtain sufficient seed for studies. 12790-5 became 12943 and 12790-16 became 12975. The seed from these individuals have been collected and is available for future work. The genotypes were verified in the next generation.

In order to get seedlings that were in a similar growth stage for comparison, wild type seedlings were incubated for 24 hours and the *briz* mutants were incubated for 2 weeks. Both sets of seedlings were stained in X-gluc solution to visualize cells that were in the G2 and early M phase of the cell cycle. Wild type seedling had staining only in the root apical meristem, no staining

was present along the root (Figure 1). However, *briz* mutants had staining throughout the root as well as the apical meristem.

Segregation of *briz* phenotype in the *abi1-1* background

Seeds from a parent that is either homozygous for the *abi1-1* or *abi2-1* mutation and heterozygous for the *briz1* mutations were plated to observe if the 3:1 ratio of wild-type:*briz* growth was obtained. Table 4 shows the data. The *briz* phenotype was scored after 7 days of growth. In the abi1-1 background, more *briz* seedlings were observed than expected, but in the abi2-1 background, the number of *briz* seedlings fit a 3:1. The same experiment was done with the *briz2* mutation. In the *abi1-1* background, the expected number of *briz2* seeds was observed. However in the *abi2-1* background, there were too many *briz* seeds to fit a 3:1. In this series of experiments, the control plating of *briz2* segregating seed also yielded more *briz* embryos and did not fit a 3:1 ratio. This could possibly be due to old seed that germinated poorly.

Discussion

Homozygous *briz* mutant seed fail to expand and turn green despite the seed looking normal. The absence of BRIZ seems to cause growth arrest during early germination. One early germination event is cell division in the root apical meristem of seedlings. We wanted to know if this normal cell division pattern occurs in the *briz* mutant embryos. Cell cycle regulated GUS protein was used as a cell cycle marker to visualize the number of cell and which cells were undergoing division. We observed the GUS staining was different than that of wild type seedlings. More GUS staining was observed along the root axis and there was less staining at the root apical tip than that of wild type. These results indicate that the cell division pattern in mutants is abnormal and suggest that the different cell division pattern could possibly be related to the subsequent growth arrest.

ABA causes growth arrest. We hypothesize that ABA responses could possibly be altered which cause growth arrest. To test this hypothesis, we introduced the *briz* mutation into two different ABA insensitive backgrounds. If *briz* seedlings are hypersensitive to ABA then in an ABA insensitive background then *briz* mutant seedlings should grow. We did not observe a reduction of the number of *briz* seedlings, in fact in some cases we observed more *briz* seedling and we don't understand why. The data we obtained does not support our hypothesis that placing the *briz* mutants in an ABA insensitive background would cause the mutants to grow. In order to make a definitive conclusion, more data needs to be obtained. More individuals in each genotypic class need to be analyzed and more seeds need to be scored for more robust statistics.

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Appendix

Table 1

Family: 12790				
Seed Packet	number germinated	no. not germinated	fit 3:1	# GUS +
1	50	0	NO	ND
2	50	0	NO	ND
3	36	14	YES	26
4	42	8	YES	24
5	41	9	YES	30
6	42	8	YES	24
7	34	16	YES	26
8	48	2	NO	ND
9	50	0	NO	ND
10	42	8	YES	24
11	36	14	YES	26
12	39	11	YES	24
13	35	15	YES	23
14	50	0	NO	ND
15	36	14	YES	22
16	33	17	YES	28
17	44	6	YES	1
18	50	0	NO	ND
19	43	7	YES	25
20	50	0	NO	ND

Table 2

Family 12434				
Seed Packet	# germinated	# not germinated	fit 3:1	# GUS +
1	49	1	no	no
2	38	12	yes	no
3	38	12	yes	no
4	42	8	yes	no
5	41	9	yes	no
6	39	11	yes	no
7	45	5	no	no
8	37	13	yes	no
9	43	7	yes	no
10	nd	nd	nd	nd
11	39	11	yes	no
12	40	10	yes	no
13	23	27	yes	no
14	44	6	no	no
15	48	2	no	no
16	40	10	yes	no
17	39	11	yes	no
18	83	21	yes	no
19	80	24	yes	no
20	nd	nd	nd	nd
21	75	29	yes	no
22	104	0	no	no
23	nd	nd	nd	nd
24	nd	nd	nd	nd
25	88	16	yes	no
26	80	20	yes	no
27	82	22	yes	no
28	104	0	no	no
29	104	0	no	no
30	104	0	no	no
31	104	0	no	no
32	104	0	no	no
33	84	20	yes	no
34	88	16	yes	no
35	79	25	yes	no
36	88	16	yes	no
37	nd	nd	nd	nd
38	104	0	no	no

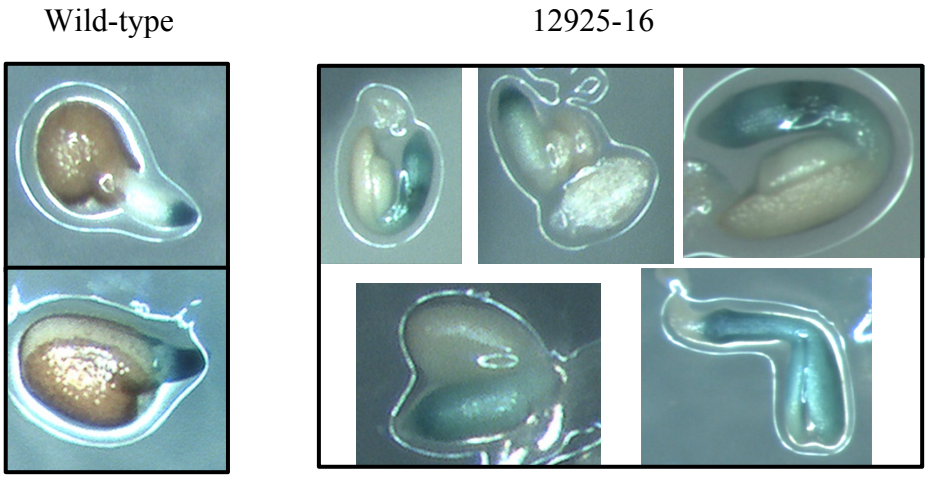
Table 3

Family 12925				
Seed Packet	# germinated	# not germinated	fit 3:1	# GUS +
7	52	0	no	
8	43	9	yes	17/30
9	40	11	yes	23
10	43	9	yes	0
11	43	9	yes	21
12	51	1	no	
13	52	0	no	
14	52	0	no	
15	45	7	yes	
16	86	18	yes	27
16	44	8	yes	
17	43	9	yes	0
18	49	3	no	0
19	51	1	no	
20	39	13	yes	15
21	52	0	no	
22	52	7	no	
23	52	0	no	
24	52	0	no	
25	52	7	no	
25	45	7	yes	
26	43	9	yes	
26	44	8	yes	
27	52	0	no	
28	43	9	yes	
28	42	10	yes	
29	52	0	no	
30	44	8	yes	
30	44	8	yes	
31	22	36	no	
31	31	21	no	
32	43	9	yes	
32	44	8	yes	
33	43	9	yes	
34	52	0	no	
35	nd	nd	nd	
36	52	0	no	
37	41	11	yes	
38	46	6	no	
39	38	14	yes	
40	43	9	yes	

Table 4

briz in various genetic backgrounds				
Plant #	genotype	# germinated	# not germinated	fit 3:1
10253-1	abi1-1 hmz briz1-1 het	65	39	no
10203-6	abi2-1 hmz briz1-1 het	75	29	yes
10201-9	abi1-1 hmz briz2-1 het	79	25	yes
10204-1	abi2-1 hmz briz2-1 het	59	45	no
7359-13	wild type briz2-1	61	43	no

Figure 1



Notes: *briz2* mutant embryos have abnormal cell cycles. Wildtype (left) seed were surface sterilized, plated and incubated in the dark for two days, then placed at room temperature under lights for 24 hours. (right) Seed from the parent 12925-16 were treated as above but incubated for 2 weeks. wildtype and *briz* seed were incubated in x-gluc solution then photographed.

Asian Americans in the 1980s: Japanese Business, the Model Minority, and Claims of "Unfair Competition"

Greg Loh

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History

The experience of Asians immigrants in the United States is closely linked to the state of relations between America and Asia. Gordon Chang described the shifting portrayals of Asians in U.S. mainstream media in his book, *Asian Americans and Politics*, explaining that Asian Americans "have been held up as models for change as well as moderation. They have been labeled hyperpolitical and apolitical, as well as super-threatening and super-loyal."[1] Chang demonstrated that rhetoric involving Asian Americans deviated drastically depending upon American-Asian relations. Although this pattern emerged in the nineteenth century, the alternating depictions of East-West relations were particularly salient during the 1980s.

The rise of Japanese automotive and electronic manufacturing businesses during the 1970s initially met guarded praise as the U.S. took credit for their rapid adjustment following World War II.[2] By the end of the 1970s, the acclamation expressed by the U.S. turned to trepidation. Deindustrialization, unemployment, and inflation contributed to depictions of Japanese business success as unfair. By the 1980s, Japan received the U.S. designation of an "unfair trading nation" with many politicians and economists concluding that their success represented a trade war.[3]

The portrayal of Asian American immigrants in the 1980s followed a pattern similar as that of Japanese businesses of the same period. The initial success of Asian Americans with university enrollment, elevated test scores, and high median income during the early 1980s led some to laud the achievements of the racial minority.[4] Asian Americans received the designation of "model minority" as the ideal for all racial minorities in the United States. However, the model minority

[1] Gordon H. Chang, *Asian Americans and Politics: Perspectives, Experiences, Prospects* (Stanford, Calif.: Stanford University Press, 2001). Print. 31.
[2] Sakoh, Katsuro. "Japanese Economic Success: Industrial Policy or Free Market?" *Cato*
[2] Sakoh, Katsuro. "Japanese Economic Success: Industrial Policy or Free Market?" *Cato Journal.* Vol. 4, No. 2. Fall 1984. Print.
[3] Nag, Amal. "Steel Firms Will File Unfair-Trade Cases; Upheaval in Market Seen for Some Items." *Wall Street Journal.* January 11, 1982. Print.
[4] Hagar, Philip. "Asians, Now 20% of UC Students, Outshine Others." *Los Angeles Times.* April 9, 1981. Print.

received praise only during the first two years of the 1980s and the congratulations generally accompanied warnings decrying their threat to American society. By 1983, positive mentions of the model minority ended following reports of Asian American student success reducing enrollment availability for white students at the nation's top universities. By the mid-1980s, Asian American student accomplishments received negative press similar to that of Japanese businesses. Pundits and politicians considered Asian student success "unfair competition" and concluded that the top universities needed racial quotas to limit their enrollment.[5] Close examination of the rhetoric employed in descriptions of the "model minority" and the success of Japanese businesses illustrated startling similarities. The effort to rationalize the accomplishments of both groups led to a dialectic simultaneously limiting their achievements and identifying them as a threat to white America. In this paper, I argue that by portraying both Asian American students and Japanese businesses as "unfair" policy makers and business leaders created a target for invective in both the economic and social spheres establishing traits that singled out Asians as a foreign other regardless of their citizenship.

The majority of American history contains negative depictions of racial minorities and immigration, making the few positive portrayals noteworthy. The emergence of the "model minority" classification described Asian immigrants in terms that placed them at odds with other racial minorities. The depiction of Asians in the United States as a "model minority" began in the late nineteenth century. Following the civil war, many Chinese immigrants settled in the South and sought work in the agricultural sector. These immigrants accepted lower wages than their black counterparts and represented the ideal worker because of perceived obedience and the lack of desire to strike. This sentiment was echoed in a statement by a southern planter in 1865 writing about Chinese labor, "He (the Chinese) is also usually honest, inclined to fulfill to the letter his contracts, and is not disposed to shirk or slight any labor or responsibility."[6] This depiction of the Chinese was the antithesis of the black labor opposition to harsh working conditions and low wages. However, these depictions did not last long, in 1870, giving lie to their representation as docile, the Chinese organized a number of general strikes, demanding higher wages and improved working conditions. Few of the Chinese stayed for the duration of their labor contracts and streamed into the surrounding cities. Not surprisingly, the rhetoric of the Chinese as an ideal work force ended abruptly.

The portrayals of Asians during the first half of the twentieth century largely targeted the negative impact of immigration on American society and labor. However, the 1950s witnessed a shift in the depiction of Asian Americans to a positive light. The civil rights movement in the 1950s and 60s again labeled Asian Americans as a model minority. Similar to the portrayals employed to oppose the agitation of black farm workers in the late nineteenth century, the 1950s depiction of Asians contrasted the struggles of blacks and Latinos. Gordon Chang stated that, "The 1960s literature… presented a triumphant story of minority immigrant communities overcoming adversity and achieving a high degree of social integration and economic success in American life."[7] Those opposed to civil rights for all, presented Asian Americans as the "model

[5] Bernstein, Richard. "Asian Students Harmed by Predecessors' Success." *New York Times.* July 10, 1988. Print.
[6] Moon-Ho Jung, *Coolies and Cane: Race, Labor, and Sugar in the Age of Emancipation* (Baltimore: John Hopkins University Press, 2006). Print. 78.
[7] Chang, *Asian Americans and Politics: Perspectives, Experiences, Prospects.* Print. 26.

minority" demonstrating that minorities can achieve economic success while remaining politically inactive. Although the efforts to stall the Civil Rights Movement ultimately failed, the contributions of Asians to the movement are widely viewed as nonexistent.

Following the fall of Saigon in 1975 and the end of the Vietnam War, tens of thousands of refugees from Vietnam, Laos, and Cambodia streamed into the United States. The refugees from Southeast Asia came in two large waves of immigration in 1975 and 1978. These immigrants were largely viewed as uneducated and unskilled. Animosity toward the Southeast Asians increased protectionist American rhetoric and suppressed the model minority stereotypes through the 1970s. However, by the early 1980s the model minority emerged as a wedge issue once again. An editorial in the *New York Times* in May of 1982, cited data from the 1980 census that Asians had the highest median family income of any ethnic group in the nation.[8] Of all high school graduates by ethnicity, Asians comprised 75 percent, whites 69 percent, blacks 51 percent, and Hispanics 43 percent.[9] Asian Americans outperformed all other racial groups, including whites, in education, university enrollment, and median income. Following the release of these numbers, the representations of Asian Americans as uneducated immigrants changed to descriptions of the highly successful and intelligent Asian. Politicians and anti-Affirmative Action proponents pointed to the success outlined in the 1980 census data and suggested the discontinuation of Affirmative Action programs. The use of the model minority stereotype in the 1980s contested the rights of minorities as it had in previous eras. However, in the 1980 depiction, Asian American student success represented a threat to whites as well as other racial minorities.[10]

The implications of a racial minority outperforming the white majority compelled many to consider the nature of the restrictions required to suppress Asian American progress. Beginning in the middle of the 1980s, top universities implemented quotas on Asian Americans limiting their enrollment. Once their quota on enrollment filled, all other Asian American applicants received rejections regardless of their qualifications. A State Auditor's report from October 1987 compiled UC Berkeley data concerning the incoming freshman class. It stated that white student enrollment dropped from 45 percent to 40 percent, while Asian students maintained a steady 26 percent over the years. The data by itself was not necessarily incriminating; however, high school grade point averages for newly admitted white students for that period averaged 3.62 versus a 3.72 for Asian Americans.[11] Despite the higher grade-point average, Asian American student enrollment did not increase. According to a San Francisco Chronicle staff editorial from December 1988, "(UC) Berkeley rarely accepted white or Asian American students without a high school grade-point average of 3.7 or 3.8, although virtually all blacks, Latinos and American Indians who apply are admitted with a grade-point average as low as 2.78."[12] When questioned about this disparity, most schools denied any bias and one UC Berkeley administrator

[8] Staff, "The New Asian Immigrant." *New York Times.* May 9, 1982. Print.
[9] Ibid.
[10] Staff. "UC Formula Born of Student Fear of Fee Hikes." *The San Diego Union*. December 21, 1986. Print.
[11] Associated Press, "State Auditor's Report- How Asians Fare in UC Admissions." *San Francisco Chronicle.* October 8, 1987. Print.
[12] Staff, "Hints of Bias by Colleges Against Asians." *San Francisco Chronicle.* December 1, 1988. Print.

went so far as to say, "I don't know why the Asians keep making an issue" out of the purported discrimination. "All they're doing is drawing attention to the fact that Asians make up 26 percent of our freshman class and adding to the frustrations some white parents feel."[13] This university administrator illustrated the growing backlash against Asian American success. The rhetoric used to describe Asian immigrants fed the belief that their achievements infringed upon white student enrollment.[14]

To explain the success of Asian American students, some attributed a combination of hard work, intellectual focus, and discipline. However, dismissing these simple explanations, numerous experts, analysts, and news articles searched for answers that demonstrated an unfair competitive advantage held by Asians. The *San Francisco Chronicle* in 1989 suggested that Asians were genetically superior and do not share the "right brain left brain dichotomy that limits conventional human reasoning."[15] The descriptions of Asian American students throughout the 1980s employed language that suggested a difference in the makeup of the Asian mind. By describing these students as "focused, hardworking, and single-minded," experts built an image of the singularly driven Asian student.[16] While innocuous in its description, this language fueled the idea that Asians succeeded because they focused on school to the exclusion of everything else. The argument suggested that the while the average white student may have lower grades and test scores, they balanced extracurricular activities like clubs and athletics and a social life, while their Asian counterparts only concerned themselves with academics.[17]

The backdrop for the fears of Asian American student achievement was the apprehension of Japanese economic domination in the late 1970s and 1980s. These anxieties featured prominently in the American consciousness and led to alarmist rhetoric concerning a business invasion of the United States. Not content to attribute Japanese achievement to business acumen, auto industry executives and politicians searched for alternative explanations. Throughout the 1980s, major mainstream news publications in the United States invoked the language and imagery of war to describe Japanese business. Terms like, "trade war, weapons of trade, and economic violence" and equating certain imports as another "Pearl Harbor" clearly identified Japanese businesses as a threat to America.[18] Many believed that if unchecked, Japanese businesses would soon become majority shareholders in the most influential businesses in America.

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[13] Lindsey, Robert, "Colleges Accused of Bias to Stem Asians Gains." *New York Times.* January 19, 1987. Print.

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[17] Lindsey, Robert, "Colleges Accused of Bias to Stem Asians Gains." *New York Times*. January 19, 1987. Print.

[18] Russell, George, Gisela Bolte, Barry Hillenbrand, and Christopher Redman. "Trade Face Off A Dangerous U.S.-Japan Confrontation." *Time Magazine.* Vol. 129, Issue 15. April 13, 1987. 28.

Japanese companies became the scapegoats for the failing American auto industry. Despite antiquated business practices, an inefficient supply chain, and overly expensive manufacturing lines, the American auto industry blamed Japanese companies for their failings. Lee Iacocca, chairman for Chrysler, in a speech in Detroit in 1985, accused the "Insidious Japanese economic and political power within the United States" as the cause for "Unemployment, closed plants, and lost tax base."[19] Politicians and news outlets created strong anti-Asian sentiment at home by echoing the sentiments expressed by Iacocca. In a curious parallel to the model minority as a threat to racial minorities, Japanese businesses received a similar accusation. A *Wall Street Journal* article in April of 1988, accused Japanese businesses of deliberately shunning black labor by building automobile manufacturing plants in rural towns.[20] The author argued that by building in small towns, the Japanese intended to employ white workers while blacks and Latinos lost their jobs in the urban U.S. plants.[21] This article made a connection between Japanese business investment and racism. It appears that by shifting the threat of Japanese success from the economic to the social, the author intended to foment wider opposition to continued Japanese investment.

By the mid 1980s, the effort to blame the Japanese for the woes of the U.S. economy fell short, and a push to understand the success of Japanese businesses began. Some experts pointed to the business practices that included lean manufacturing, employee wellbeing, and just-in-time supply-chain management for their success. However, instead of examining business practices, many focused on the foreign nature of the Japanese culture, emphasizing the differences between western and eastern ideals. For those searching for answers to Japanese accomplishments, they looked no further than the feudal legacy of the samurai. The warrior code, *bushido*, fit the rhetoric of western xenophobia and neatly explained how Japan waged an economic war with financial control of the United States as the prize.[22] Those employing the language of war in their descriptions of Japanese business achievement used this explanation as justification for increased sanctions against Japanese trade.

With American businesses adopting the principles of Asian society by reading Sun Tzu's *Art of War* and Miyamoto Musashi's, *Book of Five Rings,* experts explored the nature of the Japanese people to understand their business productivity. In a manner similar to that of the investigation into the success of Asian American students, inquiries into the differences between Japanese and American labor began in earnest by the mid-1980s. A study examining the education system of the Japanese explained that it created students for "sustained commitment and hard work," and they learned skills only to "serve them in the labor force."[23] An education system whose sole purpose was to educate and train laborers for their national economic machine alarmed some Americans. However, the conclusion of the study stated that the education system developed a "capable worker and a broadly literate population," but students in the system failed to develop

[19] Iacocca, Lee. "The Insidious Japanese." Detroit, MI. 1985. Keynote Address.
[20] Schlesinger, Jacob M. "Fleeing Factories: Shift of Auto plants to Rural Areas Cuts Hiring on Minorities." *Wall Street Journal.* April 12, 1988. Print.
[21] Ibid.
[22] Boaz, David. "Yellow Peril Reinfects America." *Wall Street Journal.* April 7, 1989. A14.
[23] Fiske, Edward B. " Study, Drawing Lessons for U.S., Cites Rigors of Japanese Schooling." *New York Times.* January 4, 1987.

creativity.[24] This study presented a Japan whose labor force needed the management skills of the United States, simultaneously belittling Japanese labor and reinforcing white superiority.

The results of the depictions of Asian American students and Japanese businesses as unfair competition led to discriminatory practices. The protectionist rhetoric toward Japan echoed the fears of Asian American student success. Just as the increasing domination of Japanese businesses in the United States led to trade sanctions and an increase in tariffs, the increase in Asian American university enrollment and elevated test scores led to talk of enrollment quotas by race. Clamors for discriminatory admission practices against Asians began in 1981 as demonstrated by a report in the *Los Angeles Times*, "(Universities) acknowledge the possibility that a form of reverse discrimination could emerge as Asians increase in number and continue to dominate certain fields."[25] While illegal to install quotas targeting Asians specifically, a de facto quota system developed in the nations top universities.

In 1986, Congress passed an extremely restrictive trade bill aimed to stifle Japanese businesses and the importation of foreign manufactured goods. Applauded by many as a triumph for American business, President Reagan realized the interconnected nature of the American and Japanese economies meant that stifling trade would negatively affect the United States. He vetoed what he called, "Kamikaze Legislation" that would send the America economy into the "steepest nose dive since the Great Depression."[26] Although this legislation eventually faltered, the passage of this bill through Congress illustrated the irrationality of the anti-Japanese sentiment in the United States and paved the way for additional protectionist legislation. To limit Japanese trade, the United States passed a number of tariffs and in 1989, President Bush named Japan an "unfair trader" because of the success of their semiconductor industry and what they believed was Japan "dumping" cheap semiconductors on the American market.[27] An article in the *Atlantic Monthly*, pushed for quotas limiting Japanese imports, echoing a similar call for university quotas against Asian American students.[28]

While not as obvious as the measures adopted to limit Japanese businesses, universities throughout the United States instituted practices to limit Asian American student enrollment. Recognizing that Asian American students excelled at standardized testing and playing on the media depictions of the single-mindedly focused Asian, universities changed their criteria for enrollment. They stopped judging student ability solely on grade-point averages and test scores, instead extracurricular activities and volunteer work received additional consideration. A *New York Times* article from July 1988 explained additional standards for admissions, "Extra points toward admissions are awarded applicants who score well on foreign language achievement

[24] Ibid.
[25] Hagar, Philip. "Asians, Now 20% of UC Students, Outshine Others." *Los Angeles Times.* April 9, 1981. Print.
[26] Merry, Robert W. "Reagan Terms House-Passed Trade Bill 'Kamikaze Legislation' and Vows a Veto." *Wall Street Journal.* May 30, 1986. Print.
[27] Powell, Jim. "Super-301: The Economic Equivalent of Civilian Bombing." *Wall Street Journal.* May 30, 1989. Print.
[28] Fallows, James. "Containing Japan." *The Atlantic Monthly.* May 1989. Vol. 263, No. 5. Print. 40-55.

tests. But the tests are not offered in Asian languages."[29] Universities adopted numerous measures limiting Asian American enrollment eventually forcing the Department of Education to investigate allegations of racial discrimination. The Chancellor of the University of California Berkeley, Ira Heyman acknowledged after years of denial that Asian American students had experienced discrimination. In April of 1989, "A joint statement by Heyman and the Asian American Task Force conceded that certain admission policies have harmed Asian American applicants but added that important steps have been taken to remove the bias."[30]

Throughout the 1980s, the mainstream media qualified the accomplishments of Asian American students and Japanese workers by employing language identifying them as individually focused, incapable of success in multiple areas. The model minority as racial construction belittled the accomplishments of some Asians while marginalizing the struggles of others. By attributing Asian achievements to a cultural upbringing that whites did not possess, U.S. businesses and universities identified Asian advancement as "unfair" and installed measures to limit their expansion. The most important element for consideration was the construction of the Asian American as an "other" that threatened white dominance. The model minority portrayal historically opposed the efforts and agitation of other racial minorities; however, by employing rhetoric linking it to a foreign power, the model minority became a threat to American society.

Although the news reports of trade wars and the next Pearl Harbor ended in the 1990s, the cyclical nature of discrimination and accusations continue. Instead of Japanese business as the culprit, the rise of China threatens U.S. sovereignty. However, one thing remains constant, these sentiments continue to target Asians. Since the 1980s, the interconnected nature of the model minority and U.S. foreign relations place Asian Americans in the path of many who look to assign blame for the woes of the economy and society. While the rhetoric of Asian American students as a threat to white students has become less prominent, the practice of discrimination through university racial quotas continues. Recent reports by the *New York Times* and the *Wall Street Journal* illustrate that top universities continue to limit Asian American student enrollment. The clear connection between the portrayals of Asian Americans and Japanese businesses in the 1980s illustrated the connection in the eyes of the public that little separated Asian American citizens and foreigners. Unfortunately, as Robert Park stated, Asian Americans are stuck with their "racial uniforms" forever delineating them as foreign.[31] Evidence demonstrates that regardless of the number of generations separating immigration and the loftiness of the achievements attained, Asian Americans are regarded as foreigners whose influence needs to be limited.

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[29] Bernstein, Richard. "Asian Students Harmed by Predecessors' Success." *New York Times.* July 10, 1988. Print.

[30] Sandalow, Marc. "UC, Asian Americans Reach Accord in Admissions Fuss." *San Francisco Chronicle.* April 7, 1989. Print.

[31] Park, Robert E. "Racial Assimilation in Secondary Groups with Particular Reference to the Negro." *Papers and Proceedings, Eighth Annual Meeting of the American Sociological Society, 1913.* 1914. Vol. 8. Print. 71.

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Sex and Social Differences of Kappa Opioid Receptor activity in the California Mouse

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Mentor: Brian Trainor, Ph.D.
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Introduction

The Stress affects individuals differently and the ways individuals cope with stress varies widely. The effects of stress can be observed at many levels, including social, emotional, mental and physiological. Stress has been linked to cancer, obesity, memory and health problems Stress related problems such as depression are twice as likely to be diagnosed in women as in men even though most research done on depression is done on males. Part of the reason for this is that there are very few species in which both males and females experience stressful situations that allow us to study stress. The monogamous California mouse (Peromyscus californicus), is unique in that both females and males defend their territories in the wild aggressively [4]. The social defeat paradigm allows researchers in the lab setting to replicate this natural behavior and assess the degree to which losing aggressive encounters is stressful. After three episodes of social defeat, losing a confrontation with a conspecific, females but not males show a significant reduction in social interaction behavior [2]. A social interaction test measures the amount of interaction time a specific mouse spends with a novel mouse. The social interaction test, allows the measurement of social or anxiety like behaviors. It is important to note this sex difference since both males and females exert aggressive behaviors such as biting and chasing yet males show an unsusceptible phenotype to this form of stress. At this point something internally is inhibiting males from decreasing social interaction behavior after stress as females show.

Understanding the effects of stress and its effects on mental disorders has motivated the study of kappa opioid receptors and whether it mediates the effects of stress on social withdrawal. The endogenous opioid, dynorhpin, binds to opioid receptors; the kappa opioid system has been implicated in stress responses [5]. When kappa opioid receptors are activated in animals you witness behaviors that resemble aspects of depression, one of these responses is social withdrawal. Social withdrawal is the term used to describe the opposite behavior of social interaction. In many species, social stress can lead to withdrawal from social engagement. Social stress decreases social interaction behavior. Knowing this can give insights into the mechanism underlying depression. Social stress is used as a model to look at the neurobiological effects that could give us insight into the mechanism underlying depression. The first aim looks at the effects of stress on activation of P38 MAP kinase during the social interaction task. The second aim

targets the kappa opioid receptor activation on social interaction using the kappa opioid agonist U50 488. The final aim looks at the sex differences during a conditioned place aversion task.

Background

One of the dopaminergic pathways in the brain is the mesolimbic dopamine system. The mesolimbic dopamine system is usually thought of as reward system but it has been shown to be activated during stressful situations as well [2]. The system is not solely activated by pleasurable acts or reward, which suggests that the system is activated by aversive factors such as stress. One of the components of the mesolimbic dopamine system is an anterior brain region, the nucleus accumbens (NAc) made up of neurons. Interestingly social interaction behavior is negatively correlated with activity in the nucleus accumbens. Neurochemically, when stress occurs, dopamine producing cells in the ventral tegmental area (VTA) release dopamine in the nucleus accumbens. Once dopamine has increased there is activation of the D1 receptor that then stimulates dynorphin expression. Dynorphin is an endogenous opioid, and exert its effect primarily via the kappa opioid receptor. When the kappa opioid receptor becomes activated the subjective effect is dysphoria. Dysphoria is characterized by intense feelings of depression, isolation and indifference to ones surroundings. Kappa opioid activation translates to the phosphorylation of P38 MAP kinase (p38), a protein responsible for the cellular responses to stress. I quantified these cells as an indirect marker of KOR activity. Not only did we want to see the neurochemical response to stress but also what behaviors are correlated with kappa opioid activation. Our study used the conditioned place aversion behavior test to assess whether an aversion was caused by kappa opioid activation in females and males.

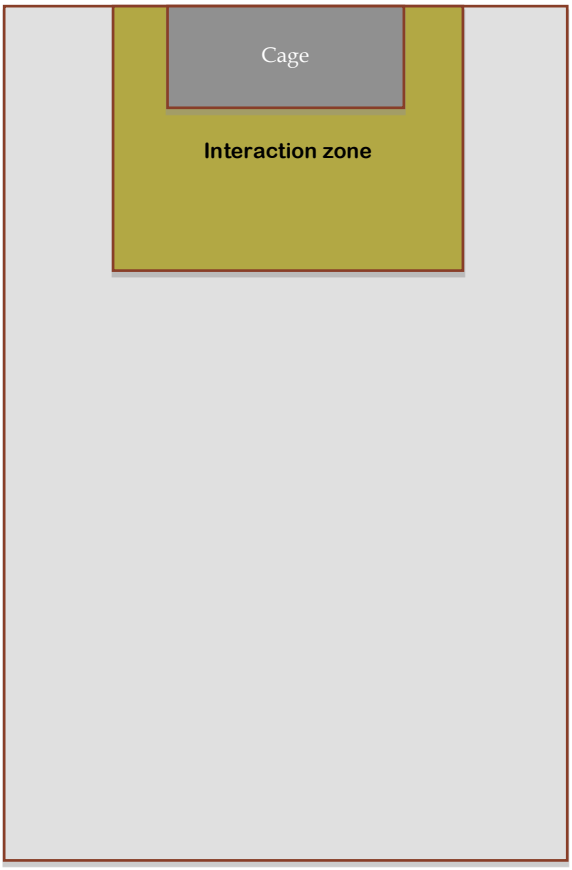
Methods

Animals: For our study we used California mice (*Peromyscus californicus*) that were bred in our laboratory colony at UC Davis. Mice were housed with one or two other cage mates in cages with sani-chips. All mice were at least three months old at the time of study. The conditioned place aversion test consisted of females and males all of which are randomly assigned to one of two groups, the experimental and the control. Mice are then either given an injection of vehicle, 2.5, 5 or 10 mg/kg of U50 488 agonist. Intraperitoneal injections were given to all mice on all three days of injections. Intraperitoneal injections are preferred for the injection of systemic drugs because it is injected directly into the peritoneum, which is easily absorbed by the bloodstream.

Social Defeat: The California mouse is unique in that both females and males defend their territories aggressively. This behavior allows researchers to look at the effects of social stress in both males and females. Social defeat, although it does not cause wounding or injury it is stressful. Mice are randomly assigned to an experimental group that will get stressed through three episodes of social defeat. The control group is placed into empty cages to account for the variable that all mice are essentially being placed into a new cage during the tests. Test runs for a total of seven minutes or until mice have been “bitten/chased” seven times. Mice are always removed before there is any serious injury or wound on focal mouse.

Social Interaction Test: Mice were tested in three separate three-minute tests to assess their social interaction behavior (figure to the right). This test was done with the lights off during the active phase of this species. Social interaction behavior is defined as the time subjects spend in the interaction zone, or within 8 cm of a small cage containing an unfamiliar, same sex mouse. The social interaction test consists of an open field that is a rectangular box with measurements 89x63x60 cm. Mice are first introduced into the open field for 3 minutes, time in which they get acclimated to this new environment which they have never been exposed to. After the first three minutes have elapsed the mice are in the second trial called the acclimation phase in which an empty 14x17x14.5 cm cage is introduced to the rectangular open field and is placed in the middle of one of the widths. They are given three minutes to explore and get acclimated to this new object in the apparatus. Once the three minutes have elapsed a novel mouse is placed into this novel cage. This is called the interaction trial in which interaction behavior is observed on behalf of the subject. Across species a novel object such as this unfamiliar, same sex mouse should be of great interest to the subjects. The program software used for the social interaction test is Any Maze which records all three trials. This includes time spent in marked spaces such as corners, the cage, the interaction zone, which is in front of the cage and the sides of the apparatus. It also records distanced traveled within the apparatus and the number of cage entries (approaches) the subject performed. Having all of these distinct data points allows the analysis to incorporate different aspects of what different behaviors can tell us about the mice [2].

Euthanasia and brain extraction:
Following the social interaction test mice are euthanized with isoflourane. Mice are decapitated and brain is collected immediately and put into 5% acrolein in PBS. Twenty-four hours later brains are switched into 20% sucrose. Approximately twenty-four hours after they have been put into sucrose they are washed in PBS, blocked at cerebellum and flash frozen (stored at -40C).



Immunohistochemistry: This is a three-day process used for the detection of antigens such as proteins, in this case phosphorylated P38 MAP kinase. Brain tissue was extracted and preserved with 5% acrolein to conduct immunohistochemistry. P38 MAP kinase antibody was used to detect endogenous levels of p38 protein in the nucleus accumbens. Brain tissue assessed was from mice that had been stressed via social defeat two weeks prior to being tested on the social interaction test and mice that were controls, hence had not been socially defeated. Photomicrographs were taken of various brain sections based on the mouse

brain atlas with a Zeiss AxioImager Microscope. Pictures were taken at 40x of the nucleus accumbens. P38 cells were counted near the anterior commissure and quantified.

Conditioned Place Aversion: This test conditions an animal to a cage based on the treatment they are given; they will associate the treatment with the assigned cage. There are three chambers, consisting of a center chamber (cage 1), cage 2 and cage 3. All of which have distinct cues that allow associations to form. In this test mice are placed in a three-chambered apparatus consisting of a center chamber in which they are introduced and allowed to navigate into two other separate cages, which are distinguishable, by tactile and visual cues. The first day of testing records the time they spent in each of the separate cages with the program Any Maze. Given the amount of time spent in cages 2 and 3, which will be the cages they will be conditioned to, a preference is determined. The cage they prefer will be their "conditioned" cage in which they will be given the agonist U50, 488. We expect they would have an aversion to this selective KOR agonist. Since we are assessing a conditioned place aversion we expect mice to have an aversion to the cage they are conditioned to and on the first day had a preference for. The "unconditioned" cage is where they will be placed after injecting them with the vehicle injection. There are two conditioning days. Each of the two days they are given 2 injections. The vehicle injection takes place in the morning, followed by being placed into the assigned "unconditioned" cage. After the second injection, consisting of one of the experimental injections, the subject is placed into the "conditioned" cage. On the fourth day they are allowed to explore the entire apparatus as in day one. Whether an aversion has been established is tested on the last day. Each test runs for a total of thirty minutes, apparatus is cleaned with quatricide after every test, and mice are returned to their home cage after the test is over.

Results

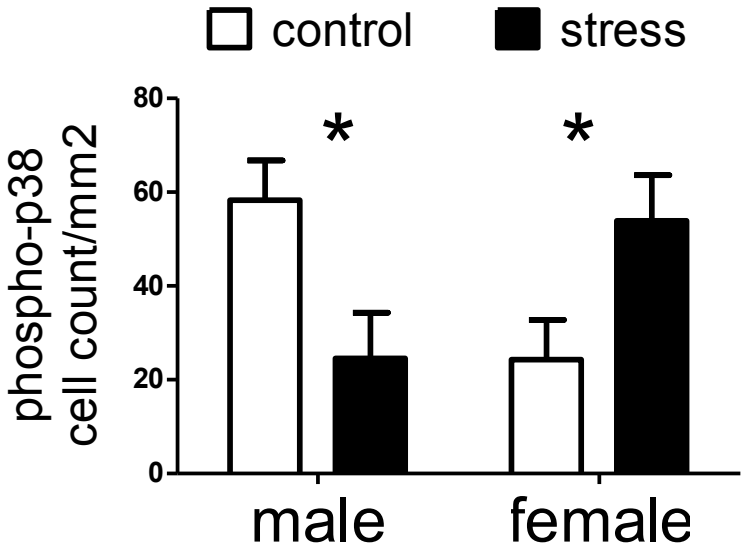


Figure 1

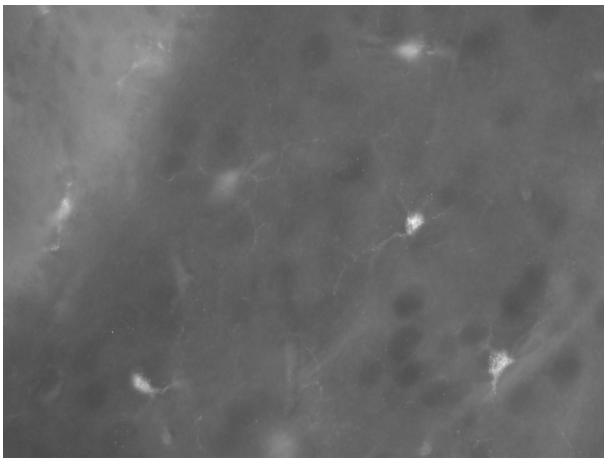


Figure 2

Stressed females but not control females showed significant elevations of phopho-p38 in the NAc. Stressed females showed an increase in phospho-p38 cells in comparison to stressed males (Figure 1). Figure 2 is just one of the many pictures of phosphorylated p38 in stressed mice; the white neurons are p38 MAP kinase. After mice are tested in the social interaction test, the amount of time spent during the interaction trial is subtracted from the amount of time spent in the acclimation trial. This is to account for the differences in being exposed to a novel object such as a small cage versus being exposed to a novel mouse within that novel cage. Any Maze software allows us to look at different variables within the social interaction apparatus such as time spent in the corners and the total distance traveled during the test. Evaluating the time spent in the corners gives us insight into whether the test provoked anxiety like behaviors or these behaviors were due to the agonist U50, 488. Total distance traveled within the apparatus and comparing it across the three different trials allows us to look at motor effects due to the KOR acting agonist.

After testing mice for a total of four days on the conditioned place aversion test; data analysis was conducted by looking at the total amount of time spent on day 1 in the three separate chambers. Their initial preference was determined by the amount of percent time spent in a specific cage. Whichever cage was preferred that became the conditioned cage in which they would receive one of the four injections. Whichever cage was the non-preferred that became their unconditioned cage in which they were all given a vehicle injection in the mornings of days two and three. The goal of the conditioned place aversion test is to test behaviorally if a certain drug produces an aversion. On days two and three we condition the mice to the cages where we give them their treatment. On day four, test day, an aversion is assessed by taking the amount of time spent in the preferred/conditioned cage on day four minus the time spent in the preferred/conditioned cage on day one. At a low dose of U50, 488 females showed an aversion, while males at a high dose show an aversion (Figure 3).

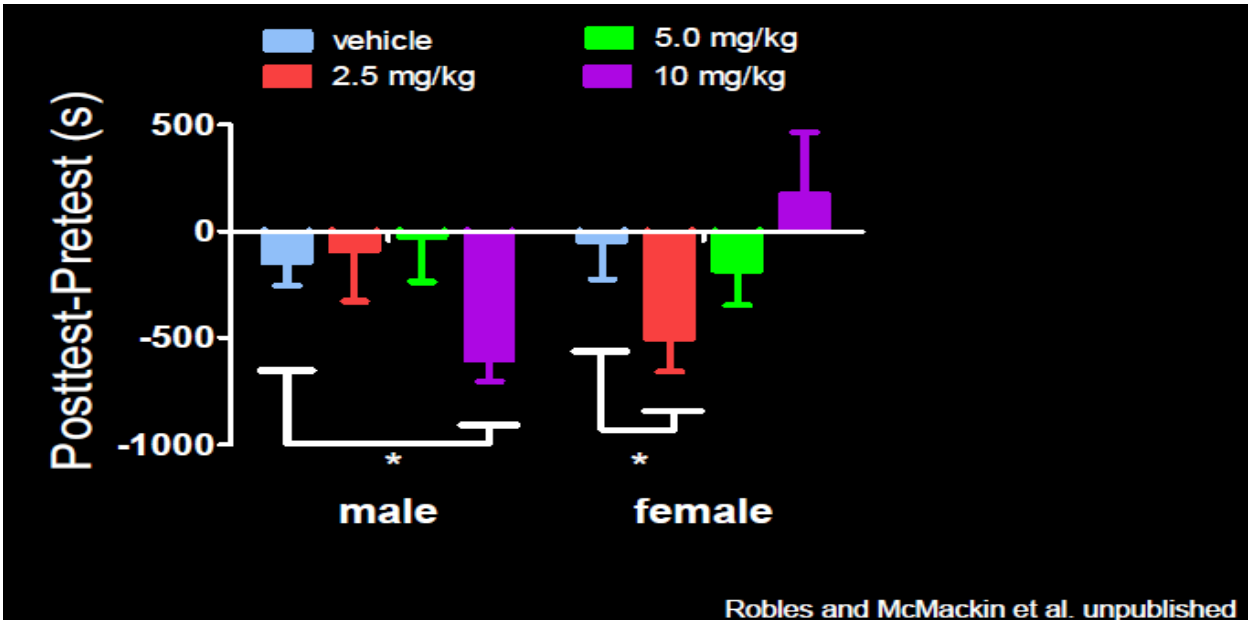


Figure 3

Conclusion

In regards to the phosphorylation of p38 in the NAC, although we do not understand why an increase in p38 cells was observed in control males, interestingly control males have more dopamine, more HVA (a dopamine metabolite), and more pCREB positive cells in NAc following social interaction than control females. This phosphorylation of p38 was only found for mice that were exposed to 3 episodes of social defeat. On the conditioned place aversion test we found a preliminary sex difference due to sensitivity of the kappa opioid agonist U50, 488. A dose response at 2.5mg/kg was found to cause in aversion in females. An aversion was also present in male mice but at a higher dose. We will look at the brains of mice in the social aversion test to assess p38 signaling. All in all our study suggests that long term kappa opioid signaling could be affected by social stress in both males and females. Yet we cannot conclude that it is kappa dependent. Further studies need to assess if social withdrawal is kappa opioid dependent and if the effects can be blocked by an antagonist. This pathway is important because the preliminary findings suggest it to be affected by stress, sensitive to kappa opioid and could affect males and females differently. This is important given that mental disorders seem to affect men and women in different ways and frequencies. Further studies could lead to the development of medication for mental disorders.

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Understanding the “Shaft” in Hip Hop: A Socio-cultural and historical Perspective

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Introduction

Shaft is a movie adaptation of a 1970 novel by Ernest Tidyman. Directed by Gordon Parks, this Blaxploitation picture captures the transition between the Civil Rights and Black Power eras and is set against the backdrop of Black inner-city life in postindustrial America. Although *Shaft* projects the message of personal liberation, Park's film illuminates the urban or inner city ghetto malaise.

To understand *Shaft*, I intend to explore the imperatives surrounding the movie industry, particularly Hollywood, that catalyzed the rise of Blaxploitation movies (Hollywood movies starring mostly Black cast in the 1970s), and also launch into the broader structural and cultural issues that framed blackness or African American representation in movies. This paper will deal broadly with the aforementioned issues and narrow on the themes of masculinity of the African American male, and also survival, and in particular, attempt to contextualize the community that produces “Shaft”. The community mentioned refers to the inner city ghettos aptly illustrated by the New York in which Shaft lived, and which was portrayed in the film.

Background

Historical roots of Black masculinity and inner city crises

As Henry L. Taylor observes in “Historical Roots of the Urban Crisis: African Americans in the Industrial City,” a deeper understanding of the relationship between black experience in the industrial city and the contemporary urban crisis makes for a better context of the resultant malaise. The focus of the discussion of the aforementioned topic by scholars from varied disciplines has been, for the most part, pivoted on the postindustrial city (Taylor & Hill 2000). The Great Migration engendered the inner city African-American demographic, but it is important to note that there is the perennial underlying theme of struggle for social justice, asserting African-American masculinity and the quest for the formation of the black community.

It is therefore necessary to note that the focus of Taylor and Hill was expressly on “agency, community building, and the struggle to shape federal labor and the New Deal policies,” directed

toward the goals of the individual, inclusive the maintenance of home and family. Agency in this context means the action(s) of the collective in politics, protest and community building (Taylor & Hill 2000). We see the pattern that legislation is the first step in instituting the types of changes—social, economic and otherwise; but often face stiff resistance by the existent status quo. Just like New Deal policies faced strong revulsion by "the color occupational system" with its "castelike" contours (Taylor & Hill 2000), the civil rights and post civil right era were accompanied by similar challenges aimed at resisting legislated change.

Engaging the historical context of the movie, it is fitting to understand that it comes almost at the heels of the civil rights era and at the rise of Black Power. I find relevance in the analysis by Gail Garfield in his book "Through our Eyes." This movie comes out in 1971 and clearly captures the realities of actualizing the victory of the Civil Rights Act to a rather resenting white establishment. This is how Garfield captures this striving by African Americans under the topic "I AM MAN":

> In 1968, hundreds of black workers went on strike against the city of Memphis, Tennessee. They were protesting the both the conditions under which they were forced to work, and the $1.04 hourly wage. During the protest they wore signs around their necks that simply said: "I am Man." The meaning was neither obscure nor ambiguous. With dignity and determination, the garbage workers offered a clear, unified and defiant message to both themselves and the white power structure in the city. No longer would our manhood be compromised, labor undermined, and justice denied (Garfield 2010).

The lingering oppression and injustice that corrodes the masculinity and dignity of African Americans was largely reticent in the mainstream movie industry (Hollywood). Hollywood chose to take a more conservative and gradualist approach to representing the condition of African Americans vis-à-vis the social and cultural changes and/or challenges that faced the Union—continental United States. It is this yearning for black power, the lack thereof, or strivings for such, that informed the militancy of the Black Power Movement. The anxieties, and often brutal realities characterizing powerlessness and entrapment should be viewed also as we look at the effectual relationship between individualism and community, both as being agency of protest and change.

But as I mentioned earlier the struggles for uplift, social, political and economic justice are rooted in the history of slavery, post-civil-war reconstruction thru the civil rights era to today. E Marvin Goodwin in his work, "Black Migration in America From 1915 to 1960," terms the movement of blacks particularly from the south into northern cities, "an uneasy exodus." Goodwin indicates that one of the outspoken critics of the "out-migration movement" was Frederick Douglas who wrote a letter in the Greenback Party paper *The National Review* opposing with vehemence the exodus that, to him, was testament to the fact that blacks and whites were incapable of living together in peace and prosperity (Goodwin 1990).

It is clear why this exodus was inevitable. The out-migration of blacks in 1879 elicited strong, sometimes violent, reaction from southern elite from local up to the federal level (Goodwin 1990) and though there were those like Douglas who saw some incremental progress in the

condition of colored people, the reality on the ground at the time as presented by writers like William Wells Brown in *My Southern Home* was a clear dichotomy. Brown's position was that if blacks did not feel secure or enjoy the safety and opportunity for advancement offered to other citizens, it was time for them to go where they would be offered such opportunities.

The 1879 migration was such a serious crisis especially for Mississippi, Louisiana, and North Carolina that it engendered a senate committee investigation. In December of that year, the senate select committee released its findings, which essentially absolved the Southern establishment of any wrongdoing and blamed the out-migration on Northern politicians and Negro leaders. The offer of large amounts of aid in the North and the Republican Party got the bulk of the blame. There was categorical denial of socio-political or economic oppression insisting that the appalling condition of tenant farmers was a necessity for maintaining the status quo (Goodwin 1990). However, there was a minority report that reinforced the degrading status of blacks to the United States Senate.

Most of the blacks that migrated to big cities in the North, like Kansas and Missouri, were not prepared for the weather and had little by way of personal possessions (Goodwin 1990). Charity and Church were the lynchpin on which communities were built. One such organization, the Kansas Freedman's Relief Association K.R.F.A., launched an appeal that was national in scope and raised money for the urgent need of food, shelter and clothing for "Refugees"—blacks, as they sought to make communities and build new homes (Goodwin). As I deal into more depth with the derogatory objectification and otherness of African Americans in their constant bid for individual as well as community uplift or betterment, it is incumbent that such social and historical bases of American racism are understood. Also noteworthy is that movies and the depiction of intersecting race and class constructs are only symptomatic of these realities.

Discussion

Framing blackness as "other"

Melanye T. Price drives this reality home in the introduction to her work "Dreaming Blackness: Black Nationalism and African American Public Opinion." Price runs through a litany of ways the African American can be "othered," from phenotype self-consciousness, bussing to summer school science programs into "white space," to whether we call Hurricane Katrina victims refugees, or quiz if President Obama is not African American or patriotic enough and wears a flag pin or not (Price 2009). Watching television during the Katrina catastrophe it was easy to see such characterizations as "looters" and desperate people looking for food in black and white, respectively. The resurgence of the "Birthers" movement (a group that believes President Obama was not born in America and therefore should not be president) only alludes to and frames his otherness in less-covert ways, and speaks to the age-old underlying problem that is the mantle of being black or colored in America.

Ed Guerrero's "Framing Blackness" lays out the historical basis for Blaxploitation as spurred by the Black Arts Movement, symptomatic of the need for the reality of African Americans to be reflected on screen, not as dictated by the dominant culture which scripted their lives in ways that will fit the romanticized social prism(s) in which they wanted blacks cast (Guerrero 1993).

The idea of having the "good" "servile" black man or "Tar baby" like the "Coons," "Bucks," "Rastus," and other such nomenclature before them was constructed for African Americans seen as 'sellouts'. Such characterization squarely fit the shoulders of Sidney Poitier, who had been the number one box office star in Hollywood by the time *Guess Who's Coming to Dinner* was released in 1967(Guerrero 1993). In his "Guess" character, like most of his movies, Poitier played the role of a successful or tolerant and tolerable black man (to the dominant white culture) getting into an interracial marriage with a White girlfriend she met on foreign soil in San Francisco. The most intimate the lovers got was a kiss reflected in the rear view mirror of a taxicab. That was exact manifestation of the gradualist approach of the Civil Rights Era in a time when the social dynamics in inner city America quite belied that catharsis. Poitier, in essence, became an anachronism. The object of Hollywood was to use simple and predictable narratives while staying politically conservative at the time (Guerrero 1993). The African American community was looking for their real reflection mirrored on the silver screen. To this end, Guerrero notes roles such as Woody Strode's in *Che'* 1968 or the supporting roles of Bernie Casey and Dick Bass in "Tick, Tick, Tick" and "Grasshopper," respectively, in 1970 were very notable (Guerrero 1993) and spoke to the striving of the African Americans via such movements as the Black Arts Movement for representation, adequate albeit, in Hollywood.

We can also borrow from history again to understand the root of characterization(s) of African Americans, in that while there is the constant quest to integrate into the dominant American culture, their contributions to pop culture have always been framed within the lenses of otherness. In *Toms, Coons, Mulattoes, Mammies & Bucks* (1973) Donald Bogle gives us a vivid evolution of the characters constructed for stereotypical and otherwise nefarious reasons to demarcate, tokenize, or plainly dehumanize the colored, especially black folk.

From *Uncle Tom's Cabin (1913)* to The *Birth of A Nation (1915)* we see consistent and concerted efforts to emphasize fear of the other and the traits that make African Americans not suitable to be integrated in the greater American society. The "place" or "placing" of African Americans as they seek individual or community uplift or integration is inextricable from whatever is considered popular culture in America. The transformation in what has been a checkered history, to say the least, has seen the constant pull and push that has had a reactionary effect, which spurred growth and sometimes wrought change (in)advertently.

The rise of the Black film industry in the 1920s and 1930s could be seen as not unconnected with reacting to the racism of White movie establishment and giving voice and work to Black artists—writers, actors, producers and technicians. But alas, all these efforts faced massive pushback and were constrained—they lacked the ability to capitulate the existing vestiges of discrimination and prejudice.

The movie *Shaft* tries to address many stereotypes surrounding race relations, while via commission and/or omission, creating some of its own. Parks uses formal elements such as mise' en scene (of a Black man standing tall) to stress the thematic significance, throughout the movie. The themes of conflict, sexual prowess, Black heroism, and change in the status quo of White omnipotence among others, featured prominently, and are being problematized also. This paper, as stated inter alia, sticks with the image of Black masculinity, individualism and community

survival. Within this milieu, we will deal with the manifestation of the countervailing reality of White dominance and resistance to the supposed gains by the civil rights legislation. To this end, the historical and social contexts become crucial as we look at the nuanced artistic portrayal of such.

There is a long history of representative art, or specifically, the constant efforts to break the mold of racism and stereotypical depiction of Blacks on screen, especially after the release in 1915 of The *Birth of a Nation* by D.W. Griffith. While Hollywood created a schema that demeaned the American Negro, there emerged a relatively successful underground independent Negro film industry that responded to these mainstream biases, while projecting the goodness in their folk. These efforts got substantial support from Negro elite (Bogle 1973).

Bogle catalogues the rather demarcated progress made by Black artists who, even as they did make strides forward toward getting into the mainstream film industry, were at best stunted by a thick glass ceiling in respect to roles scripted for them. Actors like Paul Robeson were offered experience and exposure in films directed by Oscar Micheaux. Micheaux provided and avenue for Black artists as well and promoted the theme of uplift. The only recorded version of performances from legendary stage actors like Charles Gilpin happened on his watch. Providing such opportunity to screen artists like Lena Horne, Eddie Anderson, Spencer Williams (later to star in television series "Amos and Andy"), Nina Mae McKinney, Louise Beaver, Matan Moreland, Herbert Jeffery; or even comics like Stepin Fetchit, Moms Mabley and Pigmeat Markham, laid the seedbed for an underground black film movement. Alas, even the relatively successful artists like Robeson 'The Black colossus' were stifled socially, politically, and otherwise by the dominant White power structure (Bogle 1973). These struggles for representation, personal betterment or uplift, are interwoven just as much as they illuminate relevant themes of the Black male individual and/versus community. These artists had the burden of a whole race (the African American negro) to shoulder, while they were also in need of work to support and better themselves in a society the already has them on the short end of the stick.

The Nexus between Blaxploitation and Hip Hop

Now, we proceed to look at the artistic or formal elements. Parks uses exceptional scoring by Isaac Hayes that went on to win an Oscar and two Grammies. This genre of 'Soul' music can be said to be the basis for Hip Hop or Rap music that would become popular almost two decades later. In "Subverting The System" (2005) Chrisitne Acham asserts that the era of Blaxploitation as a film movement did not end in the 1970s. Acham posits that there was a resurgence of the phenomenon in the 1990s with the advent of what is now contemporary hip hop music, fashion and culture within the greater context of popular black culture. Thematically, the very definition "Blaxploitation" which saw Hollywood casting almost entirely black actors to exploitatively promote the common themes of sex, drugs and violence (Acham 2005), is still inherent in the manifestations and criticisms of hip hop music today.
We need to look no further than the lyricism of the soundtrack "Shaft" which is symptomatic of the striving to assert manhood or masculinity when it proclaims:

> Who's the black private dick
> That's the sex machine to all chicks

> Shaft
> You damn right
> Who's the man that will stick his neck out for his brother man …who's the cat that would not cop out when there is danger all about you see this cat shaft is a bad mother he is a complicated man
> No one understands him but his woman. (Isaac Hayes 1971)

We see the portrayal of masculinity as a response to the insecurities seething beneath. A deeper look at the character Shaft invites us to peel off all the layers of boldness and sauciness, only to reveal a defense mechanism and role play that aims to challenge the dominant White culture and project masculinity at the expense of women, especially Black women. Every time his handler, the White police lieutenant Vic Androzzi, approaches Shaft all he says is, "I got laid." Sexual prowess here suffices for masculinity. The getting "laid and getting paid" (later to reemerge in hip hop) tropes persist throughout the movie. Through such cinematic tools as close ups and the like, Parks is able to portray power and dominance. Also Shaft's promiscuity and objectification of women comes across as his mode for showing masculinity. The African American male as reactionary to *his place* as an underdog in the greater context of the American power structure is a theme Parks sufficiently accentuates. Though Shaft is subversive and exhibits a level of ghetto smartness to deceive and 'stick it to the man,' that 'man' is a Caucasian male—the 'real man' representing the traditional dominant power structure.

This narrative, or variations of the same still linger today in the characterization of hip-hop and other forms of protest music or cultural productions. Admittedly, theoretical discourses of masculinity in crisis have been limited in the ability to explain domestic violence and misogyny in the Black community especially. Craig Watkins posits that such discourses are reductive because they obscure the constantly mutating contours of intra-complexity of masculinity across race, class, and sexuality (Representing, 1998). Watkins draws from Arthur Brittan's explanation that the 'crisis of masculinity' is constricted to mean 'men in general' as their 'natural' role as breadwinner along with their self-assurance, collective nerve and 'sense of certainty' is challenged. Watkins explains that movies such as *Straight Out of Brooklyn* (1991) do not only project the 'ghettocentric imagination' of the postindustrial inner city ghettoes, but also depict the 'fractured masculinity' among Black males. Their powerlessness and incapacity to play the provider role results in an inclination to domestic violence as an outlet for reassertion of lost power that has been surmounted in the public sphere (1998). But then, that manhood must find its roots in the youth that produced these Black men. Men 'incapable' of sustained gainful employment as a condition of ghetto realities in America were aptly captured by a string of films, including *Spike Lee Joint*s, with related themes released in the early 1990s especially.

Watkins references John Singleton's engagement with the entrapment of inner city ghettoes and the shaping of urban space. The setting of *Boyz in the Hood* (1991) frames spatial and social isolation of the Black working class and urban poor, and their exclusion from formal and informal networks which leverage access to employment and opportunity (1998). With the use of cinematic tools like "classical cutting," Singleton was able to illuminate the nuanced and varied forms of social isolation using the films three central characters: Tre, Ricky and Doughboy. Added to that, he enunciates themes that create a narrative web which captures, via close ups and camera angles, the ghetto-centric imagination of Black youth athleticism as commodity, lack of

focus on education, lack of opportunity, and the fact that everything is pointing toward the dream of making it out of the ghetto and 'making it big' (1998).

Understandably, hip hop of the early 1990s imbed such themes of the post industrial inner city ghetto reality in the same manner as Blaxploitation movies of the early 1970s on. The unholy confluence of hopelessness and dreams are what connect the embodiment *Shaft*, a sense of convoluted masculinity expressed rather wantonly by violence, sex and crime, and hip hop. Like Blaxploitation movies were an opportunistic, whimsical, response by Hollywood to the pendulumic tastes of popular culture markets, hip hop is similarly a response to a youth market looking to associate with the same ghetto-centric fantasy of the real life and struggles of Black America expressed in mostly protest music. The emergence and relevance of what has been dubbed Generation X—a generation of Americans born after the Baby Boomers between 1965 to 1980—in popular youth culture, and rap music's ability to be part of the mainstream, pervading white urban and rural America, complete with gangsta themes and 'ghettocentricity', are emblematic of the impact of Black youth culture on the greater American popular culture.

Ghettocentricity and Voyeurism as Popular Culture

At this point, what has been a marketable voyeurism into to the struggles of Black America, as expressed mainly in themes of 'gangsterism' and sense of identity in the public sphere, may be for all intents and purposes melancholia-ridden masculinity. Melancholia and masculinity discourses have been rife in scholarly circles. What has been minimally charted territory within theoretical frameworks is how these relate to the proclivity to cultural expressions like the Black protest music and themes imbedded in rap music. In his work on male melancholia in films by Martin Scorsese, Mark Nichols indicates that since the Renaissance, the *homo melancholicus* has been deemed "a man of genius, insight and creativity." Nichols notes that Pythagoras viewed it as "a case of too much black bile in the system," while Walter Benjamin thinks it is a "social and personal struggle between rebellion and conformity." Nichols notes Freud's take in *Mourning and Melancholia*: "The distinguishing mental features of melancholia are profoundly painful dejection, cessation of interest in the outside world, loss of capacity to love, inhibition of all activity, and lowering of self-regarding feeling to the degree that finds utterances in self-reproaches and self-revilings, and culminates in a delusional expectation of punishment." Essentially, Nichols projects the melancholic as "a man apart," with a "keener eye for the truth" than the non-melancholic, and that these attributes may manifest in different combinations (2004).

Any serious understanding of the use of the hitherto expletive lexicon as NIGGAZ, BITCHES AND 'HO'S replete in rap music, must be viewed with proper understanding of melancholia and its impact on Black masculinity. Socio-economic exclusion, repression and battered masculinity goes a long way in explaining why one of the most successful early rap groups from the Compton, South Central Los Angeles of the early 1990s chose to go by the name "Niggaz With Attitude." The self-reflexive and flagrant use of an otherwise derogatory term (Nigger) is telling of psychological make-up of these Black youth. The braggadocio and explicit nature of their lyricism that led to a legal battle bordering on free expression (that I ardently followed as a youngster), speak to the "self-reproaching" and "self revilings" aforementioned.

Watkins argues that though discourse surrounding Generation X obliterate their roots in the Black community, the recent nomenclature, "hip hop" generation, is an atonement to the indelible role and place of Black youth in popular American culture (1998). Hollywood merely commodified Black experiences or fantasies of the same, which evidently cannot be excised from popular entertainment in America, from minstrelsy, through *Shaft,* to hip hop. It is imperative to state that Black cultural productions have not only fed the greater American popular culture, but vice versa. To this end, it is rather erroneous to shove the blame of misogyny squarely at the doorstep of hip-hop artists and their music videos, when misogyny predates hip-hop and is rampant in the mainstream American media. Contemporary critique of hip-hop is laden with feminist notions of misogyny appropriated in the context of Black men derogating females, particularly of their kind—Black women. What these critics have often skirted are the roots of a 'wounded' masculinity that feels compulsion for a 'Shaft-like' reassertion of manhood, abhorrent and reductive albeit, projected by the "getting laid, and paid" pimp or 'mack' motifs.

Conclusion

In summation, Watkins posits that the Black youth's identification with ghetto street culture is predicated, in part, on 'lack of access to mainstream institutional life,' and that the 'decisive move to gangsta iconography' is also due to limited opportunity to the greater American culture community as in every other facet of society (1998). Watkins surmises, "Hip hop culture bears the imprints of how black youth struggle to understand, enjoy, and represent the world they profoundly experience. Thus, to see them struggle to turn the misery and pain of social and economic marginalization into a vibrant expressive culture vividly illustrates how aggrieved populations struggle to remake society in ways that make their everyday lives more empowering, rewarding, and pleasurable even in the face of seemingly insurmountable odds" (1998). This is the reality that one can be inclined to describe as the cathartic projection that connects the preponderance of the same themes in *Shaft* and hip hop, decades apart. Rife critique has been advanced in recent years targeted at the "eye candy" depiction of women in hip hop videos, notable among them, the 2007 documentary *Beyond Beats and Rhymes* by Byron Hurt. A scene in that movie shows students of a college for Black women, Spelman in Atlanta, protesting against rapper Nelly whose music video for "Tip Drill," shows him swiping a credit card on the backside of a near-naked woman (Reuters 2007). As inexcusable as these clearly misogynistic acts are, they can only be understood, if at all, by the pathology of the society that creates them. Black popular cultural productions, *Shaft* and hip hop included, are just microcosm of the wider moral, social and cultural morass. Bigotry and misogyny are real in America, they predate and transcend hip hop. Whether it is talk show host Rush Limbaugh on nationally syndicated talk radio spewing forth vitriol against Jamestown University student Sandra Fluke about birth control pills and entitlement, or current hip hop sensation Kendrick Lamar ranting about his "Bitches" in the "Hood" in his 2012 album "Good Kid, Mad City," misogyny is here to stay. Also, Lamar's inner-city ghetto reality remains the inspiration for him and many African American hip-hop rappers, who are part of America's popular culture, FOREVER.

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On the Stabilization of n-Link Inverted Pendulums

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Mathematics

Abstract

Many examples of control systems are found in modern-day industrial applications, ranging from the Segway to cruise control in an automobile. The self-stabilizing inverted pendulum serves as an archetypal problem by which the robustness of such control systems, which use feedback to control themselves, is measured. In this project, we investigate problems related to the radius of stability, which is a concept that gives insight into how far we may deviate from equilibrium before the control system fails. We analyze the nature of stability within n-link inverted pendulum systems, where n is an arbitrary integer. To aid us in this task, we have built several computer simulations in Mathematica, a computational software package, which animates the solution of the system and provides numerical data to help in the analysis of the radius of stability. We hypothesize that as the number of links in the system increases, the radius of stability will decrease accordingly. Since control systems are widely used in modern day society, it is important that we understand the stability of such systems, thereby maximizing the safety and effectiveness of their applications.

Introduction

The problem of stabilizing an inverted pendulum system is essentially a mathematical idealization of the problem of balancing a ruler on your hand. It has long been a primary focus in the field of control theory, where it has proven to be useful in the development and analysis of various control models. As mentioned in [6], the inverted pendulum is considered to be “the jewel in the crown of every control department." The widespread interest in inverted pendulum systems is largely due to their highly unstable, nonlinear dynamics.

While inverted pendulum systems have many important theoretical consequences, the problem of finding their stability solutions also has very many interesting and useful applications in a diverse number of fields. As mentioned in [9], they can be used to model a rocket booster at lift-off as an inverted pendulum with one link balancing on a cart. The stabilization of a multi-link inverted pendulum with three links can be used to model the problem of bipedal motion in robots. An arbitrary multi-link inverted pendulum system, the type that will be considered in this paper, can be used as a two-dimensional approximator for robot manipulators.

Naturally, this dichotomy also translates to the body of literature concerning the study of inverted pendulum systems, with much of the research being divided into two settings. One setting primarily involves implementing the theoretical consequences of modern control theory in a controlled, experimental setting. Unlike computer simulations, the presence of outside forces that influence the ability to control a given system are not ignored or discounted as being trivial when developing these control models. Such "outside forces" include influential factors such as friction and human error.

The other setting resides primarily in a theoretical or computational context. It is often useful and cost-effective to consider theoretical examples or to conduct experimental analysis based on computer simulations. Typically, the presence of external perturbations on a system is ignored in favor for a more simplified model. Much of the literature and research is concerned with using such computer simulations to conduct analysis on the nature of the stability of a specified inverted pendulum system, as well as to test the efficiency of proposed control models. The advancement of modern computer technology and software has allowed researchers to create powerful and useful tools that allow one to gain further insight into the inverted pendulum problem. Furthermore, these tools are extremely beneficial in developing theoretical controllers that may prove to be successful in an experimental setting. Examples of this can be found in: [6], [2], [3], and [1].

While both approaches are interesting and useful, this paper is mainly concerned with the stability properties of a particular inverted pendulum system as opposed to the theoretical consequences of control theory. In particular, we have chosen to analyze the stability solutions of multi-link inverted pendulum systems. We will develop a computer simulation, using the computational software package *Mathematica*, which will both find and animate the stability solution of a multi-link inverted pendulum system.

The primary goal of this paper will be to confirm the results of [5] using a pendulum-and-cart system as opposed to a torque controller. This paper will also provide additional analysis of the stability of the inverted pendulum using various computational methods. Finally, we hope that the research and analysis done in this paper will set up future projects concerning the **structured real radius of stability**, as defined in [5] and [10]. We hope to eventually prove the conjecture made in [5] that the **structured real radius of stability** decreases to zero as the number of links in a multi-link inverted pendulum system increases to infinity.

Mathematical Model

In this paper, we consider a multi-link inverted pendulum with an arbitrary number of "links". Such an inverted pendulum and cart system with n "links" will be defined as and referred to as follows:

> **Definition 1.** *An* n**-Link Inverted Pendulum**, *where* $n \in Z$, *is defined as an inverted pendulum and cart system with n points (all masses are unitary, i.e:* $m_1 = m_2 = \cdots = m_n = 1$*) and n rods of lengths* $d_1, d_2, \cdots, d_n$,

where the center of the cart with position $x(t)$ and mass $c = 1$ is connected to the point m_1 by a rod of length d_1, and for some $i \in \mathbb{Z}$ with $1 \leq i < n$, the points m_i and m_{i+1} are connected by a rod of length d_{i+1}. The system will have n angles, where θ_1 is defined as the angle between the horizontal line that goes through the top of the cart with position $x(t)$ and the rod of length d_1, and θ_i is defined as the angle between the horizontal line that passes through the point m_{i-1} and the rod of length d_i.

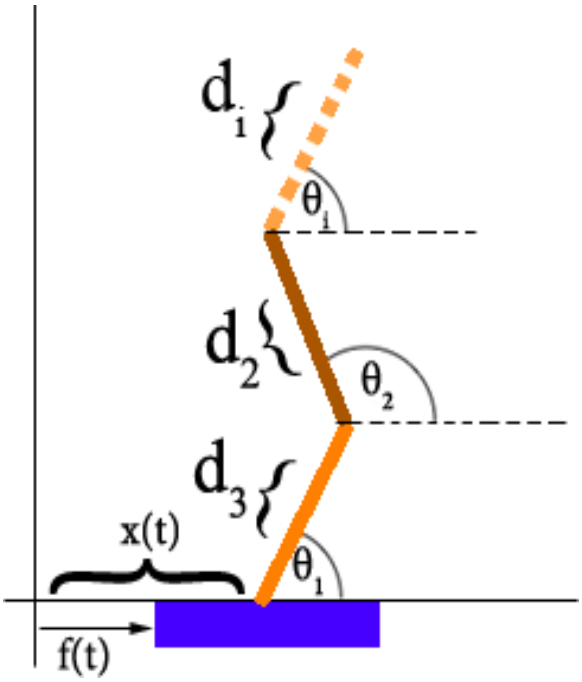

Figure 1: An arbitrary n-Link inverted pendulum system

It is shown in [5] that an n-Link inverted pendulum system is both controllable and observable for all $n \geq 1$. This is particularly important because if a linear-time invariant system (like the n-Link inverted pendulum) is controllable, then it can be put into a form that is known as Controller Hessenberg form.

Definition 1. *A pair of matrices* (**A**, **B**) *where* $\mathbf{A} \in \mathbb{R}^{n \times n}$ *and* $\mathbf{B} \in \mathbb{R}^{n \times 1}$ *is said to be in controller Hessenberg form if* $\{\mathbf{BA}\} = \{\beta e_1 \mathbf{H}\}$ *for some* $\beta \neq 0$ *and* **H** *is an upper Hessenberg matrix such that* $e_{i+1}^T He \neq 0$ *for* $1 \leq i \leq n-1$.

The existence of such matrices will prove to be extremely invaluable when, in the conclusion of this paper, we state the conjecture concerning the **structured real stability radius** of the n-Link Inverted Pendulum system. However, before the discussion of the analysis provided in this paper can begin, it is important to understand the dynamics of the n-Link inverted pendulum and how its equations of motions can be derived for an arbitrary integer n.

To derive the equations of motion for a 1-link inverted pendulum system, we begin by determining the position of the center of mass of the pendulum arm as a function of time. At any time *t*, the center of mass of the pendulum arm is determined by (1).

(1)
$$p(t) = \left\{\frac{1}{2}dcos\big(\theta(t)\big) + x(t), \frac{1}{2}dsin\,(\theta(t))\right\}$$

Hence, the kinetic energy of the pendulum arm is determined by (2).

(2)
$$K(t) = \frac{1}{2}\,\|p\,(t)\|^2 = \frac{1}{2}\left(\frac{1}{2}d^2cos^2\big(\theta(t)\big) + \left(x'(t) - \frac{1}{2}d\theta'(t)sin\,(\theta(t))\right)^2\right)$$

We then develop the equations of motion for the 1-link inverted pendulum system using the Euler-Lagrange equations. By subtracting the potential energy of the pendulum arm from the kinetic energy, we obtain the Lagrangian for the system (3).

(3)
$$L(t) = \frac{1}{2}cx'\,(t)^2 - \frac{1}{2}dsin\,\big(\theta(t)\big) + \,K(t)$$

We proceed by plugging this into the set of Euler-Lagrange equations, as defined by (4).

(4)
$$\left\{\frac{\partial}{\partial t}\frac{\partial L(t)}{\partial x'(t)} - \frac{\partial L(t)}{\partial x'(t)} = f\,(t), \frac{\partial}{\partial t}\frac{\partial L(t)}{\partial \theta'(t)} - \frac{\partial L(t)}{\partial \theta'(t)} = 0\right\}$$

After the preceding substitution, the following equations of motion for the 1-link inverted pendulum system are yielded in (5), where $m = 1$, $d = 1$, and $c = 1$.

(5)
$$\left\{-\frac{1}{2}cos\big(\theta(t)\big)\,\theta'(t)^2 + 2x^{"}\,(t) - \frac{1}{2}sin\big(\theta(t)\big)\theta^{"}(t) = f\,(t),\right.$$

$$\left.\frac{1}{4}\theta^{"}\,(t) + \frac{1}{2}cos\big((t)\big) - \frac{1}{2}sin\big((t)\big)\,x^{"}(t) = 0\right\}$$

Which can further be simplified into the following set of equations in (6).

(6)
$$\{-cos\big(\theta(t)\big)\theta'(t)^2 + 4x^{"}(t) - sin\big(\theta(t)\big)\,\theta^{"}(t) = 2f(t),$$

$$\left.\theta^{"}(t) + 2\,cos\big((t)\big) - 2\,sin\big((t)\big)\,x^{"}(t) = \,0\right\}$$

These equations adequately describe the nonlinear dynamics of a 1-link inverted pendulum. However, it should be noted that these equations become increasingly more complicated as the value of *n* increases. For example, let us consider a 2-link inverted pendulum system. The position of the center of mass of the two pendulum arms are described by the following set of equations in (7) and (8).

(7)

$$p_1(t) = \left\{\frac{1}{2}d_1\, cos\big(\theta_1(t)\big) + x(t), \frac{1}{2}d_1 sin\,(\theta_1(t))\right\}$$

(8)

$$p_2(t) = \left\{d_1\, cos\big(\theta_1(t)\big) + \frac{1}{2}d_2\, cos\big(\theta_2(t)\big) + x(t), d_1\, sin\big(\theta_1(t)\big) + \frac{1}{2}d_2 sin\,(\theta_2(t))\right\}$$

If we repeat the process used for the 1-link inverted pendulum, we get the following Euler Lagrange equations in (9) which describe the equations of motion for a 2-link inverted pendulum system, (with $c = 1$, $d1 = d2 = 1$).

(9)

$$\{2f(t) + 3\, cos\big(\theta_1(t)\big)\,\theta_1'(t)^2 + cos\,(\theta_2(t))\theta_2'(t)$$

$$+3\, sin\big(\theta_1(t)\big)\,\theta_1^{"}(t) + sin\big(\theta_2(t)\big)\,\theta_2^{"}(t) = 6x^{"}(t),$$

$$9cos\,(\theta_1(t) + 3\, sin\big(\theta_1(t) - \theta_2(t)\big)\,\theta_2'(t)^2 + 8\theta_1^{"}(t)$$

$$+3\, cos\big(\theta_1(t) - \theta_2(t)\big)\,\theta_2^{"}(t) = 9\, sin\big(\theta_1(t)\big)\,x^{"}(t),$$

$$3\, cos\big(\theta_2(t)\big) + 3\big(\theta_1(t) - \theta_2(t)\big)\theta_1(t) + 2\theta_2^{"}(t) =$$

$$3\, sin\big(\theta_1(t) - \theta_2(t)\big)\,\theta_1'(t)^2 + 3sin\,(\theta_2(t))x^{"}(t)\}$$

Obviously, this process gets grueling for anything bigger than a 1-link inverted pendulum system. With this in mind, a computer simulation was built which involves functions that derive the equations of motion for any arbitrary *n*-Link inverted pendulum system. The development of this computer simulation is detailed in the next section, where an explanation of functions used in order to derive the equations of motion for an arbitrary *n*-Link inverted pendulum is given.

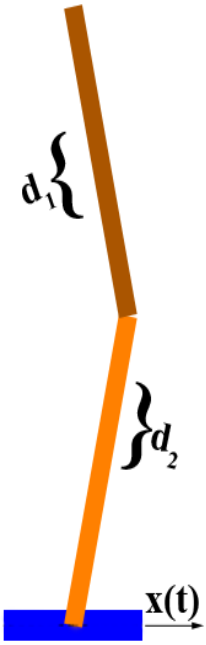

Figure 2: Diagram of a 2-Link inverted pendulum system

Developing the Computer Simulation

The primary purpose of this paper is to perform an analysis of the stability properties of an n-Link inverted pendulum and how these properties are affected as $n \rightarrow \infty$. As noted above, finding the equations of motion for an n-Link inverted pendulum system where $n \geq 1$ is a painstaking process and one can easily imagine that finding the stability solutions for such a system is even worse. Fortunately, a series of functions were built by Andrew Moylan in [8] using the computational software package *Mathematica* that compute the equations of motion for an arbitrary n-Link inverted pendulum system. By utilizing the control theory capabilities of *Mathematica*, Moylan's program [8] is able to compute a state space representation matrix for a given model and subsequently derive an adequate linear quadratic regulator (LQR) controller. Table 1 details a list of the functions used in this preliminary computational process, with a few minor functions being omitted for purposes of clarity.

Next, Moylan constructs the function **AnimateNPendulum** which uses the graphical capabilities of *Mathematica* to build a visual model of an n-Link inverted pendulum and cart at any given time t. The contents of this function are not as important as its output, and therefore a description of the code included in the **AnimateNPendulum** function has been omitted for purposes of clarity.

coordinates $[n]$	Instantiates a table of coordinate variables $(\theta_1(t), \theta_2(t), \cdots, \theta_n(t), x(t))$.
velocities $[n]$	Instantiates a table of values by taking the time derivative of each entry in *coordinates* $[n]$, yielding the list $(\theta_1'(t), \theta_2'(t), \ldots, \theta_n'(t), x(t))$
armcenter $[i]$	Calculates the center of mass for a link of length d_i, where $1 \leq i < n$.
ke $[i]$	Determines the kinetic energy of a link of length d_i, where $1 \leq i < n$.
pe $[i]$	Determines the potential energy of a link of length d_i, where $1 \leq i < n$.
lagrangian $[n]$	Uses *ke* $[i]$ and *pe* $[i]$ to find the Langrangian of the system.
equations $[n]$	Finds the Euler-Lagrange equations using the set of equations given by *langrangian* $[n]$.
model $[n]$	Finds the state space matrix for the equation list *equations* $[n]$.
costs $[n]$	Calculates the cost matrix for the given system, these values are chosen arbitrarily by the researcher.
gains $[n]$	Calculates the LQR gains using the model given by *model* $[n]$ and the costs given by *costs* $[n]$.
controlforce $[n]$	Calculates the control force needed in order to reach the desired stability solution (if possible).
equilibrium $[n]$	Outputs a list of n equilibrium points that will be used by our **SimulateNPendulum** function.
initial $[n]$	Outputs a list of initial conditions for the angle positions, the angle velocities, the cart position, and the cart velocity.

Table 1: A list of functions used in the n-Link inverted pendulum simulation

The final function constructed by Moylan is the **SimulateNPendulum** function. This function takes a value for n as its input and a control force $f(t)$. In this model, the control force $f(t)$ is the LQR controller developed by the above functions in Table 1. The control function f(t) acts on the cart with position x(t) in order to achieve stability. Using the table of functions in Table 1, **SimulateNPendulum** computes the stability solution for an n-Link Inverted Pendulum system and then uses **AnimateNPendulum** to animate the solution. The output results in a real-time animation of an n-Link inverted pendulum system starting from its initial state and moving towards its stable, equilibrium state. It should be noted that when no stability solution can be found, the program will enter an infinite computational sequence, causing the program to crash.

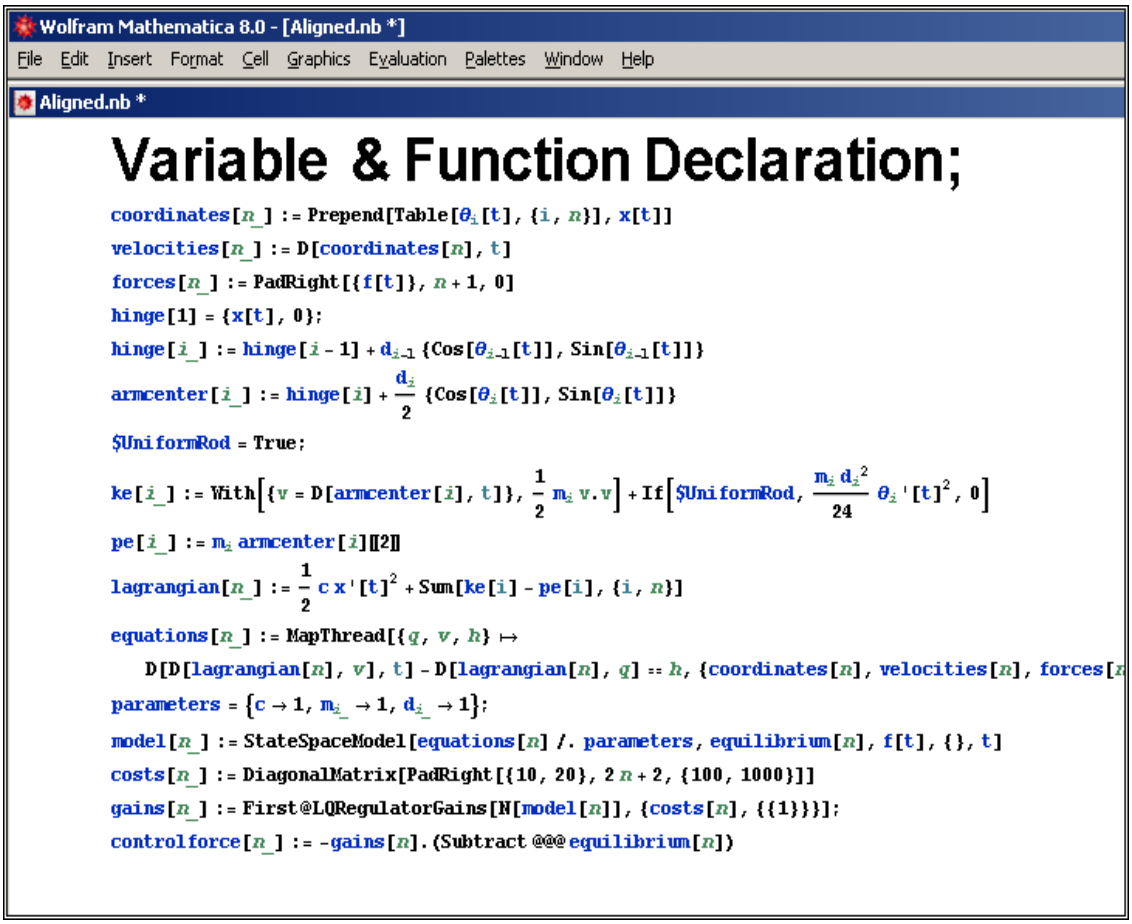

Figure 3: The Mathematica Environment

Data Analysis

To measure the stability properties of the n-Link inverted pendulum, three different initial conditions for angles $\theta_1, \theta_2, \cdots, \theta_n$ were considered. Based on the aforementioned computer simulation, three different programs were constructed that used, respectively, the following settings as initial conditions:

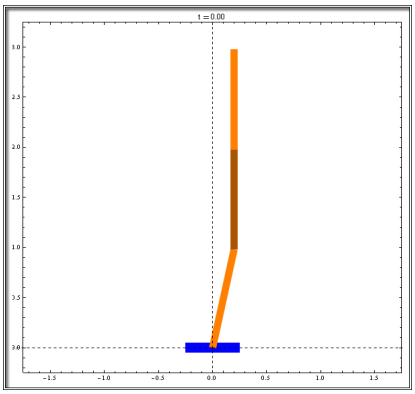

Figure 4: Initial Conditions for Program I (First Link Only)

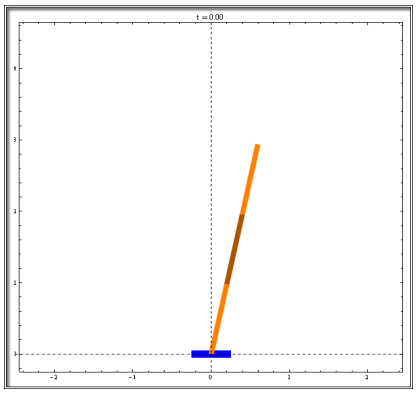

Figure 5: Initial Conditions for Program II (All Angles Aligned)

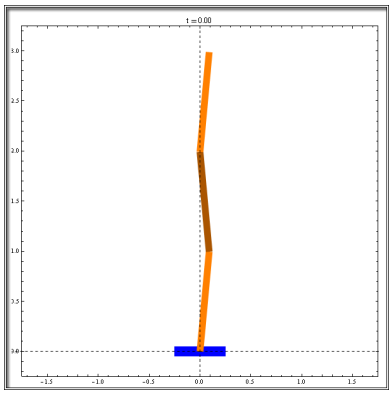

Figure 6: Initial Conditions for Program III (Alternating Angles)

- Program I (First Link Only) sets $\theta_1 = \phi$ for some $\phi \in \mathbb{R}$, and $\theta 2 = \theta 3 = \cdots = \theta_n = 0$ (see Figure 4).
- Program II (All Angles Aligned) sets $\theta 1 = \theta 2 = \cdots = \theta_n = \phi$ for some $\phi \in \mathbb{R}$ (see Figure 5).
- Program III (Alternating Angles) specifies an initial value ϕ such that the angles alternate between $-\phi$ and ϕ, for some $\phi \in \mathbb{R}$. That is,

$$\theta_i = \begin{cases} -\phi \; if \; 2 \mid i \\ \phi \; if \; 2 \nmid i \end{cases}$$

where $1 \leq i \leq n$ (see Figure 6).

n	ϕ
1	1.28289367
2	0.40573173
3	0.24945257
4	0.19282457
5	0.14201623
6	0.10499025
7	0.09773687
8	0.10411705
9	0.09084849

Table 2: Collected Data for Program I (First Link Only)

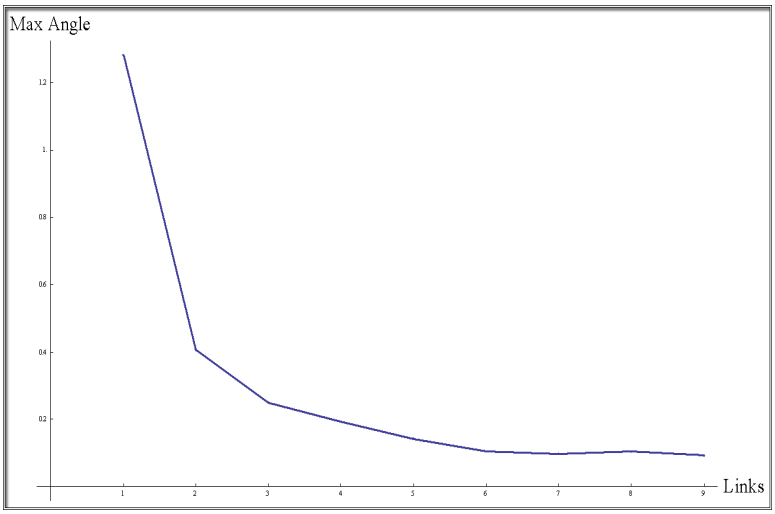

Figure 7: Graph of n vs. ϕ for Program I (First Link Only)

We then approximated the maximum initial angle offset ϕ from the upright position for $n = 1, 2, \cdots, 9$ up to eight decimal places. If an initial angle offset was chosen such that it was larger than the maximum value, *Mathematica*'s numerical solver for differential equations, **NDSolve**, would attempt to find a stability solution for a system that does not exist with respect to the desired equilibrium state and the induced LQR controller. Thus, this would produce a solution where the time $t \to \infty$. With this in mind, the value ϕ was used as a benchmark for the relative robustness of an n-Link inverted pendulum system under the corresponding initial conditions. It was conjectured that these values would show a decreasing pattern as the value of n increased, which would be in correspondence with the results found in [5].

For Program I (First Link Only), the initial conjecture is supported by the data in Table 2. These values are plotted against each other in Figure 7. In this graph, we can see a clear decreasing pattern for the value of the maximum offset ϕ as n increases. Further, this trend continues as we see that for Program II (All Angles Aligned), the initial conjecture is also supported by the data collected (see Table 3 and Figure 8). Lastly, the decrease in the maximum offset value ϕ is even more apparent in Program III (Alternating Angles), as the drop-off between $n = 1$ and $n = 2$ is quite large in comparison with the First Link Only and All Angles Aligned cases (see Table 4 and Figure 9).

n	ϕ
1	1.28289367
2	0.51061781
3	0.39098419
4	0.25607472
5	0.25144739
6	0.15826837
7	0.17755204
8	0.11641672
9	0.12607300

Table 3: Data collected for Program II (All Angles Aligned)

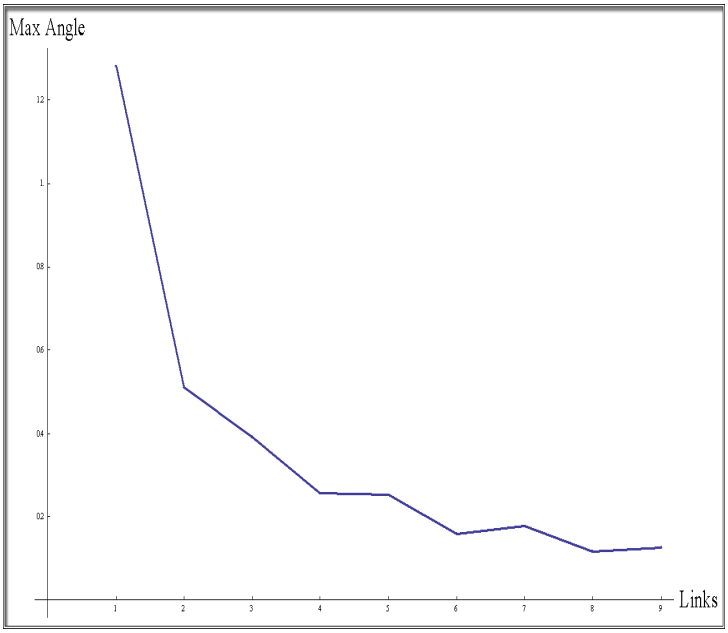

Figure 8: Graph of n vs. ϕ for Program II (All Angles Aligned)

n	ϕ
1	1.28289367
2	0.31248125
3	0.09807911
4	0.01721683
5	0.00354283
6	0.00079995
7	0.00019011
8	0.00004601
9	0.00001091

Table 4: Data collected for Program III (Alternating Angles)

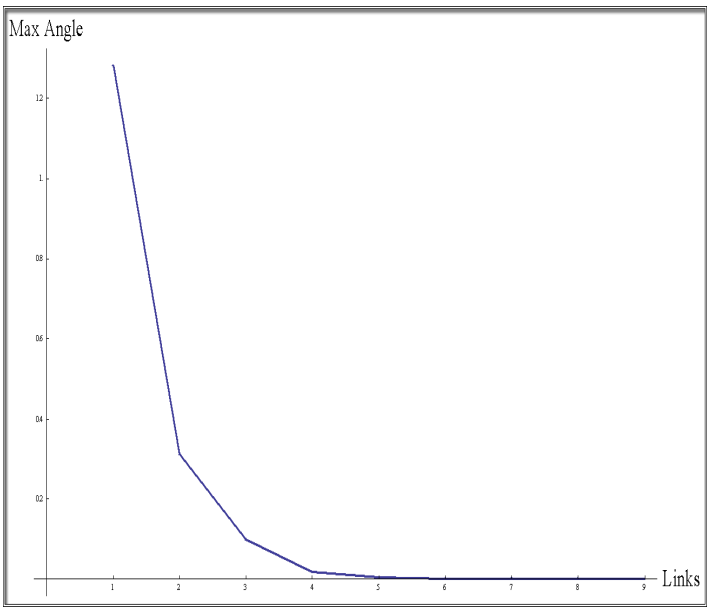

Figure 9: Graph of n vs. ϕ for Program III (Alternating Angles)

These stability benchmarks were arbitrarily chosen, and one should note that there are virtually an endless amount of possibilities that could be chosen as robustness indicators. Moreover, this process was only extended for n-Link inverted pendulum systems where $1 \leq n \leq 9$. This limitation on n stems primarily from limited computational resources. As n increases, the computational power required in order to fi and animate the stability solution of an n-Link inverted pendulum system grows at an alarming rate.

While, theoretically, any multi-link inverted pendulum system is controllable (as mentioned in the Conclusion of this paper), this does not mean that it is necessarily techno- logically feasible to find a stability solution for the considered system. In the next section, the conjecture, which inspired this paper, is made. This conjecture seemingly alludes to the idea that stability solutions for the n-Link inverted pendulum become increasingly hard to compute as $n \longrightarrow \infty$.

Conclusion

While the data gathered over the course of these experiments is definitely useful in beginning to understand the nature of the n-Link inverted pendulum, these collections of analyses only provide a very early development towards the overall goal of proving that the **structured real stability radius** of the system tends towards zero as n tends towards infinity. Now that we have had a vague insight into the robustness properties of the n-Link inverted pendulum and cart system, the definition of the **structured real stability radius** is given.

Definition 1. *Consider a closed-loop, asymptotically stable, linear time-invariant system:*

$$\dot{x} = \mathrm{A}x$$

then the structured real stability radius of the set of matrices (A, B, C) ∈ $\mathbb{R}^{nxn}$ x $\mathbb{R}^{nxm}$ x $\mathbb{R}^{pxn}$ *is defined as:*

$$r_2(\mathrm{A}, \mathrm{B}, \mathrm{C} = inf\{\bar{\sigma}(\Delta) : \Delta \in \mathbb{R}^{mxp} \; and \; \mathrm{A} + \mathrm{B}\Delta\mathrm{C} \; is \; unstable\}$$

where $\bar{\sigma}(.)$ *denotes the largest singular value of (.).*

In future projects, it is hoped that a formalized proof can be given which shows that the **structured real stability radius** tends toward 0 as *n* tends toward infinity. A method for computing the **structured real stability radius** has been given in [10] and [5]. However, before this next phase of the research can begin, further background research must be conducted.

These computational methods for finding the **structured real stability radius** will be studied in the near future in hopes that they will spark the initial steps towards a formalized proof of the aforementioned conjectures. In the mean time, the results of this paper have provided necessary inspiration towards discovering such a proof. In particular, this paper has given evidence to support the notion that the robustness of the *n*-Link inverted pendulum system is extremely affected by large values of *n*. The next step now will be to translate these properties into a theoretical language so that a formal proof may be constructed.

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Kreñòl: A New Language in the Hispaniola?

L C Tavárez Varela

Mentor: Linda Egan, Ph.D.
Spanish and Portuguese

Abstract

Hispaniola, known today as Haiti and the Dominican Republic (DR), was "discovered" by Columbus in 1492. French and Haitian Creole are spoken in Haiti while the DR speaks Spanish. Scholars from a wide range of disciplines have approached the Hispaniola to study its historical and cultural richness. However, they have not yet addressed the existing correlation between the languages spoken on the island or how these linguistics barriers impact the economic and social interactions between both countries. This study investigated language interactions of Haitian Creole and Dominican Spanish speakers in the border city of Anse-à-Pitres, Haiti. The study looked at 20 hours of recorded natural speech between Dominican Spanish and Haitian Creole speakers interacting at the market: La Puerta de la Confraternidad. These speakers used, among other mechanics, a newly emerging pidgin language that I called ***Kreñòl.*** *Kreñòl can be defined as the verbal encounter of both civilizations. In this research I've exemplified the meaning that is constructed by bilingual speakers of Haitian* ***Kre****yòl and Dominican espa****ñol*** *when they combine both languages to create Kreñòl.*

Introduction

The island of Hispaniola, currently occupied by the nations of Haiti and the Dominican Republic, was the first in the "New World" where the Spanish formed a colony. As such, it served as a logistical base for the conquest of most of the Western Hemisphere. French and Haitian Creole are the major languages of Haiti, while in the Dominican Republic, Dominican Spanish is spoken. Scholars of various educational branches have carried out investigative work on the island; these studies focus on the history and cultural diversity that the island has to offer. However, many of them have not had the opportunity to study the relationship between the languages spoken in both countries and how these language barriers affect the economy or the social relations of these countries. This study seeks to explain some of these socio-economic relations happening on the island. The focus of the study took place, for more than a year, in one of four country binational markets, better known as *"La puerta de la confraternidad" or "The door of fellowship,"* in the border towns of Anse-à-Pitres and Pedernales.

Also, I had the opportunity to visit the largest country market on the island for a whole day, located between the border towns of Ounamente and Dajabon. The importance of being in this market is that I could see the same effects of language occurring among vendors. This indicates

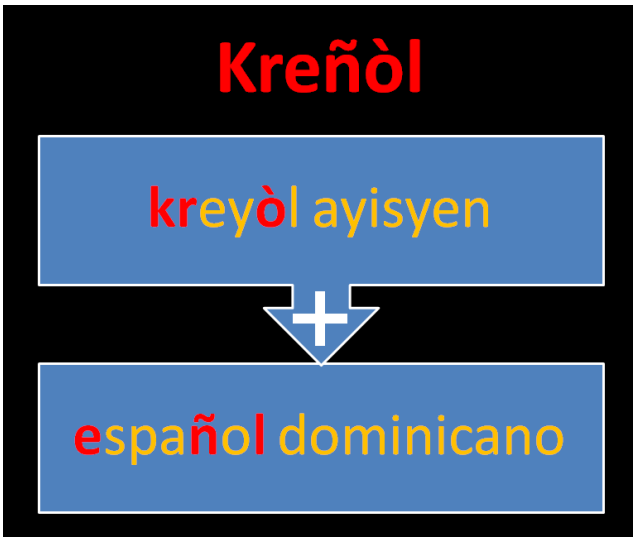
that the expansion of Kreñòl not only occurs in the southwest of the country, but rather it is a phenomenon that spreads silently among sellers of both countries in all binational markets.

This study is focused on 20 natural conversations (not intended or tested) by Haitian vendors in the market. In this study, I focused on Claudine and Rasamel. These participants come from different generations. Claudine is older than Rasamel, has 10 children, and three of their children are part of the classes that I teach on the island. Rasamel, on the other hand, provides the youthful look of the study. He is very charismatic and sociable. For him to use this linguistic phenomenon is not only a source of employment, but rather a simple and easy way to communicate with their Dominican counterparts.

These vendors use a new language, pidgin-like, which I called Kreñòl. According to the dictionary of the Royal Spanish Academy, pidgin (pronounced [pĭj'ən]) is a language characterized by combining syntactics, phonetics and morphologicals of a language with another's lexical units. The origin of the term is unclear. It has been suggested that the word was taken from the Chinese pronunciation of the English word "business", but could also be due to the expression "Pigeon English", referring to the passenger pigeon (which is the meaning of the term in English) (Pidgin, 2013).

I define Kreñòl as a linguistic encounter between two civilizations, Haitian and Dominican. This means that when confronted by the need to sell their products and communicate with the buyer and/or sellers, both members of the island use a simpler way to communicate. They use this mixture, or pidgin, because they know little about the language of business; in the case of the Haitians, it is Spanish. The Dominicans, on the other hand, do not care to speak Creole or see the need to learn and so, always speak in Spanish. Many of them claim that as the market is on the Dominican side of the island, their country, they do not have the need to learn Creole. For them, Haitians should, and must, be able to communicate if they wish to sell productively. The most interesting part of this research is the ability in which Dominicans understand Kreñòl, the new mixture of languages.

In this analysis I have examined the explanations made by bilingual participants of Haitian *kr**e**y**ò**l* (Creole) and Dominican *e**spa**ñ**ol*** (Spanish) when they combine both languages to create **Kreñòl**. I put certain letters of both languages in red because from there I made the name Kreñòl. My interest is not to destroy any of the languages established, but rather to find a balance between the two languages and what I consider appointing a new phenomenon. In this case, Kreñòl contains the same number of letters in which the original names of the languages of these countries are written, (a ratio of 3:3), because I see a change of the same ratio and/or average when speakers combined both languages to create a new word. However, pronunciation and other effects proved that Creole is more use than Spanish; such details will be explained later.



This figure explains how I derived the word Kreñòl. This is a new word, never before written. I was inspired by the original names of the most used languages in the island, Dominican (espanol) Spanish and kreyòl (Creole) ayisyen. Moreover, as there is a 50% contribution by each language, so far, I used the same number of letters to explain and name Kreñòl.

Background: A Brief history of the island

The Tainos

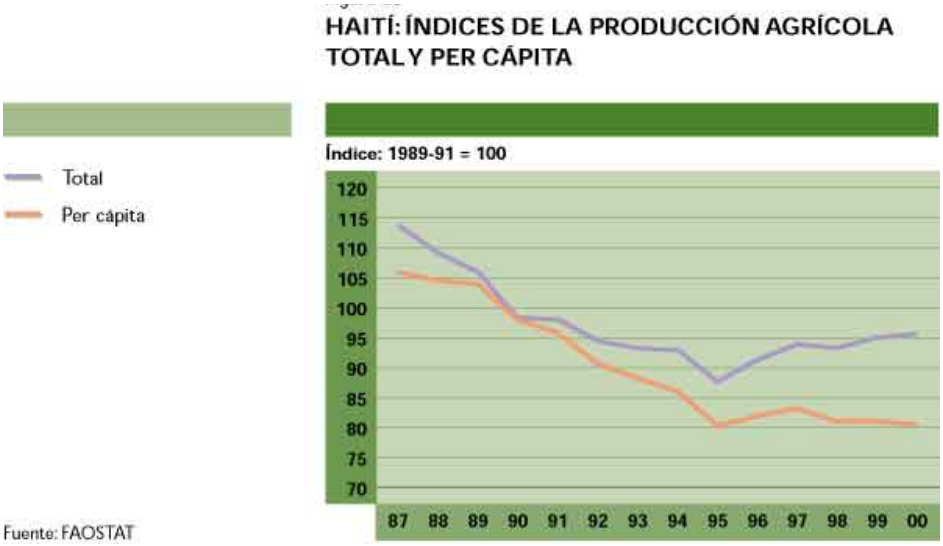
Christopher Columbus "discovered" (it was not a discovery as it was inhabited by the indigenous people) the island on December 5, 1492, in the final days of his first trip to "the Indies". Columbus and his colleagues found the island inhabited by a large population of friendly Taino Indians (Arawaks), who welcomed the explorers. Columbus established a makeshift settlement on the north coast, near the present city of Cap Haïtien. The land was fertile, but of greater importance to the Spanish was the discovery of gold that could be achieved by bartering with the natives, who were adorned with jewels, or removing it from the alluvial deposits of the island. The Tainos called the island various names, but the most common was Ayti or Hayti (mountainous land).

Africa in the Caribbean

Black slavery was critical to the economic performance of new companies that emerged after the European invasion in America. In some cases, as in the Hispaniola, it was the main source of income for the ruling classes. Following the demise of the Tainos, the demand for labor grew and slaves were needed to work in the hundreds of mills and coffee plantations that arose across the island. Slavery marked 400 years of contemporary history and the life of a few small islands in the Western Hemisphere and the Caribbean, the name of the sea that washes its shores (Baez, 2003). The Yoruba, who constitute about 30% of the total population of Nigeria, were more than 28 to 40 million individuals across the African region (22 million Africans speak their language on the continent). Such individuals were many of the slaves in Haiti. African slaves that arrived in Haiti were accustomed to collective activity and some agricultural practices such as African siembrade, with farm implements, the plow and the machete, from Europe decent. Among other

customs, African slaves forced into Catholic marriage continued to practice polygamy, dances and some unique recreational forms of their culture (Fandrich, 2007).

Economic situation of the island



This chart shows how agricultural production in Haiti has been in decline since 1987. The country's deforestation is the main cause of this problem. In Anse-a-pitres, there is no good land for cultivation, and most agricultural products reach the people from Dominican companies.

Haiti has the lowest per capita income in the Western Hemisphere, and it is the poorest country in the Americas. Social and economic indicators place Haiti in falling positions behind other developing countries with low incomes (particularly in the hemisphere) since the 80s. Haiti is in place 145 of 177 countries in the Human Development Index of the UN. Approximately 70% of the population lives in poverty. Around 70% of Haitians depend on agriculture, which consists mainly of subsistence farming on a small scale and employs about two-thirds of the economically active population. Poverty is extreme in much of the population, and their income is not enough to buy a little rice or other basic foods. To survive, they must eat a type of cookies made of mud (clay), shortening and salt, which are sold at low prices, thus causing malnutrition and other consequences of physical ailments. FAO estimates that half the population lives in extreme poverty, on less than $ 1 a day in a country with over 10,033,000 inhabitants according to Census 2009.

On the other hand, the economy of the Dominican Republic has shifted from exports of agricultural goods to exports of services. The growth of the country has been driven by new sectors such as tourism, telecommunications, and remittances. In 2012, the Dominican economy faced changes in terms of taxes, with the implementation of the tax reform that includes increased state revenues to cushion the shortfall in which the country found itself. To increase revenue, it pretended to follow the National Development Strategy, which proposes to reduce tax evasion, raise the quality of public expenditure, efficiency and transparency and an additional 4% of GDP to

pre-university education. According to the 2012 census there are approximately 10 million inhabitants living in DR (Dominican Economy, 2013).

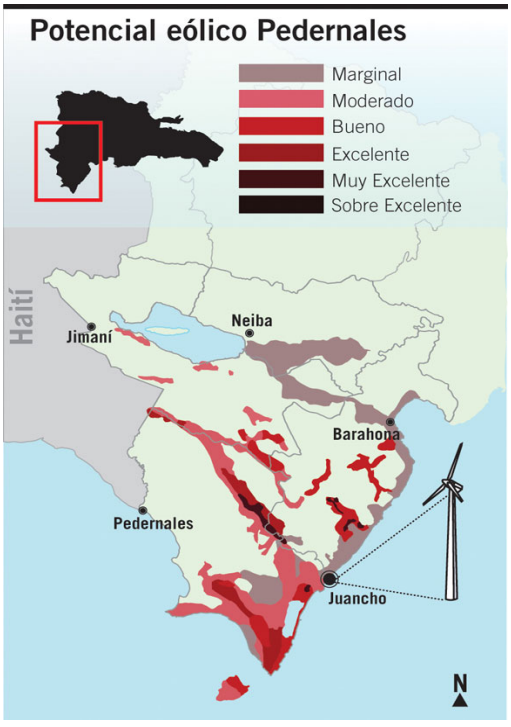
Methods

Before the first trip to Haiti in June 2012, I spent more than seven months studying the educational and economic system of the island. I did several readings and research with my mentors. Also, in the McNair program, I trained for investigative work outside the United States, and I prepared for the Institutional Review Board (IRB) review. I successfully passed the review and got permission from the University to conduct interviews in the binational markets (See Figure 1: Map of the island of Haiti and Dominican Republic). Similarly, I took several courses on bilingual education in the United States and on the effects of bilingualism in students. At the same time, I worked as a tutor of Spanish in college and as an assistant to a teacher at a primary school in the area, Cesar Chavez Elementary School. With these studies in mind I developed several questions that inspired my thesis:

1. What are the relationships between the languages spoken in Haiti and its economy?
2. Are there any correlations? If any, what are they?
3. Does it have anything to do with the location of the participants or market? Does the location alter the benefits?
4. Are the participants using a new language or a common language? If it is a new language, what makes it different and unique?

Situational Context of the study: field, tenor and mode

In the book *Mi Lengua: Spanish as a Heritage Language in the United States*, Roca and Colombi describe three linguistic phenomena influencing each language variation: field, mode, and tenor. I decided to use them in this work because it will help the reader better understand how language is seen as a system of meanings, where elections are originated in accordance with the purpose for which language is used (Roca, 82).



FIELD is defined as the activity in which the participants are involved, what happens and what it is spoken about on the subject (82). Haiti is heavily influenced by Africa. Among the most prominent cultures we find the Kongo, Igbo and Yoruba. Since the Yoruba came to Haiti as slaves, their cultural richness still present to this day on the island, not only in the food, culture and music, but also in the language. According to statistics in 1780, more than 45,000 slaves arrived on the shores of the Hispaniola and with them their language, religion and culture. Anse-a-pitres and Pedernales are the towns

that noticed Kreñòl development for the first time. Currently, there are four binational markets on the island, and although the Pedernales market is not very big, it's the only one with quick access to the sea (See figure Potencial eólico Pedernales for more details).

TENOR according to Roca and Colombi, refers to the social roles that exist in the situational context between speaker and audience, meaning, whoever the participants are and the relationship between them (82). The participants, or tenor of this study, are the parents of some of the students I have taught English and Spanish through Ann Prepare Lavni, Inc. *La puerta de la confraternidad* or *The door of fellowship* is the name of the market in which I conducted my research for more than one year. In addition to this market, I had the opportunity to visit the largest country market of the island for a whole day, located in Dajabón, where I also noticed the influence of Kreñòl. This indicates that this linguistic phenomenon is happening all over the island, and not only in the Southwest. It also indicates that if use continues, it could become a pidgin language, and even a form of Creole.

Education in Haiti suffers from shortage of monetary funds; the town of Anse-a-pitres has no secondary schools, universities, or libraries. The sixth grade is the highest level of education for youth in the area (See Figure 2: Elementary school in Haiti). Hence, the importance to work at the market and to know a bit of Spanish in order to sell on Mondays and Fridays, days when the market is open. Many parents do not know Spanish and their children (males aged 10-16 years) will help with sales. Girls, on the other hand, take care of household responsibilities and some of them become mothers at age 14 or earlier. Customers come from both countries, but over 80% are Dominican.

MODE is the role of language and the nature of the text itself and its role in this context, including the channel (is it spoken or written, or a combination of the two?) (82). As I mentioned before, in Haiti they speak Creole and French, while in the Dominican Republic they speak only Spanish, and outside schools, academia environment, and the media Dominican Spanish is spoken specifically (a variation very different from standard or academic Spanish). Furthermore, Dominican Spanish is strongly influenced by the Yoruba language. In Dominican Spanish, we can observe the use of archaisms, which although not frequently used, they are still known by most of the people and their use is not strange (examples of which are the words stove, deal, cover, malmara, etc.). Similarly, the Dominican dialect uses several terms called indigenisms, which have great popularity in the richness of language. Despite having a completely extinct indigenous population, these terms were marked. Many say that the Dominicans indigenisms come from the only remaining Taino survivor of the Hispaniola, Enriquillo, which despite being of Taino ancestry was already completely hispanicized.

The African influence is in the words, speech, accent, colloquialisms and intonations. According to historians, the locals of Guinea in West Africa, along with the Congo, were forced to learn and neutralize Castilian forms. People in the Cibao region are the descendants of runaway slaves, and therefore their Spanish tends to be more of a creole language, similar to how the Haitians speak differently from those in the capital. For example, only from hearing a cibaeño talk, Dominicans can quickly know their origin and even their academic level.

Dominican Phonetics

Dominican Spanish is spoken with a lisp and does not distinguish between the sound that represents the letters "c" (before "i" and "e"), "z" and "s". The three letters represent the phoneme /s/. For example, in Dominican Spanish, the verbs "cazar" (hunt) and "casar" (marry) sound the same.

Yeísmo: In the Dominican Republic, the sound represented by "ll" has become the lateral /ʎ/ a sound like the sound represented by "y" (and). This is carried out in phoneme sounds [j] or [dʒ]. Lambdaization: very common phenomenon in the lower classes, where the implosive consonant changes (at the end of a syllable or word) for /l/. Example "New yol" or "niu yol" (for New York), "coltar" or "coitai" (to cut)

There are three different geographical regions of pronunciation that are Southern, northern (Cibao), and Santo Domingo, which is in the center of the south and east (the pronunciation in the east is more neutral). Also, there is the tendency to shorten words and put them together.

- In the North region, use of "i" between the words predominates, (caminar = "caminai") [walking] (madre, mal, mar = "mai, mai, mai" are pronounced all the same) [mother, evil, sea] and there are expressions that are no longer used in the Spanish of Spain, but in one way or another have survived in DR as (Aguaita = "listen"), (es a menester? = "it is required").
- In the South region, the "r" between words predominates and it is also dragged or strongly pronounced where it stands (walking = "caminarrr"), (let's go to the people = Vamono parr pueblo). Less often you can hear a change in the "o" for "u" (vamonos = "vámunu") [let's go].
- In Santo Domingo, (Capital City), there is "l" (walking = "caminal") and words become much shorter with the deletion of the "s" in some cases (vamos a ver = "vamoavé") [we'll see].

Despite regional differences in dialects (geolectos), Dominican Spanish also has sociolects, or a difference of dialect between social classes. It says that the syntax and morphology of Dominican Spanish have great African influence; however the phonics is African with a differentiation between the educated and cultured. Despite a difference, Dominican Spanish has specific characteristics as yeismo, the lisp and the complete lack of voseo.

In the binational markets, there are several languages: Spanish, Creole, English and Kreñòl variation (which still is not a language). Since markets are on the Dominican side of the island, Haitian vendors have to know some Spanish. In the case of Anse-a-pitres, sellers can only sell during Mondays and Fridays (days when the market is open), and this provides income for the livelihood of the whole week or even the month. So there is a correlation between the ability to use the language of business (Dominican Spanish) and income, since the channel language is spoken here.

Haitian Phonetics

Haitian Creole, despite having originated from the French, has a grammar that is very different and much simpler, mainly in the following points:

- Verbs are not conjugated according to time or person.
- It lacks grammatical gender, that is, the adjectives do not agree in gender with the noun they qualify.
- Use of person suffixes to indicate possession of nouns.
- Use of auxiliary modifiers to indicate all tenses.

Creole uses a basic order of constituents of type Subject Verb Object (SVO), as well as French. Many grammatical features, particularly pluralized nouns and pluralized possession, are indicated by adding certain suffixes (postpositions), like *me*, to the main word. It is an issue which punctuation should be used to connect the suffixes to the word. The most popular alternatives are the script, the apostrophe, or even a space. The case is more complicated when the "suffix" contracts and is reduced to a single letter (like *m* or *w*).

Nouns

Haitian Creole nouns have no gender: *El plural de un sustantivo se indica agregando la partícula yo después del sustantivo (yo también funciona como articulo definido plural)*. The plural of a noun is indicated by adding the article *yo* after the noun (*yo* also works as a plural definitive article). Example: *liv yo* o *liv-yo* (libros) [books] and *machin yo* o *machin-yo* (carros) [cars]

Pronouns

There are six pronouns, one for each combination of number and person. There is no difference between direct and indirect. Some pronouns have an obvious French origin, some not.

Person/number	Haitien Creole		French	GLOSA
	Plain Form	Short Form		
1/singular	*mwen*	*m* o *m‘* o *‘m*	*je*, *moi*, *me*	'yo, mí, me'
2/singular	*ou* *		*tu*, *te*, *vous*	'tú, te, usted'
3/singular	*li*	*l‘*	*il*, *elle*, *lui*, *le*, *se*	'él, ella, le, lo, se', etc.
1/plural	*nou*	*n‘*	*nous*	'nosotros, nos'
2/plural	*ou* o *nou* **		*vous*	'vosotros, os, ustedes'
3/plural	*yo*	*y‘*	*ils*, *elles*, *eux*	'ellos, ellas, los, les', etc.

Notes: * Sometimes *ou* can be written as *w*. The *w* indicates *ou*. ** Depending on the context.

Record: Lexicogrammatical features

The most interesting thing about this phenomenon is when a Haitian seller uses Kreñòl instead of only Spanish or Creole, the seller sells more and Dominicans customers can understand the seller better. Kreñòl is not patuá, as Patuá is a variation of French from 1789. When a Haitian speaks

patuá to a Dominican, the Dominican simply does not understand. The patuá is a mixture of sixteenth century English, 1789 French and several dialects spoken among the slaves. This implies and even gives some validation to the hypothesis that Kreñòl is a boom and/or possible new linguistic variation implemented during business between the two nations.
I must emphasize that Kreñòl use is more common among Haitian vendors and their children. Many Dominicans do not care to learn Creole, much less Kreñòl. They believe that Haitians are the ones that should learn Spanish and use Kreñòl to sell as they are in their territory. Kreñòl is used among primary school students with whom I have worked. For them, speaking this way is fun and funny. And many times when I did not understand in Creole, they spoke Kreñòl and I quickly understood. Also, some Dominican students also use Kreñòl when talking to Haitians, and in many cases as a fun way to refer to marketers.

Code switching according Roca and Colombi, is the rapid alternation of English and Spanish within an argument and even within the same sentence. It is a regular language behavior, which has systematic functions and obeys defined linguistic principles (102). There is code switching among participants in this study (in this case of Dominican Spanish into Creole and vice versa), so they exchange words or phrases in both languages in the same sentence when the words spoken in Kreñòl are not understood. I know of no written form of Kreñòl. What is being studied in this research is mainly verbal, but there are rules about when, how and why to use the phrases and words created by participants.

Because this phenomenon is so recent, participants use words that resemble Spanish. For example, the host language is Spanish, so it is important for children to study and learn Spanish. But the pronunciation has a tone in Creole, since those that most use Kreñòl are Haitians.

The Informants: Claudine and Rasamel[1]

Of all the participants, I selected two for this article for very important and personal reasons. Claudine and Rasamel represent two different generations coming together to use Kreñòl.

Claudine was born in Port au Prince. She is the mother of 10 children, 6 girls and 4 boys. She and her husband moved to Anse-a-pitres over 10 years ago, where their last 3 children were born. Her two eldest sons help her to sell in the market. They speak Spanish more fluently than her and her husband. Although Claudine does not know much Spanish, she defends herself very well in the market when selling her products. Almost always, she takes her children with her for extra help, and confesses to using Creole words that sound like Spanish to succeed. Her educational level is very basic, having completed only the third year of primary school. She can read and write very little, but urges her children to go to school. Claudine says, "I do not know much about school or how to speak Spanish, but I want my children to move forward." Claudine helped me throughout the study. Since my first trip, she was the first to open the doors of her home to me. Her multilingual children participate in classes with me and treat me like part of the family. For Claudine, it became common and normal to see me accompany her on Mondays and Fridays in the market taking notes. She always helped me and answered my questions with en-

[1] For security and privacy issues, I have changed the original names of the participants and replaced them with pseudonyms.

thusiasm. Claudine, in this study, represents an older generation of the island, which is forced to learn this phenomenon to bring money home.

Rasamel was born in a village in Banane, Haiti. His father is Haitian and his mother Dominican. He lived most of his life in Haiti until the age of 16 and then traveled with his mother to Villa Consuelo, DR—birthplace of his mother. In Haiti, he never had the need to speak Spanish, as his mother speaks fluent Creole. He completed his studies in a small primary school in Haiti and when he reached DR, he started high school but did not finish due to lack of income and his limited Spanish vocabulary. Rasamel is the fifth child of ten. From an early age, he became independent from his family and several times returned to Haiti by the route of Pedernales. In this way, he became familiar with the market and started selling ice cream in the area. Rasamel says that his fluency in Spanish is due to the continuing influence he received in Anse-a-pitres and Pedernales. For him, switching from one language to another is extremely easy and necessary. He says, "even though I may not know the words very well, I can always predict whether I need to mix or pronounce the word in Spanish". As he is half Dominican, he makes sure to speak like the rest of his friends, but is very proud of his Haitian roots. Rasamel has a 3-year-old daughter who lives in Banane. Rasamel provides, with his charisma and enthusiasm, the youthful side of the study. For him, speaking this way is extremely entertaining, and he was always willing to repeat phrases I did not understand.

Vocabulary words (examples)

Claudine's natural talk - example #1. In this passage, I describe the reaction of one of the vendors to the achievement of another vendor who was not in the same section:

> *"siempr sale usted con eso; tod que dis ese papeluch es por dicir nu; yo no pued crer un cose tan inverosímil. Me da dolín de cabeza pensalo. Si es ciert su triunf, amodecí no pued durar much si otre man ma poderos no lo coj baje su protección y plesi...mejo vende el sipón y fulá, ale ale"*

Point 1: The participant has removed many final vowels, a phenomenon that is far from the well-known approaches to Spanish produced by French and Haitian. Only the conversion of /a/, /o/ final [e] (sewn <thing, otre <other) may occur in partially acquired Kreñòl by Spanish speakers of Haitian Creole.
Point 2: Within Kreñòl we have found Haitian words in the nuclear vocabulary, e.g., **nu** instead of *us* or *nous* in French.
Point 3: The **amodecí** expression may derive from *I say*. It is more likely, however, that it comes from the Haitian archaic pronoun *mo* (which still exists in Haitian patois of Samana and French Creole of Louisiana). *Deci* may be the Haitian word dezi 'desire' or a combination of Haitian pronoun and Spanish verb.
Point 4: The word **plesi** was registered from its Haitian origin plézi 'pleasure.'
Point 5: **sipón** (< Haitian zipon < French jupon) 'skirt, enagua,' **fulá** 'handkerchief'
Point 6: **dolín** (< Haitian dolè 'pain') 'cholera, rage'

Grammar: code switching (examples)[2]—Rasamel

H- lo mejor oriyinal carabelita fantacia, rosa oriyinal pal Kalora. Si quiere llamamame yo toy ahí mimo, ¿dime a ve compai? (risa) yo soy de Bani, estreyo, asociación nacial bonsua, pase ke hay mucha de la vaina,
D-Repite, repite, repite
H- ¿dime a ve maniático? ¿tu ta ahí?
D- dale dale, ¡¿dime a ver como he, como he?!
H- asociación nacional bonsua, hay mucha cosa que ta pasando en Bani entero. Yo kiero pa defendelte. En Haití también hay gente media errrarcodiga, errrarcodiga he ke tan andando, hay mucho ciclone k tan pasando, yo no se k fue k ta pasando, el maniático va venil con otro detalla, el yonarice profesional en santo domingo ke tan hablando. Ehhh Asociasion nacial bonsua por la paleta que ta vendiendo, eta ta vendiendo flow ahora. Porque hay mucha forma, hay oriyinal carabelita fantacia, rosa numero uno pal kalora. Un por ejemplo si la chokolata con cascarona si tu te kiere compra una comparona, tu le da una moldia chikitica y kita el kalora de arriba y se va suaba. Un por ejemplo ostra ve el sabora, si tu kiere tu la da una moldia chikitica y se va toe el sudol. El numero uno pal kalora. Un por ejemplo mira ahí (empieza a sacar paletas de la nevera andante), la de bicocha la chokolata con mani si tu kiere tu priva de comparanona tu la da una moldia chikitica y kita esa cacaron de mani y se te va jevi en tu bokita. Mira ahí
D-okey, okey
H- traje chokolata de bicocho y tu resuelve y tu le da una moldia se va suaba
D-ya colta eso
Caro-pero tú hablas bien el español. Cuéntame, ¿de dónde eres?
H-gracia. No yo le sabe, que significa eso, polke tu sabe ke yo no soy de aki. Polke yo soy de frrrancia. Mi pai e francia, mi mai Villa Consuelo de Santo Domingos
Caro-¿entonces siempre vienes por aquí?
H-yo toy vendiendo elada y curando con mis amigos. Yo yoy parao en la calle
Caro-¿cómo te llamas? ¿Qué te gusta hacer?
H- yo soy Rasamel ke canta, to lo tipo saben quien soy yo y mi amora, mi amores y toito saben ke soy yo. (Sonido de trompeta) canta: "bicocho chokolata chokolata con leche con fresa de sabora oriyinal carabelita fantacia rrosa numero pal kalora, niña niño señora señore viejo k eta dulmiendo, rrrrevantate el numero uno pal kalorai llego pa come elata pol pipa"
D-mira ahí ahora todito te vamo a compra la paleta

Phrase/sound: **Dominicanism**	**Creole**	**Kreñòl**	**New/not known**
Pol pipa (eating a lot of icecream)	Oriyinal (*orijinal la*, the participant pronunces G like a Y)	Elada (combination of helado and *krèm glase.—icecream--* Rasamel changes de ending of lado for -lada making the creole sound *glase* {glas})	Rrrrrevantate*

[2] Codes for who is talking in the conversation: Heladero--Rasamel (H), Dominicans of the area buying the ice cream (D), and myself (Caro).

Toito (all)	Bonsua (*bon aswè*, means good evening, but Rasamel uses it as the name of the organization he rep-resents)	Yo le sabe –I know (in creole is *mwen konnen*. The participant uses the end of creole {-ne} mixinf it with Spanish –*yo lo sé*)	yonarrrice
Curando (having a good time with friends, relaxing)		Bicocha (*gato* equivalent to cake in Creole, wheras in spanish is biscocho. Rasamel only adds an {a} at the end of the Word, like Claudine did also.	errrarcodiga
Priva (a person who thinks and believes is superior to others)		Suava (*suave* –smoot- in Spanish and *mou* in creole. –ou makes the same sound as –ua at the beginning of the word)	estrrrreyo
Vaina (in dominican spanish it means a lot of things. In this case it refers to the prob-lems occurring in both country's poli-tics)		Chokolata (*chocolate* in spanish and *chokola* in cre-ole. More than 50% of the Word is in creole, but to make it sound like in Spanish he adds *–ta* instead of *–te)*	
Carabelita (fake)		Detalla (detay-details- in creole. Again he adds an{a} at the end, living more than 75% in Spanish)	
		Kalora (*calor/ chalè*. –Hot- More tan 95% is in spanish, but the end has an {a})	

Notes: * I am not familiar with the meaning of these words but when spoken by Rasamel, there is much emphasis on the {r} pronounciation. Since neither Creole nor French emphasize the {r} pronunciation, I have noted these as examples of Kreñòl.

Other examples:

Change of the word: "thanks"
Español dominicano: gracia[3]
Creole haitiano: Mèsi
Patuá: Mesi
Kreñòl: Grasi

Change of the word(s): "how many"
Español dominicano: ¿Cuánto?

[3] In Dominican Spanish, an aspiration exists with an S at the end of words

Creole haitiano: Konbyen?
Patuá: Konbé?
Kreñòl: Cuánbye?

The Spanish of Claudine and Rasamel

Glenn Martinez explained that the issue of code switching by Chicanos in the United States is debatable. Many see it simply as a Spanish accented English while others propose that Chicano English is a dialect of English as valid as African-American vernacular English (AAVE). As in the case of Chicanos in the U.S., the same goes for Haitians in Dominican Republic. Many criticize the speech of Haitians when they use Spanish. But for hundreds of Haitians, speaking this way is not a luxury but rather a necessity. As we saw in the case of Rasamel, he tries to sound as Dominican as possible and uses dominicanisms throughout his conversation to prove that he can speak like the rest of his Dominican friends. Words like: *toito, carabelita, priva*, among others, are only useful in some way by Dominican speakers. This characterizes the Dominican Spanish slang (for details refer to the Dominican phonetic section).

The Creole of Claudine and Rasamel

Returning to the case of Chicanos studied by Martínez, they (Chicanos) use a Spanish that has influences of English. Both Claudine and Rasamel use an informal, Dominican Spanish influenced by the way they talk in Pedernales. Their Spanish is not formal, much less their Creole. Education levels of both participants are low, so the French influence is minimal in their speech. For the examples mentioned above, we can see that their Spanish and Kreñòl are heavily influenced by their native language of Creole. They do not seek to develop complete or fixed sentences, but use short and to the point sentences, as if they were using a pidgin. Both use a colloquial Spanish, not only with their children but also in the work area. Such words are: *pal, toito, ostra ve*, among others. This practice of Creole shows that while participants work on the Dominican side of the island, they still have speech features of their maternal village with which they express their identity.

Claudine, Rasamel and their motivations for code switching and use of Kreñòl

The speech of the informants may vary depending on the person and their location. With a monolingual person speaking Dominican Spanish, informants use the little Spanish they know and quite a bit of Kreñòl, especially in their workplaces. On the other hand, when both are in their country of origin, home or with family, they use only Creole and a little Kreñòl among their children. None of the informants use French, as their education levels are very limited and they do not have the need to use it. Claudine says that although her children do not know much, they are always using this combination of Creole and Spanish, especially when they play or attend school. Both Claudine and Rasamel claim that this combination of languages was implemented in this area of the country (Pedernales and Anse-a-pitres), since in Port au Prince it is not necessary to speak Spanish and in Villa Consuelo only Spanish is necessary. In both cases is interesting to note which language the informants choose when speaking to one another in the workplace.

I am interested to know: why choose a certain language? Why combine it in a certain way? The book *Growing up Bilingual*, by Ana Celia Zentella, presents a study of bilinguals in The Block of New York. The bilinguals Zentella focuses on consist of a group of Puerto Rican girls. Chapter five explains that the girls sometimes use the dominant language of the recipient and change if the recipient changes. They use the *"follow the leader"* process when responding in Spanish if someone speaks to them in Spanish or switch to English if they do the same. When they heard me speak in Creole, they quickly followed me and were glad to see a Dominican speaking their language. But as soon as they perceived my linguistic limitations they began to speak in Spanish. Similarly I used phrases and words in French and/or Creole and they also did the same. From there we ended up using Kreñòl in every conversation.

Onomastic pronunciation

Glenn Martinez explains that in the case of Chicanos, pronouncing the Spanish words for names, places, food, etc., is very common when speaking English. Some Chicanos use Spanish phonology, with no intention of changing to Spanish. Using Spanish phonology demonstrates one way Chicanos perform resistance to the dominant culture of the United States. According to Martinez this preferred pronunciation is commonplace and generally the rule. However, within the United States, this behavior is seen as irritating, especially by English monolinguals who are opposed to bilingualism. Zentella, on the other hand, explains that the Puerto Rican girls preferred the English pronunciation of their names. It is possible that his attitude may change over the years. Paca, for example, is only six years old and does not really understand the political problems between Spanish and English within the U.S.

In the case of the informants in Haiti, they are proud of their French names and request that their names are pronounced correctly. Both Rasamel and Claudine made me repeat their name several times. Also, they changed my name from Carolina to Kawolin, the equivalent of Creole. Not only did they do that, but in both classrooms students called me "pwofesè Kawolin" (teacher Carolina) (See Figure 2: Pwofesè Kawolin). Haitians are very aware of the political problems between the two countries. During my first trip the community, they did not trust my "good intentions," as they could not expect anything good from a Dominican. However, once they saw my work they changed their attitudes. Also, I tried to adapt to their culture, language and traditions. Soon, I began using the name Kawolin and showed great interest in their work and education. I think this approach helped me with the project. Haitian participants know that to survive financially, they have to speak Spanish and Kreñòl. But that does not cause them to set their cultures aside. Despite speaking the language of the trade, each participant kept her Creole accent and pronunciations, as in the case of Chicanos.

According to Martinez, the structural framework of pronunciation is based on the use of the language that has the most prominent words. The most prominent words are those that occupy a higher position in the structural hierarchy of the sentence. Another technique that is used to identify the predominant language is to count the number of words in each language. The language with the most words is probably the predominant language. This is not the case with Kreñòl. In Example 1 and in the conversation with Rasamel, there are more words in Dominican Spanish than in Creole. However, the pronunciation is more Creole than Spanish.

Syntactic hierarchy in code switching

Linguists around the world have completed studies about code switching and grammar and have determined that bilinguals follow certain grammatical rules when they switch codes. Zentella states that "Spanish and English bilinguals don't favor change between a pronoun and an auxiliary [verb], or between an auxiliary and an infinitive, or omit the 'a' person or indirect objects" (116). For example, participants don't prefer to say "yo like carrots" and "me gusta to cook". In her study, the author determined that participants follow the syntactic hierarchy in terms of code switching between English and Spanish. Zentella says that the data of Poplack and Lipski indicate similar constituent barriers where bilinguals switch codes in the sentence, the noun and the object of the noun phrase.

In the second part of my study, I will focus on these syntactic aspects. I want to know why they change in certain cases and not in others. Also, I would like to develop a table of possible pronouns and verbs to determine the possible linguistic future of this phenomenon.

Conclusion

This article has discussed the socio-economic and linguistic boom in the island of Hispaniola, known today as Haiti and the Dominican Republic. We made a journey from the beginning of the nation to its present condition and development of this new combination of the most prevalent languages. To illustrate Kreñol, I used two native speakers of Creole, Clauidine and Rasamel. Both work in the country market, *La Puerta de la confraternidad* or *The door of fellowship*. Both are exposed to Dominican Spanish and have children or parents who also are greatly influenced by Dominican culture. Both informants express their roots through their language. Although we have no written records of Kreñol, I analyzed several natural conversations expressing the identity of both participants and chronicled the use of code switching.

For all the reasons above, Kreñol is used in order to sell and buy products in these binational markets. This is a phenomenon that requires the speaker to use code switching for many reasons, giving systematic use which often has a purpose, like changing the subject, citing, clarifying, calling to attention, etc. Clearly, the informants have many more advantages than monolinguals. Both Claudine and Rasamel can use more than one word to describe things. They can communicate easily with their children in Creole, with their vendors in Dominican Spanish, and with their shoppers in Kreñol; a skill that monolingual Dominicans don't have. This gives us an idea of the richness of the vocabulary that both informants possess with their bilingualism, and in other cases, multilingualism.

The Creole of both participants have more influences on the pronunciation of words than Spanish does, although, the formation of words tends to look more Spanish than Creole. The Spanish influence is seen in the syntax, phonetics and semantics. One interesting thing about this study is not only that it describes the conflict between the two countries, but it also focuses on how, despite so many stigmas, both participants maintain their identities through language. For that and many other reasons Kreñol, in my opinion, actually represents the young, hard working Haitian

culture more than the Dominican culture. It could become a boom as the Chicano movement was in the United States. The language helps to keep alive our culture, diversity and above all else, it sets us apart from the crowd. So, I strongly believe that we should support research on these linguistic topics, since they not only help break stigmas, but also help improve the understanding of bordering countries.

Discussion

What is the future of Kreñol?

This phenomenon has many aspects that need to be investigated. Still, a conclusion cannot be reached on whether or not it is a new pidgin or perhaps, even a language. Kreñol's use, not only by the market vendors, but also by students, leaves much to examine and consider. To reach a solid conclusion, it is necessary to investigate Kreñol in different parts of Haiti and Dominican Republic and see how deep its roots extend. I firmly believe that as Creole ended up being the national language of Haiti, leaving the French as secondary language, Kreñol could do the same. I do not think that the same happens in the Dominican Republic, although there is a great Kreñol influence in the border areas.

Kreñol is a literary and linguistic boom because its use is increasing. It greatly influences the Haitian economy and its geographic location influences how it is spoken by participants. I firmly believe that the younger generation, as in the case of Rasamel, will continue to see the importance of knowing Spanish, and will study harder the language of trade, in this case Spanish. I also believe that if Kreñol expands further into Haiti, it could become a pidgin, and possibly even Creole. What remains for us is to conduct broader and more complex research to help us get to the core of this boom, which could end up being the next language of the island.

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Appendix

Figure 1: Map of the island of Haiti and Dominican Republic

Notes: Research sites are Anse-a-pitres, Haiti and Pedernales, Dominican Republic

Figure 2: Elementary school in Haiti

Figure 3: Pwofesè Kawolin


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