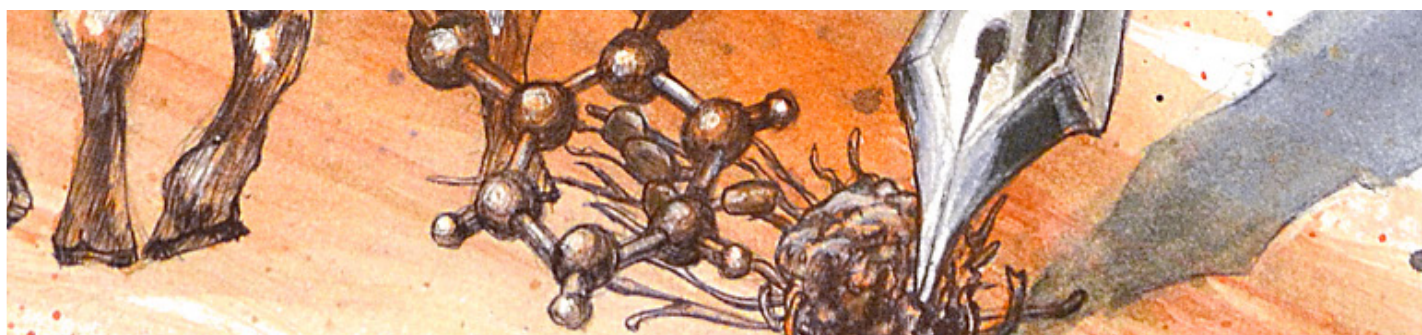




THE UNIVERSITY OF TEXAS AT AUSTIN

UNDERGRADUATE RESEARCH JOURNAL

VOLUME 16 NO 1.





VOLUME 16 NO.1

**UNDERGRADUATE
RESEARCH
JOURNAL**

2017

The University of Texas at Austin Undergraduate Research Journal

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The Texas Undergraduate Research Journal would like to extend special thanks to the Office of the Vice President for Research, the Office of Student Affairs, and the University Co-Op for their generous continued support of our mission throughout the Journal's years of operation.

We are also very excited to announce the new partnerships established this year with the College of Liberal Arts, Cockrell School of Engineering, College of Pharmacy, College of Communications, Jackson School of Geosciences, and the Waggoner Center. We look forward to serving the undergraduate community together and working to enhance the student research experience across the university.

Lastly, we would like to recognize the invaluable feedback of our faculty reviewers. And, most of all, we thank the authors themselves, whose inspiring research continues to change the world.



FROM THE EDITOR

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BRONWYN SCOTT,
EDITOR-IN-CHIEF

On behalf of the 2016-2017 Editorial Board, I am proud to present this year's edition of The University of Texas at Austin's Undergraduate Research Journal (URJ). As always, our publication owes its success to the dedication of the editors and directors, the generous support of our sponsors, and the students conducting world-class research here at UT Austin.

This issue features a selection of the best research - representing a rich diversity and depth of thought - that our university has to offer. These articles span multiple disciplines: an economic analysis of the board game Monopoly shares space with a comparison of 13th-17th century medicinal herbs and spices, a powerful address made by Lyndon Banes Johnson alongside a play about Galileo. Some discuss mathematical constructs, and others still explore the history of the everyday meatloaf. Nonetheless, each paper represents the dedication embodied by the journal's staff and the inspiring researchers we had the pleasure of working with.

Beyond our publication this year, the URJ has worked to advocate for the student research community. We continued hosting our annual business, humanities, and science discussion panels aimed at exposing students to potential mentors and research topics, as well as our writing workshop in the spring. Our flourishing blog regularly highlights research with a focus on undergraduate experiences. The URJ has also initiated partnerships with student organizations to host a quiz-bowl tournament and support research in under-represented fields.

It has been a great privilege to work with this publication and its supporters for the past four years. As readers, I hope you enjoy perusing this issue as much as we enjoyed producing it. I encourage you to explore our past volumes and student blog on our website, texasurj.com.

Hook 'em!
Bronwyn Scott

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Role of Anxiety and Memory Confidence in Compulsive Checking Behaviors

ABSTRACT

The current study investigated how decreased memory confidence and anxiety affect repeated checking behaviors in otherwise healthy undergraduate participants. The researcher introduced a new control condition to explore a possible alternative explanation to prior findings. A sample of 23 participants (21 females and 2 males) was chosen randomly from the PSY 301 participant pool at The University of Texas at Austin. After being asked to complete a battery of computerized memory and creativity tasks, participants were given negative feedback about their performance on either the creativity or memory measures. Following the negative feedback, participants were asked to complete a final creative memory task followed by a self-report measure of checking behaviors. The data revealed a significant increase in levels of anxiety following the negative feedback, regardless of condition. The results also showed that subjects in the Memory Feedback condition did not differ reliably from subjects in the Creativity Feedback condition on their reported urge to check. However, the increase in anxiety related to receiving negative feedback was not significantly correlated with the reported urge to check. Implications, limitations, and future directions are discussed.



ACCORDING TO THE AMERICAN Psychiatric Association (2013), Obsessive Compulsive Disorder (OCD) is an anxiety disorder characterized by obsessions (intrusive, persistent thoughts that cause the subject anxiety), and/or compulsions (repetitive, ritualistic, purposeful behaviors intended to reduce the distress caused by the obsessions). In the past, OCD was poorly understood. Early behavior-based theories of OCD were limited and included little consideration of the internal factors of the disorder. However, following the cognitive revolution, as attention shifted away from behaviorism, an abundance of cognitive theories of psychological disorders emerged (Beck, 1976; Salkovskis, 1985). This shift, from behaviorism to cognitive

theory, was revolutionary because it allowed researchers and clinicians to focus on the patient's thoughts and beliefs for the first time (Salkovskis, 1985). It was also accompanied by a rapid growth in the development of new paradigms and studies that would allow researchers to empirically test the new cognitive-based theories, which provided a wealth of new hypotheses.

Among the most influential of these early theories was Beck's cognitive model (1976), which offered a coherent cognitive interpretation of several mood and anxiety disorders, but did not include OCD. However, a few years later Salkovskis (1985) addressed this oversight and developed a preliminary cognitive theory specific to obsessive disorders. His model focused on the internal factors of obsessive disorders

as opposed to the behaviors, and became a guiding force in the conceptualization and research of OCD for many years.

In 2005, an international group of researchers convened and identified three main factors related to OCD, an elevated sense of responsibility and overestimation of potential threat, perfectionism and a decreased tolerance of uncertainty, and exaggerated importance of thought (OCCWG, 2005). More recently however, studies have shown a possible link between decreased memory confidence and compulsive checking behaviors (Alcolado & Radomsky, 2011). The current study will further explore this relationship, and examine whether decreased memory confidence could be a predictive factor in compulsive checking behaviors and a possible cognitive mechanism underlying the disorder (Alcolado & Radomsky, 2011). If decreased memory confidence is discovered to be a causal factor in checking behaviors, it may lead to more accurate measures, improved treatment options, and a better understanding of OCD.

Cognitive Theory of Obsessional Disorders

Salkovskis (1985) was among the first to attempt to develop a cognitive theory of obsessive disorders. His theory, an extension of Beck's cognitive model (1976), was based on conclusions drawn from his own clinical patients.

Salkovskis's model concentrated on what he described as unwanted intrusive thoughts, negative automatic thoughts, and their effects on the patient. He believed that obsessions were actually caused by a patient's reaction to their intrusive thoughts, not the intrusive thoughts themselves. He reasoned that if the intrusive thought was offensive, or conflicted with the patient's beliefs or values, it would result in negative automatic thoughts including self-condemnation and guilt. The patient, driven by guilt, would then engage in com-

pulsive repetitive behaviors in an attempt to avoid blame and reduce their distress.

While Salkovskis's theory has limitations, he is credited with isolating an elevated sense of responsibility as a major contributing factor of OCD, noting that many of his patients' intrusive thoughts centered on being responsible for causing damage or harm to others. Lopatka and Rachman (1995) provided experimental support for the theory. They developed a study that isolated and manipulated perceived responsibility as a variable in compulsive checking and washing behaviors. The researchers found that decreasing perceived responsibility in a hypothetical situation greatly reduced the subject's self-reported distress, anxiety, and urge to check.

Identifying Cognitive Factors Related to Obsessive Disorders

Following the work of Salkovskis, a large group of international researchers came together to form the Obsessive Compulsive Cognitions Working Group (OCCWG, 2005) and to develop unified measures to assess obsessive disorders. The group identified three main factors related to OCD- an elevated sense of responsibility and over-estimation of potential threat, perfectionism and a decreased tolerance of uncertainty, and exaggerated importance of thought (OCCWG, 2005). The researchers also created the Obsessive Belief Questionnaire (OBQ) and the Interpretation of Intrusions Inventory (III) which have been shown to have good internal consistency, validity, and test-retest reliability (Myers, Fisher, & Wells, 2008).

Cognitive Theory of Compulsive Checking

Some time after Salkovskis's preliminary theory of obsessional disorders, Rachman (2002) developed a cognitive theory of compulsive checking to address what had be-

(2002) developed a cognitive theory of compulsive checking to address what had become recognized as one of the most common symptoms of OCD. He extended and refined Salkovskis's theory, focusing on the intrusive thoughts and maladaptive beliefs that characterize the disorder and drive the related behaviors (American Psychiatric Association, 2013; Rachman, 2002).

Rachman (2002) hypothesized that compulsive checking behaviors were mediated by three cognitive factors; an elevated sense of responsibility, an over-estimated probability of harm, and the anticipated severity of the harm. He believed that most checking compulsions were motivated, deliberate acts meant to prevent some vague future harm from occurring and provide temporary relief from the related anxiety. Rachman (2002) also made the groundbreaking assertion that compulsive checking was a self-perpetuating mechanism driven by four elements, a theory that has gained substantial empirical support.

The first element in Rachman's (2002) self-perpetuating cycle states that patients with compulsive checking behaviors over-estimate the likelihood of harm occurring when they are responsible. This assertion builds upon Salkovskis's (1985) earlier theory that an elevated sense of responsibility is a major contributing factor of OCD and Lopatka and Rachman's (1995) findings that manipulating a participant's perceived responsibility greatly affected the subject's self-reported distress, anxiety, and urge to check.

The second element in the cycle is an uncertainty that the potential threat has been avoided. Rachman (2002) reasoned that checking behaviors often began as a way to thwart anticipated harm. However, because the checking is meant to prevent some vague, future harm there can be no definite certainty that the danger has been evaded, and a de-

creased tolerance of uncertainty drives the patient to check again and again in an attempt to relieve the distress (OCCWG, 2005; Rachman, 2002).

Rachman's (2002) third element is the decrease in memory confidence caused by repeated checking and the maladaptive beliefs and appraisals that are common among compulsive checkers. The more a patient checks to assure themselves that a threat has been avoided, the more the patient's confidence in their memory decreases, and the less likely they are to attain certainty (Rachman, 2002; Radomsky, Gilchrist, & Dussault, 2006; Van den Hout & Kindt, 2003). Some patients with compulsive checking behaviors interpret this decrease in memory confidence as a sign of mental illness and deterioration (Rachman, 2002).

The final element in the self-perpetuating cycle is the finding that a compulsive checker's sense of responsibility is increased following a completed check. As the patient's sense of responsibility increases, the self-perpetuating mechanism begins again with an elevated sense of responsibility leading to an exaggerated probability of harm.

Van den Hout and Kindt (2003) provided empirical support for Rachman's (2002) theory that repeated checking causes memory distrust. Van den Hout and Kindt (2003) hypothesized that repeated checking affected memory confidence by affecting the familiarity, vividness, and detail of a memory trace. They believed that repeated checking would increase familiarity with an object or scene, and that as familiarity increased, the processing of the episode would become more semantic and conceptual. The shift to conceptual processing inhibits lower level, bottom-up perceptual processing associated with vividness and details. As the memory trace becomes less vivid and detailed, confidence in

the memory decreases leading to memory distrust.

The researchers designed a paradigm in which healthy participants repeatedly checked a virtual gas stove and virtual light dimmer switches (Van den Hout & Kindt, 2003). They observed a significant decrease in memory confidence related to vividness and detail for the participants who repeatedly checked the virtual stove, but not for subjects who had switched back and forth between checking the light switches and the stove (Van den Hout & Kindt, 2003). This demonstrated that repetitive, ritualistic checking could lead to memory distrust, even in healthy participants. The researchers also found, surprisingly, that memory accuracy remained unaffected for both conditions. Overall, these findings supported Rachman's (2002) theory, and paved the way for future studies to examine the effects of repeated checking on memory confidence.

Radomsky, Gilchrist, and Dussault (2006) expanded on Van den Hout and Kindt's (2003) findings by utilizing a more ecologically valid paradigm in order to increase the sense of responsibility and threat estimation believed by Rachman (2002) to be cognitive factors related to repeated checking behaviors. Radomsky et al. (2006) designed a study involving healthy undergraduate participants who were instructed to ritualistically check a real kitchen stove and a faucet. Radomsky et al. (2006) found that despite the richer encoding environment of a real life paradigm there was a significant decline in memory confidence, vividness, and detail for subjects who repeatedly checked the stove compared to participants who had switched between the faucet and the stove. They also found a slight decrease in memory accuracy, which they thought might be due to the increased responsibility and threat estimation relat-

ed to the real-life paradigm. The results were largely consistent with the findings of Van den Hout and Kindt (2003), and led the researchers to conclude that decreased memory confidence caused by repeated checking may be a large part of the self-perpetuating mechanism initially proposed by Rachman (2002).

A Novel Approach

Having found substantial empirical support for Rachman's (2002) hypothesis that repeated checking causes a decrease in memory confidence, Alcolado and Radomsky (2011) approached the issue from a novel direction (Radomsky et al., 2006; Van den Hout & Kindt, 2003). Building on the work of Nedeljkovic, Moulding, Kyrios, and Doron (2009), Alcolado and Radomsky (2011) hypothesized that decreased memory confidence may possibly be another mediating factor that is predictive of compulsive checking behaviors. The researchers designed a study in which they artificially manipulated the memory confidence of participants to examine the effects on repeated checking tasks.

Alcolado and Radomsky (2011) began by giving healthy undergraduate subjects a battery of pretest measures, including a standard memory test, to ensure there were no trait differences in memory confidence prior to the manipulation. The participants were then randomly assigned to either the Low Memory Confidence condition or the High Memory Confidence condition. The researchers then provided false feedback based on conditions, such that subjects in the High Memory Confidence condition were informed that they had above average memories, while participants in the Low Memory Confidence condition were told that they had performed poorly on their memory test, and their scores were far below average. After receiving feedback from the researchers, subjects were taken to another

er room to play a memory card game. Later, they were asked to turn out the light as they left the room after playing the game. Participants were then asked about the first pair of cards they completed in the card game, their confidence in their answer, as well as their desire to check that they answered correctly. They were also asked whether they had turned out the light, their confidence in their answer, and their desire to check that it was off. Finally, subjects also rated their urge to destroy the results and to try again.

The findings indicated that participants in the Low Memory Confidence condition displayed a significantly greater urge to check both the memory game and the light task compared to those in the High Memory Confidence condition (Alcolado & Radomsky, 2011). Subjects in the Low Memory Confidence condition also reported a greater urge to destroy the results and try again. The results mirrored the earlier findings of Van den Hout and Kindt (2003), revealing no significant differences in memory accuracy between the High Memory Confidence condition and the Low Memory Confidence condition.

Overall, the results supported the hypothesis, demonstrating that decreased memory confidence could be a predictive factor in compulsive checking behaviors and a possible cognitive mechanism underlying the disorder (Alcolado & Radomsky, 2011). Alcolado and Radomsky (2011) argue that future assessments of compulsive checking behaviors and OCD may benefit from including a measure of maladaptive beliefs about memory confidence. However, further research is needed to replicate and validate the study's findings.

The current study is an attempt to replicate the findings of Alcolado and Radomsky (2011) by utilizing a similar experimental structure to investigate the role of decreased memory confidence in repeated checking be-

haviors. We will also attempt to improve upon their experimental design by addressing some of the limitations of the earlier study. First, it could be argued that the study lacked an adequate control condition. Both conditions received differing types of false feedback. The High Memory Confidence condition received false positive feedback while the Low Memory Confidence condition received false negative feedback. It is possible that the increased desire to check and the greater urge to destroy the results and try again reported by participants in the Low Memory Confidence condition may have been affected by the anxiety caused by receiving pointed negative feedback, a factor that was not explored in the earlier study (Alcolado & Radomsky, 2011). Also, Alcolado and Radomsky's (2011) study involved approximately two hundred participants, and the same results may be difficult to duplicate with fewer subjects.

The present study will attempt to control for the effects of anxiety related to negative feedback by utilizing a more balanced experimental design including a novel control condition. Subjects in both the Memory Feedback condition and the Creativity Feedback condition will be exposed to a memory measure and a measure of creativity. Participants in the Memory Feedback condition will receive negative feedback on the memory measure, but no feedback on the creativity measure while subjects in the Creativity Feedback condition will receive negative feedback on the creativity measure, but no feedback on the memory measure. We will also attempt to strengthen the manipulation of memory confidence by setting unrealistically high expectations for performance in addition to giving pointed negative feedback in order to decrease the number of participants needed to observe the effect.

Having addressed the above limitations, two different patterns of data are plausible. If the self-reported increase in urge to check is in fact driven by the manipulation of memory confidence, as hypothesized by Alcolado and Radomsky (2011), then it would be projected that participants in the Memory Feedback condition would report a significantly greater urge to check than participants in the Creativity Feedback condition. However, if the increased desire to check is actually caused by anxiety related to receiving negative feedback, then it would be expected that the urge to check reported by the two conditions would be more similar. It is expected that participants will display an increase in state level anxiety following the negative feedback manipulation regardless of condition.

Methods

Design

The experiment was a between-subjects design with feedback type as the main independent variable. Participants in the Memory Feedback condition were given unrealistically high expectations for their performance on the memory measures, received false negative feedback about their performance on those measures, but did not receive any feedback on the creativity measures. Conversely, subjects in the Creativity Feedback condition were given high expectations for their performance on the creativity measures, then received false negative feedback about their performance on those measures, but did not receive any feedback on the memory measures. The main dependent variables were urge to check and desire to destroy the results and try again, which were considered to be proxies for checking behaviors and were measured via self-reported scales. All data were analyzed using SPSS.

Participants

A preliminary group of 200 students were recruited from the PSY 301 Participant pool at The University of Texas at Austin and received course credit for participation. All participants were age 18 years or older. Subjects began by filling out an online pre-screening form comprised of a battery of inventories including a measure of state and trait anxiety, an inventory of OCD related beliefs and symptoms, as well as a measure of depressive symptoms. Any participants who had been diagnosed with OCD, anxiety disorders, or depression and were receiving treatment or medication were not included in the study. Subjects who scored highly on the OCD or depressive measures (see Materials section) were also excluded to avoid causing any added distress during the negative feedback portion of the study. A representative sample of 23 participants (21 females and 2 males) was chosen randomly from the subjects who met the criteria for participation in this study. Participants in this sample were 43.48% Asian or Pacific Islander, 30.43% Caucasian, 17.39% Hispanic or Latin American, 4.35% African American, and 4.35% Other (More Than Once Race) with a mean age of 19.04 years.

Materials

Center for Epidemiologic Studies Depression Scale (CES-D) – the CES-D is a 20-item self-report measure that screens for depressive symptoms (Radloff, 1977). Subjects who scored 17 or higher were excluded from the study.

State-Trait Anxiety Inventory (STAI) – The STAI is a 20-item self-report inventory that measures levels of both state and trait anxiety (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

Yale-Brown Obsessive Compulsive Scale (Y-BOCS) – The YBOCS is a 10-item self-re-

port measure that screens for OCD related symptoms including obsessions and compulsions (Goodman et al., 1989). Subjects who scored 9 or higher were excluded from the study.

Short Form State-Trait Anxiety Inventory (Short Form STAI) – The Short Form STAI is a brief 6-item self-report inventory that measures levels of state anxiety (Martean & Becker, 1992).

Creativity and Memory Tasks – The creativity tasks included a version of Guilford's Alternative Uses Task (Guilford, 1967) and the Remote Associates Task (Mednick & Mednick, 1967). The memory tasks were created by the experimenter, and included tasks inspired by Operation Span (Turner & Engle, 1989), 3 Dimensional Mental Rotation Tasks (Ganis & Kievit, 2015; Shepard & Metzler, 1971), and Letter-Number Sequencing (Wechsler, 1997).

Self-Report Rating Scales (0-100) – Researchers utilized the same Self-Report Rating Scales described by Alcolado and Radomsky (2011). Subjects were asked to indicate their "urge to check the correct answer on a scale of 0-100 with 0 being not at all and 100 being an extreme urge to check the correct answer" as well as their "urge to destroy the results of this exercise and try again, on a scale of 0-100 with 0 being not at all and 100 being an extreme urge to destroy the results and try again". The Self-Report Rating Scales were adapted to be administered electronically via Qualtrics, and required that subjects indicate their answers on an interactive horizontal sliding scale labeled from 0-100 instead of answering verbally.

Procedure

Approval from the Institutional Review Board at the University of Texas was acquired prior to the study. The study began by receiv-

ing informed consent from all subjects prior to participation. The subjects were compensated for participation by receiving course credit. The current study included two parts. The first part consisted of an online prescreening survey administered using Qualtrics, and the second part of the study required that the participant come into the lab to complete the creativity and memory tasks.

Each participant began by filling out a pre-screening form in Qualtrics to determine their eligibility to participate in the second part of the study in the lab. Prior to completing the pre-screening survey, subjects were presented with an online informed consent document that contained a deceptive description of the purpose of the study. The consent form stated that the purpose of the study was to learn more about how creativity may be related memory, assess some new creative memory tasks for future use in our lab, and participation was voluntary. The pre-screening form contained questions from the Center for Epidemiologic Studies Depression Scale (CES-D), State Trait Anxiety Inventory (STAI), and the Yale-Brown Obsessive Compulsive Scale (Y-BOCS). The pre-screening survey was used to exclude subjects with a history of mental illness, anxiety disorders, or OCD from participating in the second part of the study because they may be at a higher risk of anxiety or negative effects caused by the negative feedback manipulation, or their condition may have confounded the results.

Participants who met the qualifications for participation were then invited to schedule an appointment to come into the lab to complete the second part of the study. Subjects who expressed an interest in completing the second part of the study were randomly assigned to either the Memory Feedback condition or the Creativity Feedback condition prior to their appointment. The participants were unaware

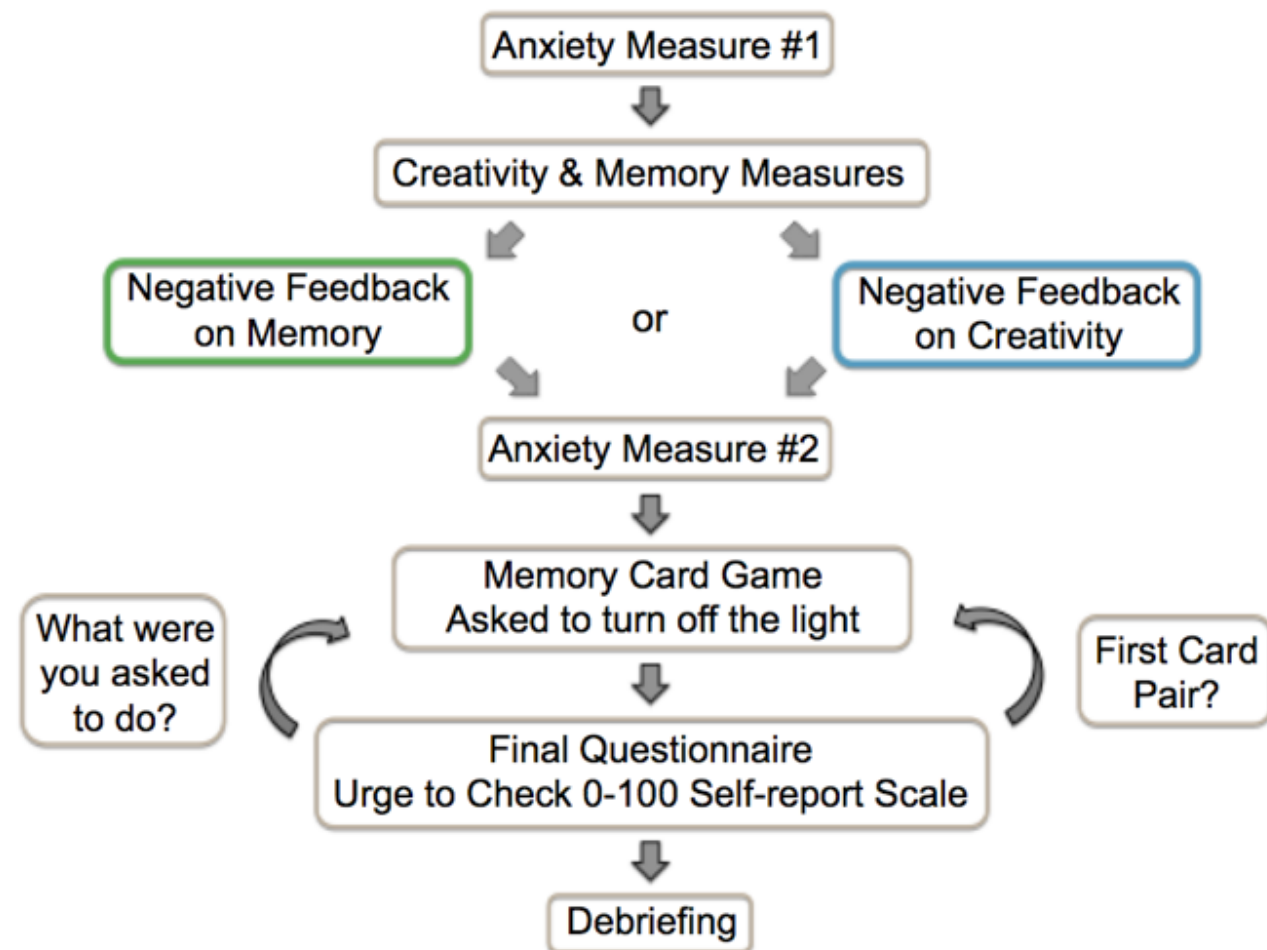


Figure 1. Chart represents the sequence of experimental procedures during the second portion of the study completed in the lab.

of the condition they had been assigned to.

Prior to participation, the researcher obtained a secondary informed consent from each subject when they came to their appointment. The subject was then asked to complete an online test administered using Qualtrics. This test included the short form State Trait Anxiety Inventory (Short Form STAI) followed by memory and creativity tasks (see Figure 1). The memory and creativity tasks were designed to be varied, challenging, and subjective enough that participants would be unsure of their performance and therefore more likely to believe the negative feedback manipulation. The experimenter did not actually score the memory and creativity tasks. Once the participant completed the creativity

and memory tasks, they were given unrealistic expectations for their performance then received false negative feedback from the experimenter based on the condition to which they were randomly assigned (i.e. "Your scores were significantly lower compared to the standard scores of people your age on this test, so most people your age would have performed better than you on average across these tasks").

Following the false negative feedback, the participant was asked to complete a short post-feedback questionnaire in Qualtrics that also included the Short Form STAI to measure any increase in the level of state anxiety following the manipulation. The remainder of the questionnaire included filler questions,

except for a question that was meant to ensure that the negative feedback manipulation was believable.

After completing the post-feedback questionnaire, the participant was escorted to another testing room and asked to complete another creative memory task. The task was the Memory card game in which the subject attempted to find matched pairs of playing cards by turning over only two cards at a time. The Memory card game was used because it requires elements of both memory (locations of specific cards) and creativity (search strategies). The participant was instructed that the researcher would be timing how long it took them to find all of the pairs and complete the task. Upon leaving the room in which the Memory game was played, the experimenter requested that the subject turn off the light, and escorted them back to the first testing room where they were asked to complete a short final self-report questionnaire in Qualtrics.

The final questionnaire began with a question about which pair of cards the participant had found first while playing the Memory card game (see Figure 1). The subject was then asked to rate their urge to check that they had answered the question correctly on a scale of 0-100 with 0 being not at all and 100 being an extreme urge to check the correct answer. They were also asked to rate their urge to destroy the results of this exercise and try again, on a scale of 0-100 with 0 being not at all and 100 being an extreme urge to destroy the results and try again. Next, the subject was asked to recall what the experimenter had asked them to do as they left the testing room (turn off the light), and again asked them to rate their urge to check the correct answer and to destroy the result and try again on scales of 0-100. This final self-report questionnaire was used as a proxy for measuring

checking behaviors. Following the final questionnaire, the experimenter debriefed the subject and explained the use of deception in the study.

Results

The researcher began by examining one of the key issues, which was whether the negative feedback resulted in an increase in anxiety. An independent samples t-test with a set alpha level of .05 indicated that the subjects in the Memory Feedback condition ($M = 10.36$, $SD = 2.87$) did not differ significantly from participants in the Creativity Feedback condition ($M = 8.25$, $SD = 2.22$) on their state level of anxiety prior to the manipulation ($t(21) = 1.98$, $p = .06$). However, as shown in Figure 2, a within-subjects repeated measures ANOVA revealed a significant increase in level of anxiety following the negative feedback manipulation ($F(1, 21) = 10.19$, $p = .004$) with no significant main effect of condition ($F(1, 21) = .002$, $p = .96$). From this information, the experimenters operationally defined the increase in level of anxiety (or anxiety level) as the difference between the Short Form STAI scores taken before and after the manipulation. To be thorough, we also ran all of our analyses using only the second Short Form STAI score taken after the negative feedback manipulation, but the outcomes were very similar to the results obtained using the increase in level of anxiety. Therefore, all subsequent analyses we report in which anxiety was a factor were calculated using the increase in level of anxiety.

The data suggests that we were able to replicate the effects reported by Alcolado and Radomsky (2011). The mean urge to check which card pair was found first reported by subjects in our Memory Feedback condition was similar to the mean urge to check which card pair was found first reported by subjects

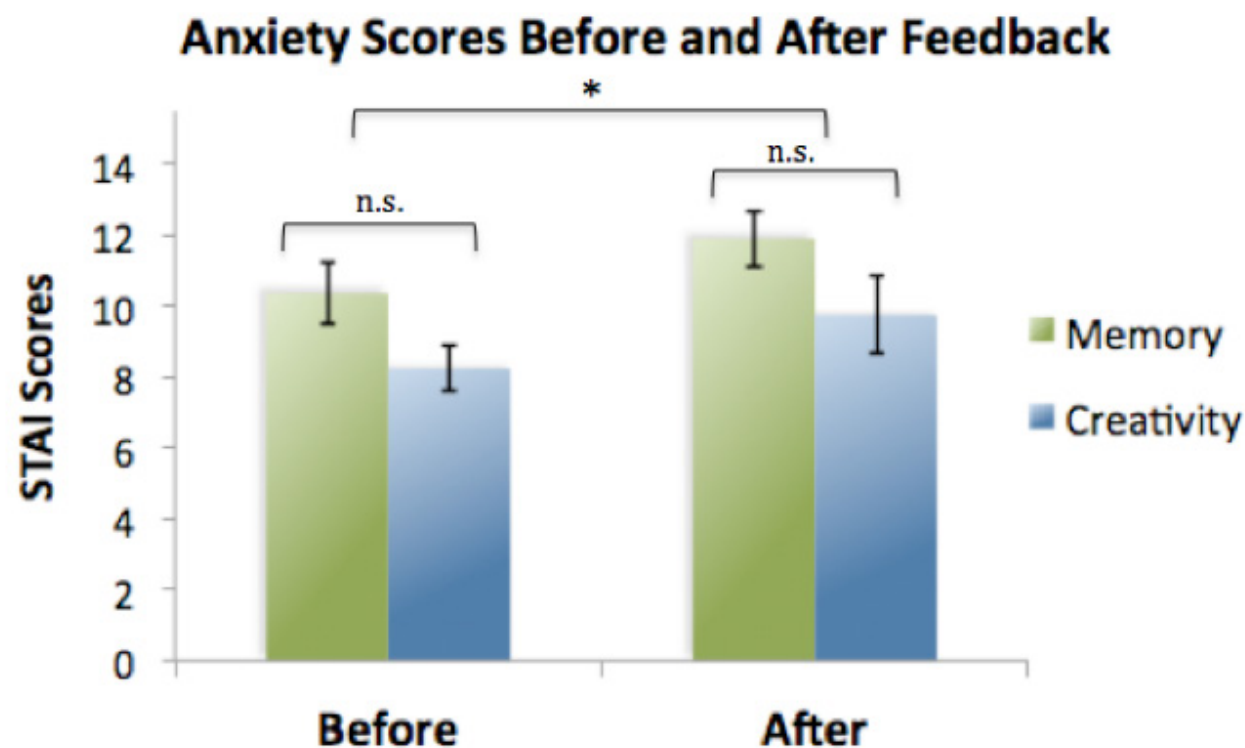


Figure 2. Graph represents the mean Short Form STAI score for each condition before and after the negative feedback manipulation. Error bars ± 1 SEM.

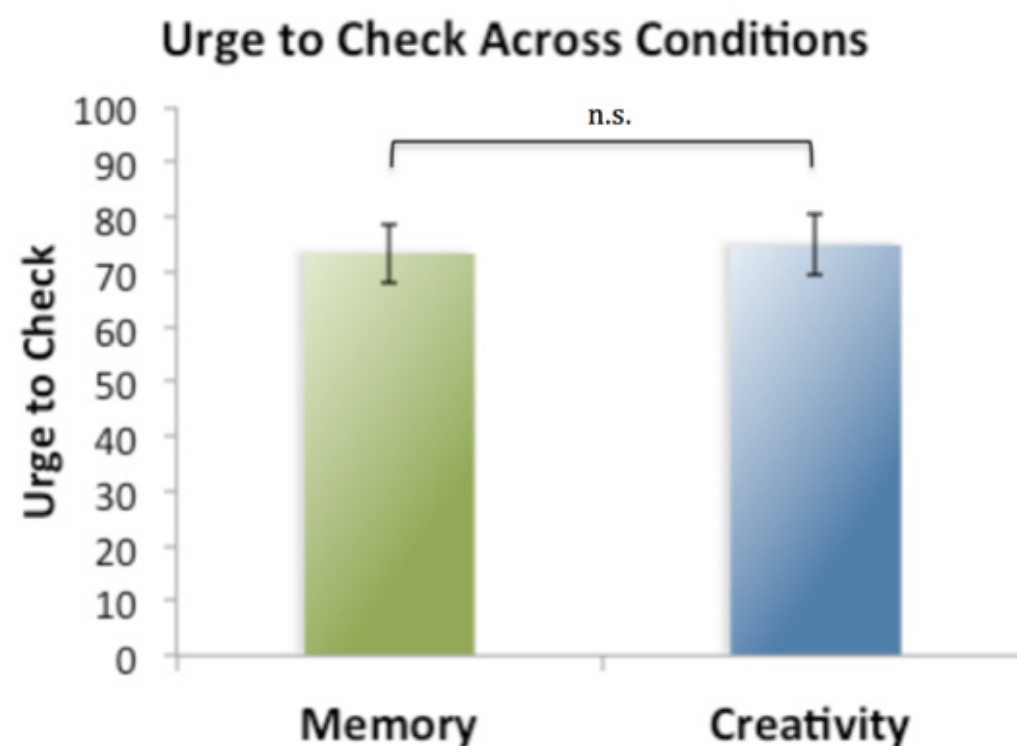


Figure 3. Graph represents the mean urge to check which card pair was found first for each condition. Error bars ± 1 SEM.

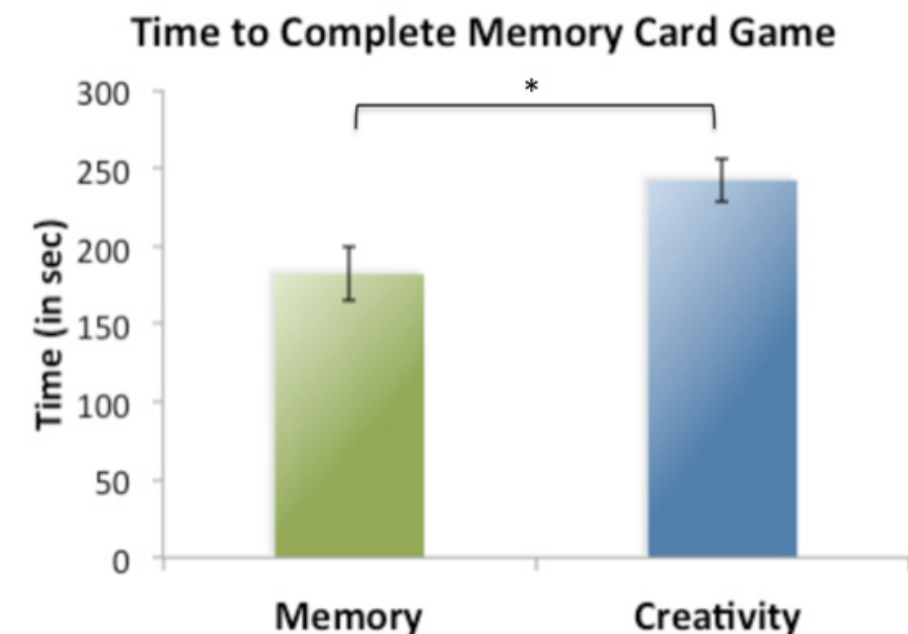


Figure 4. Graph represents the mean time to complete the Memory card game for each condition. Error bars ± 1 SEM.

A graph of the data showed that participants in the Memory Feedback condition ($M = 73.36$, $SD = 17.99$), and subjects in the Creativity Feedback condition ($M = 74.92$, $SD = 19.75$) did not demonstrate a reliable difference in urge to check their answer about the first card pair found in the Memory card game (see Figure 3). An ANCOVA revealed that there was no significant main effect of condition on urge to check when the increase in level of anxiety was included as a covariate ($F(1, 20) = .04$, $p = .85$), and there was no significant interaction between the increase in level of anxiety and condition ($F(1, 20) = .05$, $p = .83$). In fact, there were no reliable interactions of anxiety as a covariate in any of the ANCOVAs performed for each of the dependent variables and they will not be mentioned further. Unfortunately, in contrast to our hypothesis the increase in level of anxiety following the negative feedback manipulation was not significantly correlated with the reported urge to check ($r(21) = .05$, $p = .83$).

Similar results were found when analyzing the remainder of our dependent variables.

Subjects in the in the Memory Feedback condition ($M = 33.09$, $SD = 30.86$) did not reliably differ from subjects in the Creativity Feedback condition ($M = 26.83$, $SD = 31.82$) in their reported urge to destroy the results of the card task and try again ($F(1, 20) = .22$, $p = .64$). There was not a significant difference between the Memory Feedback condition ($M = 11.82$, $SD = 18.88$) and the Creativity Feedback condition ($M = 14.42$, $SD = 27.79$) in the reported urge to check that the light had been turned off upon leaving the testing room ($F(1, 20) = .06$, $p = .8$). Finally, participants in the Memory Feedback condition ($M = 18.64$, $SD = 21.75$), and subjects in the Creativity Feedback condition ($M = 21$, $SD = 32.04$) did not demonstrate a reliable difference in urge to destroy the results of the light task and try again ($F(1, 20) = .04$, $p = .84$). These results are inconsistent with the findings of Alcolado and Radomsky (2011), which found a significant effect of condition on urge to check and urge to destroy the results and try again for both the card task and the light task when using a positive-feedback control condition.

Surprisingly, participants in the Creativity Feedback condition ($M = 242.25$, $SD = 47.33$) took significantly longer to complete the Memory card game than participants in the Memory Feedback condition ($M = 182.09$, $SD = 55.43$) ($t(21) = -2.81$, $p = .01$; $d = 1.17$; Fig. 4). However, time to complete the Memory card game was not significantly correlated with urge to check ($r(21) = .007$, $p = .97$). Also, the increase in anxiety following the negative feedback manipulation was not significantly correlated with the time to complete the Memory card game ($r(21) = -.003$, $p = .99$).

Discussion

The results of this study revealed that there was not a significant difference in the mean urge to check or the mean urge to destroy the results and try again reported by the two conditions for the card task or the light task (see Figure 3). This is inconsistent with the previous study, which found reliable differences in urge to check and urge to destroy the results and try again across all dependent variables when using a positive-feedback control condition (Alcolado & Radomsky, 2011). These findings indicate that the observed checking behaviors are not driven solely by the manipulation of memory confidence via negative feedback on memory performance, and suggest that decreased memory confidence is not necessarily a predictive factor in compulsive checking behaviors (Alcolado & Radomsky, 2011).

Importantly, the data did indicate a significant increase in level of anxiety following the negative feedback, regardless of condition (see Figure 2). Unfortunately, there was not sufficient evidence to support the hypothesis that the increase in anxiety related to receiving negative feedback was driving the observed increase in checking behaviors.

Therefore, while negative feedback on performance does seem to affect self-reported urge to check, we were unable to isolate the exact mechanism driving the effect in the present study. We will now speculate on a few plausible interpretations of the current data.

It may be that the unexpected finding that participants in the Creativity Feedback condition took significantly longer to complete the Memory card game than participants in the Memory Feedback condition could provide some clues to the cognitive mechanism underlying the effect of negative feedback on checking behaviors (see Figure 4). This discovery also differs from the earlier study, which found that subjects in the Low Memory Confidence condition and High Memory Confidence condition did not differ on times to complete the Memory card game (Alcolado & Radomsky, 2011). Therefore, it appears that the creativity feedback affected the results of the memory card game in a way that the memory feedback did not. It is possible that the Creativity Feedback condition may affect a currently unknown factor, such as self-esteem, perfectionism, or self-efficacy, to a greater extent than the Memory Feedback condition. Another explanation for this finding is that subjects in the Memory Feedback condition were somehow primed to perform better on the Memory game task, or conversely, subjects in the Creativity Feedback condition were negatively primed for the task. The Memory card game was described to participants as a “creative memory” task, and despite efforts by the experimenters to ensure that the two conditions were as similar as possible and differed only in the words “creative ability” or “memory performance” during the negative feedback, it may be one of the two conditions was judged to be more salient to the card task.

The present study is considered an at-

tempt to replicate the findings of an earlier study (Alcolado & Radomsky, 2011) as well as a preliminary investigation into the effects of negative feedback on reported urge to check, a prominent symptom of OCD. Several limitations of this study should be mentioned. First, both the current study and the earlier study operate on the assumption that negative feedback on memory performance is in fact affecting memory confidence as measured by the expression of self-reported checking behaviors. However, the lack of an objective measure of memory confidence *per se* means that any changes to memory confidence must be inferred from behavior purportedly related to it. Also, it is possible that negative feedback on creative ability may have inadvertently affected memory confidence, in addition to other factors. This could explain the lack of a significant difference in checking behaviors between the two conditions (if memory confidence is indeed a causal factor) whereby the other latent causes affected by the creativity confidence manipulation may drive the slowdown in completion time on the Memory card game.

Future iterations of this paradigm could address these confounds by including a direct measure of memory confidence taken before and after the negative feedback manipulation to ensure that the negative feedback is having the specific, desired effect of reducing memory confidence. Second, it is possible that the observed increase in urge to check found in the present study is driven by a more general cognitive impairment related to receiving negative feedback, although this is only speculation. Future studies could explore the possible effects of negative feedback on factors like self-esteem and self-efficacy, as well as other factors known to be related to OCD such as an elevated sense of responsibility, perfectionism, a decreased tolerance of

uncertainty, and exaggerated importance of thought (OCCWG, 2005).

Overall, the results of the current study support the hypothesis that receiving pointed negative feedback on performance results in an increase in state level anxiety, and indicate that negative feedback seems to be related to an increase in self-reported urge to check in otherwise healthy undergraduate participants. However, after introducing a novel control condition the statistically similar urge to check reported by the two conditions across all of the dependent variables suggests that the observed checking behaviors are not driven solely by the manipulation of memory confidence, and that decreased memory confidence is not necessarily a predictive factor in compulsive checking behaviors (Alcolado & Radomsky, 2011). This implies that Alcolado and Radomsky's (2011) indication that maladaptive beliefs about memory confidence should be included in future assessments of compulsive checking behaviors and OCD may be unfounded. Future studies that explore the cognitive mechanism driving the effect of negative feedback on checking behaviors may discover a previously unknown factor underlying OCD, and could further our understanding of the disorder and aid in our development of useful therapeutic interventions to treat the condition.

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Clarice Guan

Relative Roles of Native Herbs and Foreign Spices in 13th-17th Century European Medicine

ABSTRACT

European medicine between the thirteenth and seventeenth centuries depended largely on plant ingredients, including local species such as mandrake, wormwood, and henbane. However, the reestablishment of trade with the East led to the increasing medical importance of foreign spices, including pepper, ginger, and cinnamon. This article aims to add dimension to existing knowledge of European herbal medicine, or herbalism, by discussing the relative roles of local plants and foreign spices in Central and Western Europe from the 1200s through the 1600s. Detailed discussion of herbalism's methodologies helps to correct and remove modern bias against its efficacy, while highlighting the historical importance of certain plant species to allow future research on their active compounds and medicinal effects. Through literature review of herbal compendiums, case studies, and books, I show that, though spices and herbs were not economically comparable, they each had essential roles in herbalism, with uses ranging from anesthesia to reproductive health. They were then integrated into religion, society, and literature, developing reputations based on their medical usefulness. Thus, an expanded discussion of these contexts is provided in order to explain the influence of foreign spices and local plants on European cultures.



PLANTS HAVE ALWAYS BEEN closely intertwined with human culture, especially in the realm of medicine. Historically, plants with pharmacological and medical effects have been regarded as highly valuable in all societies – beyond that, the importance of plants to humans has always been affected by the plants' properties, be they chemical or abstract. This was especially true in Central and Western Europe between the thirteenth and seventeenth centuries, when herbal medicine (“herbalism”) depended not only on local plants but also on foreign spices for health and healing. However, the rationales behind the importance of foreign spices and local herbs were unique, so that neither became dominant in herb-

alism. Instead, they worked in tandem, fulfilling different needs and niches in medicine, society, and culture.

The study of herbalism is related to a need to expand, clarify, and explain ethnobotanical knowledge of the past. Twenty-first century medicine revolves around diagnoses of specific ailments and the targeted use of pharmaceuticals as treatment. In contrast, herbalism ascribed qualities and powers to its ingredients that were based not on chemical effects but on concepts and beliefs that are no longer popular in modern settings. Thus, modern opinions of herbalism often dismiss it as ineffective, due to a perceived dependence on ritual and superstition. It is worthwhile to address and correct this bias, especially as

ongoing studies of historical Europe continue to reveal the reasoning and sophistication present in medical literature and treatments of the time.

Cultural Developments in Europe from the 1200s to the 1600s

European medical practices between the thirteenth and seventeenth centuries are often seen as outdated and ineffective, due in part to an association with the “Dark Ages.” This misnomer, which originally addressed the period between the fifth and fifteenth centuries, rose from the misguided perception of Europe as intellectually and culturally crippled following the collapse of the Roman Empire. However, modern research has shown that while certain practices were indeed underdeveloped or lost, others persisted – herbalism in particular did not merely survive but grew, developing new nuances throughout Medieval and Renaissance times. That is not to say that herbalism between the thirteenth and seventeenth centuries met present-day standards of healthcare; however, it must be acknowledged that stagnation was not a defining factor of medicine during this time, largely due to the invention of the printing press and the redevelopment of trade with Asia.

What written knowledge was available in Europe in the early Middle Ages was copied by hand in monasteries, and therefore it was slow to disseminate. The invention of the printing press in the fifteenth century expanded the reach of medical practitioners, by allowing quicker distribution of recorded information. As publication became more efficient, physicians, apothecaries, and their apprentices moved away from oral tradition, congregating in universities instead. Curricula included the writings of Galen, Dioscorides, and Avicenna, all of whom were ancient recorders

of herbal and medicinal knowledge (Riddle 102). With secure knowledge of preexisting medicine, physicians were thus able to develop further upon their own practices between the 1200s and 1600s.

The printing press also encouraged the publication of new information, whether it was an original discovery or a clarification of previous knowledge. The earliest printed herbal texts (“herbals”) included the German *Tractatus de virtutibus herbarum*, published anonymously in 1484 as a novel presentation of knowledge from older sources (Riddle 140). Similarly, in England texts appeared compiling the effects and uses of regional plants, as well as the lore surrounding them. These works included Peter Treveris’s *The Grete Herball* in 1526, one of the first widely disseminated English texts, and William Turner’s *New Herball*, which was finished in 1568 and provided a structured guide to herbal and botanical information (Mann 116-117). Thus, a continuing stream of knowledge existed from ancient sources to European herbals, allowing physicians to identify, gather, and use plants with confidence and efficacy.

Herbalism was not restricted by any rules to the use of local plants, but the fall of the Roman Empire had stymied the trade of ingredients between the West (Europe) and the East (Asia). By the thirteenth century, contact had been restored by the Crusades and by routes recorded by merchants such as Marco Polo. As connections were restored, trade and travel brought foreign plant products that, like local plants, accrued various uses in herbalism. Foremost among these imports were spices, which would eventually provoke European exploration over much of the globe.

To prevent confusion, clear explanations of the terms discussed must be given. “Spices” in this article will refer to non-European plant products imported to Europe, most often in

their dried form. Inorganic spices such as salt are excluded, as well as any rare animal substances such as ambergris. Spices, of course, have always had a large role in cooking; historically, however, it must be noted that they have had uses outside the culinary, especially in medicine. The reinvigoration of the spice trade allowed herbalists to develop treatments that depended on foreign plants, affecting the relative importance of local herbs as a result.

The plants found commonly in Central and Western European landscapes will be referred to as “local plants” or “local herbs,” though it should be remembered that not all of them are herbaceous (that is, not all are non-woody, as the botanical use of “herb” would suggest). In addition, though some herbs that will be discussed, like rosemary, are relevant to the culinary arts, others, like deadly nightshade, would be quite unwelcome on any plate. A full list of the plants discussed in this article, including their scientific names, can be found in the Appendix.

Finally, after defining the relative roles of spices and herbs within herbalism, this article will turn to the “reputations” of both, which in this article is taken to mean the perceived importance of the selected plants to Central and Western European populations, which was informed by the medical significance of each plant in question. After establishment of the medical perspective, discussion will then address the portrayal of foreign spices and local herbs in religious, social, and literary contexts, in order to demonstrate the effects of herbalism on European cultures between the thirteenth and seventeenth centuries.

Methods and Principles of Herbalism

The goals of herbalism were to cure ailments, preserve health, and record the medical effects of its ingredients. Its applications could be simple: comfrey, for example, was

applied directly to treat minor wounds (Bevan-Jones 52). However, Riddle describes a growing emphasis on “polypharmacy” in herbalism, which called for the use of many different ingredients in each remedy (107). An example of polypharmacy was the Great Rest (*Requies magna*), a thirteenth-century anesthetic recorded by the Italian physician Nicholas (or Nicolaus) of Salerno in his *Antidotarium Nicolai*. The recipe, which was intended for patients whose fever or pains prevented them from sleeping, was as follows:

Take three drams (10.244 g) each of roses and violets; one dram and a half (5.8 g) each of opium, henbane, meconium of white (opium) poppy, mandrake, wild lettuce, seeds of purslane, fleawort, nutmeg, cinnamon, and sugar. Two scruples and five grains (2.9 g) of white and red and citric sandalwood, ash, and tragacanth. Give with violet syrup to patients suffering acute fever; we can give it to them intermittently mixed with honey. (Everett and Gabra 444)

Notable ingredients in this recipe are henbane, mandrake, and opium, which in the modern day are commonly associated with toxic rather than beneficial effects. The use of these three in the Great Rest risked death, not sedation; but Everett and Gabra note the care with which Salerno recorded his measurements and instructions, concluding that the Great Rest was specifically designed to prevent overdose in its patients. Salerno’s notes give serious warnings of its potential lethality, guiding physicians to administer it with attention and care. A less direct indicator of Salerno’s restraint is the amount of the Great Rest his recipe produced: “one or two pounds” at most, in small, chestnut-sized portions (Everett and Gabra 447). Though Everett and Gabra acknowledge that a chestnut is not the most consistent of measurements, Salerno’s

explicit instructions are promising support of his caution in making the Great Rest available to herbalists.

It is also important to note that the medical efficacy of herbalism was based on cultural concepts unfamiliar to the modern perspective. Prominent among these was the belief in humoral theory, which originated from earlier Greco-Roman times. By this theory, the base qualities of the world – heat, cold, moisture, and dryness – composed the fluid “humors” of the human body, defined as blood, yellow bile, black bile, and phlegm. The unique mixture of humors in an individual subsequently affected the “temperament,” which referred to one’s overall health and predisposition to illness. In many cases, physicians aimed to rebalance a patient’s temperament, often combining plants of different qualities to do so.

Medicine between the 1200s and 1600s also focused on the concept of sympathetic magic, which stated that objects or events with similar characteristics could affect each other when used in certain ways. The resin called dragon’s blood, for example, was recommended in the fourteenth century by the English surgeon John of Arderne to control bleeding, due to its vivid red color (Jones 167). Practitioners believed firmly in the physical qualities that marked plants as beneficial, referring to them as “virtues” or *dynamidia*. Dendle describes *dynamidia* as a “wonderful, divine property” that hinted at the use of a plant, and there was an enduring faith in “virtuous” plants that accepted them as vessels of celestial power (56). Proof of a plant’s divine potential varied in reasoning: the lily root was prized for its perfectly balanced temperament, while the peony signaled its benefit by supposedly shining in the dark (Jones 168; Dendle 56). However, all *dynamidia* was instilled in plants by a divine hand, giving them purpose and justifying their use. The virtues

of plants were often drawn out by complex recipes such as the Great Rest, but at other times a broader sense of protection was invoked directly from one plant, as in the following prayer:

Herb *ricinum* [castor-oil plant, *Ricinus communis*], I pray that you heed my incantations, and that you ward off hail, lightning, and all storms, through the name of omnipotent God who bid you to be created. (Dendle 55)

It is this combination of ritual practice and pharmaceutical remedy – the equal credibility of sympathetic belief and careful recipes – that endured and developed throughout Europe, under the collective name of herbalism.

At first, humoral theory and sympathetic magic may seem to have diverted practitioners from credible, effective treatments, sending them instead toward superstition and coincidence. However, as Dendle explains, knowing the chemical effects of a plant would not have impacted an herbalist’s practice, as chemistry was not the focus of medicine at the time (55-56). Medicine in this time period was, by its own rules, a professional mixture of pharmacy and magic: the system itself was a mystical one, not simply one supplemented by superstition. Medicinal plants were effective because of their *dynamidia*, and the sympathetic importance of the physical form was such that individual plants of the same species could have differing applications. Both Leonard Fuchs, a German physician and botanist, and Pietro Andrea Mattioli (or Matthioli), an Italian botanist, prescribed the local herb borage to treat malaria in the sixteenth century, stressing that the number of stems on the plant indicated which malaria it would counter best (Alcock 36-7; Adams et al. 286). This distinction reflected how multiple forms of malaria have been recognized since ancient times: malaria tertiana, for which three-

stemmed borage was recommended, causes fevers at three-day intervals, while malaria quartana, which called for four-stemmed borage, causes fevers at four-day intervals.

As a final defense of herbalism’s efficacy, present-day research has indeed produced viable, chemical support for some of its recipes. For example, modern analysis of the Great Rest indicates that the use of henbane and mandrake introduced quick-acting alkaloids (hyoscyamine and scopolamine) into the bloodstream, sedating patients until the longer-term effects of the opium’s morphine set in (Everett and Gabra 448). The recipe also harnessed the disorienting effects of henbane, which discouraged patients from overdosing in attempts to quickly dampen their pain. Though herbalism in its historical contexts did not depend on such chemically-based rationales, the Great Rest demonstrates that herbalists had complex knowledge of their ingredients, which allowed them to make informed prescriptions that were effective, but not recklessly so.

In summary, herbalism combined the physiological effects of plants with how those plants appealed to social and cultural opinions. What plants offered to physicians, they offered to everybody else – a sense of healing, aid, and connection to a divine force that had placed both plants and humans in the world to begin with. This connection made medicinal plants a principle element of Central and Western European cultures, as their power and value permeated other aspects of everyday life.

Medical Applications of Local Herbs and Foreign Spices

Local Herbs in Medicine

European texts and practices from the 1200s to the 1600s relied largely on a selec-

tion of local plants, which were harvested, prepared, and administered in a variety of ways. The rural, agricultural lifestyle that dominated these periods, along with the consistent use of plants in medicine, ensured that most people were able to recognize a variety of local herbs (Riddle 123). Physicians, who often procured their own ingredients, could be expected to wield even greater botanical knowledge. John of Arderne, for example, considered juniper among the best of ingredients, and he directed fellow physicians to exact locations in England where it grew:

... Its leaves are slender and sharp-pointed and it bears a few green berries which blacken when they are grown... It grows in Kent on Shooter’s Hill on the road to Canterbury, and at Dorking in Surrey. It also grows in many other places in that county, also at Bedington near Croydon. Country folk are ignorant of its true name, calling it Gorst. And when it grows broad and low to the ground it is more fertile with its fruit. (Jones 176)

The local plants discussed in this article are varied and many. Of the local species to be discussed, the mandrake will be addressed later as a particularly illustrative example; first, however, discussion turns to wormwood, sage, and henbane, which will briefly illustrate herbalism’s uses for local plants.

Wormwood is one of the most common ingredients listed in the *Leechbook* of Bald, an Anglo-Saxon herbal and “physician’s desk reference” that dates to the tenth century (Bevan-Jones 150; Hummer 1588). Well beyond the 1600s, its use in herbal treatments persisted: wormwood was a popular remedy against snake bites, as well as intestinal parasites, and thus its common name was based on its ability to combat “worms” of various types. A present-day examination of various herbals, including those of German botanist

Hieronymus Bock and the previously mentioned Matthioli and Fuchs, found that wormwood was also described as effective against malaria, whether eaten or taken as a liquid extract (Adams *et al.* 285).

Sage had the influence and status of a cure-all in medieval Europe, as it was believed to cure many ailments and preserve wellness. It was commonly grown in gardens for use in therapeutic teas, to be drunk every day for good health, and it could be prescribed for a variety of illnesses, including malaria, epilepsy, and the plague (Lehner and Lehner 111). Like many spices, sage was commonly added to foods for its culinary effects; however, unlike many spices, the appeal of sage was in its accessibility, as it could be easily found or grown by people of any social or economic class. Thus the *Regimen sanitatis salernitanum*, a thirteenth-century health code (and poem) that describes the uses of many plants, praises it to no end:

Why should a man die in whose garden sage grows? Against the power of death there is no medicine in our gardens; but sage calms the nerves, takes away hand tremors, and helps cure acute fever... O sage! The saviour! Of nature the conciliator! (Scully 70-71)

Certain plants were applied with both pharmacy and magic in mind. Henbane, which Salerno included in his Great Rest, also served as a painkiller on its own: even past the seventeenth century, henbane seeds were burned to produce narcotic fumes that relieved patients of toothache (Bevan-Jones 78). In addition, the henbane root had talismanic uses, as between the tenth and eighteenth centuries it was thought to relieve pain if worn as a charm, not taken as a drug (Bevan-Jones 78). In a different vein, the root could be tied onto the left thigh of a woman who could not conceive, in order to produce a

male child (Osborn 149). These last two uses fall under the theory of sympathetic magic, demonstrating how the use of one medicinal plant could range from the physiological to the mystical.

The belief in plants as talismans was not restricted to a choice few species; rather, the principles of *dynamidia* and innate power widely supported such a use. Dendle cites the discovery of “bronze and silver amulet capsules” in Germany and Switzerland that were worn as charms and contained certain plants, among them henbane leaves (52-53). Indeed, various medical texts of the time indicated that carrying a remedy, rather than ingesting it, could be enough to produce beneficial effects. The reasoning behind this strategy may be examined in the case of plantain (not to be confused with the fruit of the same name), a hardy roadside herb that survived despite being crushed by passing travelers. A charm in Old English lauded plantain’s resilience, asking it to protect its users from “poison and flying-disease” just as it protected itself from trampling (Dendle 53). Finally, John of Arderne also used talismans (though he called them amulets), recommending a specific one against cancer:

pick dropwort (sometimes called stonewort) before sunrise on Thursday while saying the Lord’s prayer and hang it round the patient’s neck... (Jones 174)

Arderne did not necessarily give a reasoning this, calling it an *experimentum* because he believed its full effects could not be truly explained. This may seem to betray the credibility of herbal talismans, and yet Arderne was not the only medical professional to recommend them. Jones points out that the divide between “magical practices” and “scholastic medicine” was not as drastic as could be imagined, reminding readers that plants were often accepted as inexplicable, but effective

guards against illness (175). Ultimately, it was the *dynamidia* of local plants that made them powerful in herbalism, regardless of how precisely their effects could be explained.

Mandrake in Medicine

The mandrake stands out in herbalism as a local plant that was perceived to have great medical and social influence. Though it is native to the Mediterranean region, it was introduced to Northern and Central Europe early in the Middle Ages, growing successfully due to the warmer climates of the time (Bevan-Jones 100). Its appearance became well known throughout Europe, as given by the English herbalist John Gerard in 1633 in his *Herball, or Generall Historie of Plantes*:

The male Mandrake hath great broad long smooth leaves of a darke greene colour, flat spread upon the ground: among which come up the floures [flowers] of a pale whitish colour, standing every one upon a single small and weake foot-stalke of a whitish greene colour: in their places grow round Apples of a yellowish colour, smooth, soft, and glittering, of a strong smell... The root is long, thicke, whitish, divided many times into two or three parts resembling the legs of a man, with other parts of his body adjoining thereto... (Gerard 351)

Though Gerard himself insisted that the plant’s shape was inconsequential, most people best recognized the mandrake by its underground root, which accrued its supposed powers because its shape suggested many possible applications via sympathetic magic.

The mandrake’s uses in medicine have been known since antiquity throughout much of Europe, as well as the Middle East and North Africa. Records of its use exist in ancient texts including the Egyptian Ebers Papyrus, the treatises of Dioscorides

in Greece, and the writings of Pliny in Rome (Mann 112-113). All of these works gave strategies for diagnosing illnesses, along with descriptions of the plants that treated them. Over and again, the mandrake was listed as an anesthetic and analgesic, able to sedate patients, numb pain, and calm fevers (Kobs 11). Early Greek and Latin texts also claimed that the mere scent of it brought sleep – perhaps these accounts influenced herbalists such as Gerard above, who describes the mandrake’s fruit as fragrant despite its lack of any actual odor (Simoons 113). This olfactory effect became realized upon the invention of the soporific sponge in the thirteenth century, which was used well into the seventeenth century to prepare patients for surgery: when moistened and held to a patient’s face, it released potent fumes from a mix including mandrake, poison hemlock, and opium, typically inducing sleep within a few breaths (Bevan-Jones 102). The range of mandrake’s uses made it medically valuable, and by the sixteenth century it had become a common garden plant in Germany and England (Kobs 7).

The mandrake’s use in medicine was based equally as much in ritual, and it was valued for its ability to protect as well as to sedate. Entire roots were prized as talismans, to be worn around the neck against accident, attack, or disease. At times the mandrake was envisioned to absorb the ills that would otherwise befall its wearer, as long as it was worn consistently (Simoons 106). This was not a unique phenomenon, as the previously discussed use of henbane roots has illustrated – however, it was mandrake that would garner cult-like renown in Central Europe, and in sixteenth-century Germany in particular (Kobs 16-17). Mandrake roots, once obtained, were bathed regularly, dressed, and kept in designated caskets or chests; they then served as household familiars, bringing for-

tune, health, and safety as long as they were cared for (Kobs 10; Kobs 15-16).

Though herbalism persisted, mandrake lore was partially obscured by the fall of the Holy Roman Empire until the Renaissance began around the fourteenth century (Kobs 12). By the time of its reemergence in literature, climates had changed for the colder, and the mandrake had become considerably rarer in Europe. Nevertheless, the mandrake regained its popularity, bolstered by its uses since antiquity and its perceived virtues. The protection offered by the mandrake had a broader scope than its uses as a drug – as a ward against evil of all kinds, the mandrake stood in the European landscape as a plant which, by the harnessing of its virtue and form, shielded humans from harm.

Spices in Medicine

Spices undeniably held much economic and social power in Europe, if not the entire world. Their importance was due to reasons beyond the culinary – historically, spices were desirable not only because of their taste but also because of their many uses in healthcare.

Before the cultural influence of spices can be discussed, it must be acknowledged that spices were largely restricted to the upper class, due to their rarity and price. The types of plants available to the different socioeconomic classes of Europe is a distinct topic that will be discussed later – for now, it should be noted that the medical importance of spices will be discussed in reference to those who could afford them, rather than the population as a whole.

It is commonly thought that a primary use for spices was to preserve meats or make old meat more palatable. To the upper class, however, fresh meat was much easier and cheaper to obtain than were spices – Freedman notes that the money needed to treat an old cut of

pork with pepper might as well have been put toward buying a live pig (*Out of the East* 3). However, even the nobility was hard-pressed to have fresh meat in the middle of winter, as pastures and the livestock that depended on them were scarce. At the end of autumn, meat was often salted to last until spring, and here spices excelled in relieving diners of painfully salty meals (Turner 109-110). Of course, at all times of the year the use of spices to flavor meats and other foods simply made meals more enjoyable, but the practice of spicing foods also had practical applications related to the importance of the diet to one's health.

Because of the continuing belief in humors, the cooks of upper-class houses were often concerned with serving “balanced” meals. As foodstuffs themselves were composed of the base qualities, cooks combined them with care, “tempering” them to maintain the natural warmth and moisture of the human body (Scully 64). Recipe books of the fourteenth and fifteenth centuries also began to include “sickdishes” that rebalanced the humors of diners who were already ill (Scully 66). While cooks did use herbs to achieve humoral effects, spices were considered to exhibit greater intensities of the base qualities, making them more potent. This preference likely grew from what Freedman describes as “the belief in the magical wealth and attraction of Asia,” from which spices originated, as well as “an infatuation with spices” that made them more desirable (“Health” 40). Spices were considered invaluable in tempering meals – particularly when most meats were considered “cold” and in need of a sauce both literally and humorally hot (Freedman, *Out of the East* 55-56). Ginger, for example, was an exemplary ingredient, considered both hot and moist; it resonated strongly with the state of the ideal human body, leading to its use in many recipes. Overall, the use of spices in

food went beyond gustatory pleasures, as the preparation of meals was a richly developed craft that improved and preserved temperament and health.

Outside of temperament, spices were also prescribed to directly combat disease. Adams et al. cite both black pepper and long pepper as treatments for malarial fevers, appearing in seventeenth-century herbals by the German Adam Lonicer and the Swiss Peter Zwinger (281). Often, spiced treatments were still delivered as an edible dish: black pepper, cooked with figs and wine, was prescribed for asthma in the French *Livre des simples médecines*, a translation of the Latin *Circa instans* from the twelfth century (Freedman, *Out of the East* 63). At other times, the serving of spices with food evolved into the serving of spices as their own medicaments, as demonstrated by the use of the confection box during the fifteenth and sixteenth centuries. The confection, or confit, included sugared pills packed with anise, pepper, caraway, or other popular spices, which were taken as needed to address digestive problems, headaches, and many other minor issues (Lehner and Lehner 113). In this way, spices moved into the realm of upper-class household medicine, either as prescriptions or as quick-fixes for small ailments.

Finally, spices were integral to warding off those diseases that were thought to travel in harmful, stagnant air. A clear example of this concept would be malaria, which bears its name today for the “bad air” historically thought to spread it. Another would be the Black Death of the fourteenth century, the devastation of which was explained as a result of “malignant vapors and odors” (Turner 177). Deterring airborne (though not in the modern sense) disease most often involved substances that produced “healthy” air – and as spices were often fragrant, remedies

and tools were developed that depended on them for protection. Aromatic spices such as myrrh, mace, and sandalwood were recommended by physicians as plague preventatives, to be carried around in portable metal spheres called pomanders (Freedman, *Out of the East* 64). Of course, the cost of such imports created a hierarchy of fragrances among the people desperate to avoid sickness: spices were considered ideal because of their stronger, longer-lived aromas, but lower classes relied on nosebags, or bundles of local herbs such as rosemary and sage (Turner 178). Though sage and rosemary are both quite fragrant, their placement toward the bottom of the hierarchy indicates a conscious preference for non-European goods that permeates the discussion in this article, especially when addressing the upper class.

The Conspicuous Consumption of Spices

Discussion will now turn briefly to the reasoning behind the upper-class demand for spices. The spice trade was a lucrative one, and as spices were passed from market to market toward the West at ever increasing rates, their final sale in Europe could fetch a thousand times their initial price (Turner 5). However, this expense did not depend simply on geography, for the possession of spices was driven by an intense social want.

Due to their perceived potency and manifold uses, one might expect an overwhelming preference toward spices as medical ingredients. In truth, physicians often did prescribe costlier spices to upper-class patients, when local, common plants would serve just as well. The use of spiced pomanders over herbal nosebags, addressed above, is a clear demonstration; another would be the common physician's proverb that states, “in return for mere words [of gratitude] we use mountain herbs, but for real money we recommend

spices and aromatics” (Freedman, *Out of the East* 69). Such blatant strategies thrived because they appealed to what Dalby calls “conspicuous consumption” – price was an indicator of quality, and for those whose affluence gave them access to the best medicines that money could buy, spices naturally stood out as desirable (124). For example, wealthy patients readily accepted prescriptions of dragon’s blood over sage, even if the latter came at a tenth of the price, because the cost of dragon’s blood proved its inherent superiority (Freedman, *Out of the East* 69). Even if the physician was acknowledged as corrupt or greedy, the upper class believed in and almost expected the necessity of spices, trusting in their price, their potency, and their exotic nature as signs of their worth.

Of course, there was a convenient intersection between the extravagance and the medical benefits of spices in the wealthy household. If so inclined, the upper class justified its fondness for spices by claiming the honest pursuit of one’s wellbeing – by this reasoning, the cost and status of spices came merely as an additional indulgence to their healthful effects. What harm was there in spending so much to fill a pomander, if the spices involved would guard against the plague? And what shame was there in putting one’s consumption of these spices on display, if they were so healthful? Wealthy Europeans therefore paid extravagant attention to presentation, using intricate pomanders and “spice plates,” made from gold or silver, to serve spiced desserts (Turner 130). Their motives in doing so most certainly were not to assure others of their well-being – rather, they took the opportunity to publicly confirm their affluence, by demonstrating how easily they could afford the rarest and most beneficial medicines available.

Those wishing to display their wealth could also do so by hosting elaborately spiced feasts. For example, Freedman reports that the marriage of Duke George of Bavaria and Princess Jadwiga of Poland in 1476 involved the purchase of “386 pounds of pepper, 286 of ginger, 207 of saffron, 205 of cinnamon, 105 of cloves, and a mere 85 pounds of nutmeg,” furnishing a series of banquets over a number of days (*Out of the East* 6). Similarly, the chronicler Gomes Eanes de Zurara diverges from his 1450 account of Prince Henry of Portugal’s capture of a Moroccan city, instead describing a feast hosted by him with “the finest wines, sugared confections...[and] a lavish selection of spices” (Turner 129). Such a focus served Zurara’s goal of portraying Henry as a truly noble man, who shared his riches graciously with his guests. As upper-class customers across Europe sought to prove their status, they exerted greater demands on the spice trade, in turn furthering the perceived social value of spices and encouraging prices to rise. Thus the spice market behaved in a cyclical manner, as the conspicuous consumption of spices justified their ever-climbing value.

The Advantages of Local Herbs over Foreign Spices

There is no question that local plants had but a fraction of the economic weight of spices. Foreign spices were so applicable (and desirable) that they were invaluable on the apothecary’s shelf, in the wealthy household’s pantry, and in the physician’s repertoire. However, despite the perceived strengths of foreign spices, there were aspects of medicine that were still addressed best by local herbs. Discussion in this section deals with three main subjects: the accessibility of herbal in-

gredients to European populations; the use of herbalism in fertility and love medicine; and the use of local herbs in reproductive health and birth control.

Accessibility

Due to their foreign allure and conspicuous consumption, spices were economically lucrative; conversely, local plants had a clear medical advantage in that they were accessible to a much larger population. Here the opinion of local herbs as “weak” or otherwise inferior was inconsequential – to the majority of the population, the availability of local herbs was a benefit. Unlike spices, which were largely only affordable for the upper class, plants like celery, rue, and juniper served as common, inexpensive medicines for physicians and patients alike.

This advantage could be seen explicitly in the gardens of monasteries, hospitals, and apothecaries, where herbs such as opium, mandrake, deadly nightshade, and hellebore were grown for regular use (Bevan-Jones 70). Whereas spices, with very few exceptions, failed to grow in the Central and Western European landscape, plants including the panacea-like sage were cultivated locally, garnering renown and praise for their plentiful presence. For instance, a sixteenth-century treatise named *The Virtues of Rosemary* describes its titular plant as “common to every woman’s garden” because it offered “restoration, revival, recovery, and renewal,” whether it was used to prevent hair loss, deter the plague, or ensure general wellness (Keiser 181; Keiser 186). Regardless of how invested the upper class was in spices, if a local plant was medically beneficial it was likely to remain relevant in herbalism, as its availability would certainly have been appreciated by the majority of the population. Physicians and herbalists, too, readily admitted the equal

powers of local herbs and foreign spices – the shrewder practitioners overlooked herbs in favor of more profitable cures, but for most they were a welcome aid in the face of disease.

Fertility and Love Magic

Despite discrepancies in cost and accessibility, remedies for love and fertility involved both herbs and spices. Turner notes dryly that “practically everything remotely edible has at some time or another been credited with sexually enhancing powers – and many inedible substances besides” (186). Recipes for fertility often suggested spices such as pepper and cinnamon, citing their heat as helpful against the humoral “cold” of the infertile body (Turner 185). In this vein, ginger was once again the most effective spice, as its heat and moisture best stimulated the human temperament. Other treatments turned to local plants, including the previously discussed henbane amulet. Nicholas Culpeper, a sixteenth-century English physician and botanist, listed feverfew as especially beneficial (though he includes two spices for reinforcement), suggesting “a decoction of the flowers in wine, with a little mace or nutmeg” to strengthen the womb (Mann 149).

A prominent figure once again, the mandrake played a notably ubiquitous role in love and fertility due to the shape of its root. Because it resembled a human, it was believed to aid in the reproduction of humans by sympathetic magic (Mann 24). However, its use in such matters involved its fruit as much as its root, as was reflected in some of the names given to the mandrake. In the Old Testament it appeared as *ddym* or *dudaim*, translating roughly to “love-apple” in contexts of fertility and love, and in Christian tradition it was interpreted to be the “Biblical love-apple” used by Leah and Rachel to achieve pregnancy (Simoons 107; Kobs 11). Other names in oth-

er languages exist, including the Persian *mihr-gyah* (“herb of love”) and the Arabic *tuffāh al-jinn* (“apples of the demon”), indicating that the connection to fertility was based in the entire plant. Altogether, the mandrake allowed passion, fertility, love, and success in courtship and marriage, most often via talismanic uses. Simoons records that pieces of the root were held for “amatory purposes,” and mandrake charms were marketed in this way well beyond the seventeenth century; later uses of the root also included adding it to meals or baths, to ensure success in courtship and pregnancy (Simoons 110). By the tenets and applications of sympathetic magic, the mandrake’s physical form gave it medicinal and talismanic powers, in alignment with the beliefs that prevailed during its uses throughout history.

Reproductive Health and Birth Control

Aside from mandrake, other local herbs were also featured more than spices in women’s reproductive health, in the forms of drugs, ointments, and other remedies. Women with menstrual complications could resort to herbs known today as emmenagogues: when consumed or applied to the body, they stimulated menstrual flow. A present-day study of the Anglo-Saxon *Leechbook* of Bald lists the following remedy for delayed menstruation:

... boil in ale *brooklime* and the two *centauries*, give [to her] to drink, and let the woman bathe in a hot bath, and drink the drink in the bath. Have previously prepared a poltice of beer dregs and of green *mugwort* and *wild celery* and of barley meal... Apply to the “kindling limb” [genitals] and to the vulva below when she gets out of the bath, and [have her] drink a cupful of the same drink warm, and wrap up the woman well, and let her be thus poulticed for a long time of the day...

(Osborn 154)

Osborn explains the stimulating properties of brooklime and celery, the latter of which is still used as an emmenagogue, and the centaury plants, which have been listed by many sources as abortifacients since ancient times (155-6). Mugwort was known to facilitate childbirth, though other sources listed it as an abortifacient instead; this discrepancy may have resulted from difficulties in telling mugwort apart from its more potent relative, wormwood. Though wormwood itself was discussed earlier as a treatment for malaria and the plague, it was a commonly known abortifacient as well. It was collectively grouped with mugwort and similar relatives under the group name *Artemisia*, and together they were commonly mentioned in texts as emmenagogues and abortifacients (Riddle 32).

Often, plants that encouraged menstrual flow could also be used to ease birth, but in other cases they terminated pregnancies and caused abortion instead. Pennyroyal and rue were both emmenagogues, but they were also commonly listed as abortifacients. It is true that many plants referenced in such a way are simply toxic; pennyroyal, for example, damages the liver if too much of its oil is ingested (Riddle 124). However, historical knowledge of pennyroyal, rue, and similar plants was detailed enough that they could be used to affect only the reproductive system, as long as the correct dosage was given at the correct time. The ease and frequency of such use varied; pennyroyal could only be administered in precise dosages of tea, while rue could be used in baths, drugs, and wine for similar effects (Riddle 52; Riddle 62). Black hellebore was cited by the Italian scholar Giovan Battista Della Porta as able to impart abortifacient properties into wine grapes, if they were grafted together (Bevan-Jones 65). Though

Porta was not primarily an herbalist, and though his suggestion would not have worked due to the failure of these “properties” to travel from one plant into the other, he was likely inspired by the lasting medical practice of infusing drinks with contraceptive or abortifacient properties.

Remedies also existed for more explicit injuries. The English theologian and physician Gilbertus Anglicus published his *Compendium medicinae* in the thirteenth century, which was translated into English in the fifteenth century. Its sixth chapter provided explanations and treatments for uterine prolapse, indicating an existing base of knowledge and herbal treatments for women’s health. Anglicus’s explanations for prolapse included corruption or imbalance of the patient’s humors and difficulties during childbirth, which resulted in the displacement or improper movement of the uterus. The suspected cause of the prolapse impacted the treatment chosen: for an excess of “cold” which “paralyzed” the uterus, Anglicus recommends “a hot bath of calamint, oregano, lavender, sage, garden cress, primrose, comfrey and rue; with treacle and sage-flavored wine,” while for prolapse during childbirth a midwife is expected to treat the patient with baths and fumes of wormwood (Domínguez-Rodríguez 111). Whether these ingredients were crucial in a patient’s recovery is not yet clear; however, it is notable that the same ingredients were used throughout other aspects of women’s reproductive health. As Anglicus described prolapse as a common ailment, it is perhaps sensible that he went beyond herbal remedies as well, prescribing a pessary or medical tampon that included nutmeg, spikenard, and clove, which would ensure a full recovery once the uterus was restored (Domínguez-Rodríguez 111).

Though recipes and charms for concep-

tion included both spices and local herbs, recipes for *contraception* more often involved the latter. These recipes involved many plants already listed, including pennyroyal, rue, and the centauries. Common methods included mixing herbs into wine, making abortifacient poultices, and using talismans. Herbals and other texts contained many recipes that were recorded as contraceptives or abortifacients – though they were not always explicitly stated as such, due to the development of religious and legal stances on abortion in Christian Europe (Riddle 90-91). For example, though the German *Tractatus* listed contraceptive and abortifacient plants, it stepped carefully around the exact terminology, instead describing them as menstrual stimulants or remedies for removing dead fetuses. In an even vaguer sense, the *Tractatus* simply recorded pennyroyal and mint as “wonderful for the womb,” thus avoiding censorship or condemnation (Riddle 140).

The Reputations of Foreign Spices and Local Herbs

The medical uses of foreign spices and local herbs had profound effects on the reputations of both. Once again, “reputations” is used here to represent the perceived cultural importance of foreign spices and local herbs to Central and Western European populations, which was informed by medical uses but also included aspects of religion, society, and literature. Though the focus on herbalism in this article allows for a perception of its ingredients as uniformly beneficial, ambiguity becomes apparent when broader considerations of reputation are taken. Thus, the roles of both foreign and local plants in herbalism must be summarized with their broader effects on European cultures in mind.

Prestige and Risk in European Spice and Herb Markets

Even disregarding the pressures of upper-class ostentation and conspicuous consumption, the spice market thrived on themes of risk, rarity, and reward. At the cusp of the fourteenth century, European exploration had spread at last into the East, to lands described by ancient authors such as Pliny of Rome. The East had always been styled as a place of wonder, and Freedman notes that the mystical role of spices in particular had been magnified to one of fabulous rarity and exoticism ("Health" 51). Those who returned to Europe told tales that strengthened preexisting visions of the East as a source of luxurious spices – yet these spices were difficult to obtain and "guarded" by various hazards, creating a rarity so excruciating that merchants supposedly could not help but ask high prices for their wares. The early European spice market painted its stock as "the attractive and the dangerous... side by side," as merchants related the harrowing journeys they took to find and gather their wares (Freedman, "Health" 51). These stories went on to pervade hearsay and literature, generating an intrigue that allowed the European spice market to thrive.

A specific example of this intrigue may be observed in *The Travels of Sir John Mandeville*, a fictional work first written in French during the fourteenth century. The novel relates the knight Mandeville's pilgrimage through Asia and Africa, and its popularity was such that it was available in at least eight languages within fifty years of its production (Higgins 6). When describing the supposed pepper forests of India, Mandeville tells an intricate and dangerous tale:

In that land, as I said, there are many different kinds of snakes and serpents because of the heat – and also because of the pepper. Some say that at certain

times of the year when they go to gather the pepper, they make fires here and there to burn the snakes or make them run away. But, with all respect, it is not so. For if they built fires round the pepper, they would burn the pepper and the trees it grows on, or shrivel them so that they would bear no more fruit; that is not true. On the contrary, they anoint their hands and feet and other places of the body with an ointment made of the juice of a fruit they call lemons, mingled with other things, and then they go boldly to get the pepper. The snakes and poisonous serpents run away when they perceive the smell of the ointment; in this way, truly, they get the pepper. (Mandeville 122-123)

Eventually, Mandeville's travels would be revealed as not a memoir but a combination of other authors' works, with the character of Mandeville written by the compiler to narrate the various tales included (Higgins 8). Whether or not Mandeville existed, however, his narrative style fit exactly into the European perception of spices. After presenting the dangers involved, he laid out in detail the strategy necessary to successfully obtain the prized pepper, reflecting the tone in which merchants told stories of their travels and wares. Perhaps it is no wonder, then, that "Mandeville" were believed so faithfully by his readers – in constructing such a narrative, his author blended very well into the narrative atmosphere that existed around spices at the time.

Outside of the spice market, the mandrake was also highly prized within European societies, whether whole or in various extracts and pieces. Its socioeconomic power was based in its many uses in herbalism, as discussed previously, and the renowned power of the mandrake reached such heights that

the practice of forgery is known to have risen by the sixteenth century. Experienced forgers took roots of bryony, which were more commonly found, and doctored them to resemble the mandrake, by carving them into the proper shape and planting grains in them to grow false hairs (Simoons 104). The practice developed over time into an elaborate profession, becoming so troublesome that multiple publications of the time directly criticized it. Herbalists such as Gerard in England and Bock in Germany berated dishonest charlatans in their writing, accusing them of coaxing exorbitant sums from unsuspecting customers (Simoons 104). The success of such duplicity was no doubt in part due to the common use of the fabricated product as a talisman, which was harder to detect than direct use of it as an ingredient.

However, these merchants did not stop at simply disguising their wares – as with spices, the mandrake's reputation was exaggerated by the supposed risks of gathering it, especially by its hawkers. Merchants spoke at length of the hazards involved in gathering their "mandrake" roots, creating an atmosphere of danger that discouraged customers from seeking the plant out themselves. This supposed risk manifested in stories about the mandrake's sinister capabilities, as well as rituals that promised to negate them. Gerard recorded some such stories in his *Herball* with considerable disdain:

There hath been many ridiculous tales brought up of this plant, whether of old wives, or some runnagate Surgeons or physicke-mongers I know not... that sought to make themselves famous and skilfull above others... They adde further, That it [the mandrake] is never or very seldome to be found growing naturally but under a gallows, where the matter that hath fallen from the dead body hath given

it the shape of a man... They fable further and affirme, That he who would take up a plant thereof must tie a dog thereunto to pull it up, which will give agreat shreeke [a great shriek] at the digging up; otherwise if a man should do it, he should surely die in short space after. Besides many fables of loving matters, too full of scurrilitie to set forth in print, which I forbear to speak of. (Gerard 351)

Other strategies for gathering mandrake involved drawing circles around it to prevent its escape, reciting various protective chants, and approaching the plant only on certain days of certain months (Simoons 121). As Gerard's account demonstrates, the legends surrounding the mandrake portrayed it as elusive and deadly to the unprepared. One purpose of these stories was to increase the reputation of the mandrake's gatherers, who supposedly were the only ones able to survive such a harrowing task. Kobs presents the mythical risks involved with the mandrake as a direct explanation for the high price at which merchants offered it, describing the mandrake harvest as an "iterative story" (12-13). Forgers boasted of their skill as herbalists to unknowing customers, who came away believing both in the dangers of mishandling the plant and in the justified cost of the root; these customers then spread superstition about the mandrake's deadly intrigue, and so the general populace steered clear of it in the wild, returning instead to the "professionals" who scattered the stories in the first place. The model by which the mandrake attained its heightened worth therefore parallels the cycle of conspicuous consumption that defined the upper-class demand for spiced medicines, though the reasoning behind the two patterns is not exactly the same.

The dangers of an uprooted mandrake guided European customers toward merchants skilled enough to harvest it, just as the

thrilling risks undertaken by merchants to acquire foreign spices reinforced their exotic nature and cost. In a similar manner, there were other local plants in Europe that had gathering rituals associated with them, in order to negate a perceived threat. Hellebore, which could be used as a purgative or an anti-parasitic in addition to its abortifacient properties, was said to cause sluggishness in those harvesting it. The solution, according to ancient Greek sources, was to eat garlic with a serving of wine, which would allow harvesters to work unimpeded (Bevan-Jones 63). In his compendium of European plants, Bevan-Jones also lists “dwale,” which originally referred to a potent anesthetic drink but changed to refer to deadly nightshade by the sixteenth century (116). The connotations of the original dwale were likely thus passed onto deadly nightshade, dissuading passerby from approaching it themselves for fear of falling unconscious. In this way, risk served a supporting role in the work of European merchants, whether they sold local or foreign plants.

Perceptions of Spices and Herbs in Religious, Social, and Literary Contexts

When considering the origins and costs of foreign spices, a perspective that Freedman calls “the meeting point of sanctity and trade” arises (*Out of the East* 91). As early as the sixth century, the Christian concept of Paradise was one filled with spices (Turner 249). In the *Romance of the Rose*, a thirteenth-century French poem, the presence of spices in a garden is a sign that the poet has found himself in a terrestrial Paradise:

In that orchard grew many a spice: cloves, licorice, fresh grains of Paradise, zedory, anise, cinnamon and every delectable spice that is good to taste after the meal. (Dalby 12)

Biblical mention of spices included frank-

incense and myrrh, as well as cinnamon, cloves, and storax, which could be mixed into “holy chrism,” an oil used in worship (Dalby 137). Because the Garden of Eden was believed to once sit in Mesopotamia, spices appeared to originate from Paradise on Earth; the Nile, Tigris, and Euphrates Rivers were then believed to carry Eden’s spices into surrounding lands, supposedly explaining why spice plants flourished in Asia despite failing to grow in Europe (Freedman, *Out of the East* 91). With this in mind, the divine nature of spices grew to be more explicit than the *dynamidia* that already inhabited all plants – that is, the belief in their origins was so strong that they could be perceived as exceedingly holy, and thus they served to connect the earthly church to the spiritual Heaven (Freedman, *Out of the East* 77). Churches, then, were often among the largest customers of spice merchants, not for medicine or opulence but for worship.

Of course, even within the church, controversy existed: while some texts credited spices with a potent “white magic,” able to exorcise demons when burned, others contended that it was the aroma of spices that attracted demons in the first place (Turner 256). The prevailing opinion was that spices were holy and good, and thus their use in church services allowed a spiritual connection to Heaven that was above criticism. By contrast, personal perfumes and heavily spiced foods were unnecessary sins, as they were used for pleasure or to flaunt one’s wealth. The sin was compounded when spices were sought out specifically because they were luxurious, regardless of any local plants that could produce the same tastes or effects. Moralists therefore pointed to the conspicuous consumption of spices as a sign of gluttony, targeting the upper class because they fell upon spices with particular zeal. One such moralist was the

German Ulrich von Hutten, whose disparaging opinion of spiced diets is related by Freedman below:

At one time, von Hutten observed, Germans nourished themselves in a manner both simple and wholesome... food was enlivened by the good, “honest” herbs of the Fatherland, but now everyone has become addicted to luxury... (*Out of the East* 147)

Criticisms of the extravagance of spices also appear in the *Canterbury Tales*, written by English poet Geoffrey Chaucer and widely read from the fourteenth century onward. Serving as a character in his own work, Chaucer tells *The Tale of Sir Thopas* by first describing the spices that surround the noble knight Thopas as he travels:

Ther spryngen herbes grete and smale,
The lycorys [licorice] and Cetewale [zedory],
And many a clowe gylofre [clove];
And Notemuge [nutmeg] to putte in Ale,
Wheither it be moyste or stale,
Or for to leye in cofre. (Chaucer 12)

Chaucer’s account continues through several stanzas, until the Host in the *Tales* interrupts him:

‘Na moore of this for goddes dignitee,’
Quod oure hoost, ‘for though makest me
So wery of thy verray lewednesse
That, also wisly god my soule blesse,
Min eres aken of thy drasty speche...’
(Chaucer 17)

That the Host pleads for reprieve illustrates Chaucer’s perceived atmosphere of nobility, which was one of “artificiality and fatiguing luxury” (Freedman, *Out of the East* 156). Thus, despite their spiritual or medical benefits, spices were not exempt from literary criticism, whether they were used to mock the upper class or used as representations of sin.

Freedman also notes that moralist dis-

cussion of spices as unnecessary luxuries often expressed a longing for a return to local plants, which produced sufficient medicinal and culinary effects without inciting gluttony (*Out of the East* 61). Indeed, as previously discussed, local herbs were consistently noted for their usefulness and accessibility. However, these plants were also prominent sources of poison, bearing a threat not attributed to spices such as pepper or cinnamon. Therefore, just as they were extolled for their virtues, they were associated with murder and assassination, particularly because poisoning was held as an especially sinister crime. In discussing poison as a theme in Chaucer’s work, Ireland points to the words of Edward Coke, an English “Common Law judge” who stated in 1615 that “of all the felonies murder is the most horrible, of all murders poisoning the most detestable” (74). Ireland then describes the apothecary in Chaucer’s *Pardoner’s Tale*, whose entreaty that “God my soule save” implies that even holding or selling a poison was a grave sin (79). Though Chaucer was not specific in what the poison contained, specific plants have certainly been catalogued, and used in literature, for their potential to harm rather than heal. Shakespeare’s *Hamlet*, first performed in the early seventeenth century, has its King murdered by “juice of cursed hebena [henbane],” in stark contrast to the consistent, historical use of henbane root as a protective talisman (Kotsias 847). Additionally, Retief and Cilliers cite Giovan Battista Della Porta as listing henbane, belladonna, aconite, and hellebore in a 1589 book on poisoning (8). While henbane, belladonna (deadly nightshade), and hellebore have already been discussed as having medically beneficial effects, all four plants listed are decidedly toxic as well; this pattern is kept by the remaining species, aconite, which was known best as an arrow poison and had the

alternate name wolfsbane (Mann 15).

The perception of some local plants as harmful gained particular strength alongside European attention to witchcraft, which developed in detail toward the end of the Medieval Period. The reputations of local plants became warped as a result, as knowledge of herbalism could be used to implicate its users in heresy. Henbane once again features here, as witches were claimed to summon “spirits and demons” with its narcotic fumes (Lee 366). In 1554, the Italian scholar Gerolamo Cardano described an ointment commonly ascribed to witches, made from “the fat of infants torn from graves and the juices of parsley and nightshade, as well as of cinquefoil and soot” (Riddle 115). Like pennyroyal, sage and parsley have been listed in texts as emmenagogues and abortifacients; Riddle also explains that cinquefoil was thought to counter poisonings, perhaps explaining its inclusion in such a recipe.

Notably, accusations of black magic commonly overlapped with those of contraception and infanticide, and they targeted women more often than they did men. Guilty witches were defined increasingly by their use of antifertility or abortifacient magic, possibly explaining the contraceptive plants (and the dead infants) listed in the witch’s ointment above. By the late fifteenth century, midwives (who specialized in reproductive health) were expected to obtain licenses to practice, taking oaths that clearly prohibited them from committing “any manner of witchcraft [or] charm,” – a French oath in 1560 condemned “superstitious or illegal means,” which Riddle interprets to include herbal abortifacients (133-134). Riddle also cites a 1624 English law, which required women to prove the natural cause of an infant’s death or face charges of homicide (135), as proof of the connections between reproductive medicine and the European witch hunts. While these connections

are certainly too broad to discuss within the scope of this article, it is clear that the healing and harmful effects of local herbs gave them an extra dimension, on par with how the reputations of spices oscillated between pious reverence and material gluttony.

Conclusions

Present-day studies of the plants discussed in this article have yielded supporting evidence for their historical uses in herbalism, if not their continued use in modern medicine. Piperine and gingerol have been identified as the active components of pepper and ginger, respectively, and studies examining the antimicrobial benefits of spiced diets are ongoing. Clove in particular has recently emerged as a potentially significant natural remedy; its essential oils contain many secondary compounds, including eugenol and various flavonoids, which have proven to inhibit and kill bacterial strains including *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus cereus*, along with various other fungal and viral strains (Cortés-Rojas et al. 92).

Local European plants have produced promising results as well: extracts of both wormwood and rue, for instance, have effectively terminated pregnancies in rats, either by preventing conception or by aborting fetuses (Riddle 48-49). Additionally, deadly nightshade’s alternate name, belladonna, refers to its historical use by women to dilate their eyes for aesthetic purposes (Bevan-Jones 114). Today, the atropine in belladonna is the active compound on which optometrists’ eye-dilating drops are based. Mandrake, henbane, and deadly nightshade are classified today as members of the same botanical family, Solanaceae. They produce alkaloids that

have been identified as quick-acting compounds, with effects on the human body that typically agree with historical accounts of their use. Foremost among these effects is anesthesia, as credited in drugs like Salerno’s Great Rest. However, sufficient doses of hyoscyamine, scopolamine, and other Solanaceae compounds cause a variety of detrimental symptoms, including respiratory depression, loss of muscle control, delirium, coma, and death (Everett and Gabra 445; Kotsias 848). Additionally, the hyoscyamine in henbane is confirmed to cause deep coma-like sleep and hallucinations, in agreement with accounts of its reported effects on supposed witches (Riddle 116). Whether informative, helpful, or harmful, the effects of plants recorded by herbalists throughout Central and Western Europe still yield valuable information today, and their potential to contribute to modern medicine is still being explored.

In conclusion, Central and Western European mindsets between the thirteenth and seventeenth centuries viewed plants as connections between humans and the divine force that had created them, and thus foreign spices and local plants had predestined roles in health, healing, and daily life. While spices fulfilled spiritual and socially elite positions, local plants maintained relevance as widely accessible remedies, especially in women’s health. The idea that spices were economically lucrative and perceived as stronger medicines was no justification to ignore local plants, especially given the cultural reputations of both. Most importantly, the uses of these various plant products served to root them firmly in religious, social, and literary contexts, warranting the continued study of herbalism as a component of European culture.

Appendix: Table of Spices

The following is an alphabetical table of common and scientific names for most of the plant species (or their products) discussed in this article, with the exception of those given only fleeting mention.

Common Name	Scientific Name
Aconite	<i>Aconitum napellus</i> L.
Anise	<i>Pimpinella anisum</i> L.
Ash	<i>Fraxinus</i> spp.
Barley	<i>Hordeum vulgare</i> L.
Black hellebore	<i>Helleborus niger</i> L.
Black Pepper	<i>Piper nigrum</i> L.
Borage	<i>Borago officinalis</i> L.
Brooklime	<i>Veronica beccabunga</i> L.
Bryony (white)	<i>Bryonia dioica</i> Jacq.
Bryony (black)	<i>Tamus communis</i> L.
Burdock	<i>Arctium</i> spp.
Calamint	<i>Calamintha</i> spp.
Caraway	<i>Carum carvi</i> L.
Castor-oil plant	<i>Ricinus communis</i> L.
Celery	<i>Apium graveolens</i> L.
Centaury	<i>Centaurea</i> spp.
Cinquefoil	<i>Potentilla reptans</i> L.
Cinnamon	<i>Cinnamomum verum</i> J. Presl
Cloves	<i>Syzygium aromaticum</i> (L.) Merrill & Perry
Comfrey	<i>Symphytum officinale</i> L.
Deadly nightshade	<i>Atropa belladonna</i> L.
Dragon's blood	<i>Draecana</i> spp.
Dropwort	<i>Filipendula vulgaris</i> Moench
Feverfew	<i>Tanacetum parthenium</i> (L.) Sch. Bip.
Fleawort	<i>Plantago</i> spp.
Frankincense	<i>Boswellia sacra</i> Flueck
Garden cress	<i>Lepidium sativum</i> L.
Garlic	<i>Allium sativum</i> L.
Grains of paradise	<i>Aframomum melegueta</i> K. Schum.
Henbane	<i>Hyoscyamus niger</i> L.
Juniper	<i>Juniperus communis</i> L.
Lavender	<i>Lavandula</i> spp.
Licorice	<i>Glycyrrhiza glabra</i> L.
Lily	<i>Lilium</i> spp.

Common Name	Scientific Name
Long Pepper	<i>Piper longum</i> L.
Mace	<i>Myristica fragrans</i> Houtt
Mandrake	<i>Mandragora officinarum</i> L.
Mint	<i>Mentha</i> spp.
Mugwort	<i>Artemisia vulgaris</i> L.
Myrrh	<i>Commiphora myrrha</i> (Nees) Engl.
Nutmeg	<i>Myristica fragrans</i> Houtt
Opium poppy	<i>Papaver somniferum</i> L.
Oregano	<i>Origanum vulgare</i> L.
Parsley	<i>Petroselinum crispum</i> (Mill.) Fuss
Pennyroyal	<i>Mentha pulegium</i> L.
Peony	<i>Paeonia officinalis</i> L.
Plantain	<i>Plantago major</i> L.
Poison hemlock	<i>Conium maculatum</i> L.
Primrose	<i>Primula</i> spp.
Purslane	<i>Portulaca</i> supp.
Rose	<i>Rosa</i> L.
Rosemary	<i>Rosmarinus officinalis</i> L.
Rue	<i>Ruta graveolens</i> L.
Saffron	<i>Crocus sativus</i> L.
Sage	<i>Salvia officinalis</i> L.
Sandalwood	<i>Santalum</i> spp.
Spikenard	<i>Nardostachys jatamansi</i> (D.Don) DC.
Storax	<i>Liquidambar orientalis</i> L.
Thyme	<i>Thymus vulgaris</i> L.
Tragacanth	<i>Astragalus</i> spp.
Violet	<i>Viola</i> spp.
Wild lettuce	<i>Lactuca</i> spp.
Wormwood	<i>Artemisia absinthium</i> L.
Zedoary	<i>Curcuma zedoaria</i> (Cristm.) Roscoe

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Marissa Kessenich

The Scientist in Society, Then & Now: A Historical Analysis of Brecht's Galileo

ABSTRACT

With any piece of literature, one should always consider—beyond its form or content—the reason for its existence in the first place. Often thought of as exclusive and distinct fields, fact versus fiction, the study of history and of literature actually share considerable common ground. The fictional narrative, constructed by authors experiencing history and its repercussions themselves, “does not ‘happen’ outside history, but within it.”¹ It is for this reason that Bertolt Brecht’s historical drama *The Life of Galileo* is so particularly intriguing and provocative. The play centers around the events of Galileo’s life beginning in 1609 and ending some time after his trial and subsequent recantation in 1633. Having been found guilty by the Roman Catholic Church of hearsay, particularly concerning his defense of heliocentrism, Galileo recanted the claims and evidence he published in his work *Dialogue Concerning the Two Chief World Systems*. Although Brecht’s historical play about these events deviates in many ways from the veritable truth of Galileo’s life and the Galileo affair, its resonance with twentieth century events makes it a valuable reflection of history—just not the history explicitly represented in the play. Brecht’s second version of *Life of Galileo*, also known as the “American version,” is heavily influenced by the dropping of the atomic bomb in 1945 and is arguably his most striking edition. Brecht uses common historical themes that connect the events of the Galileo affair to those of the mid-twentieth century in order to explore the role of science and, more importantly, the scientist in society.



BERTOLT BRECHT WAS A GERMAN poet and playwright whose works reflect the social and political upheavals of the first half of the twentieth century. Born into the working middle class of Bavaria in 1898, Brecht’s artistic trajectory developed within a common German narrative: part of a traditional, evangelical family, Brecht fought in World War I for the Kaiser. His poetry from that period reflects a deep confusion between patriotism and religiosity; his growing disillusionment with the German cause evolved into a general suspicion of the true nature of authority in all forms.² After return-

ing from the war, Brecht began looking into Marxism and became intrigued by Marx’s theory of society and the dialectical relationship between society and history. This dialectic, which emphasizes historical speculation and critique in revolutionary practice, became a large influence on Brecht’s writing.³

An inevitable dimension of literature is that of social change—it is for this reason that Brecht’s entire career was built on works that highlighted the social ills of greedy, power-hungry capitalist socio-political institutions. However, *Galileo* sets itself apart in its historically-based characters and setting—

something none of Brecht’s other plays share. Rarely were Brecht’s revivals of the past meant to be bound by the strict parameters of historical fact. His play *Mother Courage*, written in the midst of Hitler’s invasion of Poland and Czechoslovakia, deals with the political climate of the first four decades of the twentieth century—namely, the dangers of capitalism, the conflict it engenders, and its effect on humanity.⁵ The play retreats to the historical setting of the Thirty Years’ War but, unlike *Galileo*, localizes its characters and the plot in a fictional course of events. The genre’s historical parameters give the audience a sense of familiarity, but the possibilities of fiction allow the author to create something new and provocative. Similarly, *The Resistible Rise of Arturo Ui*, written in 1941 in the midst of Brecht’s edits for the second version of *Life of Galileo*, is an allegorical piece. It follows the life of Arturo Ui, a 1930s Chicago mobster, in his pursuit of complete control over the cauliflower racket through the violent disposal of his competition. Brecht created a fictional story to parallel and parody historical events; the play’s characters and plot quite conspicuously allude to the rise of Adolf Hitler and fascism in Germany in the 1930s. In *Life of Galileo*, on the other hand, Brecht bends the biographical truth of the Galileo affair—add-

ing and altering characters and editing the historical course of events—to fit his needs. Such a lack of conformity puts into question why he decided to use an explicit historical foundation for his message at all.

Editing it into three main versions over the course of more than a decade, Brecht spent more time on *Galileo* than he did on any of his other plays. Though the three versions do not differ substantially in plot, the implications of the characters’ actions change according to Brecht’s understanding of current events. Each version of the play, written and rewritten in 1938, 1945, and 1953, encapsulates the dynamic historical context of the mid-twentieth century. The next section of this paper deals with the differences between the first and second versions, focusing on the edits Brecht and Charles Laughton, an English actor and playwright, made and what influenced them.

Life of Galileo: The American Version

Despite being set in the first half of the seventeenth century, *Life of Galileo* belongs to the twentieth. The ever-changing socio-political climate of the 1930s and 1940s heavily influenced Brecht’s perceptions of the events of the Galileo affair and, thus, influenced his edits

¹ K.N. Panikkar, “Literature as History of Social Change,” *Social Scientist* 40.3 (2012): 3.

² John Fuegi, “Bertolt Brecht,” *Colloquia Germanica* 10.4 (1976/77): 299.

³ Douglas Kellner, “Brecht’s Marxist Aesthetic: The Korsch Connection,” in Betty Nance Weber and Hubert Heinen, ed., *Bertolt Brecht: Political Theory and Literary Practice* (Atlanta: University of Georgia Press, 2010), 29-30.

Brecht developed his conceptions of dialectics while working with Marx scholar Karl Korsch, who consolidated Marxist theory as follows: “Marxian theory... is a new science of bourgeois society... it represents the new views and aims of the class oppressed in bourgeois society. It is, so far, not a positive but a critical science. It ‘specifies’ bourgeois society and investigates the tendencies visible in the present development of society, and the way to its imminent practical transformation. Thus, it is not only a theory of bourgeois society but, at the same time, a theory of the proletarian revolution.” It is out of this theoretical framework that Brecht’s style of epic theatre developed (discussed later).

⁴ Eric Bentley, Introduction to *Galileo: A Play by Bertolt Brecht* (New York: Grove Press, 1966), 12.

⁵ *Oxford Reference*, “Mother Courage and Her Children,” <http://www.oxfordreference.com/view/10.1093/oi/authority.20110803100212124>.

in each version. The first version took inspiration from the same source as many of his plays: his homeland. Under self-imposed exile in Denmark after the rise of Hitler, Brecht saw the Galileo affair as a symbol of truth living beyond its oppression. The apocryphal anecdote Brecht had in mind was one that depicts Galileo as a champion of truth:

The moment he [Galileo] was set at liberty, he looked up to the sky and down to the ground, and, stamping with his foot, in a contemplative mood, said, *Eppur si move* [sic]; that is, still it moves, meaning the earth.⁶

The vignette alludes to Galileo's continued belief in and passion for scientific truth even after his conviction as a heretic and recantation of his scientific claims. This is the most obvious reason for Brecht choosing Galileo and the Galileo affair as his subject and setting: similar to *Mother Courage*, *Life of Galileo* is an allegory for "the time when it was written, the 1930's, in which...truth in Germany had to be hidden under coats."⁷ However, the play is also a defense of cowardice. Brecht depicts Galileo as a man living to fight another day. His betrayal, gutless as it may seem, is actually a necessary means of preserving truth for the future. If he had not recanted, he would have been executed and all of his life's work—especially his influential final work on the laws of physics—lost forever. In this version, Brecht seems to project his own experience onto Galileo. Rather than staying in Germany when Hitler came to power and joining a resistance movement, Brecht fled his homeland

in order to write freely. Brecht's presentation of Galileo's recantation parallels and justifies the author's own guilt about the moral cost of the pursuit of truth.

However, the second version of *Life of Galileo* demonstrates a significant revision of Brecht's thesis. Rewritten in California in the wake of the atomic bombing of Hiroshima in 1945, Brecht's second attempt depicts Galileo's abjuration as not simply an act of cowardice, but a crime against humanity—"the 'original sin' of modern natural science."⁸ The "infernal effect of the great bomb" altered the lens through which Brecht saw Galileo's trial and refutation: "the atom bomb is, both as a technical and as a social phenomenon, the classical end-product of [Galileo's] contributions to science and his failure to contribute to society."⁹ In this new version, Brecht suddenly turns the tide of history against Galileo, whom he paints as a selfish scholar of science, a subject which, in the second version of the play, Galileo comes to realize should be practiced in the pursuit of "eas[ing] human existence."¹⁰

In his monologue in the penultimate scene of the play, Galileo expounds upon his error in recanting:

If you give way to coercion, science can be crippled, and your new machines may simply suggest new drudgeries. Should you, then, in time, discover all there is to be discovered, your progress must become a progress away from the bulk of humanity. The gulf might even grow so wide that the sound of your cheering at some new achievement would be echoed by a uni-

versal howl of horror...I surrendered my knowledge to the powers that be, to use it, no, not *use* it, *abuse* it, as it suits their ends. I have betrayed my profession.¹¹

This speech of Galileo's is unique to the second version of the play.¹² Brecht's thesis is no longer arguing for the freedom of research, but rather "to dissent from those who see scientific advance as 'an end in itself.'"¹³ No longer is the Church at fault for limiting the freedoms of the people; instead, Galileo is at fault for not protecting the people in his selfish pursuit of scientific knowledge.

Brecht's new stance stresses the idea that the scientist must take on a social consciousness about his work; he cannot simply concern himself with the numbers, but also the use of his work in the larger context of humanity. Galileo's "new machines," alluding primarily to the telescope, allowed him to study important physical phenomenon, but would also lead to "new drudgeries" for the human race—specifically, the Americans' atom bomb. Galileo's surrendering of his work to the "powers that be" was the drop of the stone whose ripples led to Hiroshima: it is not his discoveries themselves, but rather his antipathy towards their broader social implications that makes him truly criminal. According to Brecht, the weaponization of science is a result of its exclusivity. In recanting, Galileo, despite preserving his works on astronomy and further contributing to the study of modern physics, robbed these sciences of their social importance. The Church reasserted its

power and effectively delayed a positive revolution of science by keeping these discoveries out of the hands of those who could do the most good with them. Brecht implicitly argues that if Galileo had refused to recant—in other words, if he fled Italy and the influence of the Church—he could have supported the positive revolution of science among the intelligentsia and kept the power of knowledge in the hands of the people rather than surrendering it to a feudal ruling body.¹⁴ Therefore, by putting the power of science in the hands of the people, Galileo would have kept the atomic bomb—in and of itself a symbol of oppression and domination—from ever coming to fruition.

Brecht foregrounds this argument by demonstrating the Marxist idea of class struggle in Scene Seven. In the scene, a monk approaches Galileo in the wake of the 1616 decree against Copernicanism to tell him why he has given up astronomy and why Galileo should follow suit. He argues that Galileo's discoveries will disrupt the peace of ordinary people and make them restless, implying a state of chaos to follow if Galileo does not recant his beliefs. The monk's concern for his parents' spiritual strength in the face of Scriptural ambiguity reflects the unstable social environment that Galileo's realizations would create:

How could they take it, were I to tell them that they are on a lump of stone ceaselessly spinning in empty space, circling around a second-rate star? What, then,

⁶Giuseppe Baretta, *The Italian Library* (London, 1757), 52.

⁷Bentley, Introduction to *Galileo: A Play by Bertolt Brecht*, 15.

At the end of the play, Galileo's student, Andrea Sarti, smuggles the *Discourse on Two New Sciences* out of Italy—quite literally hiding it from the Inquisition under his coat.

⁸Bertolt Brecht, "Notes and Variants" in *Life of Galileo* (New York: Arcade Publishing, 1994), 126.

⁹Ibid

¹⁰Brecht, "Notes and Variants" in *Life of Galileo*, 123.

¹¹Bertolt Brecht, *Galileo: A Play by Bertolt Brecht* (New York: Grove Press, 1966), 123-24.

¹²This speech from the second version replaces the following speech from the first: "For science demands that facts not be subordinated to opinions but that opinions be subordinated to facts. It is not in a position to limit these propositions and apply them to 'some' opinions and 'such and such' facts. To be certain that these propositions can always and without limitation be acted on, science must do battle to ensure that they are respected in all fields." (Bertolt Brecht quoted in Bentley, Introduction to *Galileo: A Play by Bertolt Brecht*, 18).

¹³Bentley, Introduction to *Galileo: A Play by Bertolt Brecht*, 18.

¹⁴Brecht, "Notes and Variants" in *Life of Galileo*, 126.

would be the use of their patience, their acceptance of misery? What comfort, then, the Holy Scriptures, which have mercifully explained their crucifixion? The Holy Scriptures would then be proved full of mistakes... We must be silent from the highest of motives: the inward peace of less fortunate souls.¹⁵

What the monk describes is the threat of class consciousness.¹⁶ With the knowledge that their toil, pain, and poverty are in vain and that the Church essentially imprisons them through Scriptural ideology, rural peasants would revolt. The monk argues that the peace of souls is more important than worldly knowledge; however, Brecht seems to side with Galileo. Preceding his abjuration, this Galileo is a champion of the people. His discoveries and inventions were meant to benefit mankind, not uphold the authority of the Church. Galileo even criticizes the monk's request, saying that if he recants, "the authorities are tendering me... my share of the fat sweated from your parents."¹⁷ In other words, when Galileo recants, he contributes to the feudal cause of maintaining power, effectively wasting the revolutionary potential of his discoveries and setting the stage for the bombing of Hiroshima.

In this revision of Galileo's character and the moral conclusion of the play, Brecht required a vehicle that translated the edits just as much as

the dialogue. Brecht collaborated with English actor Charles Laughton in his revisions of *Life of Galileo*. Laughton was a classically trained English stage actor who, having moved to Los Angeles in the 1940s to pursue film acting, quickly became known as one of the best performers, directors, and writers of his generation. Laughton helped Brecht translate his original work from German into English, however his largest contribution was assisting Brecht in making *Galileo* a piece of true epic theatre. Brecht, arguably the most famous epic playwright, constructed epic theatre from his own understanding of Marxist philosophy. Rather than focusing on the limited, present suffering of a single character, Brecht addressed the more epic-scale concerns of history and the individual's engagement with social forces.¹⁸ This theatrical style represents "a model of how to change... the productive apparatus" of the theatre and aspires to be unique from so-called 'bourgeois theatre,' also known as illusionism, by instituting a phenomenon known as the alienation effect.¹⁹ This dissonance between the play and reality—which Marxist productions aim for—makes it the task of theatre not to mindlessly entertain the audience, but rather to engage them and encourage their critical speculation on the connection between what they see on stage and how it relates to their own reality.²⁰ In order to achieve this, Brecht and Laughton made over a dozen revisions to

¹⁵Brecht, *Galileo: A Play by Bertolt Brecht*, 83-84.

¹⁶In Marxism, class consciousness is one of the main tenets that claims the awareness of one's relation to the means of production (and therefore to the structure of power) is vital. Marx theorized that this awareness would lead to revolution and the rise of the proletariat, transforming it from a wage-earning, property-less mass into the ruling class.

Laura Desfor Edles and Scott Appelrouth, *Sociological Theory in the Classical Era* (Northridge: Pine Forge Press, 2010), 26.

¹⁷Brecht, *Galileo: A Play by Bertolt Brecht*, 85.

¹⁸Pericles Lewis, *Cambridge Introduction to Modernism* (Cambridge: Cambridge University Press, 2007), 190.

¹⁹Terry Eagleton, *Marxism and Literary Criticism* (Berkeley: University of California Press, 1976), 64.

²⁰Eagleton, *Marxism and Literary Criticism*, 65-66.

the production that would prevent the audience from being lulled into fantasy.²¹ By placing a subject familiar to the audience within a strange setting—i.e. the Galileo affair within the context of current events—he creates a model of the present.²² What Brecht and Laughton achieve is an experimental form of theatre: the play tests its own hypotheses about the relationships between science and society, authority and truth, and ethics and science through the feedback of the audience. In other words, in addition to the dialectic occurring within the play there is a dialectical relationship between the playwright and the audience.

The reaction of the audience, therefore, is crucial to the play's message and effectiveness. The American version of Brecht's play opened in Los Angeles at the Coronet Theatre on July 30, 1947 and in New York City that December. Despite high enthusiasm and anticipation for the play, reviews fell flat. Capitalist, American audiences did not appreciate the "unnecessarily enigmatic" style that "[put] form ahead of content."²³ The fact that Brecht's presentation of an immoral protagonist did not come across—the review of the Los Angeles production called Galileo "an appealing human figure"—demonstrates a strong disconnect between Brecht and his audience.²⁴ While this could reflect a defi-

ciency of the audience, it is more likely that the audience's rejection of Brecht's thesis is due to the quality of his argument. The change in the penultimate scene, the defining edit made by Laughton and Brecht, seems to have fallen flat. In scholar and playwright Eric Bentley's introduction to the American version of the play, he contends that "the impression is, rather, of someone Brecht arbitrarily declares bad at this stage in order to make a point... One moment, a Tito is a Jesus, and the next, a Judas." Brecht's final judgment alters so dramatically without substantially changing much of the rest of the play that the audience could not follow him on such a deep, indirect condemnation.²⁵ Brecht's attempt to reveal a new truth highlighting the importance of the moral scientist in modern society largely failed.

Allegory and Thematic Connections: Why Galileo?

As alluded to earlier, Brecht's decision in writing a historical drama is a perplexing one. Despite being no stranger to allegorical works, Brecht was not necessarily privy to using historical figures and events to make his point. Thus raises the question: why did Brecht choose Galileo? Brilliantly put by Eric Bentley,

²¹Specifically, Brecht and Laughton agreed on fourteen points in order to create their Marxist masterpiece, among which were the following: stage decorations should be bland and timeless and should not suggest a medieval or Roman style; any props or physical movements of the actors should serve an explicit and meaningful purpose other than aesthetic pleasure, anything more would detract from the dialectic; the portrayal of Galileo should not rouse audience sympathy or empathy, but rather their curiosity and criticism; and, most strikingly, the actors' lines should be kept short and should convey a distance between actor and character—the audience to be constantly aware that they are acting a part. (Brecht, 135-137 Notes and Variants)

²²Bentley, Introduction to *Galileo: A Play by Bertolt Brecht*, 14

²³Comment appeared in a review of Brecht's original production in New York City. Brooks Atkinson, "Charles Laughton Opens Experimental Theatre Season in Brecht's 'Galileo,'" *The New York Times* (New York, NY), December 8, 1947.

²⁴Comment appeared in a review of Brecht's original production in Los Angeles.

Gladwin Hill, "Brecht's 'Galileo' Bows on the Coast," *The New York Times* (Los Angeles, CA), August 1, 1947.

²⁵Bentley, Introduction to *Galileo: A Play by Bertolt Brecht*, 21.

he or she a good subject for a history play.”²⁶ The fact is, strict historical accuracy is not the point of a history play. Within literature, verisimilitude, or the *appearance* of truth, is enough; the moral is what counts. While storytellers may depart from the fact of history, they maintain the forces of history.²⁷ Veritable history, while fascinating and valuable in its own right, is chaos. Out of the meaninglessness of pure history, playwrights must construct a relevant moral—a venture that, more often than not, requires some degree of artistic license.²⁸ No doubt it is the malleability of the Galileo affair that, at least partially, attracted Brecht to use it. Brecht wrote the play “in those last dark months of 1938, when many people felt...approaching the end of that great age to which the world owes the development of the natural sciences, together with such new arts as music and theatre.”²⁹ Thus, Galileo—the father of modern science—symbolizes the beginning of this waning age of reason. However, as the world evolved, so did the moral of his role in history. While Brecht rewrites certain parts of history, most notably Galileo’s daughter Virginia (known in history by her monastic name, Maria-Celeste), and ignores others, he maintains the skeleton of history, which makes it both familiar and exploratory.

The themes present in *Life of Galileo* demonstrate Brecht’s extrapolations of the moral history of the Galileo affair into the twentieth century. One of the most prevalent themes of the play is that of technological determinism. Based on the idea that technological progress determines social change, this theme appears throughout the play. As discussed earlier in

this paper, in the context of the Galileo affair, Galileo’s telescope is a symbol of revolutionary technology. In the first few scenes of the play, the audience sees Galileo conceive his own telescope based on a description by Ludovico, one of his students, of one he saw in Holland. Despite taking this technology to the Venetian senate in order to sell the patent, intending the telescope to be “lucrative to manufacturers and merchants,” Galileo uses it to study the skies.³⁰ In a conversation with one of his contemporaries, Sagredo, Galileo describes his discovery of the moons of Jupiter. Sagredo is shocked at Galileo’s assertions and warns him,

You are suspicious and skeptical in science, but in politics you are as naïve as your daughter! How can people in power leave a man at large who tells the truth, even if it be the truth about the distant stars?...A moment ago, when you were at the telescope, I saw you tied to the stake, and when you said you believed in proof, I smelt burning flesh!”³¹

Sagredo foresees the dangerous dance that Galileo is initiating with the Catholic Church. Also a critic of Galileo’s relationship with the Grand Duke Cosimo de’ Medici, Sagredo is obviously wary of Galileo’s dealings with the ruling classes. By spouting heretical views with no concern for the consequences, Galileo endangers the potential his discoveries hold for the future of science and society. Sagredo’s warnings of Galileo’s political naïveté reflect Brecht’s own observation that Galileo exists in “that most dangerous territory” where he “indulges his science like a vice.”³² While the scientist’s intention may be scientific discovery

²⁶Bentley, Introduction to *Galileo: A Play by Bertolt Brecht*, 12.

²⁷M.A. Cohen, “History and Morals in Brecht’s ‘Life of Galileo,’” *Contemporary Literature* 11.1 (1970): 81.

²⁸Bentley, Introduction to *Galileo: A Play by Bertolt Brecht*, 11.

²⁹Brecht, “Notes and Variants” in *Life of Galileo*, 121

³⁰Brecht, *Galileo: A Play by Bertolt Brecht*, 55

³¹Brecht, *Galileo: A Play by Bertolt Brecht*, 65

for the sake of science, its actual product can be coopted and corrupted. By selling out to the “powers that be,” Galileo interrupted the the positive evolution of society his technology had the potential for. Instead, the Galileo affair marked the beginning of the slow progression of science that would remain marred by feudalism.³³ Otto Hahn’s “pure” scientific discovery of the energy created by splitting the uranium atom, revolutionary for its time in 1938, was innocent—that is, without practical application. Despite being “suspicious and skeptical in science” himself, Hahn’s naïveté concerning what people would do with his work echoes—and is arguably a result of—Galileo’s own ignorance. Thus, although Galileo himself does not burn at the stake, perhaps it is the victims of Hiroshima Sagredo smells in his vision.

Brecht’s treatment of the relationship between science and religion is also a transcendent theme of his play. In *Life of Galileo*, the Pope acts less as the leader of the Catholic faith and more as a figure of political authority and power. His character appears quite secular; he leaves the theological debates to Galileo and Bellarmine in Scene Six and refuses to “set himself up against the multiplication table” and make his kingdom appear “a cesspool for defunct ideas” in Scene Eleven.³⁴ This being said, Brecht sets up the leader of the Church to appear relatively bland. He can represent any ruler at any point in time. The relationship

between “religion” and science is actually one between science and authority at large. Within Marxist theory—tying Galileo’s life to philosophies of the nineteenth and twentieth centuries—science is an engine of progress and a means of production.³⁵ When the Church forces Galileo to recant, it successfully coopts these means of progress and production. In a similar fashion, the United States, United Kingdom, and Germany silenced and co-opted the scientific discoveries within the field of nuclear physics in the name of political power and physical oppression of their enemies. It was Brecht’s hope that audiences familiar with the Manhattan Project would relate this cooption to current events.

In his article analyzing the story of Galileo as told by Brecht, M.A. Cohen identifies that “it is not so much the character of Galileo that invites interest as his social role.”³⁶ Cohen’s statement perfectly encapsulates the artistic value that Galileo adds as the subject for Brecht’s history play. The Galileo affair represents a force of history that has permeated time and space, and Brecht’s allegorical relationships between seventeenth and twentieth century events prove this. Despite its lack of resonance with a live audience, Brecht’s play uses the Galileo affair in order to shed light on the dangers of science falling into the wrong hands and the responsibility of the scientist to safeguard his discoveries.

³²Brecht, “Notes and Variants” in *Life of Galileo*, 126.

³³Brecht includes in the American production an “Epilogue of the Scientist” which includes the following lines: “Groveling at our rulers’ feet/We sell our brains for what they’ll pay us/To satisfy our bodies’ need./So, despised by those above us/Ridiculed by those below/We have found out the laws that move us/Keep this planet on the go./Knowledge grows too large for nitwits/Servitude expands as well/Truth becomes so many titbits/Liberators give us hell.”

Brecht, “Notes and Variants” in *Life of Galileo*, 128.

³⁴Brecht, *Galileo: A Play by Bertolt Brecht*, 77-81; Brecht, *Galileo: A Play by Bertolt Brecht*, 108-109

³⁵Michael L. Smith, “Recourse of Empire: Landscapes of Progress in Technological America,” in Merritt Roe Smith and Leo Marx, ed., *Does Technology Drive History?: The Dilemma of Technological Determinism* (Cambridge: MIT Press, 1994), 38.

³⁶Cohen, “History and Moral in Brecht’s ‘Life of Galileo,’” 83.

Some Considerations on the Relationships Between an Infinite Group and its Subgroups

ABSTRACT

Group theory has been studied for centuries by many researchers. In the case of finite groups, Lagrange proved that the cardinality of any subgroup of a given finite group is an integer divisor of the cardinality of that group. This paper defines a new concept related to both finite and infinite group theories and their subgroups, called *pseudo-partitions* of a group. The new main result of our paper proves that the set of elements obtained from removing a subgroup from a pseudo-partition of a(n) (in)finite group cannot be a subgroup of the given group.

MSC Classification: 20B05 (General theory for finite groups), 20B07 (General theory for infinite groups)



GROUP THEORY HAS BEEN studied for centuries by many researchers in mathematics. This paper considers the topic of a group and its subgroups. Considering the finite groups, Lagrange proved that the cardinality of any subgroup of a given finite group is an integer divisor of the cardinality of that group.

Let us consider a well-known example of a finite group, S_3 , the group of all permutations of order 3. The concept of a group is formally described in Definitions 2.1 and 2.2. The identity element is $\sigma_1 = (1\ 2\ 3)$, denoted in many references as id_3 . The rest of the permutations can be simply listed, in order, as $\sigma_2 = (2\ 1\ 3)$, $\sigma_3 = (1\ 3\ 2)$, $\sigma_4 = (2\ 3\ 1)$, $\sigma_5 = (3\ 1\ 2)$, and the last one $\sigma_6 = (3\ 2\ 1)$. The group S_3 is special for many reasons, including the fact that it is one of the smallest finite non-commutative group considering the composition of permutations, \odot , in its group operation. For example, $\sigma_2 \odot \sigma_3 = \sigma_4$, while $\sigma_3 \odot \sigma_2 = \sigma_5$. Since any

subgroup's cardinality is an integer divisor of the original cardinality, that is, 6, it is clear that all subgroups of S_3 are $\{\sigma_1\}$, $\{\sigma_1, \sigma_2\}$, $\{\sigma_1, \sigma_3\}$, $\{\sigma_1, \sigma_6\}$, $\{\sigma_1, \sigma_4, \sigma_5\}$, and the group itself. Their cardinalities are divisors of 6, these are, 1, 2, 3, and 6. While identifying all subgroups can be proved case by case, the purpose of this research work is to provide a new theoretical result about arbitrary groups, not only for this particular permutation group.

We believe that there is room for improvement and finding connections between subgroups in order to find other subgroups. This paper defines a new concept related to the (in)finite group theory, called *pseudo-partitions* of a group. This definition works for both finite and infinite groups. Briefly, a *pseudo-partition* of an infinite group G is any set of subgroups of G such that any subgroup has an element not present in any of the other subgroups of the partition. The new main result of our paper

will prove that the set of elements obtained from removing a subgroup of G from a pseudo-partition of G cannot be a subgroup of G . This implies that given the list of all subgroups, we can combine them in order to get larger subgroups or to prove that some of their combinations can never form a subgroup. To the best of our knowledge, this is a new result in infinite group theory.

In the next section, *Preliminaries*, we list the vocabulary that will be used throughout the paper. Then, we state and prove some support lemmas that will guide us into proving our main theorem and a couple of examples, detailed in section *The main result. Conclusions* and *References* end this paper.

Preliminaries

There are many references defining the group structure, including [1], [2].

Definition 2.1 A **group** is a nonempty set G on which there is defined a binary operation $(a, b) \rightarrow a * b$ satisfying the following properties:

1. *Closure:* If $a, b \in G$, then $a * b \in G$.
2. *Associativity:* $a * (b * c) = (a * b) * c, \forall a, b, c \in G$.
3. *Identity:* There is an element $1 \in G$ such that $a * 1 = 1 * a = a, \forall a \in G$.
4. *Inverse:* If $a \in G$, then there is an element $a^{-1} \in G$ such that $a * a^{-1} = a^{-1} * a = 1$.

By including the set of elements and their operations, the group from Definition 2.1 may be denoted as $(G, *)$. In many references, the identity 1 from Definition 2.1 of a group G is also denoted as id_G or simply id .

Definition 2.2 A **subgroup** H is a group G is a nonempty subset of G that forms a group under the binary operation of G . We will denote

H as a subgroup of G by $H \preceq G$.

In general, we say that B is a proper subset of a set A if and only if $B \subset A$ which means there exists an element $x \in A - B$. The definition of a proper subgroup is similar to the definition of a proper subset.

Definition 2.3 We say that a subset H is **proper** if it is neither equal with the identity subset nor to the set G itself. We denote that by $H \prec G$.

Definition 2.3 says that a subgroup H is proper if there are some elements in G not contained by H .

Considering again the subgroups of S_3 , the proper subgroups are $\{\sigma_1, \sigma_2\}$, $\{\sigma_1, \sigma_3\}$, $\{\sigma_1, \sigma_6\}$, and $\{\sigma_1, \sigma_4, \sigma_5\}$.

We will use now Definition 2.2 to construct our first lemma as a different way to characterize the subgroup definition. We begin by stating some support lemmas that will be helpful to prove our main contribution of this paper: the theorem about a *pseudo-partition* of an infinite group.

Lemma 2.1 Let $(G, *)$ be a group and H a subset of elements from G . Then $H \preceq G$ if and only if H satisfies the following properties:

1. $\forall x, y \in H \Rightarrow x * y \in H$
2. $\forall x \in H \Rightarrow x^{-1} \in H$

Proof

(only if) Clearly, due to Definition 2.1;
(if) Let us consider an arbitrary x from H . According to property 2, we get that $x^{-1} \in H$, too. By taking $y = x^{-1}$ in property 1, we get that $x * x^{-1} \in H$. That implies $id \in H$. Now, proving the associativity for H is quite clearly because of the associativity for G . Let us

consider $a, b, c \in H$ arbitrary elements. Since $H \subseteq G$ as a set inclusion, it means that $a * (b * c) = (a * b) * c$, hence the associativity for H holds true. In conclusion, all four properties of Definition 2.1 are satisfied, hence $H \leq G$.

Lemma 2.1 is a relatively trivial result, but it is very useful in many results regarding sub-groups. In fact, Lemma 2.1 is applied for proving the next lemma.

Lemma 2.2 *Let us consider $(G, *)$ a group. Then $H \leq G$ if and only if $\forall x, y \in H$ implies $x * y^{-1} \in H$.*

Proof (if) Let us consider an arbitrary x from H . By taking $y = x$, we get $x * x^{-1} \in H$. This means that the identity id is an element of H . By taking $x = id$, it means that $\forall y \in H$ $y^{-1} \in H$, that is, property 2 of Lemma 2.1. Hence, by substitution of y by y^{-1} , we get $x * (y^{-1})^{-1} \in H$. This is equivalent to $x * (y^{-1})^{-1} = x * y \in H$. Since both properties from Lemma 2.1 are satisfied, we know that H is a subgroup of G .

(only if) Clearly, from Lemma 2.1 after substituting y in property a by y^{-1} .

By taking $y = x$ in Lemma 2.2, we get that any subgroup of a group contains the identity of that group.

Lemma 2.2 is actually a comprised form of Lemma 2.1. The next lemma goes one step further in identifying the membership of the inverse of an arbitrary element relative to the complement of a subgroup.

Lemma 2.3 *Given $(G, *)$ a group and $H < G$ a proper subgroup. Then $x \in G - H$ if and only if $x^{-1} \in G - H$.*

Proof (only if) Let x be an arbitrary ele-

ment of $G - H$. We assume by contraposition (reductio ad absurdum) that $x^{-1} \notin G - H$. This implies $x^{-1} \in H$. Taking $x = id$ and $y = x^{-1}$ in Lemma 2.2, we get that $x \in H$. This represents a contradiction with the hypothesis. So, $x^{-1} \in G - H$.

(if) Similarly with (only if) part, by using the fact that $(x^{-1})^{-1} = x$.

The next lemma is somehow complementary to Lemma 2.3 in the sense of describing a property related to the closure of elements from the complement of a subgroup.

Lemma 2.4 *Given $(G, *)$ a group and $H < G$ a proper subgroup. Then the following properties hold:*

1. *there exist $x, y \in G - H$ such that $x * y \in H$;*
2. *If $x \in G - H$ is an arbitrary element, then for every $y \in H$, we have $x * y \in G - H$.*

Proof

1. We assume by contradiction that $\forall x, y \in G - H$, we get $x * y \in G - H$ (by negating $x * y \in G - H$). According to Lemma 2.3, we get that $x^{-1} \in G - H$ once $x \in G - H$. By taking $y = x^{-1}$ we get $x * x^{-1} \in G - H$. This means $id \in G - H$, which is a contradiction because $id \in H$. The contradiction is clear because any subgroup contains the identity element, id . In conclusion, there exist $x, y \in G - H$ such that $x * y \in H$.
2. We assume by contradiction that $x * y \notin G - H$, that means $x * y \in H$. Since $y \in H$ and H is a subgroup, it means that $y^{-1} \in H$. According to the closure property applied to $x * y \in H$ and $y^{-1} \in H$, we get $(x * y) * y^{-1} \in H$. By associativity, we get $x * (y * y^{-1}) \in H$, that is, $x \in H$. This is a contradiction with

the hypothesis $x \in G - H$. Hence $x * y \in G - H$.

The next lemma uses Lemma 2.4 to identify some properties of $G - H$ assuming that H is a subgroup.

Lemma 2.5 *Let $(G, *)$ be a group and $H < G$ be a proper subgroup. Then the following two properties hold:*

1. *$G - H$ is not a subgroup of G ;*
2. *Any proper subset K of elements of G that includes $G - H$ cannot be a subgroup of G .*

Proof

1. According to point 1 of Lemma 2.4, it means that $G - H$ does not satisfy the closure property of a group. Hence, $G - H$ cannot be a subgroup.
2. We assume by contradiction that there exists K a proper subset of G that includes $G - H$ and $K < G$. We need to prove first that there exists $y \in H - K$. We assume by contradiction that there is no $y \in H - K$. That means $H \subseteq K$. From the hypothesis, we know that $G - H \subseteq K$. Combining the last two sets inclusions, we get $G \subseteq K$. This represents a contradiction with the hypothesis stating that K is a proper subset of G . We conclude that there exists $y \in H - K$.
3. Let us take now $x \in G - H$ an arbitrary element. According to point 2 of Lemma 2.4, we get that $x * y \in G - H$. That implies $x * y \in K$ because K includes $G - H$. This also implies $x \in K$, so $x^{-1} \in K$ because $K \in G$. According to the closure property of K , since $x * y \in K$ and $x^{-1} \in K$, it means $x^{-1} * (x * y) \in K$. By associativity of K , it implies that $(x^{-1} * x) * y \in K$. This is equivalent to $y \in K$, which

represents a contradiction with $y \in H - K$. Hence the conclusion holds, that is, K cannot be a subgroup of G .

Lemma 2.5 is used to prove the main result of this research paper, which requires the formal definition of *pseudo-partition* (Section 3).

The Main Result

This section is dedicated to the main result of this paper. The key ingredient of the main result is that once all the subgroups have been identified, for any set of subgroups "covering" the entire infinite group, then removing one of the subgroups cannot lead to a subgroup. To make things clearer, we need Definition 3.1.

Definition 3.1 *Given an infinite group G , we say that the subgroups H_1, H_2, \dots, H_k of G form a **pseudo-partition** if*

1. $H_1 \cup H_2 \cup \dots \cup H_k = G$
2. $\forall i \in \{1, 2, \dots, k\}, \exists x \in H_i - (H_1 \cup H_2 \cup \dots \cup H_{i-1} \cup H_{i+1} \cup \dots \cup H_k)$.

The words "pseudo-partition" from Definition 3.1 are used instead of just "partition" because these subgroups may actually have common elements, such as id , for example.

Next, we present the main result of our paper. Compared to most of the existing results in group theory which identify when a set of elements form a subgroup, Theorem 3.1 proves that some set of elements cannot be a subgroup.

Theorem 3.1 *Let G be an infinite group and H_1, H_2, \dots, H_k a pseudo-partition of G . Then $H_1 \cup H_2 \cup \dots \cup H_{i-1} \cup H_{i+1} \cup \dots \cup H_k$ is not a subgroup of G , for any $i \in \{1, 2, \dots, k\}$.*

Proof It is understood that $H_1 \cup H_2 \cup \dots \cup H_{i-1} \cup H_{i+1} \cup \dots \cup H_k$ for any $i \in \{1, 2, \dots, k\}$. Consequently, by Lemma 2.5, $H_1 \cup H_2 \cup \dots \cup H_{i-1} \cup H_{i+1} \cup \dots \cup H_k$ cannot be a subgroup of G .

Just for the sake of checking this result for finite groups, Figure 1 shows the structure of all subgroups of group S_3 , showed with a frontier of different color. Following the same order of listing the subgroups from Introduction, we can denote $H_1 = \{\sigma_1, \sigma_2\}$, $H_2 = \{\sigma_1, \sigma_3\}$, $H_3 = \{\sigma_1, \sigma_6\}$, and $H_4 = \{\sigma_1, \sigma_4, \sigma_5\}$.

The next three examples illustrate the applicability of Theorem 3.1.

Example 3.1 Let us consider the group S_3 (Figure 1). Clearly, the subgroups H_1, H_2, H_3 , and H_4 form a pseudo-partition of S_3 . As a direct implication of Theorem 3.1, the set $\{\sigma_1, \sigma_3, \sigma_4, \sigma_5, \sigma_6\}$ is not a subgroup of S_3 because the element σ_2 from H_1 is not in the above set of elements.

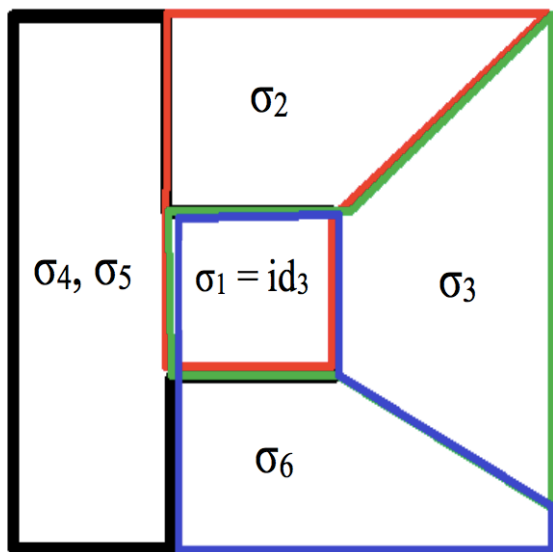


Figure 1: The structure of all subgroups of group S_3 .

Example 3.2 For the same group S_3 , the set $\{\sigma_1, \sigma_2, \sigma_3, \sigma_6\}$ is not a subgroup of S_3 because the elements σ_4 and σ_5 from H_4 are not in the

above set of elements. These examples can actually be checked using Lagrange's Theorem based of the fact that 5 is not a divisor of 6.

Even if the above proof can also be done using Lagrange's Theorem, Theorem 3.1 holds also for infinite groups (where Lagrange's Theorem is not applicable). So, let us consider next an example of an infinite group.

Example 3.3 It is known that $\mathbb{Z} \times \mathbb{Z}$ denotes $\{(m, n) \mid m, n \in \mathbb{Z}\}$ and $\mathbb{Z} \oplus \mathbb{Z} = (\mathbb{Z} \times \mathbb{Z}, +)$ denotes an infinite group over the pairs of integers with addition.

Let us denote $H_1 = \{(2m, n) \mid m, n \in \mathbb{Z}\}$, $H_2 = \{(m, 2n) \mid m, n \in \mathbb{Z}\}$ and $H_3 = \{(m+n, m-n) \mid m, n \in \mathbb{Z}\}$. Clearly $(H_1, +) \preceq \mathbb{Z} \oplus \mathbb{Z}$, $(H_2, +) \preceq \mathbb{Z} \oplus \mathbb{Z}$ and $(H_3, +) \preceq \mathbb{Z} \oplus \mathbb{Z}$.

These three infinite subgroups define the set of pairs for which the first component must be even (H_1), the second component must be even (H_2) or neither component must be even (H_3).

Hence, it is relatively easy to check that $H_1 \cup H_2 \cup H_3 = \mathbb{Z} \times \mathbb{Z}$.

Although H_1, H_2 and H_3 have common pairs (e.g., $(4, 6)$), there are pairs from one subgroup which do not belong the other two subgroups. For instance, $(4, 1) \in H_1 - (H_2 \cup H_3)$, $(3, 8) \in H_2 - (H_1 \cup H_3)$ and $(13, 7) \in H_3 - (H_1 \cup H_2)$. As a consequence of this property and according to Definition 3.1, the subgroups $(H_1, +)$, $(H_2, +)$ and $(H_3, +)$ form a pseudo-partition of $\mathbb{Z} \oplus \mathbb{Z}$. By applying Theorem 3.1, removing any one of these subgroups, we get that neither $H_1 \cup H_2$, $H_1 \cup H_3$ nor $H_2 \cup H_3$ is not a subgroup of $\mathbb{Z} \times \mathbb{Z}$.

Conclusions

Many research papers in group theory proved results stating conditions of when a

set of elements forms a subgroup structure. On the contrary, our paper described a result when a set of elements cannot form a subgroup structure. As such, this paper proved that a pseudo-partition of an (in)finite group cannot be a subgroup of that given group.

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From Stretcher to Golden Meal: The Rise of Meatloaf in the American Diet



AS HEADLIGHTS PULL INTO the driveway, the dining room table is adorned with the final set pieces for dinnertime. While the main course is finishing up in a futuristic electric oven, a steaming bowl of frozen Birdseye peas, carrots, and corn is placed on the table alongside buttery golden mashed potatoes made instantly from a box of Idaho Spuds. The man, exhausted from work, walks through the front door to meet his smiling children waiting for him by the foyer. His beloved wife greets him with a kiss as he sets down his bag and hangs up his coat. "What's cooking?" he wonders. "It's your favorite meal!" The kids run into the dining room with the loving couple trailing behind. Beyond the distraction of the side dishes, the man's focus hones in on the glowing meatloaf in the center of the table. Crispy ends, slightly burnt by the pan, hold together a pound of prime sirloin mixed with breadcrumbs for the shape and a plethora of herbs for the flavor. The overworked man salivates at the sight of dinner, hungry for the comfort of a home cooked meal.

The postwar United States symbolized the success of capitalism. Since the onset of the Great Depression in 1929 and throughout the 1930s, Americans struggled to put a roof over their heads and have a nutritious meal to end the day. As the country escaped poverty through the industrial war effort during World War II, a ration system was put

in place at home to provide for soldiers abroad. With the war over, rationing subsided and American people, now prosperous, were free to become the great consumers they were destined to be. Through the trials and tribulations of depression and war, meatloaf remained constant in the American diet. Meatloaf allowed for a family to stretch ingredients for longer periods of time, utilizing ingredients typically used up in a single meal, adding breadcrumbs or other grains, and creating several meals for the week. Meatloaf provided for an efficient way to spend ration points while keeping the family nutritionally sound. Finally, the dish provided the essential ingredients for a healthy meal with versatility to suit the consumer's additional nutritional and gastronomical desires. When families with newfound wealth fled to the suburbs, they brought their meatloaf recipe with them and experimented with the staple meal, using better ingredients and trying new combinations. Whether the country was destitute or rich, scared or safe, hearty meatloaf followed to provide stability to American dinner tables and nutrition to American families.

Before diving into the importance of meatloaf during the Great Depression, a short history of the dish should be examined. Meatloaf's ancestor, scrapple, can be traced back to colonial America, notably in the German and Dutch settled mid-Atlantic colonies of New York, New Jersey, and Pennsylvania.¹ *Panhaas*,

as scrapple was called in Dutch Pennsylvania, is traditionally made with all parts of the hog, boiled to separate "head meat, livers, and hearts," as well as "snouts and skins," from the bone.² In European tradition, buckwheat or other thickeners were added. However, scrapple changed due to influence from the Native American population. "Scrapple," quotes author Susan Ellis, "was the wedding of German sausage-making skills to American Indian corn meal."³ The combined ingredients formed a breakfast loaf meant to last anywhere from several days to weeks at a time. The consumer carved a slice for breakfast and pan-fried the congealed meat until ready to eat. The hearty scrapple combined European culture with American ingredients to create a uniquely American dish for the survival of the colonists.

After gaining an understanding of scrapple, the comparison to meatloaf becomes clear. Meatloaf, like scrapple, mixes finely ground meat with spices and a thickening agent to create a filling meal. Both dishes allow for a variance in ingredients, allowing for creativity if choices are available or flexibility if limited. Meatloaf and scrapple provide the necessary proteins and carbohydrates needed to be energized throughout the day and fill a hungry stomach at dinnertime. The resulting meal can be eaten several times per cooking, providing for both convenience for the chef and ease on the wallet. Finally, and most im-

portantly, is the notion of waste and saving money. Ellis claims scrapple is "a prime example of that thrifty Dutch desire to waste nothing and want not."⁴ The same can be said for meatloaf as an example of American desires throughout the early 20th century, beginning as a model for thrift and becoming an American staple.

Technological advances allowed for meatloaf to popularize. The universal grinder, invented in 1897, could grind two-and-a-half pounds of meat per minute, revolutionizing the meat industry.⁵ Butchers, and eventually supermarkets, offered ground beef, making recipes requiring minced meat possible. Ovens cooking with gas became commonplace around the turn of the century as gas lines connected to households. The rise of the electric oven during the 1920s and 1930s sparked competition with gas ovens, though the spread of electricity still desired vast improvements.⁶ Enclosed ovens were beneficial to the cooking of meatloaf for its ability to evenly cook the loaf throughout rather than heating directly from an open flame. Finally, at-home refrigeration and freezing became possible with the synthesis of Freon 12 by Frigidaire in 1930.⁷ The leftover meatloaf could be kept for longer periods of time with refrigeration, adding to the appeal of the dish for families struggling financially. With technological advancements moving from the lab to the home, families began wasting less and

¹Colonial Cookery in North America. n.p.: The Great Courses, 2013, 27:11.

²Susan J. Ellis, "Pennsylvania Folklife Vol. 22, No. 3" (1973). Pennsylvania Folklife Magazine. Book 53, pg. 11.

³Ibid, pg. 13.

⁴Susan J. Ellis, "Pennsylvania Folklife Vol. 22, No. 3" (1973). Pennsylvania Folklife Magazine. Book 53, pg. 10.

⁵Lee S. Dean, "Grinding meat: All in a day's work," *Star Tribune*, May 2, 2012, www.startribune.com/grinding-meat-all-in-a-day-s-work/149873425/

⁶<http://inventors.about.com/od/ofamousinventions/a/oven.htm>

⁷War, *Nutritionism, and the Great Depression*. n.p.: The Great Courses, 2013.

cooking in unique ways.

The Great Depression of the 1930s slowed the integration of new technologies while the government embraced its new role as the protector of the people from economic calamity. The Great Depression, occurring in part due to agricultural overproduction during World War I, put many Americans out of work.⁸ Wheat and beef were plentiful during the war and immediately after, but the deadly droughts of the Dust Bowl forced many farmers off of their land. Though many farmers struggled, livestock and crops were still being produced at surplus rates.⁹ Americans struggled to meet their daily needs as thousands of workers were laid off and could not afford the produce of the struggling farmers. A dangerous cycle began; farmers produced too much, lowering the price of their products, while workers were unemployed and could not afford expensive food, further devaluing crops and hurting the farmers. The American government, led by President Franklin Delano Roosevelt, became instrumental in the food industry for the first time, forcing farmers to hold crops when supply was too high or rerouting surplus to poor citizens.¹⁰ Agencies, such as the Federal Emergency Relief Administration (FERA) and the

Federal Surplus Relief Corporation (FSRC) assisted the unemployed through governmental work programs and by diverting surplus foods to their dinner plates.

One particularly helpful program was SNAP, or the Supplemental Nutrition Assistance Program, founded in 1939. The program worked by allowing Americans on welfare to purchase orange stamps at a 1 to 1 ratio with the dollar.¹¹ For every orange stamp, which could be used on any food item, the purchaser received a \$.50 blue stamp to be used on surplus items.¹² As nutrition became a national craze during the Great Depression, housewives searched for vitamin packed meals that could be supplemented with food stamps.¹³ The government also had nutrition in mind when establishing the program. In 1933, USDA economist Hazel Stiebeling determined food plans for different cost levels, suggesting weekly servings for different types of foods. Proteins and vegetables were of most importance, while fats, sugars, and breads were left to the desires of the consumer.¹⁴ As Howard Williams and David Long explain, the purpose of the Food Stamp Plan was twofold; "The first purpose was to bolster a sagging demand for specific agricultural products. A second consideration was to make these specific agricultural prod-

⁸Ibid.

⁹"Food 1929-1941." *Historic Events for Students: The Great Depression*, edited by Richard C. Hanes and Sharon M. Hanes, vol. 2, Gale, 2002, pp. 21-49. U.S. History in Context

¹⁰*War, Nutritionism, and the Great Depression*. n.p.: The Great Courses, 2013.

¹¹"A Short History of SNAP," last published November 20, 2014, <http://www.fns.usda.gov/snap/short-history-snap>

¹²Ibid.

¹³David Long and Howard Williams, "Evolution of the Food Stamp Program," Research Circular 191, June 1972, pg. 4.

¹⁴America's Eating Habits: Changes and Consequences. United States Department of Agriculture. May 1999, Table 1.

¹⁵David Long and Howard Williams, "Evolution of the Food Stamp Program," Research Circular 191, June 1972, pg. 4.

ucts available to families who were unable to provide themselves with sufficient foods to be properly nourished."¹⁵

If proper nourishment at the cheapest cost was the goal, meatloaf became a golden meal for struggling families. For example, take a meatloaf recipe from *Fashions in Foods in Beverly Hills* from 1931.¹⁶ The recipe calls for one-and-a-half pounds of cheaper chopped round steak, which contains 23g of protein per 3 oz of steak, a remarkable amount considering ground beef contains only 18g per the same amount.¹⁷ The recipe also calls for several different vegetables and herbs, specifically one onion, one green pepper, parsley, and tomatoes, turning meatloaf into a vehicle to get these necessary foods into the diet. While vital vegetables snuck their way into the loaf, it was often in minimal quantities. Processed foods, such as bagged frozen vegetables and instant mashed potatoes, arrived on supermarket shelves and provided a nutritional boost in the form of sides. However, only those wealthy enough to purchase the latest appliances could store and prepare the newest supermarket arrivals.¹⁸ Finally, even if beef was hard to come by, meatloaves could become "salmon loaf with canned salmon; ham loaf, made with ground pork, was popular in southern states; and venison loaf was prepared in areas with abundant deer."¹⁹ During hard times, people became resourceful with their eating habits in order to keep

food on the table and the family healthy.

With war on the horizon, America's economy improved with an increase in manufacturing for militaries foreign and domestic. As people were put to work, they had more money to spend on goods than ever before. The technologies they missed out on during the 1930s, such as refrigerators, electric stoves, and freezers, were bought for new homes. Foods could last longer than ever in the freezer, and processing foods in cans and freezer bags lengthened shelf life. Despite renewed wealth, war's arrival at the homeland on December 7, 1941, forced further sacrifices to be made by the general public. The canned goods that people desired were going abroad to feed desperate Britons and fighting soldiers. Transporting food became difficult when tires, steel, and gasoline became rationed.²⁰ Prosperity was put on hold until war was won.

War rationing implemented a points system similar to that of the SNAP program. However, rationing during the second World War consisted of ration books for specific items rather than overall goods, starting with sugar at half a pound per week and extending to gasoline and other goods soon after.²¹ As Lizzie Cunningham explains in her book *The Taste of War*, the most frustrating sacrifice was beef rationing. "Red meat, preferably beef, was highly valued as a prime source of energy... and its presence helped to define the

¹⁶*Fashions in Foods in Beverly Hills*, Beverly Hills Woman's Club, 1931, pg. 54.

¹⁷Matthew Kadey, "The Ultimate List Of 40 High-Protein Foods!" October 4, 2016, <http://www.bodybuilding.com/content/ultimate-list-40-high-protein-foods.html>

¹⁸*War, Nutritionism, and the Great Depression*. n.p.: The Great Courses, 2013.

¹⁹Food 1929-1941, *Historic Events for Students: The Great Depression*, 2002.

²⁰"Take a closer look at war rations," National World War II Museum, <http://www.nationalww2museum.org/learn/education/for-students/ww2-history/take-a-closer-look/ration-books.html>

²¹Ibid.

²²Lizzie Cunningham, *The Taste of War*, 431.

food as a proper meal. But during the war most red meat, and especially steak, disappeared into the army bases.”²² Instead of beef with their meals, many women resorted to pork, chicken, and meatless proteins for dinner, resulting in families eating surprisingly more protein during the rationing period.²³ In the same fashion as the Depression, World War II promoted creativity with food in order to get the most nutrition with the same basic dish. Instead of trying new recipes that the government or companies suggested, women “preferred to use ‘stretchers’ to make their meat go further and reduced waste by religiously using up leftovers.”²⁴ Meatloaf, the golden stretcher, could be made with anything and continued its reign as an extraordinary meal for dining on a budget.

Americans were largely frustrated by rationing, believing that rationing was unnecessary and was a ploy for patriotism.²⁵ Some were fed up to the point of ignoring rationing and bought goods from black market shops. Small slaughterhouses opened and traded locally to evade the Office of Price Administration, the bureau for war rations. Butchers sold highly valued cuts of beef as pre-ground hamburger meat so that the customer would use fewer ration points for a better steak.²⁶ The black market never grew enough to destroy the economy but it allowed for choice in a system that limited options to the customer. “The

privations Americans had put up with during the Depression and now during the war,” according to Collingham, “shaped their post-war desires.”²⁷ Illustrated by Norman Rockwell’s Americana painting *Freedom from Want*, images of freedom and indulgence stood side by side at the dinner table.²⁸ Americans wanted to live the life of extravagant consumption they were promised.

Following the war, consumption drove the American economy and solidified patriotism to the dinner table. Families moved from the overgrown cities into quaint suburbs with a small yard and a Craftsman home. Free from rationing, people drove cars more and ate with an abundance of options. The lavish consumerist lifestyle they had hoped for arrived a couple dozen miles outside of the city in a quiet neighborhood of their own. Though rationing had ended, the footprint implanted by the war years remained. Simple meals eaten because of wartime restrictions became celebrated by victorious Americans.²⁹ As Abigail Carroll describes, “during World War II, the sit-down family dinner became an anchor of stability and a symbol of what the nation was fighting for.”³⁰ The impending Cold War with the Soviet Union reignited anxieties in American families. Dinner’s success at calming fears during the previous 20 years allowed for its continued dominance in Cold War society.

Fear of Soviet communism, the archenemy

²³Ibid.

²⁴Ibid, 432.

²⁵Ibid, 431.

²⁶Lizzie Collingham, *The Taste of War*, 432.

²⁷Ibid, 429.

²⁸Norman Rockwell, *Freedom from Want*. 1943. Oil on canvas, 45.75 in × 35.5 in, Norman Rockwell, Museum, Stockbridge, Massachusetts.

²⁹Abigail Carroll, *Three Squares: The Invention of the American Meal*, Perseus Books Group, 2013, 100.

³⁰Ibid.

of American capitalism, promoted purchasing rather than saving. Purchasing, it was argued, “[prevented] the expected post-war economic slump,” and kept the social welfare state away from American society.³¹ Processed foods became an unlikely market to receive a postwar boom. Canned fruit and frozen vegetables, for example, simply made healthy living easier for the consumer.³² Further, nutritionists during World War II were able to manipulate products to provide nutritional boosts for the consumer. For example, nutritionists “persuaded the government to implement the fortification of basic foodstuffs such as bread, milk, and margarine with iron, the various B vitamins and vitamins A and D.”³³ An obsession of health during the war established a celebration for processed foods in the postwar years, a celebration challenged in recent years.³⁴ Meatloaf, using ingredients reinforced in the laboratory, maintained its status as a hearty meal for the health conscious American. Changes to food production during the war continued into post-war society, allowing for healthy living through abundant purchasing.

Convenience did not deter the consumer from popular dishes like meatloaf. Processed foods, and an increasing prominence of handy appliances, allowed for more attention to be given to the main course.³⁵ With less time spent on mashed potatoes and steamed vegetables, housewives were able to experiment more with the main dish. The abundance of supermar-

kets in newly-developed suburbs allowed for an array of meats and ingredients to be sold to the average American, all of which could be used to revamp staple recipes like meatloaf. No longer were consumers forced to substitute canned salmon for hearty ground steaks. Instead, choicer cuts of sirloin were ground to make a better meal. Different meats, such as gourmet Italian sausages and healthier options like turkey, were mixed with beef to add variety. Soldiers traveling the world during the war came home with a desire for exotic tastes, incorporating foreign spices into staple foods cooked by their wives.³⁶ To meet changing tastes, bottled sauces and condiments were bought in grocery stores which could easily be mixed into the meatloaf or added as a frosting for appearance. Variety in postwar America allowed for creativity and luxury in the kitchen of affluence.

Ignoring the suppressed internal strife of the decade, the United States of the 1950s is often remembered through rose-tinted glasses. Elaine Tyler May claims, “racial and class divisions were concealed beneath an aura of unity in the aftermath of the war. Post-World War II America presented itself as a unified nation, politically harmonious and blessed with widespread affluence.”³⁷ Today, many reminisce fondly on the beginnings of American suburbia, debatably home to the “American way of life.”³⁸

³¹Abigail Carroll, *Three Squares: The Invention of the American Meal*, Perseus Books Group, 2013, 100.

³²Lizzie Collingham, *The Taste of War*, 494.

³³Ibid, 421.

³⁴Ibid, 498.

³⁵Ibid, 430.

³⁶Lizzie Collingham, *The Taste of War*, 495.

³⁷Elaine Tyler May, *Homeward Bound*, Perseus Books Group, 1988, 8.

³⁸Ibid.

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Andrew Haruki Hill

An Economic Analysis of the Monopoly Board Game

ABSTRACT

Almost every American family has joined together to play the Monopoly board game. Its first version was created by Elizabeth Magie, who wanted the game to reflect her views on a prevailing tax method called "land-value tax". She was deeply invested in the current economic situation at the turn of the century and was critical of the prevailing monopolists of the time. In fact, she designed the first version of Monopoly (which she called "The Landlord's Game") "as a teaching tool to promote the economic theories of Henry George, whose progressive ideas on both taxation and women's rights remained Magie's lifelong passion."¹ A man named Charles Darrow stole the idea and sold it to the Parker Brothers, who released it as the game we know and love. A game that has such deep-rooted economic origins deserves an economic explanation.



MONOPOLY LENDS ITSELF to an economic study because it, along with other games, is subject to constraints and rules. First, there is the board, which has 40 spaces comprised of properties, and features. The properties are made up of three groups: Simple Properties (which are further grouped into colors), Utilities, and Railroads. The feature spaces are made up of Go, Chance/Community Chest spaces, Jail, Go To Jail, Income Tax/Luxury Tax, and Free Parking.

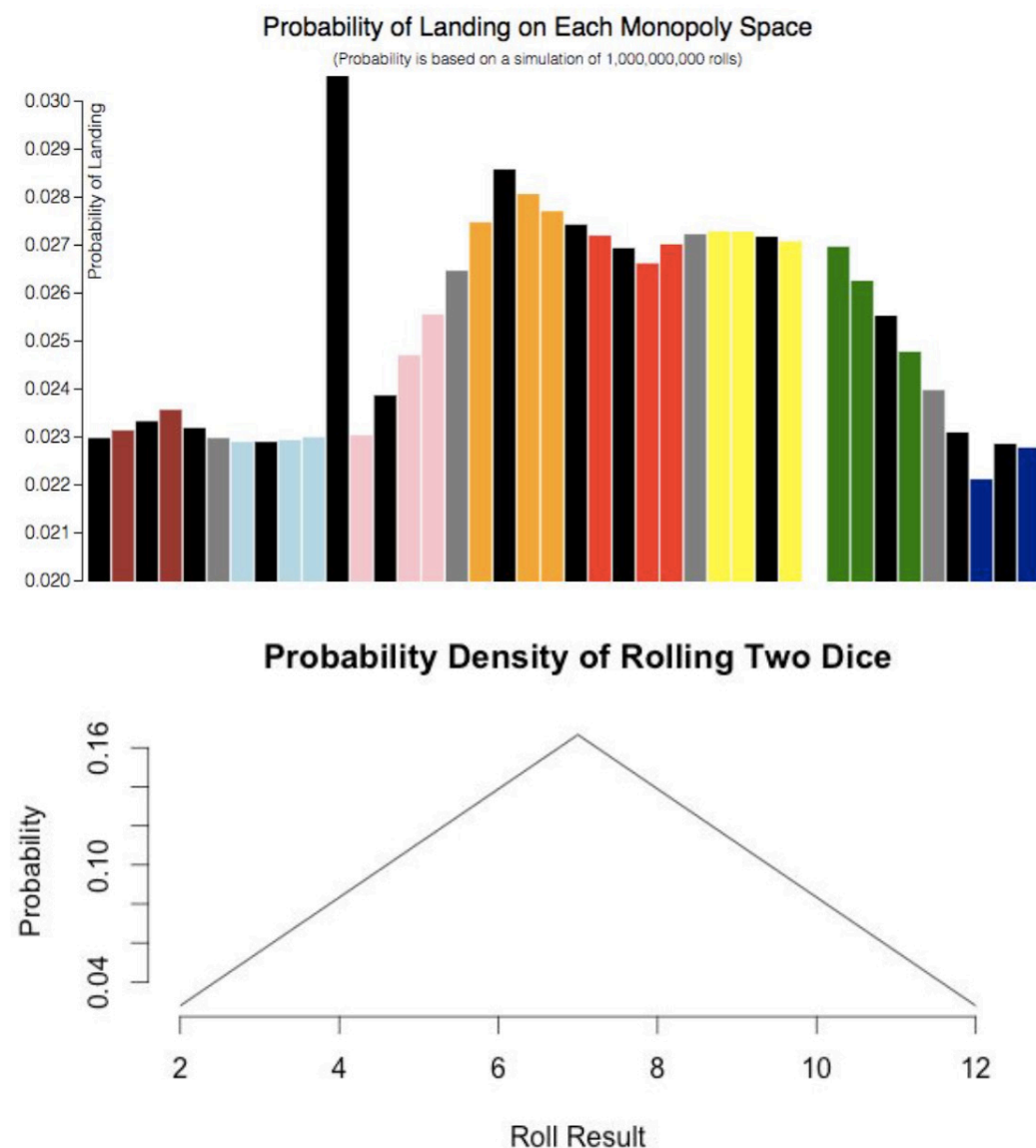
When players pass Go, the starting space on the board, they receive \$200. After landing on a Chance or Community Chest space, the player must draw a card from one of the respective decks which either monetarily penalize or help a player or send them to another space on the board. The Jail space forces the player to stay on the space for three turns and the Go To Jail space sends the player to Jail. The Tax spaces simply fine players who land on them and the Free

Parking space has not effect. Players navigate through those spaces by rolling two dice and travelling the number of spaces indicated by the addition of dice. If a player rolls the same number with each die then they get to roll again, but if they roll doubles three times in a row², they are sent to Jail. There are more rules, but they do not directly influence the study.

The Data

I wrote a script³ in Python, a programming language, that simulates Monopoly. In the simulation a player rolls two dice and moves across the board while recording its location after every roll. The player is subject to all of the features that are in the game. After rolling 1,000,000,000 times, I computed the probability of landing on each space.

In the appendix, Figure 2 contains a table with the location, name, and probability of landing on each property. For easy reference, Figure 1 displays



a classic Monopoly board. Below is a graphic of the probability of landing each space⁴. The graphic omits the “Go to Jail” space which has a zero percent probability of landing because it immediately sends the player to the “Jail” space.

Some interesting data points arise from the simulation. High-probability properties are mostly grouped in the northwest corner of the board. If the dice were rolled 1,000,000,000 times on a board without features, the probabilities would be equal amongst all spaces. However, the features disturb that uniform probability density. The inclusion of Jail, in

which players are locked up 1 in 37.4 rolls (or 2.68% of rolls), causes more players to start their turn from the southwest corner on the tenth space. This effect is even more powerful considering there are Chance and Community Chest cards that send players to Jail. With minor variations, the probabilities of landing in the northwest corner properties closely resemble the probability density of rolling two dice, shown above, compounded with the even distribution mentioned in the board with no rules or cards.

The Community Chest space in the northwest side of the board owns the highest land-

ing probability of all spaces, with 2.832% of all rolls. It is no mistake that it is exactly seven spaces away from Jail, matching the peak of the Probability Density graphic above.

Examination of the probability densities of two dice and how they can compound on one another help explain why players land on some spaces more than others. The highest roll probability for properties belongs to Tennessee Avenue, which is one space ahead of the northwest Community Chest. Theoretically, both the 16th and 18th space should share the same probability because the probabilities of rolling a six and an eight with two dice are equal. But, Tennessee Avenue (space 18) holds a slight edge over St. James Place (space 16) because of Chance cards that move a player to Electric Company on space twelve and Pennsylvania Railroad on space fifteen. The probability densities of those two spaces are also compounded with the two before and their peaks are much closer to Tennessee Avenue than St. James Place.

The same logic of compounded probabilities can be used to explain why there is a distinct hump on the Probability Density Graph for the third space, Baltic Avenue. The probability of landing on this space contains the compounded probabilities of Go (space 0), Boardwalk (space 39), and Short Line (space 35), all properties that Chance and Community Chest cards lead to.

The compounded probabilities can also

explain why there is a noticeable dip on the 23rd space, Indiana Avenue. This property is thirteen spaces away from Jail and does not fall within the compounded probabilities because two dice can at most add up to twelve. The small bump right before the 24th space, Illinois Avenue can be explained by the Chance card that sends a player straight to the property.

The steep dropoff after the thirtieth space, Go To Jail, occurs simply because once a player lands on that space, they are immediately sent to the opposite side of the board. It is no mistake that the space with the lowest roll probability is seven spaces after Go To Jail, Park Place. The simulation suggests players should end up on Park Place a measly 2.186% of rolls. The probability density picks up right after and trends upward until the final space, Boardwalk.

One could reasonably tailor their Monopoly strategy to owning as many high-roll probability spaces as possible while avoiding low-roll probability spaces. But playing this way would ignore most of the other constraints of the game.

Four main factors directly influence a property's value. The first is a property's rent. Each property has different rents associated with it that opposing players have to pay if they land on the space. It's obvious that Boardwalk, which has a \$50 rent, is more valuable, in that respect, than Mediterranean

¹Wagner, Erica. "Do Not Pass Go: The Tangled Roots of Monopoly." *New Statesman*. 24 June 2015. Web. 24 Jan. 2016. <<http://www.newstatesman.com/culture/2015/06/do-not-pass-go-tangled-roots-monopoly>>.

²A phenomenon whose theoretical probability is only 0.0046

³The code for the simulation can be found at: <https://github.com/harukihill/monopoly-project/tree/master>

⁴The interactive version of the graphic can be found at: <https://bl.ocks.org/harukihill/21391f8d58be850d70a06e14b23fd556>

Avenue, which has a \$2 rent. The second is a property's cost. Players may be hesitant to splurge on Boardwalk, which costs \$400, but would have no problem acquiring Mediterranean Avenue, which costs \$60. The third factor is the probability of landing on a property. The probability of landing on a space determines how many times opposing players will pay rent and give you money. Lastly, value can also be determined by the probability of monopolizing a set of properties, therefore allowing a player to build more houses and reap the benefits of astronomically high rents.

Property Value Score

In order to accurately estimate the value of properties, I created Property Value Score (PVS). PVS takes in those factors to calculate a score for each property, including Utilities and Railroads. I use a dimensionless value to compare properties because it is impossible to calculate a true dollar value for each property. Hypothetically, that true dollar value would be composed of the rent, probability of landing, and the number of rolls left in a game. However, the rules do not enforce a finite number of turns, so the game could last ad infinitum. The competitive nature and rules of Monopoly prevents the calculation and simulation of a proper estimate of game length.

The formulation of PVS uses the probability of landing, rent, cost, probability of monopolization, rent from houses and hotels, cost of houses and hotels, and number of houses or hotels as variables.

The variable R represents the rent gained from an opposing player and the same variable with a subscript, R_h , is the rent value with houses or a hotel on the property. The same variation applies to the variables C , which represents the cost of a house, and C_h is the cost of

each house. $P(land)$ is the probability of landing on the space is applied to the whole equation because the main way a property can give value to its owner is if an opponent lands on it and pays rent. The probability of monopolization, $P(monopoly)$, is the product of the $P(land)$ of the other properties of the same color (the model assumes the probability of landing on one space is independent of the probability of landing on another). n represents the number of houses a property has in the property PVS equation and represents the number of railroads owned in the Railroad PVS equation. One peculiarity of the railroad equation is the $P(other railroads)$. It represents the average probabilities of landing for three other railroads other than the railroad for whom PVS is calculated. The average is taken because it does not matter which extra railroad is owned. The average probability is raised to the power of n , the number of railroads owned, in order to appropriately weigh the rent and costs of the extra railroad. All of these equations are scaled upwards by a factor of one thousand for clarity.

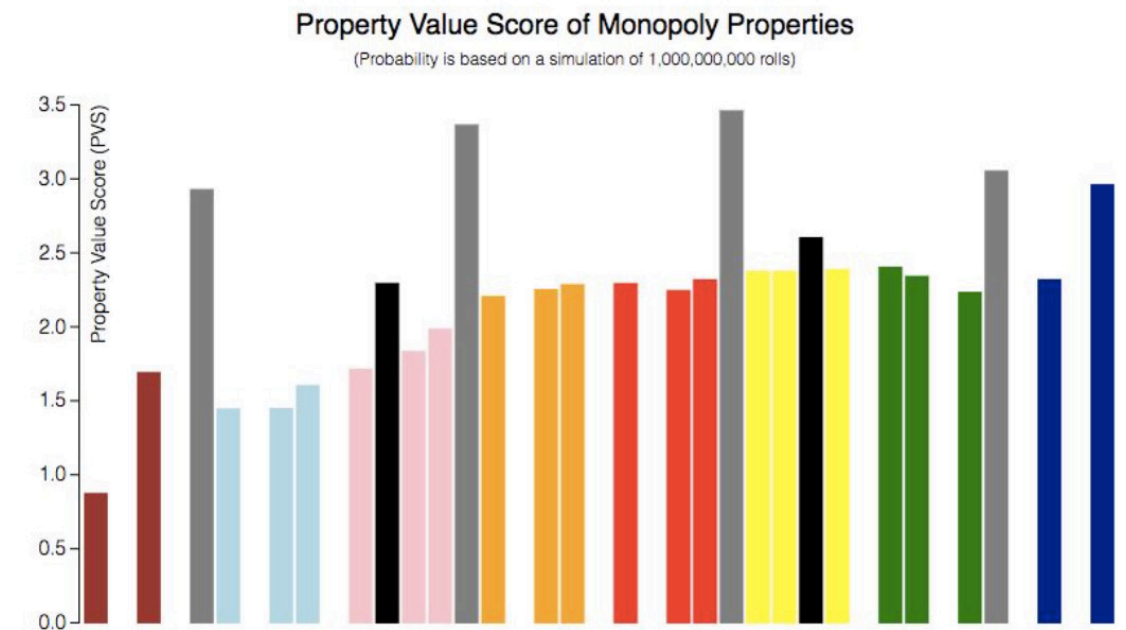
On the next page are the mathematical formulations for the Property Value Scores of ownable spaces in Monopoly. Below is a graphic⁵ of the PVS for each ownable space on the board. Also, a table of the scores can be found in the appendix.

The first and most major realization from the model is the incredible value of Railroads, colored in grey. The four Railroads are among the top five most valuable properties. A major component of their value comes from their Cost to Rent ratio. A property similar to the Railroads in cost is New York Avenue. That property's rent is \$16 while the Railroads' rent are each \$25. Another reason they are highly valuable is a player does not have to monopolize all

$$PVS(property) = P(land) \left[\frac{R}{C} + P(monopoly) \sum_{n=1}^5 \frac{R_h}{C + nC_h} \right] * 1000$$

$$PVS(railroad) = P(land) \sum_{n=1}^4 P(other railroads)^n \frac{25 * 2^{(n-1)}}{200n} * 1000$$

$$PVS(utility) = P(land) \left[\frac{14}{150} + P(other utility) \frac{70}{150} \right] * 1000$$



the same type of property before rent is increased. With each added Railroad, the rent goes up from \$25 (one Railroad) to \$50 (two Railroads), \$100 (three), and finally \$200 (four). New York Avenue's rent jumps from \$16 to \$80 with one house added and then quickly eclipses the rent of four Railroads when another house is added. But a player must first funnel \$560 into Orange properties before buying a house. One factor that raises the value of a Railroad that is not reflected in PVS is in a real game of Monopoly players do not go around the board as many

times as the simulation. In the simulation of 10,000,000 rolls, the simulated player passes 'Go' 1,597,633 times (1 in 6.3 rolls or 15.97% of rolls). With fewer rolls, there is a smaller chance that a player will land in the same area enough to monopolize same color properties. This fact assumes only one player is playing. Railroads have the benefit of being spaced out much more evenly and a player could buy all four of them without making deals with other players.

The results also suggest one of the perennially overlooked Brown properties, Baltic

⁵ The interactive version of the graphic can be found at: <https://bl.ocks.org/harukihill/a2adc68c34f86f41dc99417b7c251ec1>
An additional graphic comparing Property Cost and PVS can be found at: <https://bl.ocks.org/harukihill/425fc01bb6123575767cfe319f92c251>

Avenue (space 3), is more valuable than the the next color group of properties, which all have much larger rents. Mediterranean Avenue (space 1) and Baltic Avenue, cost \$60 each and only return a rent of \$2 and \$4 respectively. Mediterranean Avenue backs up its low cost and rent with a measly 0.79 PVS, the lowest of all properties. But Baltic Avenue far outperforms the other Brown property with a 1.60 PVS. So what makes a property that has such a low rent and low probability of landing that valuable? One advantage Baltic Avenue is its probability of monopolization is much higher than many other properties. Probability of monopolization is a key component of PVS and is calculated by multiplying the landing probabilities of all properties of one color. There are only two Brown properties compared to three of the next color, Blue. Even though the probability of landing on a Brown property is lower than a Blue property, it is more likely that a player monopolizes the two properties in Brown than the three properties in Blue.

The same property of monopolization raises the value of Utilities. There are only two Utilities, Electric Company (space 12) and Water Works (space 28) and their rent increases when a player owns both. The rent of both utilities are determined by a dice roll of the landing player multiplied by a factor of four and ten depending on how many Utilities are owned. The expected value of rent when a player owns one Utility is \$14, which is on par with an Orange property such as St. James Place, but it costs \$30 less than that property. The expected value of rent when a player owns two Utilities is \$70 and the cost of two Utilities is \$300. There are no properties that have a base rent of \$70 (the highest is Boardwalk which owns a \$50 rent) so the costs of both cannot be compared. But, using a linear regression model with only proper-

ties, a reasonable estimate can be inferred. The rents and costs of the other properties are doubled in the graph above in order to more accurately compare them with the combined Utilities.

The blue point on the far right is the rent and cost of the combined two Utilities. The points deviate slightly from their actual values because the data is jittered in the x-direction for clarity. The red line represents the linear fit for the rent and cost of all the other properties. The line has an amazingly high correlation ($r^2 = 0.968$) and its regression model is $Cost = 120.7 + 8.2 Rent$. The model suggests that a property with rent equalling \$70 should cost, on average, \$696, more than double the actual cost of the two combined Utilities. That predicted point can be found on the red line directly above the blue circle.

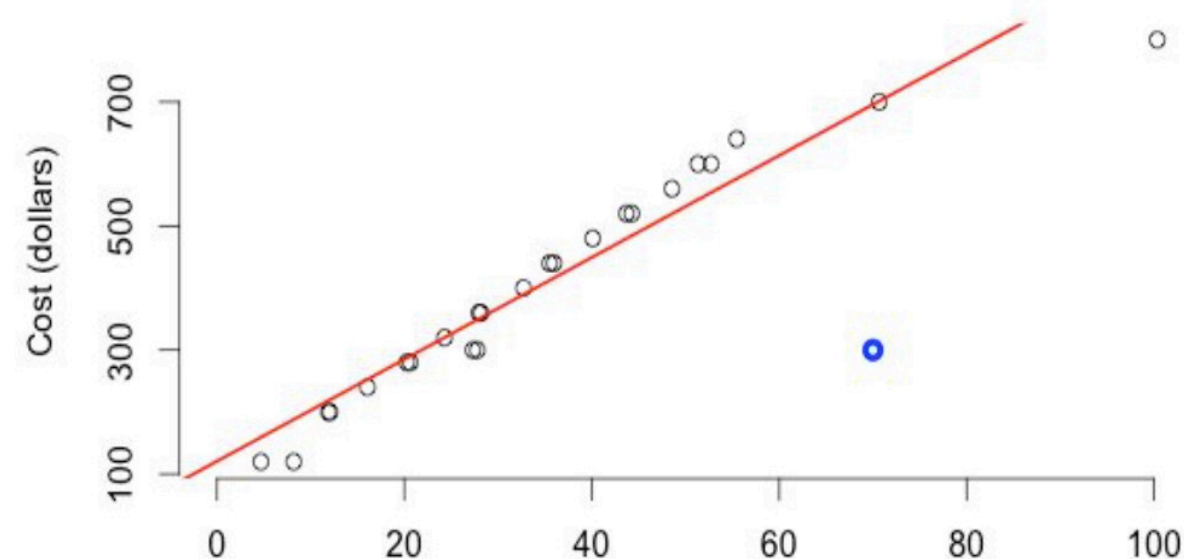
An Alternate Valuation Method

Another metric that can shed light on the true value of each property is the number of turns it takes to recoup the cost of a property. This metric uses some of the same data as before but instead of generating a dimensionless value, it returns a property's value in terms of rolls. In the appendix, Figure 4 is a table with the data.

The conventional wisdom says that as more houses are added to a property, the number of turns it takes to recoup the cost go down. But for seventeen out of twenty-two properties, the opposite is true, which suggests having four houses is sometimes more valuable than buying a hotel. All of the properties after and including St. Charles Place (space 11) adhere to the previous point.

The scarcity of houses also suggests having four houses is more valuable than owning a hotel, despite the jump in rent. There are only thirty-two houses in a standard Monopoly set and when the supply is exhausted, players can

**Double Rent vs. Double Cost of Properties
(Not Including Railroads and Utilities)**



no longer buy them. This strategy also blocks opposing players from improving their properties because houses must be bought evenly amongst a color, meaning a player cannot buy two or more houses on one property while leaving the rest empty. This rule applies to buying a Hotel as well. Examples before have clearly demonstrated the power of buying houses and increasing the rent of properties, so if a player can monopolize houses, he puts himself in prime position to win.

The valuation method further substantiates PVS' results. An example is Baltic Avenue (space 4) requiring fewer rolls to recoup its cost (643.5 rolls) than all of the Blue properties. Also, Railroads prove once again to be the dominant type of property as they require far fewer rolls to recoup their costs than every other property.

Conclusion

Optimal Monopoly strategy, as determined by this study, can be summed up by the following. Spaces with the highest roll probability are clumped around the north-

west corner. A player who wants their opponents to land on his or her properties should trade for or buy properties from that area. According to PVS, players should also try to buy Railroads and Utilities. Also according to PVS, value of a property increases as a player makes their way around the board, with the exceptions of Baltic Avenue, which is more valuable than the next color of properties, and the Green properties. Lastly, players should try to monopolize houses and never buy hotels.

Although no Monopoly game should (hopefully) ever have 1,000,000,000 rolls, the information gleaned from the simulation should prove to be useful to not just Monopoly players, but also anyone wanting to simulate other board games or real-world phenomena.

Appendix

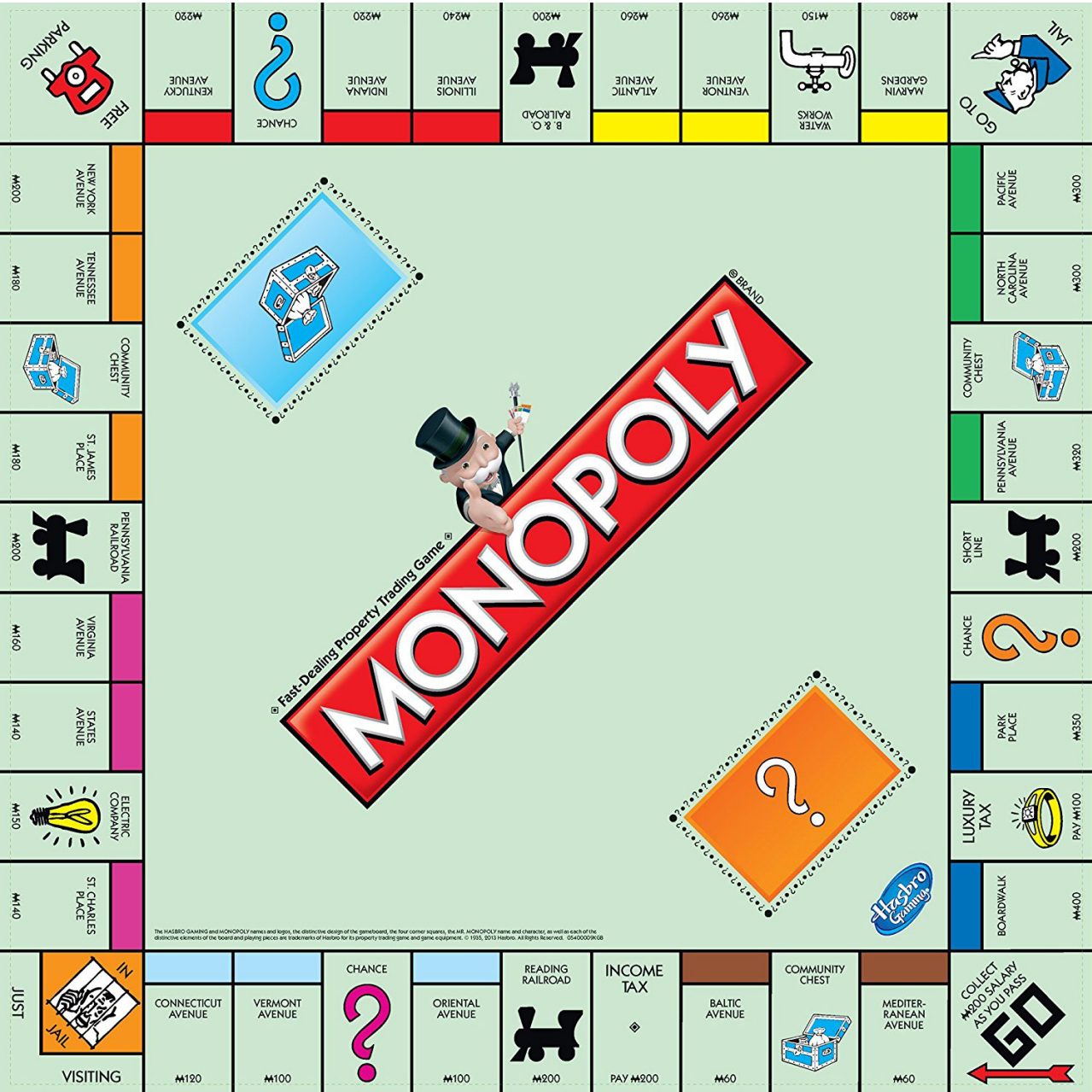


Figure 1: Monopoly Game Board. Retrieved from: http://ecx.images-amazon.com/images/I/81oC5pYhh2L._SL1500_.jpg

Simulation Data (based on 1,000,000,000 rolls)					
Location	Name	Probability	Location	Name	Probability
0	Go	0.02272	20	Free Parking	0.02717
1	Mediterranean Avenue	0.02288	21	Kentucky Avenue	0.02694
2	Community Chest	0.02307	22	Chance	0.02668
3	Baltic Avenue	0.02331	23	Indiana Avenue	0.02636
4	Income Tax	0.02293	24	Illinois Avenue	0.02676
5	Reading Railroad	0.02272	25	B. & O. Railroad	0.02697
6	Oriental Avenue	0.02264	26	Atlantic Avenue	0.02703
7	Chance	0.02264	27	Ventnor Avenue	0.02702
8	Vermont Avenue	0.02268	28	Water Works	0.02692
9	Connecticut Avenue	0.02274	29	Marvin Gardens	0.02682
10	Jail	0.05416	30	Go To Jail	0
11	St. Charles Place	0.02278	31	Pacific Avenue	0.02671
12	Electric Company	0.02361	32	North Carolina Avenue	0.02600
13	States Avenue	0.02455	33	Community Chest	0.02527
14	Virginia Avenue	0.02530	34	Pennsylvania Avenue	0.02452
15	Pennsylvania Railroad	0.02621	35	Short Line	0.02372
16	St. James Place	0.02722	36	Chance	0.02284
17	Community Chest	0.02832	37	Park Place	0.02186
18	Tennessee Avenue	0.02781	38	Luxury Tax	0.02260
19	New York Avenue	0.02745	39	Boardwalk	0.02252

Figure 2

Property Value Scores For Ownable Spaces					
Location	Name	PVS	Location	Name	PVS
1	Mediterranean Avenue	0.79	21	Kentucky Avenue	2.21
3	Baltic Avenue	1.60	23	Indiana Avenue	2.16
5	Reading Railroad	2.84	24	Illinois Avenue	2.23
6	Oriental Avenue	1.36	25	B. & O. Railroad	3.37
8	Vermont Avenue	1.36	26	Atlantic Avenue	2.29
9	Connecticut Avenue	1.52	27	Ventnor Avenue	2.29
11	St. Charles Place	1.63	28	Water Works	2.52
12	Electric Company	2.21	29	Marvin Gardens	2.30
13	States Avenue	1.75	31	Pacific Avenue	2.32
14	Virginia Avenue	1.90	32	North Carolina Avenue	2.26
15	Pennsylvania Railroad	3.28	34	Pennsylvania Avenue	2.15
16	St. James Place	2.12	35	Short Line	2.97
18	Tennessee Avenue	2.17	37	Park Place	2.23
19	New York Avenue	2.21	39	Boardwalk	2.87

Figure 3

Number of Turns to Recoup a Property's Cost							
Name	Location	Base	1 House/ 2 Railroads/ 2 Utilities	2 Houses/ 3 Railroads	3 Houses/ 4 Railroads	4 Houses	Hotel
Mediterranean Avenue	1	1311.2	480.8	233.1	102.0	71.0	54.2
Baltic Avenue	3	643.5	236.0	114.4	50.1	34.9	30.1
Reading Railroad	5	352.1	352.1	264.1	176.1		
Oriental Avenue	6	736.2	162.0	78.5	34.4	28.7	24.6
Vermont Avenue	8	734.9	161.7	78.4	34.3	28.7	24.6
Connecticut Avenue	9	659.6	120.9	70.4	30.8	25.4	22.6
St. Charles Place	11	614.6	140.5	76.1	35.1	32.3	32.6

Figure 4

Electric Company	12	453.8	90.8				
States Avenue	13	572.6	130.9	70.9	32.7	30.1	32.6
Virginia Avenue	14	527.0	105.4	57.1	28.5	26.0	27.2
Pennsylvania Railroad	15	305.2	305.2	228.9	152.6		
St. James Place	16	472.3	84.0	47.8	24.0	22.5	25.8
Tennessee Avenue	18	462.3	82.2	46.7	23.5	22.1	25.8
New York Avenue	19	455.4	72.9	43.1	21.9	20.9	24.5
Kentucky Avenue	21	453.7	86.6	53.5	27.0	28.0	33.7
Indiana Avenue	23	463.7	88.5	54.6	27.6	28.6	33.7
Illinois Avenue	24	448.4	78.5	44.8	25.4	26.7	32.2
B. & O. Railroad	25	296.6	296.6	222.5	148.3		
Atlantic Avenue	26	437.2	70.6	40.4	23.6	25.0	30.8
Ventnor Avenue	27	437.4	70.7	40.4	23.6	25.1	30.8
Water Works	28	398.0	79.6				
Marvin Gardens	29	435.0	65.2	37.3	22.4	24.0	29.5
Pacific Avenue	31	432.0	74.9	44.2	27.5	29.3	36.3
North Carolina Avenue	32	443.8	76.9	45.4	28.2	30.1	36.3
Pennsylvania Avenue	34	466.1	70.7	41.7	26.9	29.2	33.1
Short Line	35	337.3	337.3	253.0	168.6		
Park Place	37	457.5	68.0	42.1	27.4	30.3	30.9
Boardwalk	39	355.2	57.7	34.0	20.9	22.5	23.2

Figure 4 (con't.)

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2. Wagner, Erica. "Do Not Pass Go: The Tangled Roots of Monopoly." *New Statesman*. 24 June 2015. Web. 24 Jan. 2016. <<http://www.newstatesman.com/culture/2015/06/do-not-pass-go-tangled-roots-monopoly>>.

Rhetorical Resolution: Lyndon B. Johnson's Joint Address to Congress



WE LIVE IN A SOCIETY consumed with power: powerful things, powerful people, and powerful politics. The word powerful itself brings an array of images to mind - cars, rockets, bullets, knowledge. Yet so often people neglect to include one of the most powerful forces humankind possesses: the power of words. The mastery of rhetoric, knowing what to say and when to say it, can give one the ability to sway, even to govern, the minds of others. President Lyndon Baines Johnson understood the influence words could hold, and though he may not have been a wordsmith himself, when the entire nation fell into turmoil he used words to set it right.

On November 22, 1963, the force of one small bullet unleashed chaos that would consume the country. In Dallas, Texas, as President Kennedy fought for his life at Parkland Memorial Hospital, Vice President Johnson was realizing the terrible duty that had been so violently thrust into his lap. At 1 p.m. the president was declared dead, and just one hour and thirty-eight minutes later, on board the *Air Force One*, Lyndon Baines Johnson was sworn in as the 36th President of the United States. This assassination was not the first in American history, nor would it be the last. Yet the circumstances that confronted Johnson were unique in American political history. "With the nation shocked and grieving after the assassination, it was

now LBJ's responsibility to bring the nation out of that shock," writes archivist Paul Santa Cruz.¹ He was left the leader of a nation in the midst of a crisis, and he knew that the way he handled the coming days would determine not only the tone of his presidency but also his chances of reelection the following year.

LBJ understood that choosing and delivering the right words might help resolve the crisis and smooth the path ahead. President Johnson planned a Joint Address to Congress on November 27, 1963, just five days after Kennedy's death. In the few days in between there was a scramble within the White House. Advice about the speech flowed from all directions, aides drafted memos, and speechwriters worked tirelessly to craft a speech capable of reuniting the country. Kurt Ritter, a scholar specializing in the study of presidential rhetoric, argues that in order for his address to be successful, Johnson had to figure out how to deliver a eulogy, an inaugural address, and the state of the union all in one.² In this difficult task the power of rhetoric would prove to be indispensable.

How did Johnson, with the aide of his advisors and speechwriters, craft a speech that could effectively convey all that was needed, and once this speech was delivered, how did the American public interpret his words? Thanks in large part to the eloquence, deft editing, and keen insight of the people he selected to assist him, Johnson was able

to stand before Congress and America and somberly but effectively take his place in the greatest office in America. The purpose of this paper is to examine Johnson's first speech as President, from the brainstorming period, through drafting and editing, to the rhetoric of the final copy in order to understand the development process and assess the impression its deliverance gave the nation.

An Influx of Opinion

Johnson asked for help, and he received it. No more than 48 hours after the death of President Kennedy had been announced, dozens of phone calls, memos, and letters containing advice on how best to continue poured into the White House. Perhaps the most striking was the advice of two men who, for the past 10 years, had been Johnson's political opponents: former President Dwight D. Eisenhower, and the Democratic Party's two-time political nominee, Adlai E. Stevenson.³ Both men sent Johnson memos containing detailed advice concerning the first steps they believed he should take.

On a memo dated November 23, 1963, just one day after the assassination, Eisenhower suggested that, among other things, Johnson "call a Joint Session of Congress to make a speech of not over 10 or 12 minutes."⁴ He laid out four points he thought were important for Johnson to cover during the speech. He suggested public acknowledgment of his

acceptance of a task of highest responsibility from the Almighty and dedication to follow through with the tasks of his predecessor with "no revolution of policy." He also thought it would be prudent for Johnson to cite his extensive experience in the political realm: "in doing so," Eisenhower wrote LBJ, "you will follow the instincts, principles and convictions that have become a part of you during so many years of public service," which taught him, among other things, the necessity of cooperation with Congress. Eisenhower went into extensive detail about emphasizing a plan for "for economic expansion and reduction of unemployment." He recommended calling for a responsible reduction of expenditures for the fiscal years of '64 and '65 that would make a tax cut possible, saying, "you [LBJ] intend to offer no special favors and you pledge there will be no prosecution."⁵ Finally, Eisenhower proposed a conclusion that would appeal for a mobilization of hearts and hands to join and move the world forward in peace and unity.

Adlai Stevenson also had several thoughts on the speech that Johnson would deliver. On November 25, Johnson received a memo from Stevenson stating, "We have developed a draft of the kind of short speech I think might be most effective in setting a tone of action and urgency for the tasks the Nations must tackle in the aftermath of tragedy."⁶ The themes in Stevenson's draft ultimately set the mold into

¹P.H. Santa Cruz, *Making JFK Matter: Popular Memory and the Thirty-fifth President* (Denton, TX: University of North Texas Press, 2015), 76.

²Kurt Ritter, "Lyndon B. Johnson's Crisis Rhetoric after the assassination of John F. Kennedy: Securing Legitimacy and Leadership," in *The Modern Presidency and Crisis Rhetoric*, ed. Amos Kiewe (City: Connecticut: Praeger Publishers, 1994), 81-82.

³Ritter, Kurt. 78.

⁴LBJ Library, Statements Box 89, "11/27/63, Joint Session to Congress" Austin, Texas. 2016. Eisenhower Memo to LBJ. From here on: LBJ Library, Statements Box 89.

⁵LBJ Library, Statements Box 89. Eisenhower to LBJ. Date?

⁶LBJ Library, Statements Box 89. Stevenson Memo and Draft to LBJ.

which the final version of the speech would fit. He recommended a eulogistic introduction that moved quickly to the importance of “turning our backs on tragedy and trouble and setting our faces to progress and peace.” He held that it was not enough to assure the continuity of government because there were too many risks to consider, both at home and abroad. He also declared, “Our people want to know – and the world wants to know – whether a single bullet from a vile assassin can stop our forward motion or even throw us off stride for more than a day or two,” and he was right. With the country in such a turbulent state there was a vested interest for many different parties, both at home and abroad, in the way the United States would react. In the face of tragedy, those at home were looking for reassurance in their government and those abroad were wondering where America would now stand. According to Stevenson, in order to resolve any doubts, the nation must “mean business” on all fronts.

On the domestic front Stevenson wanted LBJ to recommit to housing, education, health, and “other goals of a rich and humane society.” But important as these issues were, they had to take a backseat to two domestic steps that could not wait: civil rights and a tax cut bill. Stevenson believed civil rights had been a matter of discussion for too long and that it was time to move forward and begin the process of righting the wrongs American society had perpetuated for so long. Like Eisenhower, Stevenson believed the tax cut would boost the economy and lower the unemployment rate. As for the foreign agenda, Stevenson’s draft rededicated the nation’s

commitments from “Europe to Asia, Africa, and Latin America” with the goal of helping to “build, strengthen and expand all regional alliances and regional economic partnership based on consent – anywhere.” But as with the domestic agenda, the goals enumerated first led to an issue of even greater importance, the need for a foreign aid bill. Falling once again in alignment with Eisenhower, Stevenson urged “Johnson to embrace explicitly Kennedy’s foreign policy posture” and continue in his footsteps.⁷ Stevenson’s draft indicates that Kennedy knew when to “match national power with national restraint at a time in history when our national safety can no longer be secured by competitive pursuit of ever greater nuclear power” and he taught us that “this nation must be ready at one and the same time to confront power with power and to seek the safe limitation of power - to defend the national interest and negotiate the common interest.”⁸

Several other people made notable contributions to Johnson’s growing compilation of drafts and proposals. The day before Kennedy’s funeral, Abe Fortas, longtime political ally and friend, submitted his thoughts to LBJ in the form of a comprehensive draft.⁹ Horace Busby, who would soon be named special assistant and speechwriter to Johnson, wrote three exhaustive drafts of about 1450 – 1900 words, but almost none of his rhetoric made it into the final draft. Neither did the suggestions of Secretary of State Dean Rusk, Senator Hubert Humphrey, former Secretary of the Treasury Robert Anderson, or numerous others.¹⁰ In the wake of such a mass influx of advice, how was Johnson to transform the

⁷Ritter, 78

⁸LBJ Library, Statements Box 89. Stevenson to LBJ.

⁹Ritter, Kurt. 79.

¹⁰LBJ Library, Statements Box 89. Various drafts and memos.

jumble of ideas on his desk into a coherent speech? According to Ritter, the process required two things: “first, a coherent rhetorical posture for the new president; and second,” to lead this transformation, “a skilled speechwriter dedicated to Johnson.” However, finding such a man would prove to be one of perhaps the most challenging tasks of the entire speechwriting process.¹¹

Though Johnson wanted to be involved in every part of the speechwriting process, he contributed almost no writing at all. He penned not a single draft, a habit that he, according to Patricia Parker Thomas’s dissertation entitled “Y’all Come to the Speakin’,” continued throughout the entirety of his presidency. Instead he depended on various writers to articulate his messages. The people credited with writing Johnson’s first real speech as president were Theodore Sorensen, John Kenneth Galbraith, and Adlai E. Stevenson, none of whom were particularly fond of, much less dedicated to, Johnson.¹² Nonetheless, whether inspired by a sense of duty to their country, the infamous Johnson Treatment, or some combination of the two, the efforts of these three men quickly moved the speech out of the brainstorming phase and into the final drafting period.

Reluctant Writers

Two days after the assassination, Johnson grabbed John Kenneth Galbraith, former United States Ambassador to India and adviser from the Kennedy staff, and pulled him

into his office. Having known Galbraith since the New Deal, Johnson chose to approach him for advice about what his most immediate actions should be. Though the request was unexpected, Galbraith was quick to answer. On the domestic front the first and foremost issue that needed to be addressed was civil rights, “and they both know LBJ would do well on it.” The second problem was the military commitment to Indochina, about which Galbraith recalled, “I got no response at all from Johnson.”¹³ Author Richard Parker speculates in Galbraith’s biography that Johnson’s silence on the matter was due to differences of opinion between Galbraith and the Kennedy senior advisers he had just inherited as staff. However, because of their shared past as “Roosevelt liberals,” Johnson knew that he and Galbraith agreed on most domestic issues, and so at the end of their meeting he asked if Galbraith would work with Sorensen to write the speech he planned to give in front of Congress in four days.¹⁴

Though Galbraith was fond of Kennedy and a devoted member of the deceased president’s staff, he did not hesitate to see the potential Johnson held. His open mindedness, however, was not shared by Theodore Sorensen, Kennedy’s chief speechwriter: “Perhaps more than any other person in the White House, Theodore Sorensen symbolized the fundamental dilemma Johnson confronted as he addressed the crisis created by Kennedy’s assassination,” argues Ritter.¹⁵ Essentially, LBJ had to embrace the Kennedy legacy but do so

¹¹Ritter, Kurt. 78.

¹²Thomas, Patricia Parker. “Y’all Come to the Speakin’: Lyndon Johnson and his Speechwriters.” Dissertation. University of Texas at Austin, 1997. Appendix.

¹³Parker, Richard. “*John Kenneth Galbraith. His Life, His Politics, His Economics.*” (New York: Farrar, Straus, and Giroux, 2004). 401. From here on as: Parker, Richard. Page #.

¹⁴Parker, Richard. 411.

¹⁵Ritter, Kurt. 79.

as his own man. Sorenson embodied the attitude that much of Kennedy's White House Staff, and frankly much of the country, held towards Johnson. He was highly apprehensive of Johnson's ability to lead and unimpressed by what Ritter calls his "western provincialism."¹⁶ In fact, Sorenson had originally intended to resign his post at the White House but was convinced to stay, if only for a short while. Nevertheless, it was Sorenson who became primarily responsible for composing the speech Johnson would deliver. With the ideas outlined by Stevenson and Eisenhower, and contributions from Galbraith, Sorenson began the process of crafting the final version address, just one day before it was to be delivered.

At 10:10 p.m. on November 25, Johnson called Sorenson to discuss the speech.¹⁷ They started by discussing the tax bill meeting he had just left, but towards the end Johnson brought up the speech. Sorenson asked Johnson if he had read any of what had already been sent over, to which Johnson replied, "Yeah, I've read Galbraith's and I rather liked it. I agree with everything he said. I think maybe he ought to add two or three little things to it." He went on to list several things he thought should be changed about the draft that Galbraith had already sent him, such as a sentence or two added about being "frugal and thrifty" and a little more on "hate stuff." As their conversation continued, Johnson momentarily drifted back to the tax bill and whether he should prioritize it or the

civil rights bill. In a sentence that reveals that Johnson must have been aware of the way Sorenson felt about him, he suggested that they might talk to Larry about it "sometime around Thanksgiving if you haven't quit me completely by then." To bring their conversation back on track Sorenson redirected Johnson to the drafts he had already received, "Well, anyway you liked Galbraith's," to which LBJ responded, "I didn't think it was any ball of fire. I think it was something that you could improve on. I thought it was a bunch of general statements. I like the compassion in it, and I don't reject the philosophy, but I think a much better speech can be written and I'm expecting you to write a better one."¹⁸ And so, with this hefty demand on his plate, Sorenson began writing what was perhaps the most onerous speech he would ever be called upon to write.

The first drafts Sorenson gave to Johnson over the next 24 hours clearly sought to eulogize Kennedy and undermine Johnson. Nearly the entire first half of these drafts memorialized and glorified Kennedy while simultaneously belittling Johnson. In the opening lines, Sorenson wrote, "For the greatest man of our time has been struck down by the foulest deed of our time – and I who cannot fill his shoes must occupy his desk." Sorenson painted Kennedy as "the greatest president in the nation's history;" highlighting, arguably exaggerating, the feats that Kennedy had accomplished in his short time as president.¹⁹ He wrote, "It is almost as if he knew his term

¹⁶Ritter, Kurt. 80.

¹⁷Miller Center Database. Recording of Telephone Conversation between LBJ and Ted Sorenson. November 25, 1963. Citation #K6311.02.

¹⁸Miller Center Database. Recording of Telephone Conversation between LBJ and Ted Sorenson. November 25, 1963. Citation #K6311.02.

¹⁹Ritter, Kurt. 81.

²⁰LBJ Library, Statements Box 89. TCS Draft.

would be short. For in little more than a thousand days and a thousand nights, he breathed new spirit and new quality into every aspect of American life." According to Sorenson, the nation that John Kennedy left behind was progressive, strong, prosperous, and at peace.²⁰ The rest of the various drafts of the speech were concerned with policies, but he gave Johnson no credit or power in these regards either. Sorenson proposed Johnson say, "We will, in short, go forward here and around the world to complete the Kennedy agenda in the Kennedy spirit"; every good thing that was to come during Johnson's presidency Sorenson was attributing to Kennedy. Though the martyrdom of Kennedy would prove to be a useful tool for Johnson to employ, there was no way he could deliver a speech that stripped him of his authority.²¹ So the staff and advisers Johnson had brought in, including Abe Fortas and Bill Moyers, set about editing Sorenson's drafts.

In the process of editing, Fortas and Moyers cut out large sections of Sorenson's work. They removed the sentiment that Johnson believed himself incapable of filling Kennedy's shoes, cut down the eulogy, and altered the pledge to "complete the Kennedy agenda" so that it resembled instead a commitment to take whatever action need be to follow through with the work he had begun. "His commitments," "His support," and "His fight" were assigned new articles. In their place the editors put "Its commitment," "to support," and "the fight," not only empowering Johnson with the ability to make these decisions his own, but also allowing the public an invest-

ment in these promises.²² By the time the final draft was finished, only eight of Sorenson's paragraphs had survived the editing process mostly intact.²³

The Finished Product

After all of the brainstorming, drafting, and editing was through, what was the final product? What promises was Johnson making? What tone was he setting? What could the American public really interpret from the rhetoric that had been so carefully crafted in the White House? As stated earlier, it was essential for Johnson to deliver three speeches in one; and his team enabled him to do so masterfully.

The eulogy for Kennedy was brief but poignant; "no words" were "sad enough to express" the loss that the country was feeling. Instead of the rambling eulogy that Sorenson had intended Johnson to give, the final draft incited action as a way of memorializing the slain president. By suggesting that Kennedy would live on not only in the "immortal words and works he left behind" but in the "hearts of his countrymen," his legacy was simultaneously cemented in history and thrust into martyrdom.²⁴

An inaugural speech is a tradition intended to allow a new president to address the nation for the first time in office and articulate the plans he has for the nation. Because of the terms of his rise to the presidency, LBJ was denied the opportunity to take part in this custom; however, the next section of his speech was designed to serve in place of such an address. In transitioning from the eulogy,

²¹Ritter, Kurt. 81.

²²LBJ Library, Statements Box 89. Draft with Edits.

²³Thomas, Patricia Parker. "Y'all Come to the Speakin': Lyndon Johnson and his Speechwriters." Dissertation. University of Texas at Austin, 1997. 81.

²⁴LBJ Library, Statements Box 89. Large Print Reading Copy.

the rhetoric of the next section became more resolute and stately. The goals of Kennedy's own inaugural address were spelled out, but as Fortas and Moyers had altered the diction. It was not Kennedy's nation that Johnson was to incite to move forward; it was everyone's. Invoking exact phrases from Eisenhower and especially Stevenson, the speech outlined the foreign policy that Johnson and his administration intended to pursue. America would keep its word. "This nation will keep its commitments from South Vietnam to West Berlin" because, as Stevenson had suggested, "national strength" must be matched with "national restraint" in the use of power. By way of drawing this section to a close, Johnson's team alluded to LBJ's extensive career: "For 32 years, Capitol Hill has been my home," asserted LBJ, leaving no doubt that he was qualified to succeed in a political system of which he had the utmost pride. The only piece of Horace Busby's three drafts that made it into the final speech concluded the inaugural section. Invoking Kennedy's call on Americans during his inaugural address to "Let us begin," Busby's line recast the appeal: "Today in this moment of new resolve, I would say to my fellow Americans, Let Us Continue."²⁵ In just one sentence, Busby gave the American public a rallying cry to get behind and introduced the apothegm by which this speech would eventually come to be known.

In the third and final section of the address that would function as the State of the Union, a more direct description of LBJ's agenda was outlined. More in Johnson's element than either of the preceding sections, the speech was specific about its objectives. In the domestic realm, there was no need to call on lofty lan-

guage; it was clear to everyone involved in the writing process what needed to be done. Using the rhetoric of martyrdom established in the opening, the speech called on Americans to pass the Civil Rights Bill of '64. It asserted, "First, no memorial oration or eulogy could more eloquently honor President Kennedy's memory than the earliest possible passage of the Civil Rights bill for which he fought."²⁶ Since the entire country was already mourning the man, the importance the speech aligned with the continuation of his legacy gave the public a way to honor his memory and Johnson a way to ensure the bill would be pushed through congress as efficiently as possible. However, not to be overshadowed by his predecessor in a realm of such importance to him, the opportunity was seized to establish Johnson's own claim to the bill by reminding the public that this stance was not new to him. "I urge you again, as I did in 1957, and again in 1960, to enact a civil rights law so that we can move forward to eliminate from this nation every trace of discrimination and oppression based upon race or color."

Then, in what Ritter calls the "time-honored tradition of State of the Union Addresses," the rest of the speech listed Johnson's legislative priorities from the tax bill to education, employment, appropriation, and poverty. Like many presidents before him, his ambitions were many and grand; yet unlike most of his predecessors, the list foreshadowed a legislative record that exceeded what anyone had come to expect of a president. Finally, the speech concluded with a one last appeal to Congress and to the people of America to "put an end to the teaching and preaching of hate and evil and violence" and to unite to

face the coming days as a country of equality and brotherhood.²⁷

Conclusion: A Promising Beginning

On November 27, 1963, Johnson stood before Congress with a 15-page speech that would take him approximately 25 minutes to deliver. Without straying from a single word of his text, Johnson recited to the nation a promise for not only healing, but also for strengthening. Ritter states, "Each portion of the address contributed in a different way to Johnson's crisis rhetoric; yet, the real artistry of the speech was that it stitched the three parts together almost seamlessly." Through the effort of a multitude of people, a speech was developed that functioned to memorialize the slain president, initiate Johnson's presidency, and reassure the public that the American government was not easily shaken. The nation loved it; on December 1, the *New York Times* ran an article by Arthur Krock headlined "Johnson's Speech: Address to Congress confirms Early Assessment of him as a Leader," that called him "uniquely well qualified for the highest office of the land."²⁸ Right beside this article was a column devoted to "comments from the US and Europe" regarding his address.²⁹ In this column the Washington Post was quoted, "...there is at the helm, in this crisis, the firm hand of a strong man with a steady purpose and a brave spirit." The US wasn't the only country that had taken notice, *L'Aurore* of Paris stated, "This was the speech of a man scarcely prone, it appears, to retreat," and the *Yorkshire Post* of Leeds wrote, "...the quiet Texan has clearly indicated his in-

tention of continuing the Kennedy policy at home and abroad of strength combined with restraint and justice. It is enough."³⁰ The powerful rhetoric of Johnson's message had effectively reverberated across the globe, allowing him to fully assume his place as the President of the United States.

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²⁵LBJ Library, Statements Box 89. Large Print Reading Copy.

²⁶LBJ Library, Statements Box 89. Large Print Reading Copy.

²⁷LBJ Library, Statements Box 89. Large Print Reading Copy.

²⁸Krock, Arthur. "Johnson's Speech: Address to Congress confirms early assessment." *New York Times (1923-Current File)*, Dec 01, 1963.

²⁹"Opinion of the Week: At Home and Abroad." *New York Times (1923-Current File)*, Dec 01, 1963.

E. Shilling, K. Holt & D. Gartman

Tourism and Coral Reef Community Structure in Akumal Bay

ABSTRACT

Coral reefs are among the most productive and diverse ecosystems in the world. They support thousands of marine species, protect coastlines, and in some regions fuel entire economies. Tourism in Akumal, Quintana Roo, Mexico has grown rapidly in the past decade, leading to an increase in nutrient loading and increased physical disturbances that apparently have led to significant degradation of coral reef communities, especially in the higher tourist density regions of Akumal Bay. The purpose of this study was to quantify the possible impact of tourism to the local reef systems. We measured tourist density, coral reef rugosity, live coral cover, algal cover, and fish population density to address the linkages between humans and reef condition. We found that a significant difference exists between what were considered “high” and “low” tourist density regions in a previous study by Renfro et al. (2013). Significantly lower amounts of live coral and lower density of fish were found at the high tourist site than at the low tourist site. The high and low tourist sites averaged 33% and 40% live coral coverage, respectively. On average, 8 more fish were counted at the low tourist site than the high tourist site. We also found significantly higher amounts of turf algae and macroalgae, an average of 10% more coverage in the high tourist reefs. Based on our observations and analysis, it is clear that while further research and data collection are needed, increased tourist density appears strongly correlated with several declining aspects of the benthic reef community structure in Akumal Bay.



THE GLOBAL DECLINE OF coral reefs has continued in recent decades, despite increased efforts to protect this resource (Bridge et al. 2013; Watson et al. 2014). Reef losses threaten the livelihood of human and marine species alike, as they are important ecologically, geomorphologically, and economically. Approximately 25% of the world’s fish diversity is dependent upon coral reefs as a breeding or feeding ground (Coral Reefs, 2016). This indicates a high probability that habitat degradation and coral loss will have significant consequences for biodiversity and productivity of reef fish assemblages (Coker et al., 2014). In addition to these

ecological roles, coral reefs help shape the geomorphology of the coastline along which they form. Beaches benefit from coral reefs in shallow waters along their shores, as they weaken the strength of waves and can decrease erosion (Bird, 2008).

An estimated 500 million people globally are in some way dependent on coral reefs via ecotourism, the fishing industry, or physical protection of shorelines (Wilkinson, 2008). Akumal Bay, the region of focus in this study, provides a strong example of how an entire community’s well-being revolves around ecotourism (Baker et al. 2013). Previous research shows tourism densi-

ty and nutrient pollution in Akumal, Mexico have altered the benthic community structure of the coral reefs (Nicholls, 2008; Lieb et al., 2011; Renfro et al., 2013). Increased tourism introduces more anthropogenic stressors to these reef communities through nutrient addition and physical disturbances (Hawkins, 1999; Chabanet et al., 2005). These stressors have been shown to lead to an increase in coral disease susceptibility, a higher amount of algal overgrowth, and decreased fish presence, all of which can contribute to coral mortality over time (Chabanet et al., 2005). In a study by Nicholls (2008), percent live coral cover in reefs located in Quintana Roo decreased, particularly in reefs adjacent to beaches with high tourism activity.

It is crucial that we continue studying reef composition and diversity in relation to anthropogenic activities. A study conducted by Renfro et al. (2013) found that increased tourism in Akumal Bay has caused a decrease in coral reef community health and reef ecosystem diversity. The objective of our study was to quantify overall reef quality and community structure through measurements of live coral cover, algal cover, and density of fish. We adopted the procedures employed by Renfro et al. (2013) in making our measurements to insure data compatibility among complementary studies. We quantified factors that are considered indicators of reef conditions (Hawkins, 1999; Noonan, 2012). By extending portions of the data set produced by Renfro et al. (2013), we had the unique opportunity to compare how parts of a reef system are affected by tourism levels and how they have potentially changed over a two year period.

Materials and Methods

Study Sites

Our research was conducted along several small, shallow (approximately 2-3 m deep)

Caribbean coral reef assemblages located in Akumal Bay, Quintana Roo, Mexico along the Yucatan Peninsula. Data collection was conducted from May 27 – June 6, 2015 at three reefs in a previously categorized “high” tourist area in northern Akumal Bay and three reefs in a previously categorized “low” tourist area in southern Akumal Bay by the Renfro et al. study (2013). The purpose was to do a comparison between the two sets of reef sites, with the main variable being tourist density.

Tourist Density

Tourist presence in proximity to our stations was quantified by counting tourists across twelve bins perpendicular to the shore (Figure 1). Collection of tourist data was done by several teams from University of Texas at Austin in Akumal, including our group. Tourist counts were collected for five days at 1500 hours. Using GPS points, the person counting tourists stood in the center and visually created the 50 m wide bin. The counter would then use a compass to orient their body to 27 degrees and record the number of tourists within each bin. This data was used to determine if significantly differing tourist density regions were present in Akumal Bay.

Transect Design

Previously established transect locations Gil et al. (2015) were re-occupied for tourist counts and utilized in our 2015 study. Three stations (Table 1 & Figure 1) were selected within each site, creating three high tourist density stations (H1, H2, H3) and three low tourist density site stations (L1, L2, L3). We established a 46 m long transect across the top of the reef at each of the six stations, with each station’s 46 m transect divided into three 14 x 2 m subtransects that were parallel to the shoreline.

Site	Coordinates	Average Depth (m)
H1	N 20° 23.691' W 87° 18.772'	3.92
H2	N 20° 23.678' W 87° 18.781'	4.79
H3	N 20° 23.628' W 87° 18.853'	3.74
L1	N 20° 23.551' W 87° 18.934'	3.55
L2	N 20° 23.540' W 87° 18.957'	4.05
L3	N 20° 23.531' W 87° 18.980'	4.59

Table 1: Coordinates and average depth for all three high tourism sites and all three low tourism sites.

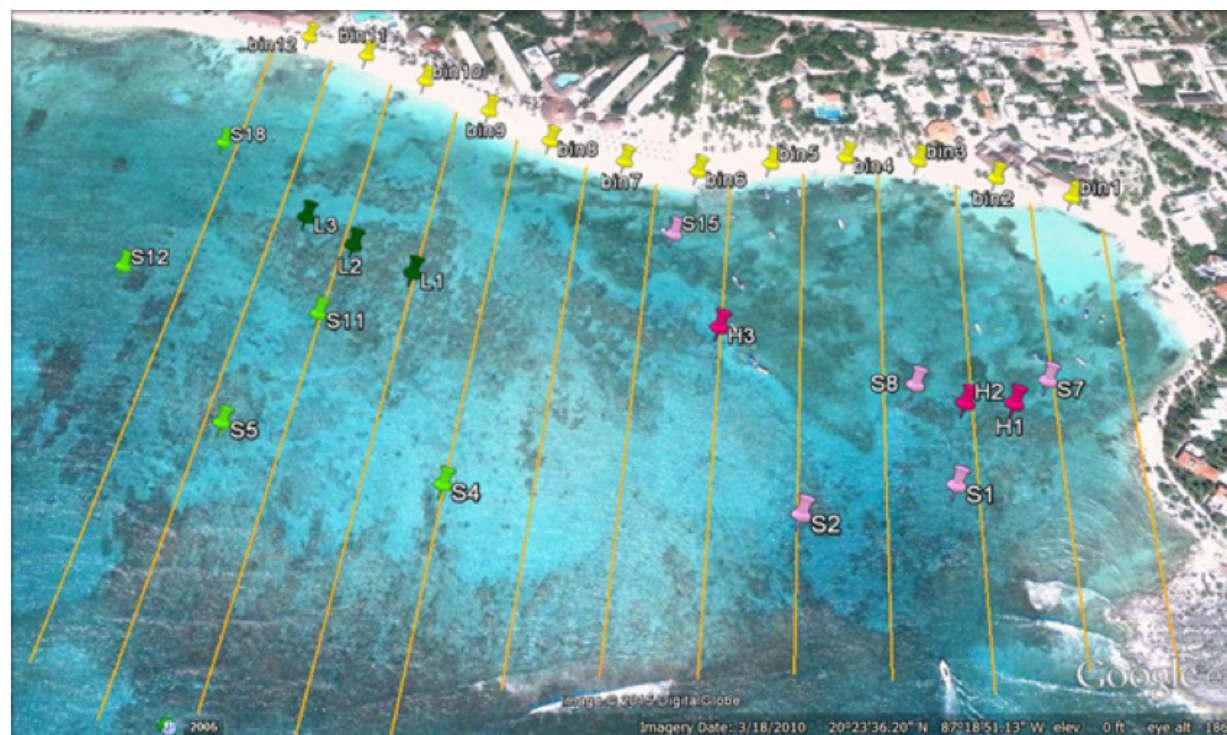


Figure 1: Akumal Bay. High tourist stations are demarcated by dark pink pins, low tourist stations by dark green pins, distribution of latitudinal bin lines used for tourist counts by yellow lines, low site supplemental fish count locations by lime green pins, and the high site supplemental fish count locations by light pink pins.

Measuring Reef Rugosity

Reef rugosity was measured along each transect at all stations using a fathometer to record depth in one m intervals along each transect. The fathometer was held directly over each point at the surface of the water. This process was completed once at each station and along each of the 14 m transects. To obtain the rugosity values for Figure 4, the rugosity measurements of the three transects within each station were first averaged together to find an average rugosity per station. These values were then averaged to produce an average rugosity measurement for the entire site (Figure 4).

Fish Counts

Following deployment of the transect tape at a station, we moved to a 10 m distance from the reef for five minutes to allow fish to return to normal activity. The total area surveyed for each site was 29 m². Then, each of the three team members approached the end of one of the three 14 meter transects and simultaneously began to swim at a rate of approximately 5 m/minute. Fish were counted and grouped into the following families: Pomacentridae, Sparisoma, Halichoeres, Canthigaster, Haemulon, Acanthurus, Chaetodon, Lachnolaimus, Ostradiidae, Lutjanas, Pomacanthidae, and Holocentridae. All fish counts were completed from approximately 0700-1100, which correlates with feeding patterns of many marine herbivorous fish and is prior to high tourist activity (Zemke-White et al., 2002). Average density of individuals within a family group of fish was calculated from two data sets. A second data set from a collaborating team's fish count collection allowed us to supplement our data. This was done to introduce replication, as we only counted fish once at each of our sites due to time constraints.

The sites of the collaborating group's fish count data was chosen based on proximity to our pre-existing stations. To exclude potential for any bias in data sets skewing the results, equal amounts of data were used from each group's data sets. Possibilities for bias include differing levels of ability to accurately identify fish species and the fact that the counts were collected in slightly different areas.

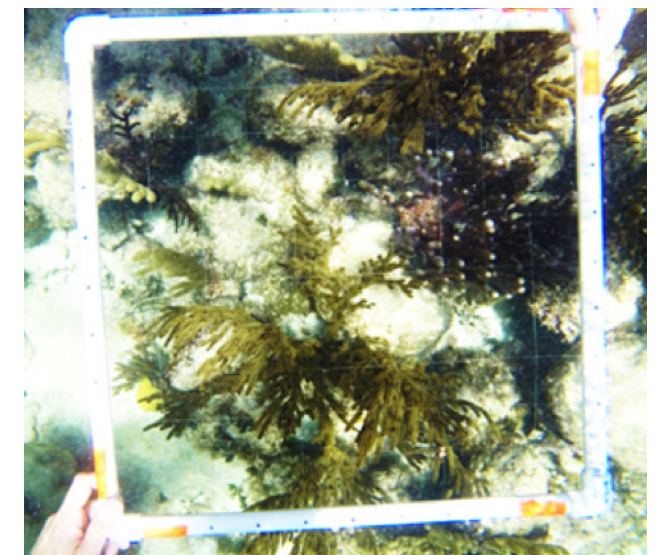


Figure 2: The 0.25 m² quadrat used for benthic cover analysis, pictured over a patch of soft coral and bare sand.

Benthic Reef Structure

Following fish counts, each member evaluated benthic reef cover along one of the 14 x 2 m subtransects. To quantify percent cover, we used a 0.25 m² PVC quadrat subdivided into 100 cells (Figure 2). The benthic cover types recorded included: branching coral, mounding coral, plating coral, Gorgonian and soft corals, fire coral, dead coral, diseased coral, bleached coral, bare or sandy patches, crustose coralline algae, turf algae, and all other macroalgae. For live coral percent cover analysis, branching, mounding, plating, Gorgonian and soft coral percent covers were

combined. Crustose coralline algae was quantified separately from the other fleshy algae (all of the turf algae and macroalgae identified) because it is considered a reef-builder due to its contribution of calcium carbonate to the reef structure (Littler et al., 2005). The grouping of corals into these functional groups was determined using Humann (1993).

Results

Tourism Density

Tourism density across Akumal Bay revealed higher levels of swimmers and bathers in bin 1 (northern Akumal Beach) which diminished southward toward bin 12 along Akumal Beach (Figure 3).

Rugosity

While it is difficult to assess specific dif-

ferences between the sites, trends can be observed (Figure 4). Both show a variety of peaks and valleys over the transects, with peaks typically corresponding to larger mounding corals, and valleys generally indicating small open patches of sand between corals or portions of the reef.

Live Coral Coverage

Patterns of live coral coverage at the high tourism site compared to the low tourism showed that in each group of coral surveyed, lower amounts existed in the high tourism sites (Figure. 5). Mann-Whitney U test conducted in R Studio ($p=0.001$, $\alpha=0.05$) demonstrated that there is more live coral cover present at the low tourist site. Cover of branching coral, mounding coral, plating coral, and Gorgonian or soft coral at sites was as follows. The average percent cover of these

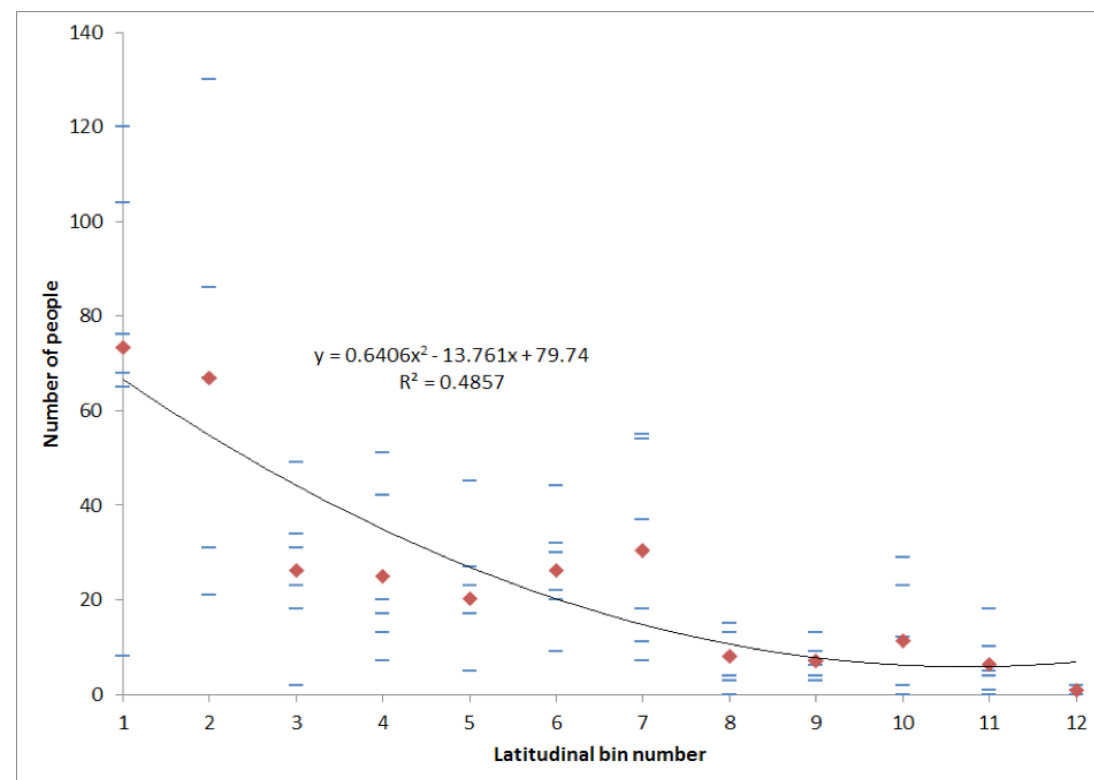
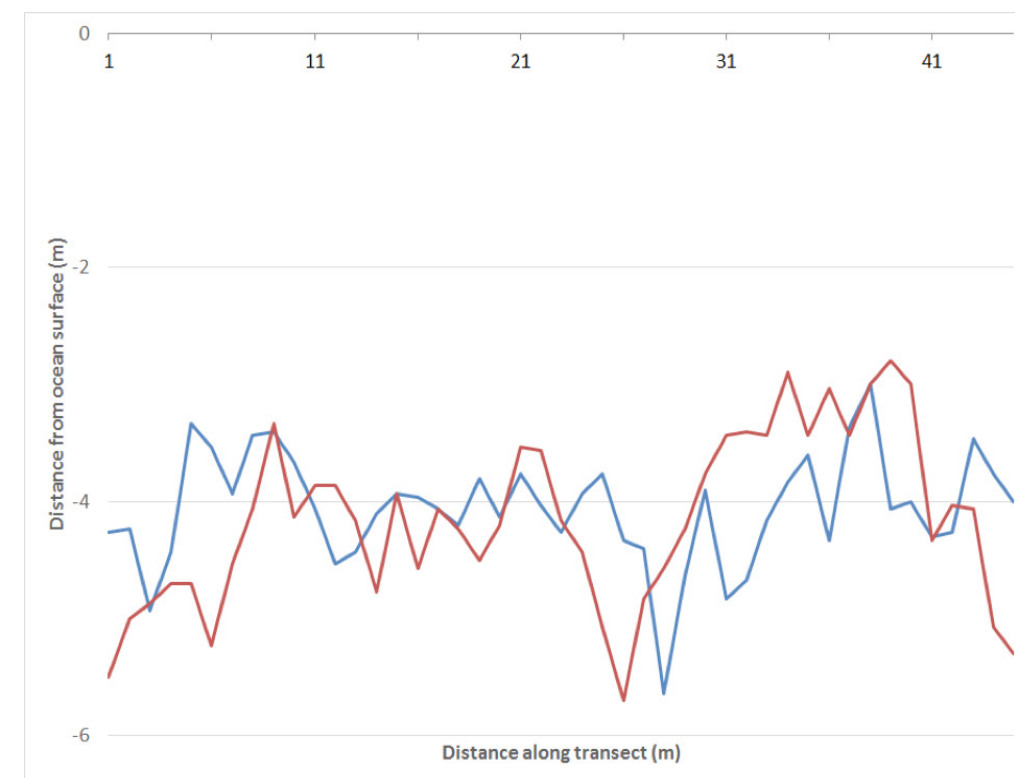


Figure 3: Regression analysis of tourist counts across Akumal Bay. Counts were taken at 1500 daily. Red dots indicate average values for each bin and blue dots indicate the replicates. Polynomial trend line shown.



groups at the high tourism site, respectively, were 3%, 4%, 0.4%, and 5%. The average percent cover of these groups at the low tourism site, respectively, were 6%, 5%, 1%, and 7%.

Algal Coverage

Average algal percent cover of the reef was greater in the high tourism site than the low tourism site (Figure 5). Turf algae and macroalgae were combined for this analysis. This was determined with a Mann-Whitney U test and proved significant ($p<0.001$, $\alpha=0.05$). The average percent cover by turf algae was 52% at the high tourism site and 48% at the low tourism site. The respective macroalgae average percent covers were 17% and 11%.

Fish Counts

Differences in fish count data between the high and low tourism sites were analyzed using a two-sample independent t-test. Data was normally distributed and met the assumptions of Levene's test of equal variance.

Results were significant ($p=0.02$, $\alpha=0.05$) with sample estimates of 26 fish on average at the high tourism site, and 34 fish on average at the low tourism site. We can therefore conclude the high tourist site had a lower density of fish.

In total, about 1,075 fish were counted in Akumal Bay; 610 fish in low tourism sites and 465 fish in high tourism sites representing four families (Figure 6). These include one individual in the families Ostradiidae (the low tourism site), Lachnolaimus (one at each high and low tourism site), Holocentridae (high tourism site), and Pomacanthidae (one at high tourist site, and three at the low tourist site).

Discussion

Tourism Density

Renfro et al. (2013) stated that tourism was increasing in Akumal Bay. This prediction is supported by our findings, as the average sum of tourists increased by about 180% from 2013 to 2015. Over time, tourist density regions have

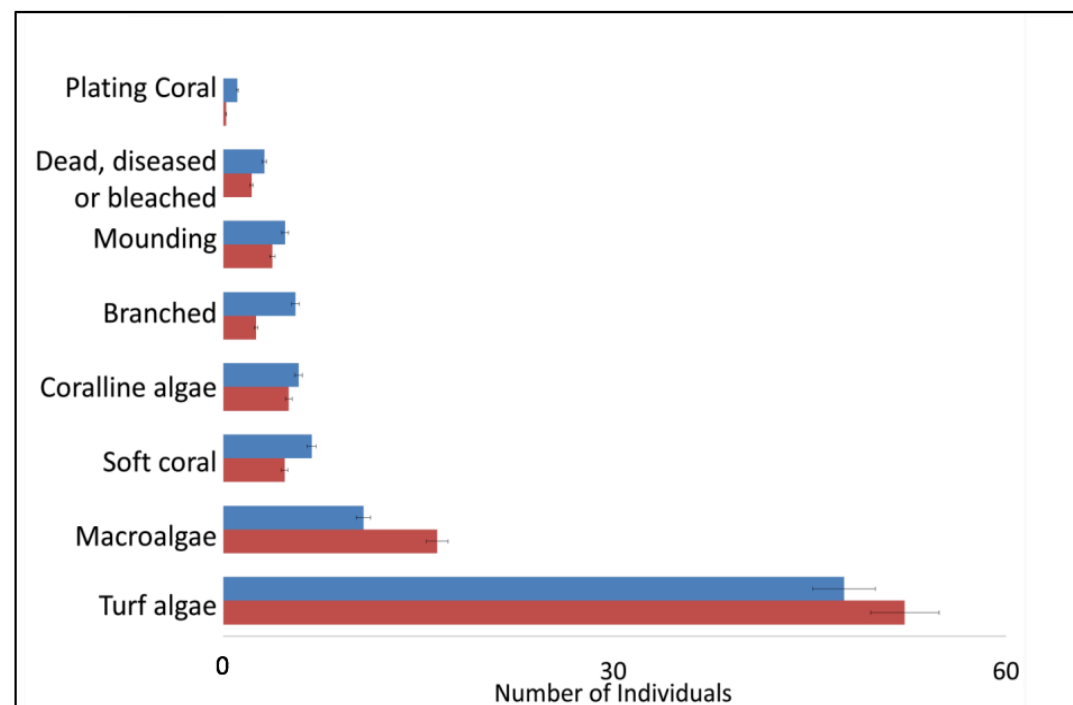


Figure 5: Average percent cover per benthic functional group at both low and high tourism sites. Red bars indicate the high tourism site and blue bars indicate the low tourism site. Values are \pm 95 % CI.

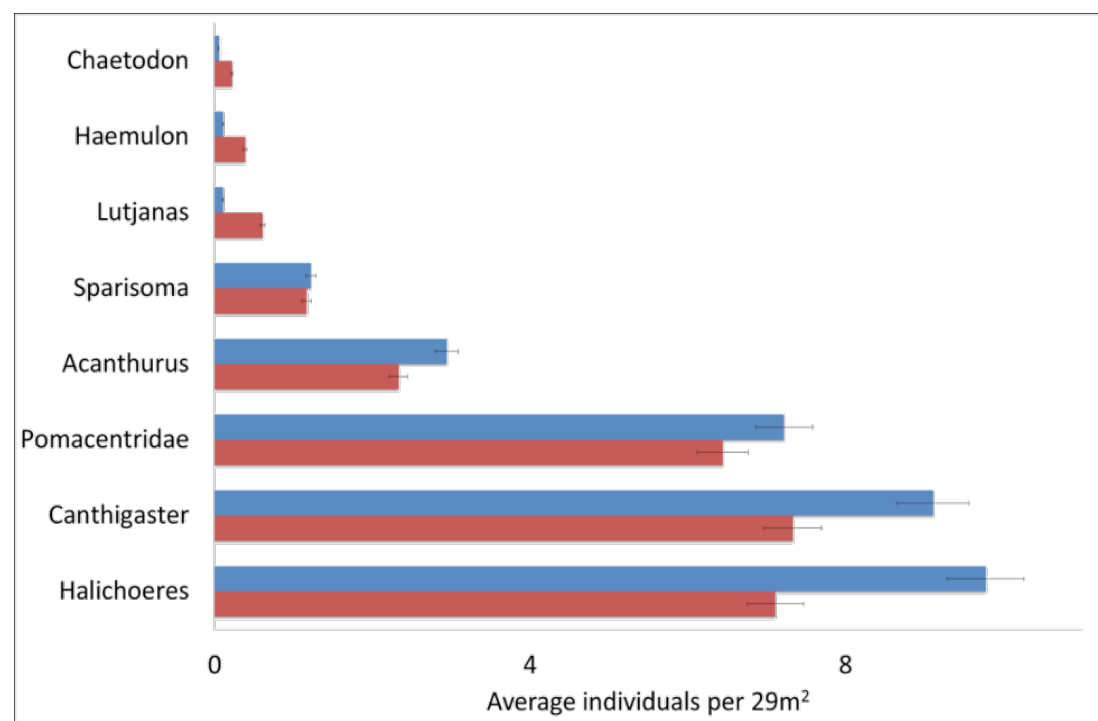


Figure 6.: Comparison of average number of fish present per family group in a 29 m² area in Akumal Bay. Red bars indicate averages at the high tourist site, blue bars indicate averages at the low tourist site. Values are \pm 95% CI.

become less defined. Renfro et al. (2013) observed a clearer distinction between the “high” and “low” tourism regions in their study. Overall, our data shows a steady decrease in tourist density from the northern end of the bay to the southern end. However, this more gradual decline in density may be a result of the reformed method of dividing the bay into latitudinal bins. Creating the bins allowed multiple researchers to complete tourist counts efficiently and allowed us to expand our data on tourist presence in the bay, but did unfortunately reduce some of the fine detail within our data.

Another possible cause of this trend may be reduced beach security within the low tourist beach area. During the previous study, when researchers entered the low tourist region they were typically asked to leave. While conducting our study in the same location two years later, no security guards were present on the beach. We believe this is indicative of the tourist density expansion pattern observed. Reduced security in the low tourism region is likely due to the construction of a new hotel south of the public beach, commercializing a larger area of Akumal Bay. Due to further development of tourist accommodations such as this and past trends, we predict the numbers of tourists visiting Akumal Bay will continue to increase in the future.

Rugosity

There is no apparent difference in the average rugosity of the coral reefs within each site. While this was not what we expected, there are a few possible explanations. First, the rugosity measurements were rough estimates taken at sizeable intervals (one meter), and thus portrayed a much less detailed illustration of the reef. Additionally, measurements with a fathometer may miss the more fragile, delicate structures of branching, Gorgonian, and soft corals due to their thinness and/or movement in the waves. Second, the deterioration of these reefs that we are attempting to quantify has only been occurring, at the very most, over the

past few decades. In this amount of time, the calcium carbonate skeletons left behind by deceased corals have not had enough time to erode away, as this process takes thousands of years (Roberts, 2006). This is particularly true for the mounding corals, as their skeletal structures are especially solid. Since these mounding corals are likely the major contributors to a rough rugosity measurement, this factor very likely affected our results.

It is clear from our rugosity data that finer measurements would be more accurate and useful. These could include the chain and tape method, or perhaps photography of the horizontal profiles of the reefs and concurrent image analysis software, for a less invasive method. This would provide more data about the abovementioned “fragile” corals. Data about these corals’ contribution to reef rugosity could be especially telling of physical damage by tourists, as these corals are considered fragile due to their higher vulnerability to damage by kicking and other motion from snorkelers (Chabanet, 2005). Considering they were likely largely missed in our measurements and are the most vulnerable to swimmers in these tourist regions, finer measurements including their profiles may yield some interesting results.

Disturbances to Coral Reefs in Relation to Coral and Algal Cover

It is well established that tropical storms and hurricanes can cause severe damage to coral reefs (Connell, 1997; Wilkinson 2008). The reefs in Akumal were subjected to these forces during Hurricane Wilma in 2005 and a large portion of the damage present today can likely be attributed to that storm (Pasch et al., 2006). However, when they are the only disturbances present, corals are typically able to recover from these events (Connell 1997). Therefore, this storm alone does not explain the differences observed between the high tourism site and the low tourism site.

From our results showing decreased live coral cover and lower fish density in the high

tourism site, we infer that it is to some extent disturbance from increased tourism that is causing the evident difference among coral reefs in Akumal Bay. There are a multitude of other factors that are likely playing a part as well, but for the scope of this study and paper we are focusing on this tourist aspect. Chabanet et al. (2005) provided a thorough analysis of tourism effects on reef structure. The main tourist disturbance found to be affecting corals in his study was physical damage, which can be caused by fins kicking and scraping coral structures. We believe this is the polarizing factor between the two sites. Physical damage to coral reefs requires elevated metabolism to fuel regeneration, which is detrimental to their ability to elicit an immune response to diseases and algal overgrowth (Goureau, 1998). Over time, the consequences of physical damage can reduce the coral's ability to reproduce successfully as well (Littler et al., 2006; Chabanet et al., 2005; Ward & Hardison, 2000; V. Hall, 2001).

Other factors that could contribute to the differences we observed between the two sites are related to nutrient loading. These include nitrogen and phosphorous, which are introduced to the water via human excretion of waste, groundwater inputs, and terrestrial runoff (Fabricius et al., 2005; Gil, 2013). There are differing hypotheses over what effects these nutrients may have on a system like Akumal Bay, due largely to influence of the karst aquifer system regularly supplying a large amount of fresh water. Circulation patterns in Akumal Bay could produce a uniform distribution of nutrients in bay waters (Nicholls et al. 2008, Baker et al. 2013; Gil et al. 2015). In the case of human waste, Gil et al. (2015) argued that localized nutrient deposits from human excretions in Akumal Bay could allow an increase in algal growth, albeit they did not see significant differences between varying tourist density regions in their study. Detailed tracer studies

would be necessary to determine the sources and effects of nutrient loadings on the reef systems of Akumal Bay.

Legally protected reef systems with high percentages of living corals and low percentages of diseased, bleached, or dead corals have 34-49% algal cover on average (Miller et al., 2003; Guzman et al., 2004; Sommer et al., 2011). In comparison to this, in the low and high tourism sites of Akumal Bay turf algae and macroalgae averaged a combined coverage of 58% and 69%, respectively. We believe that high algal growth on a reef system, as observed in Akumal Bay, is indicative of negative health characteristics such as coral injury, disease, bleaching, or mortality. We define living corals of relatively healthy status to be those not suffering from any of the abovementioned characteristics. These healthy corals carry out processes like mucus production to prevent the binding of algae or settling of sediment or bacteria (Brown and Bythell, 2005). If this function cannot be completed due to disturbances straining their immune systems, turf algae and macroalgae are presented with an opportunity to utilize coral as a substrate (Brown and Bythell, 2005; Jompa and McCook, 2003; Chal et al., 2010). This subsequent overgrowth of the reef by algae increases the coral's need to compete for necessary resources. Light is one of the major limiting resources at these coral-algal interfaces (Roy, 2004). The foliage of turf algae and macroalgae, in addition to trapping sediment at their holdfasts, prevents the coral's symbiotic zooxanthellae from carrying out photosynthesis by blocking light (Jompa and McCook, 2003; Roy, 2004). Since zooxanthellae produce as much as 90% of organic matter for their host coral tissue, a prolonged lack of sunlight may lead to a decrease in the amount of living coral in the reef system over time (Sumich, 1996).

This elevated algal percent coverage in

Akumal Bay, when compared to other coral reefs, was even more exaggerated in the high tourist site. We believe the significantly higher amount of turf algae and macroalgae in the high tourism site is caused by a combination of anthropogenic factors that include both direct physical disturbance and nutrient loading into Akumal Bay. This nutrient loading can include waste produced by tourists while swimming in the bay. When coral-algal interactions occur, increased nutrient resources are shown to only benefit the dominant species that monopolizes the abundance (Tilman, 1988; Smith et al., 1999). Fast-paced algal growth is dominant in these interactions, as its growth rate increases with the initial addition of nutrients and can therefore utilize the resource to gain the upper hand. In comparison, corals are slow-growing, oligotrophic organisms and cannot quickly utilize or thus benefit from nutrient abundance in the presence of algae (Bruno et al., 2003; Shantz and Burkepile, 2014; Mumby and Steneck, 2008).

Algal coverage is normally limited by reef fishes and crustaceans, reducing the likelihood for overgrowth. An absence of herbivorous feeding or populations of these species due to a fear response from boats, swimmers, and snorkelers threatens the interface balance (Vermeij, 2013; Januchowski-Hartley, 2011). In our study, fish counts were found to be lower at the high tourism site, correlating with the higher algal percent cover observed. A study conducted by Januchowski-Hartley et al. (2011) found that fearful fish behavior occurs in response to human presence, similar to a predatory threat response. This fear reaction to humans in the water could be occurring in Akumal Bay, negatively affecting the density and distribution of fish among the coral reefs. Supporting evidence from our data found the three most abundant fish families counted in this study typically contained individuals of less than 10 cm in length (Humann, 1993).

We believe this indicates a phenomenon in which these smaller fish are capable of taking refuge in rugose coral reefs, while larger fish are fleeing to find an area that is less disturbed by humans or better protected. This hypothesis, that increased human presence is leading to an increase in algal coverage by introducing nutrients and scaring away fish, will only compound decreasing coral health in the future.

Other perturbations include the release of chemicals associated with sunscreen which have been shown to exacerbate disease susceptibility among corals (Danovaro et al. 2008). Based on the density of tourists that we documented at Akumal beaches, as many as 130 people in a latitudinal observation bin in the high tourism site, the release of sunscreen oils and nutrients into the local ecosystem is likely considerable. This release occurs directly over the reefs in shallow water and likely becomes in rapid contact with the corals and algae.

Broader Impact and Recommendations for Future Work

The utilization of natural resources like coral reefs for ecotourism must be done in a thoughtful and constantly forward-thinking manner. The collapse of these delicate reef systems in Akumal Bay would not only be tragic ecologically, but economically as well. We believe that if nothing in the management of the coral reef habitat in Akumal Bay changes, the system could reach a point of no return. Reef systems are capable of recovery from the disturbances seen in Akumal Bay when they are present in the short term, but as they face these stressors over longer periods of time, recovery becomes increasingly less likely (Chabanet et al. 2005).

To prevent future impacts on the reefs and allow them to recover, we have several recommendations for the citizens, government, and private organizations in Akumal that partici-

becomes increasingly less likely (Chabanet et al. 2005).

To prevent future impacts on the reefs and allow them to recover, we have several recommendations for the citizens, government, and private organizations in Akumal that participate in or benefit from the management of these resources.

The first issue is the high density of tourism. The idea of limiting tourism by placing a threshold on the number of people who can be on the beach at one time is commonly suggested, but we believe this is an impractical solution. However, this is not to say that efforts to limit tourism in some extent should not be made. We believe methods such as reducing the number of people in a snorkel tour group and limiting the number of snorkel tours in the bay on a daily basis would be successful. Rather, we feel it would be more effective to increase the cost of snorkel tours and charge a fee to access the beach. These funds could employ more people to help police the reefs and monitor activity in the bay. This proposed solution provides a small amount of jobs while simultaneously furthering the protection of the coral reef community and securing the jobs of those whose work depends upon the reefs.

We also suggest a ban on sunscreen use in Akumal Bay. Rash guards are a great alternative, without the chemical additives. This policy sounds extreme, and would be difficult to implement, but this has already been done in several of the protected cenotes in Akumal. Therefore, the protocols for establishing this policy successfully are already in place and would likely ease the process.

To the scientific community we recommend continued efforts studying and monitoring the changes in Akumal Bay. Centro Ecological Akumal, a non-governmental organization, is contributing hugely to this effort. A broader study similar to this one

would be ideal in terms of determining to what extent tourism is impacting the coral reefs. If researchers located a reef system with similar ecological, geological, and geographical parameters in a region with little to no tourist presence, they could conclude with more certainty that trends seen in Akumal are entirely due to the anthropogenic influence. While we did find significant differences in tourism density along Akumal Bay, the distinction between a “high” and “low” tourist region is becoming increasingly blended. Within a decade the entirety of Akumal Bay may be considered a high tourist region.

The coral reefs in Akumal Bay are not the only ones facing anthropogenic threats. Reef protection and management efforts are growing globally, but many researchers remain in agreement that for conservation methods to be effective, the ecology of these reefs needs to be better understood (Watson et al., 2014; Mouillet et al. 2016, Bellwood et al. 2004, MacNeil et al. 2015, Bridge et al. 2013).

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The UN Guiding Principles on Business and Human Rights and Related Recommendations for the U.S.



THE UNITED NATIONS Human Rights Council's endorsement in 2011 of the UN *Guiding Principles on Business and Human Rights* (Guiding Principles) was a key milestone in clarifying the responsibilities of business enterprises in relation to internationally recognized human rights. Authored by Harvard University Professor John Ruggie following extensive consultations, the Guiding Principles, with the support of the US government, establish that businesses have a clear responsibility to "respect" human rights and to outline the measures that should be taken to fulfill this obligation. The political pressures that gave rise to the appointment of Ruggie and, ultimately, the Guiding Principles arose from controversies within the footwear and apparel industry, where the practices of large, multi-national corporations (MNCs) and their subcontractors have for many years been the subject of criticism. With the Guiding Principles now in place for more than six years, and in light of human rights abuses in Bangladesh exposed by the 2013 Rana Plaza garment factory disaster, what is the current level of human rights compliance among leading companies in the footwear and apparel industry?

This paper considers whether the human rights-related policies and reporting of three of the largest U.S.-based footwear and apparel companies,

Gap Inc. (Gap), Nike, Inc. (Nike), and VF Corporation (VF), comply with the expectations and requirements set out in the Guiding Principles. For this purpose, "evaluation criteria" have been developed drawing both from the Guiding Principles and related UN guidance. These have been applied to publicly disclosed policies and public reports of Gap, Nike and VF. Each of these widely respected companies is found to fall short of the Guiding Principles in a number of material respects. Moreover, the approach to human rights policies and reporting of the three companies deviates significantly, posing challenges for consumers and other stakeholders wishing to monitor and compare these companies' human rights compliance.

In 2014, the Obama administration announced that the U.S. government, following the lead of many other countries, would develop a National Action Plan (NAP) for promoting compliance with the Guiding Principles among U.S.-based businesses. In December 2016, the outgoing administration released the U.S. government's first National Action Plan on Responsible Business Conduct. Accordingly, this paper identifies the major features of the current NAP and offers some recommendations for any future revisions of the plan in the context of the Gap/Nike/VF compliance failings, as well as

the current political realities in the United States. It is recommended that any future U.S. NAPs include reforms of disclosure obligations in U.S. securities law as well as federal and State-level government procurement and contracting policies designed to encourage, but not to mandate, compliance with the Guiding Principles.

The Rana Plaza Disaster

On April 24, 2013, the eight-story Rana Plaza in Bangladesh collapsed, killing 1,129 people (Butler, 2013) and injuring over 2,500 more ("Bangladesh Building Collapse," 2013). The building contained a bank, apartments, shops, and several garment factories manufacturing apparel bearing the brands of Benetton (Smithers, 2013), Joe Fresh (O'Connor, 2013), Monsoon (Factory 'Supplied High Street Fashion Retailers', 2013), Mango, Primark (Factory 'Supplied High Street Fashion Retailers', 2013), Wal-Mart (Greenhouse, 2013) and other household names. Serious cracks in the building had been discovered and recorded by a local TV channel on the previous day, prompting the bank and shops to close immediately (Ahmed, 2013). The building owner, Sohel Rana, assured the media that the building was safe (Ahmed, 2013) and demanded that the garment workers return to work the following day. It was reported that paid gangs were engaged in beating workers who refused to comply ("Factory Collapse in Bangladesh"). Following the collapse, Mr. Rana was arrested ("Dhaka Building Collapse," 2013). He is currently awaiting trial ("Bail for Rana Plaza Owner," 2014).

Rana Plaza is considered both the deadliest garment factory accident and accidental structural failure in modern human history ("May Day Statement," 2013). International media organizations reported extensively on the events in Bangladesh, and the scenes of

death and destruction provoked strong public sympathy in the United States and other developed countries. These reports were followed by expressions of moral outrage, with the focus of news and social media shifting to the involvement of MNCs whose products were being manufactured in the Rana factories, and whether or not they bore some responsibility.

While the Rana disaster was notable in terms of the scale of its human impact, MNCs operating within the footwear and apparel industry have, for many years, drawn regular criticisms from civil society and non-governmental organizations of being complicit in alleged human rights violations. Many such MNCs develop, and regularly update human rights-related policies and reports, ostensibly to/limit human rights abuses and/avoid public criticism and consumer backlash. The Rana tragedy begs an obvious question: are the human rights initiatives of these MNCs all that they should be, or is there more that could be done to reduce the risk of future human rights abuses within the sector?

Business and Human Rights: The Current International Framework

The UN Global Compact

In 2000, the UN launched its Global Compact to provide "a practical framework for the development, implementation, and disclosure of sustainability policies and practices" ("Overview of the UN Global Compact," 2013). Although participation by MNCs and other businesses in the Global Compact is voluntary, the initiative has attracted more than 12,000 participants, including over 8,000 businesses in approximately 145 countries ("UN Global Compact Participants," 2014). Gap and Nike are participants in the Global Compact, although VF is not. Participants must subscribe to numerous principles

relating to human rights, labor, the environment and anti-corruption under the Global Compact, which declares that "[b]usinesses should support and respect the protection of internationally proclaimed human rights... [and] make sure that they are not complicit in human rights abuses" ("The Ten Principles").

The Global Compact is not legally binding, and the UN does not monitor the activities of companies that belong to it ("Frequently Asked Questions," 2013), although there are measures in place to ensure "that the integrity of the Global Compact is safeguarded at all times" ("Integrity Measures," 2011). If a participant is found to be in violation of the Global Compact's principles, the "Global Compact Office" has the ability to remove it from the initiative, and indicate this on the Global Compact website ("Integrity Measures," 2011). However, the office has no authority to remedy any actions or outcomes associated with a participant's violation.

UN Guiding Principles on Business and Human Rights

In 2005, Professor John Ruggie ("Secretary-General Appoints John Ruggie," 2005) was appointed as a Special Representative of the UN Secretary General with a mandate to):

1. "[i]dentify and clarify standards of corporate responsibility and accountability for businesses and human rights;"
2. "[c]larify the implications for businesses of concepts such as 'complicity' and 'sphere of influence';" and
3. "[d]evelop materials and methodologies for undertaking human rights impact assessments of the activities

Over a period of six years, Ruggie consulted extensively on, and ultimately developed, the

Guiding Principles. The United Nations characterized the endorsement of the Guiding Principles by the UN Human Rights Council in 2011 as an "unprecedented step" ("Framework and the Global Compact," 2014), and the U.S. government, which co-sponsored the council's resolution, proclaimed its strong support ("Business and Transnational Corporations Responsibility to Respect," 2011).

The Guiding Principles comprise thirty-one individual principles, many of which address human rights compliance by business enterprises (including, but not limited to MNCs). The Guiding Principles are said to be grounded in recognition of:

- (a) States' "existing obligations to respect, protect and fulfill human rights and fundamental freedoms"
- (b) the role of business enterprises as "specialized organs of society...required to comply with all applicable laws and to respect human rights," and
- (c) the "need for rights and obligations to be matched to appropriate and effective remedies when breached" ("Guiding Principles," 2011, p. 1).

This is commonly known as the "protect, respect and remedy framework."

Interpretive Guide for the Guiding Principles

In 2012, the UN published Ruggie's Interpretive Guide for the Guiding Principles, the stated purpose of which is "to provide additional background explanation to the Guiding Principles to support a full understanding of their meaning and intent" ("Interpretive Guide," 2012, p. 3). As different industries and enterprises work towards implementing the Guiding Principles, Ruggie expresses hope that the Interpretive Guide will help these

stakeholders understand both the meaning and intent of the Guiding Principles and their own responsibility to respect human rights. Ruggie sees the Interpretive Guide as “a resource not just for businesses, but also for Governments, civil society, investors, lawyers and others who engage with business on these issues” (“Interpretive Guide,” 2012, p. 3).

Scope of the Guiding Principles, and their Relationship to the Global Compact

The UN has clarified separately that the Guiding Principles address the responsibility of all business enterprises to respect human rights, and that participants in the Global Compact have gone beyond the Guiding Principles by voluntarily agreeing to support and respect human rights (“Guiding Principles Relationship to Global Compact,” 2014).

The Guiding Principles clarify that the obligation to respect international standards of human rights applies even when individual states are unwilling or unable to fulfill their own human rights obligations, and extends beyond merely complying with domestic human rights laws and practices (“Guiding Principles,” 2011, p.13).

Human Rights Policies and Reporting by Gap, Nike & VF

Each of Gap, Nike, and VF is a global, US-based MNC, has its shares listed on the New York Stock Exchange and is registered with the U.S. Securities and Exchange Commission (SEC), and derives a significant portion of its total revenues from the United States (“Listings Directory,” 2015). Each company is focused on the development of a valuable footwear and apparel brand or brands¹,

consumer perception of which is critical to its business success and enterprise value. All three have, in the past, been at the center of “publicity storms” related to actual or alleged human rights abuses linked to them by the business practices of third-party suppliers in developing countries. Each company has taken a variety of specific and general measures to address these issues, including voluntarily adopting human rights-related policies and reporting practices. The human rights-related experiences of, and measures taken by each of these companies are briefly discussed below.

Gap Inc.

In the early 1990s, the United States witnessed a strong public debate concerning working conditions within the global garment industry (Rhone, Stroud and Webb, 2004, p. 209). In 1993, Gap responded by introducing its *Sourcing Principles and Guidelines* (Rhone et al., 2004, p. 209). Subsequently, Gap faced a sustained and directed criticism from various non-governmental organizations (NGOs), alleging that one of its suppliers in El Salvador, Mandarin International, was violating the Gap Sourcing Principles (Rhone et al., 2004, p. 209). In 1996, Gap replaced the Gap Sourcing Principles with a “new, more rigorous” Code of Vendor Conduct, which was “expressly designed to apply to firms other than Gap Inc. - to those that supply products to Gap Inc.” (Rhone et al., 2004, p. 209). The Gap Code of Vendor Conduct has remained in effect since 1996. In 2010, Gap introduced a Human Rights Policy in recognition of its commitment to the “United Nations Guiding Principles on Business and Human Rights, as well as other recognized international policy frameworks” (“HR Policy and Code of Vendor Conduct,” 2015). Gap

periodically publishes human rights-related compliance reports. (Gap Report). Gap says that this report “frankly discusses successes and failures, challenges and opportunities” in the areas of human rights and environmental compliance (“Gap 2011/2012 Report,” 2012, p. 13).

Nike, Inc.

In 1991, Jeff Ballinger, director of “Press for Change” (a consumer information organization monitoring labor rights issues in developing countries), published a damaging report on poor working conditions within “sweatshops” in Indonesia, a country from which Nike was sourcing at the time (Nisan, 2013). Later that year, Nike published the Nike, Inc. Code of Conduct that it said “clarifies and elevates the expectations we have of our factory suppliers and lays out the minimum standards we expect each factory to meet” (“Nike Code of Conduct,” 2010). The Nike Code of Conduct remains in place today. In 1992, Ballinger further published an article in *Harper's Magazine* that made specific allegations concerning Nike's involvement in human rights abuses (Nisan, 2013). In 1996, Nike formed a department “tasked with working to improve the lives of factory laborers,” however, alleged human rights abuses linked to Nike continued to emerge (Nisan, 2013).²

In 1997, Nike hired diplomat and activist Andrew Young to review Nike's foreign labor conditions (Canedy, 1997; Nisan, 2013). Although Young reported favorably on Nike, he was criticized for neglecting to address low wages, using Nike interpreters to translate in interviews, and being accompanied by Nike officials on his factory visits (Nisan, 2013). In 2005, Nike claimed an industry first by pub-

lishing a list of all factories with which it contracted globally, and committed to continue reporting on labor standards, audit data and other information (Nisan, 2013). In 2011, Nike published its Code of Business Conduct and Ethics (“Corporate Governance,” 2014), which “addresses the behavior of Nike, Inc. employees” (“Governance Accountability and Reporting”). Nike has also developed a Code of Leadership Standard, which provides a logistical framework for putting the Nike Code of Conduct into practice (“Sustainability,” 2015). Nike publishes its *Sustainable Business Performance Summary* (FY 12/13), which is intended for “those who seek a deep understanding of both the sustainability issues Nike faces and our strategic response to those issues as we strive for long-term sustainable growth” (“Nike Summary,” 2013, p. 85).

VF Corporation

VF is a holding company that oversees a number of footwear and apparel brands through its various subsidiaries and divisions. In 1997, VFC established its *Global Compliance Principles*, which detail the minimum requirements and standards that all factories wishing to do business with VF must meet (“VF Terms of Engagement,” 2015). The VF Compliance Principles contain separate policies for factories that are directly owned by VF, and those that are contracted by VF. Owned factories are required to comply with VF's “Ideal Plant Model,” which requires adherence to VF's *Code of Business Conduct* (“VF Global Compliance,” 2015). The VF Code of Conduct “clarifies or adds guidance on [VF's] policies relating to conflicts of interest, anti-corruption, global trade compliance, anti-boycotting regulations, data privacy, inter-

¹Gap's brands include: Gap, Old Navy, Banana Republic and Athletica. Nike is a single brand company. VF Corporation's brands include: Timberland, The North Face, Lee, Wrangler and Nautica.

²Nike's published denial of these allegations caused it to become embroiled in a high profile false advertising case (discussed below under *Recommendations for the Proposed U.S. National Action Plan*).

nal reporting and other topics” (“VF Investor Relations,” 2011). Third-party factories contracted by VF must abide by VF’s *Terms of Engagement*, a policy “which sets forth the key principles under which [VF] and its worldwide subsidiaries are required to operate” (“VF Terms of Engagement,” 2015). VF produces periodic compliance reports, which “provides an overview of VF’s commitments to associates, business partners and communities, and the steadfast principles under which we operate” (“VF Compliance Report,” 2011, p. 4).

VF became embroiled in public controversy over two competing factory safety initiatives arising from the Rana factory collapse: The Bangladesh Accord, which has over 200 signatories mainly based in Europe (“Signatories”), and the Bangladesh Alliance, which has 29 members based in the United States or Canada (“Membership”). VF was criticized for its decision to join the Bangladesh Alliance (Husband, 2015), which some argue lacks the enforceability of the Bangladesh Accord. Some US-based universities terminated contracts with VF for the supply of branded apparel, which reportedly cost VF over \$4 million in lost profits (Collins, 2014).

Do the Human Rights Policies and Reporting of Gap, Nike and VF Comply with the Guiding Principles?

Evaluation Criteria

A discussion of the criteria used to evaluate the human rights policies and reporting of

Gap, Nike and VF is set out below. The criteria relate to: substantive scope, scope of application, due diligence/response/tracking, transparency, and effective grievance/remediation.

Substantive Scope: *Does the human rights-related policy and reporting of the Multi-national Corporation address compliance with all of the internationally recognized human rights covered by the Guiding Principles?* An effective human rights policy/report should address the obligation of MNCs to respect all of the internationally recognized human rights standards referred to in the Guiding Principles. These are to be “understood, at a minimum, as those expressed in the International Bill of Human Rights and the principles concerning fundamental rights set out in the International Labour Organization’s Declaration on Fundamental Principles and Rights at Work” (“Guiding Principles,” 2011, p. 13). Although labor-related human rights violations by MNCs are often the focus of public and media attention, the Guiding Principles note that a business enterprise can impact on virtually any of the internationally recognized human rights, even ones not traditionally associated with corporate activity³. In addition to the enumerated human rights standards, the Guiding Principles state that it may be necessary, especially when dealing with particularly vulnerable communities, for businesses to incorporate further human rights standards (“Interpretive Guide,” 2012, p. 11). The Substantive Scope criterion involves an assessment of whether or not the relevant human rights policy/report incorporates the human

³The Interpretive Guide emphasizes that “it is... not possible to limit the application of the responsibility [of enterprises] to respect human rights to a particular subset of rights for particular sectors” noting that “[e]ven rights such as the right to a fair trial, which is clearly directed at States, can be adversely affected if, for example, an enterprise obstructs evidence or interferes with witnesses” (“Interpretive Guide,” 2012, p. 13).

rights standards referred to in the Guiding Principles, and also contemplates the possibility that other human rights standards could be relevant.

Scope of Application: *Does the human rights policy/report address compliance by the MNC itself (including its subsidiaries) as well as by each of its “business relationships”?* The Guiding Principles clarify that respect for human rights by a business enterprise extends to each of its “business relationships,” meaning its “business partners, entities in its value chain, and any other non-State or State entity directly linked to its business operations, products or services”⁴. The Scope of Application criterion involves an assessment of whether or not the scope of the relevant human rights policy/report adequately responds to this requirement.

Due diligence/Response/Tracking: *Does the human rights policy/report appropriately address the MNC’s responsibility to conduct due diligence on actual or potential human rights impacts, the taking of action on findings, and the tracking of responses to determine their effectiveness?* Under the Guiding Principles, MNCs are expected to conduct human rights due diligence, which should go

beyond risks merely to its own business (i.e., it should extend to risks to rights-holders) and be initiated as early as possible (“Guiding Principles,” 2011, p. 18). Potential human rights impacts should be addressed through prevention or mitigation, and actual human rights impacts should be a subject for remediation. Furthermore, business enterprises are expected to integrate their findings into future corporate practices⁵. Businesses should, in certain cases, consider retaining external resources to achieve the foregoing⁶. The Due diligence/Response/Tracking criterion involves an assessment of whether or not the relevant human rights policy/report adequately addresses the MNC’s responsibilities in relation to due diligence, responses to human rights issues, tracking of effectiveness and general oversight processes (whether internal or external).

Transparency: *Does the human rights policy require the relevant MNC to disclose publicly its human rights impacts, including breaches of the policy by itself or its business relationships, and does the MNC’s human rights reporting appear to satisfy this requirement?* The Guiding Principles require that business enterprises have in place policies and processes through which they can demonstrate that they respect human rights

⁴Guiding Principle 13 states “responsibility to respect human rights requires that business enterprises...[s]eek to prevent or mitigate adverse human rights impacts that are directly linked to their operations, products or services by their business relationships, even if they have not contributed to those impacts” (“Guiding Principles,” 2011, pp. 14-15).

⁵Guiding Principle 19 states that “[i]n order to prevent and mitigate adverse human rights impacts, business enterprises should integrate the findings from their impact assessments across relevant internal functions and processes” and that effective integration requires, among other things, that “oversight processes enable effective responses to such impacts” (“Guiding Principles,” 2011, p. 20).

⁶The Interpretive Guide notes that [for an enterprise’s efforts to respect human rights] to have “legitimacy... [it] needs to know...that it is indeed respecting human rights in practice” and that there [may be] a need for “external expert resources that can support and assist their efforts to meet their responsibility to respect human rights” (although this is not strictly required) (“Interpretive Guide,” 2012, p. 23).

in their conduct⁷. The Guiding Principles further contemplate that business enterprises must be prepared to demonstrate this publicly, and should be reporting formally on their human rights practices if their businesses “pose risks of severe human rights impacts” (“Guiding Principles,” 2012, p. 23). Given the significant human rights-related issues associated with the global footwear and apparel industry over the last 20 years, as well as events such as the Rana tragedy, it seems fair to conclude that Gap, Nike and VF are “engaged in operations that pose risks of severe human rights impacts” such that they (and others operating in this sector) should, under the Guiding Principles, be reporting on human rights matters regularly and formally⁸. The Transparency criterion involves an assessment of the scope, specificity, form, quality and frequency of public disclosures of human rights impacts/responses, including consideration of whether such disclosures are subject to any independent verification.

Effective Grievance/Remediation: *Does*

the human rights policy/report provide for and/or disclose an effective operational-level grievance mechanism for affected individuals and communities, and has the MNC made an appropriate remediation commitment? The Guiding Principles are grounded in recognition of the obligation to “respect” human rights, but also the ability to provide an “appropriate and effective” remedy when this obligation is breached (“Guiding Principles,” 2011, p. 1)⁹. Operational-level grievance mechanisms “for individuals and communities who may be adversely impacted” by a business’ activities are mandated by the Guiding Principles¹⁰ (“Guiding Principles,” 2011, p. 31). A grievance mechanism is said to be effective only if it meets “certain core criteria”¹¹ and “can only serve its purpose if the people it is intended to serve know about it, trust it and are able to use it” (“Guiding Principles,” 2011, pp. 24-25 and 34). The Effective Grievance/Remediation criterion involves an assessment of the effectiveness of operational level grievance mechanisms (applying the core criteria), and a determination of whether, and to what

⁷The commentary also notes that formal reporting is “evolving, from traditional annual reports and corporate responsibility/sustainability reports, to include online updates and integrated financial and non-financial reports.” Moreover, the GP 21 commentary notes “[i]ndependent verification of human rights reporting can strengthen its content and credibility” (“Guiding Principles,” 2011, p. 23-4). The Interpretive Guide notes the importance of transparency in protecting the “enterprise’s reputation and build[ing] wider trust in its efforts to respect human rights” (“Interpretive Guide,” 2012, p. 59).

⁸Guiding Principle 21 requires human rights communications should be “of a form and frequency that reflect an enterprise’s human rights impacts and that are accessible to its intended audiences” and “[p]rovide information that is sufficient to evaluate the adequacy of an enterprise’s response to the particular human rights impact involved” (“Guiding Principles,” 2011, pp. 23-4).

⁹Guiding Principle 15(c) requires that enterprises have in place policies and processes “to enable the remediation of any adverse human rights impacts they cause or to which they contribute” (“Guiding Principles,” 2011, p. 16). The commentary to Guiding Principle 11 clarifies that the responsibility of business enterprises to “address adverse human rights impacts with which they are involved” requires “taking adequate measures for their prevention, mitigation *and, where appropriate, remediation*” (emphasis added) (“Guiding Principles,” 2011, p. 13).

¹⁰The commentary to Guiding Principle 29 notes that such mechanisms “are typically administered by enterprises, alone or in collaboration with others, including relevant stakeholders” but “may also be provided through recourse to a mutually acceptable external expert or body” (“Guiding Principles,” 2011, p. 31).

extent, the relevant MNC has publicly committed to remediating human rights impacts it has caused or to which it has contributed.

Evaluation of the Human Rights Policies and Reporting of Gap, Nike and VF

This section discusses and evaluates the human rights policies and reporting of Gap, Nike and VF against the criteria set out above.

Substantive Scope: The Gap Vendor Code adopts only a portion of the international human rights standards incorporated into the Guiding Principles, mainly those related to labor standards. The Gap HR Policy is more broad, stating that Gap “will, in addition to adhering to national laws, *seek to ensure* respect for fundamental human rights, as defined by the UDHR, the International Covenant on Civil and Political Rights (ICCPR) and the International Covenant on Economic, Social and Cultural Rights (ICESCR), throughout [its] operations” (emphasis added) (“Gap Human Rights Policy,” p. 2). In practice, however, the focus of Gap’s human rights efforts appears to be much narrower. The Gap HR Policy states that “due to the nature of the retail and apparel industry, we believe the labor rights...are among the most relevant to our apparel supply chain and our Operations... [t] herefore, our primary focus for implementation of this policy concentrates in these areas” (“Gap Human Rights Policy,” p. 3). Moreover, the “seek to ensure” formulation appears to soften Gap’s commitment in a manner inconsistent with the Guiding Principles (which

establish an unqualified obligation to respect human rights). Consistent with the Guiding Principles, the Gap HR Policy recognizes that Gap’s “business and the environments in which [Gap operates] are continually evolving and that additional human rights issues relevant to [Gap’s] operations may become greater priorities in the future” (“Gap Human Rights Policy,” p. 3).

The Nike Code of Conduct and Nike Code of Ethics do not expressly incorporate or refer to any internationally recognized human rights standards. The 11 principles set out in the Nike Code of Conduct address labor-related issues, including minimum age requirements, freedom of association and working hours, and fail meaningfully to address non labor-related human rights (“Nike Code of Conduct,” 2010). Nike has acknowledged that specific issues will remain its focus, such as dealing with “freedom of association, excessive overtime and wages” because these are deemed to be a “priority” in its industry (“Nike FY 12/13 Summary,” 2013, p. 38).

The VF Compliance Principles comprise 16 principles, which VF says represent a “commitment...that each piece of apparel...will be made consistent with internationally recognized labor standards, such as the UN Global Compact and the International Labor Organization’s doctrine for human rights” (“VF Global Compliance Report,” 2011, p. 8). These principles (which are similar in scope to the Nike Code of Conduct) focus on guaranteeing basic labor rights, such as fair compensation, a non-discriminatory work environment and

¹¹The core criteria are set out in Guiding Principle 31 and address: (a) legitimacy (enabling trust, fairness of process), (b) accessibility (being known, providing assistance to overcome barriers), (c) predictability (clear time frame, available outcomes, monitoring of implementation), (d) equity (access to information, advice and expertise), (e) transparency (information about progress, performance of mechanism), (f) rights-compatibility (outcomes that accord with recognized human rights), and (g) continuous learning (improvement and prevention) (“Guiding Principles,” 2011, pp. 33-4).

safe working conditions (“VF Global Compliance Report,” 2011, p. 18). VF’s policies do not include a commitment to respect all of the internationally recognized human rights standards contemplated by the Guiding Principles.

Neither the Nike nor the VF human rights policies contemplate the possibility that additional human rights may be relevant in certain situations (as the Gap HR Policy does).

Scope of Application: The Gap Vendor Code of Conduct “applies to all factories that produce goods for Gap Inc. or any of its subsidiaries, divisions, affiliates or agents,” but does not apply to other types of business relationships (e.g., States or State-owned entities) as contemplated by the Guiding Principles (“Code of Vendor Conduct,” 2007, p. 1).

The Nike Code of Conduct “clarifies and elevates the expectations” Nike has of its “factory suppliers” and lays out the minimum standards it expects each such factory to meet (“Nike Code of Conduct,” 2010). Their code of Ethics extends to all “business partners, such as agents, distributors, consultants, representatives, attorneys, independent contractors, external temporary workers and suppliers,” although not to States/SOEs (“Nike Code of Ethics,” 2011, p. 7).

The VF Compliance Principles apply to all “facilities that produce goods” for VF or any of its subsidiaries, divisions or affiliates (including facilities owned and operated by VF and its contractors, agents, and suppliers) (“VF Terms of Engagement,” 2015). However, neither the VF Compliance Principles nor the VF Code of Conduct applies to any of VF’s business relationships other than such “facilities” (“VF Terms of Engagement,” 2015).

Due diligence/Response/Tracking: Gap has stated publicly that it will “continue investing in credible human rights due diligence

processes as described in the UN Guiding Principles on Business and Human Rights” (“Gap 2011/2012 Social Report,” 2012, p. 30). The Gap Vendor Code states that Gap will continue developing its monitoring systems to ensure compliance with the Guiding Principles, although the code does not contemplate any independent oversight (“Code of Vendor Conduct,” 2007, p. 14). Gap says that it has assembled an in-house “Monitoring & Vendor Engagement team” (“Gap 2011/2012 Social Report,” 2012, p. 30), which is responsible for assessing working conditions in the factories that manufacture its branded apparel (“Monitoring and Remediation,” 2013). This internal monitoring process is said to include “ratings” that can be tracked over time (“Gap 2011/2012 Social Report,” 2012, p. 37). However, Gap notes that it “begin[s] monitoring non-apparel suppliers once their volume reaches an agreed-upon threshold” in order to allocate resources “efficiently,” and admits that only about one-half of its audits are unannounced (“Gap 2011/2012 Social Report,” 2012, p. 37).

The Nike Summary states that “audits and monitoring remain an important component” of how Nike ensures that its Code of Conduct is “enforced” (“FY 12/13 Summary,” 2013, p. 37). The Nike Leadership Standard addresses how Nike measures “efforts and compliance” with the Nike Code of Conduct (“Sustainability,” 2015). Such efforts are said to take the form of “audit visits by both internal and external parties” (“Sustainability,” 2015)¹². The Nike Summary states that, in Nike’s 2013 fiscal year, “94% of factories went through a full assessment of labor, health, safety and environmental compliance” (“Nike FY 12/13 Summary,” 2013, p. 38). Nike rates factories on their level of compliance using a scale ranging from “Gold” to “Red,” with “Bronze” (the middle rating) indicating full compliance with the

Nike Code of Conduct and the Nike Leadership Standard (“Nike FY 12/13 Summary,” 2013, p. 37).

VF requires factories that it owns/controls to “participate in the Worldwide Responsible Accredited Production (WRAP) Certification Program,” which requires that an independent, accredited monitor perform unannounced audits to determine compliance with twelve “production principles,” and also conduct confidential employee interviews to corroborate satisfactorily the facilities’ responses (“VF 2011 Global Compliance Report,” 2011, p. 18). Such owned/controlled factories are also subject to the requirements of VF’s “Ideal Plant Model” (IPM) that, since 1993, has defined VF’s safety standards (“VF 2011 Global Compliance Report,” 2011, p. 18). VF says that “regular audits [are] conducted by auditors employed or contracted by VF” (“VF 2011 Global Compliance Report,” 2011, p. 26), and that every quarter a report summarizing factory audit results is presented by VF’s Vice-President, Internal Audit to the Audit Committee of its Board of Directors for “review and consideration of risk management matters” (“VF 2011 Global Compliance Report,” 2011, p. 38). Third-party contractors must agree to VF’s “Terms of Engagement,” but are not subject to a certification procedure (“Sustainability & Responsibility Global Compliance,” 2015).

Transparency: Gap says it recognizes the importance of “transparency, accountability, and honesty” (“Gap Reporting and Materiality,” 2015), and the need to report publicly on its social and environmental impacts (“Gap 2011/2012 Social Report,” 2012, p. 13). Gap commits to publish a new Social and Environmental Responsibility Report every two years (which it argues is an “appropriate time-frame”¹³), and to update its compliance data annually (“Gap 2011/2012 Social Report,” 2012, p. 14). Gap says its published human rights reports are independently reviewed by “experts on social and environmental issues from a number of non-governmental organizations and socially responsible investment firms,” with which it is said to have been collaborating for more than 10 years¹⁴ (“Gap 2011/2012 Social Report,” 2012, pp. 15-16).

Nike says “transparency [is]...fundamental to [its] approach to sustainability,” and that it endeavors to achieve this by disclosing data against the targets it has previously set,¹⁵ and that it seeks to make its reporting more interactive and engaging (“FY 12/13 Performance Summary,” 2013, pp. 3, 5 and 85). Nike seeks feedback on both its reporting and its data points, working with “Forum for the Future” to engage a “Stakeholder Review Panel” that has included representatives from World

¹²The Code of Leadership Standard states that factories must “submit to and cooperate with compliance audits, either by Nike, Nike Affiliates, designated third-party auditors or “independent external monitoring” conducted at the request of the Fair Labor Association” (“Nike Code Leadership Standard,” p. 18).

¹³Gap argues that “biennial reporting is an appropriate timeframe given the systemic and global nature of the issues our company seeks to proactively address. It also allows us to devote the optimal allocation of resources to doing and communicating” (“Gap 2011/2012 Social Report,” 2012, p. 14).

¹⁴Gap’s 2011 report mentions “the Public Reporting Working Group (PRWG)...[which] was instrumental in providing feedback on content, insights into our overall message, and perspective on our data and progress, including areas where we need to do more” (“Gap 2011/2012 Social Report,” 2012, p. 15).

¹⁵Nike says further that it “believe[s] that transparency is a central component of a responsible business strategy and that reporting is a critical part of delivering transparency” (“FY 12/13 Performance Summary,” 2013, p. 85).

Wildlife Fund, GoodGuide and the Academy for Sustainable Business (“FY 12/13 Performance Summary,” 2013, pp. 86-7). Nike has, for example, disclosed publicly that its internal audit team identified “a number of opportunities for improvement and investment, including better documentation of information, internal checks at multiple levels, review of forward-looking public commitments, documentation of systems and controls, and improved interactions with key internal audiences” (“FY 12/13 Performance Summary,” 2013, p. 87). Nike says it seeks to verify, both internally and externally, reported data points and notes that it “[understands] the importance of external assurance,” but “still believe[s] [it has] internal steps to complete before undertaking a robust external review” (“FY 12/13 Performance Summary,” 2013, p. 87).

VF says it is “dedicated to engaging and working with industry peers, working groups and Non-Governmental Organizations (NGOs) to foster and to promote a healthier and safer work environment” (“VF 2011 Global Compliance Report,” 2011, p. 32). VF has published just two Compliance Reports in ten years, one in 2005 and the VF Compliance Report in 2011 (“VF 2011 Global Compliance Report,” 2011, p. 6). VF makes no commitment on the timing of its reporting, but says “moving forward, we will continue to report our progress on social compliance initiatives” (“VF 2011 Global Compliance Report,” 2011, p. 3). VF “recognize[s its]... responsibility to provide stakeholders with a greater level of engagement and transparency regarding the social and environmental performance of our brands and products” (“VF 2011 Global Compliance Report,” 2011, p. 8) but, to date, has not announced any specific measures to achieve this.

Effective Grievance/Remediation: The Gap Vendor Code outlines sanctions that can be levied by Gap against suppliers failing to comply with its requirements. For example, if Gap determines that a factory has violated the code it may “at its discretion either terminate its business relationship and/or require the factory to implement a corrective action plan” (“Code of Vendor Conduct,” 2007). The Gap Report refers to the “importance of maintaining operational-level grievance mechanisms, as a means for affected stakeholders to raise concerns about a company’s impacts in order to seek remedy” (“2011/2012 Responsibility Report,” 2012, p. 32). The Gap Report further notes that protecting freedom of association is an important part of ensuring grievance mechanisms are successful, and that Gap will incorporate the advice of “credible” third parties to establish “effective grievance mechanisms” (“2011/2012 Responsibility Report,” 2012, p. 139). The Gap Vendor Code does not disclose any specific procedure available to its employees, third-party workers or other parties potentially affected by breaches of the Gap Vendor Code, although it has established “a confidential, third party-hosted 24/7 hotline available to all employees worldwide” (emphasis added) (“2011/2012 Responsibility Report,” 2012, p. 32).

The Nike Summary says that factories found to be below a “Bronze” level (i.e., in non-compliance) must “undergo management review...and establish remediation plans” (“FY 12/13 Performance Summary,” 2013, p. 69), though the nature and scope of such plans are not outlined. Nike says 82% of its contracted factories have a “grievance system” in place (although all are required to have one), and that such systems are used in “70% of the cases” (“FY 12/13 Performance Summary,” 2013, p. 39). The Nike Code Leadership Standard explains that an “effective”

grievance process (“Nike Code Leadership Standard,” Freedom of Association p. 3) must include a written grievance policy, effective communication of that policy, proper training of staff to handle grievances, and a “means to document and track grievances” (“Nike Code Leadership Standard,” Freedom of Association p. 3).

VF says it exerts compliance pressure by terminating its relationship with any supplier given a “rejected” rating (“Terms of Engagement,” 2015). However, the VF Compliance Report fails to outline or discuss any available grievance mechanisms for affected third parties.

Summary of Main Observations

A number of comments can be made, and observations drawn, from the foregoing evaluation of the human rights policies/reports of Gap, Nike and VF.

Firstly, each MNC has clearly sought meaningfully to address human rights-related issues in terms of both policies and reporting, reflecting (at the very least) a perceived need to manage human rights risks related to its business and to protect and preserve the reputation of its brand(s) among consumers. It also appears that each MNC has a strong understanding of the principal human rights-related issues that affects its business and industry, and has tailored (sometimes too narrowly) its policies/reporting to reflect the structure of its business (e.g., the use of third-party factories, etc.). This observation supports a key feature of the Guiding Principles, which emphasize the importance of encouraging business enterprises (and collaborative industry initiatives) to address their responsibility to “respect” human rights based on their individual circumstances and challenges. The Guiding Principles note “the scale and complexity of the means through

which enterprises meet [their responsibility to respect] may vary according to [size, sector, location, ownership and structure] and with the severity of the enterprise’s adverse human rights impacts” (“Guiding Principles,” 2011, p. 15).

Secondly, it is apparent that, in the 20 years since human rights concerns within the footwear and apparel sector first arose (including the six years since the Guiding Principles were adopted), no clear industry norms with respect to human rights policies/reporting have become established. The structure, scope and general approach of Gap, Nike and VF to human rights policies and reporting demonstrate considerable divergence (which is likely to exist across the sector), making evaluation and comparisons of compliance with the Guiding Principles challenging. It is likely that the “cost” to consumers, NGOs and other interested stakeholders of conducting compliance reviews and attempting to draw meaningful conclusions from them would discourage all but the most determined.

Thirdly, the human rights policies/reporting of each of Gap, Nike and VF has disclosed cases of actual or apparent non-compliance with the standards expected of them under the Guiding Principles. In some instances, the non-compliance appears highly material. In particular:

The substantive scope of each MNC’s human rights-related policies and reporting was overly narrow, failing properly to incorporate the full range of internationally recognized human rights;

The scope of application of VF’s human rights policies was materially narrower than contemplated by the Guiding Principles (whereas Gap’s and Nike’s policies approached full compliance in this area):

- The human rights-related due dili-

gence, response and tracking efforts of all three MNCs appear reasonably comprehensive, although the approach to independent involvement/verification varies widely;

- While Gap and Nike have taken significant measures to address the transparency of their human rights compliance records, VF currently lags behind them in terms of both the frequency and scope of its human rights reporting;
- While each MNC has established discretionary tools with which it can enforce third-party compliance with human rights policies, none has publicly committed to use such tools or reported on its enforcement activities; and
- Gap and VF appear to have done significantly less than Nike in terms of meeting their obligation to make grievance mechanisms available to affected third parties.

Given that material human rights-related compliance shortfalls have been observed among these major participants in the global footwear and apparel sector (which has historically been at the centre of the business and human rights debate), it seems likely that similar (or perhaps even lower) levels of compliance would be found to exist in other industries, particularly ones that are not as “consumer-facing.”

National Actions Plans:

The UN Working Group on Business and Human Rights encourages all States to develop, enact and update a national action plan as part of their responsibility to disseminate

and implement the Guiding Principles, and has published guidance on the development of NAPs (“Guidance on NAP,” 2013). The UN reports that fourteen countries have already produced NAPs¹⁶, 22 countries (including the United States) are in the process of developing a NAP or have committed to doing one, and six countries have witnessed efforts within their civil society to do so.

United Kingdom: The First Mover

On September 4, 2013, the United Kingdom launched *Good Business: Implementing the UN Guiding Principles on Business and Human Rights*, its action plan to implement the Guiding Principles (“UK First to Launch Action Plan,” 2013). The UK NAP includes a range of initiatives, including measures related to government procurement, government-led foreign investment support and corporate disclosure. The UK is committed to “ensuring that in [government] procurement human rights related matters are reflected appropriately when purchasing goods, works and services” (“Good Business,” 2013). The UK NAP outlines future measures designed to ensure that “agreements facilitating investment overseas by UK or EU companies incorporate the business responsibility to respect human rights” (“Good Business,” 2013). Furthermore, the UK NAP references changes to the UK Companies Act (which became effective on October 1, 2013) requiring “large companies to report non-financial information including disclosures on human rights where such information is necessary for an understanding of the business” (“UK First to Launch Action Plan,” 2013).

¹⁶United Kingdom, The Netherlands, Denmark, Spain, Finland, Lithuania, Sweden, Norway, Colombia, Switzerland, Italy, USA, Germany and France
(<http://www.ohchr.org/EN/Issues/Business/Pages/NationalActionPlans.aspx>)

Current U.S. National Action Plan

Development of a U.S. NAP

On September 24, 2014, the White House released a “fact sheet” on “[t]he U.S. Global Anticorruption Agenda” that included the following significant announcement:

“Working with U.S. Business - The U.S. Government works closely with U.S. businesses to ensure that private actors maintain their international brand as transparent and accountable partners. The United States will develop a National Action Plan to promote and incentivize responsible business conduct, including with respect to transparency and anticorruption, consistent with the UN Guiding Principles on Business and Human Rights and the OECD Guidelines on Multinational Enterprises.” (“Fact Sheet,” 2014)

It is notable that there was no specific reference in the fact sheet to compliance with human rights responsibilities by U.S.-based businesses. The administration appeared to be walking a difficult political line, wishing to take (and to be seen by the international community as taking) steps to implement the Guiding Principles, while at the same time avoiding domestic criticism that it is adding to the “red tape” burden of U.S. industry or suggesting that U.S.-based MNCs are not fully complying with their human rights-related responsibilities.

The First (and Current) U.S. NAP

On December 16, 2016, the U.S. Government released its first NAP – “Responsible Business Conduct: First National Action Plan for the United States of America.” It largely reflects existing federal policies and guidance (Regaignon), and some commentators have

argued that it is not as effective or far-reaching as it could be (Micek, 2017). It records an intention and/or commitment on the part of the U.S. government to action in five broad categories as follows (“Fact Sheet,” 2017):

1. “Continue to refine the ways in which the USG purchases and finances responsibly.” The U.S. government intends to promote responsible business conduct through its “laws, policies, and international commitments, as well as through the purchasing of goods and services.” Some specific examples include “[s]trengthening laws preventing the import of goods produced by forced labor,” “[ensuring] governments at all levels promote [responsible business conduct]... through purchasing,” and “[i]dentifying means through trade agreements to encourage companies to engage in [responsible business conduct].”
2. “Work with companies, civil society, and foreign governments to share best practices and support high standards.” Specific measures articulated in the NAP include “increased government participation in ‘multi-stakeholder initiatives’ that promote [responsible business conduct]... in various sectors and regions,” and “[c]onvening stakeholders to develop and promote effective metrics for measuring and managing labor rights impacts in supply chains.”
3. “Facilitate [responsible business conduct]... by [c]ompanies.” The U.S. Government states that it “encourages companies to follow the best domestic and international practices and is supportive of company efforts to voluntarily report on certain aspects of their

operations.” To that end, the NAP commits to (among other things) “[c]reating an online database containing government reports on issues such as human rights, human trafficking including forced labor, child labor, and investment climates so that companies can more effectively make investment decisions and “mitigate risk,” and “[p]roviding new and increased training for [U.S. Government]... officers and officials” on these issues.

4. *“Highlight the success stories of leading companies.”* The U.S. Government seeks to “recognize... and highlight... when companies achieve high [responsible business conduct] standards with meaningful results for workers and communities.” Specifically, the NAP states that the Government “encourages businesses to treat tools like the OECD Guidelines and the UN Guiding Principles as a floor rather than a ceiling for implementing responsible business practices” and that the “U.S. government is supportive of company efforts to voluntarily report on human rights impacts, anti-trafficking measures, transparency and anti-corruption efforts, and other related aspects of their global operations, including the opportunities and challenges they face [(“First National Action Plan,” 2016)][necessary?].”
5. *“Seek to provide effective mechanisms to address negative impacts when they occur.”* In the event that “challenges arise,” the NAP encourages the implementation of “mechanisms... by which affected parties can raise concerns, report problems, and seek remedies, as appropriate.” Specifically, the NAP commits to “[i]mproving

the performance of the U.S. National Contact Point for the OECD Guidelines for Multinational Enterprises, including by announcing a fall 2017 peer review, organizing workshops to promote RBC, and publishing an outreach plan.”

Since the election of President Trump, concerns have raised about the near-term future of the U.S. NAP and, more generally, the U.S. government’s commitment to promote responsible business conduct by U.S. MNCs (Ewing, 2017). As one author wrote, “[t]he ideology and policy prescriptions of Trump’s advisors and cabinet, abetted by Republicans in Congress, means the likely weakening of protections for consumers, workers, and communities against corporate abuses under federal U.S. law, especially concerning the activities of U.S. companies abroad (ibid.).” However, a central element President Trump’s election campaign was his focus on “fair trade” over “free trade” (Financial Times, 2017). Precisely what the new administration regards as “fair trade” is not yet clear. However, the administration could seek to argue that an example of unfair trade practices is the lack of a level global playing field in terms of ethical business conduct (ibid.). In this context, it is notable that neither China nor Mexico (two countries that have been the cross-hairs of the new administration) has produced a NAP, and China has given no indication to the United Nations that it intends to do so. MNCs based in countries that do not actively encourage ethical business conduct are, it could be argued, able to produce their products at costs that are structurally lower than MNCs that meet minimum standards of ethical behavior. By maintaining, and potentially strengthening, the commitment of the U.S. government to promoting responsible business conduct

by U.S.-based MNCs, the Trump administration might actually strengthen its own hand in any upcoming trade negotiations. In any event, it is anticipated that the current NAP will undergo revisions and improvements in the coming years. This paper offers a number of practical and realistic recommendations for any such revisions, focusing in particular on the first and fourth categories in the current NAP (identified above).

Recommendations for Revisions of the U.S. National Action Plan

The Political Limits of Legislating for Human Rights Compliance by Business Enterprises

Past attempts at a national legislation in the United States, Canada and Australia to address human rights compliance by MNCs have largely failed due to lack of political support. These are briefly discussed below.

United States: Cynthia McKinney of the US Green Party introduced a bill for *The Corporate Code of Conduct Act* on three separate occasions – 2000, 2001 and 2006 (Macklin and Simons, 2014, p. 264). Her bill was designed to “establish strict guidelines for corporations in terms of Labor Rights, Human Rights and environmental protection based on US and internationally recognized standards” and sought to “hold [MNCs]... liable in US courts if they are in violation of the Code” (“McKinney Introduces Landmark,” 2000). The bill failed on all three attempts (Wallace, 2014, p. 283).

Canada: In 2009, Liberal MP John McKay introduced a bill for *An Act Respecting Corporate Accountability for the Activities of Mining, Oil or Gas in Developing Countries* (which became known as the “Responsible

Mining Bill”) to the Canadian parliament (Macklin and Simons, 2014, p. 260). It was, he said, a “modest” bill with the stated aim of ensuring “that corporations [engage] in mining, oil or gas activities...in a manner consistent with international best practices and...to international human rights standards” (Macklin and Simons, 2014, p. 262). Mining companies lobbied forcefully, claiming that the Responsible Mining Bill would put them at a competitive disadvantage globally, and the bill ultimately failed (Macklin and Simons, 2014, p. 264).

Australia: The Australian Democrats introduced a bill for the *Australian Corporate Code of Conduct Bill 2000*, which was somewhat broader in scope than the U.S. and Canadian proposals. It would have compelled a wider group of MNCs to comply with specific human rights and other standards, and to submit a compliance report to the Australian Securities and Investment Commission (Macklin and Simons, 2014, p. 266). The bill, which was dismissed by the Australian government as “impractical and unwarranted” and a potential source of friction with other nations, ultimately failed (Macklin and Simons, 2014, p. 266).

Recommendations for Revisions of the U.S. NAP

In light of these failed legislative efforts to require human rights compliance in the United States, Canada and Australia, the U.S. NAP will likely need to focus on encouraging (rather than mandating) compliance with the Guiding Principles if it is to avoid significant resistance from the business community and within Congress. Moreover, the U.S. NAP should seek to build upon (rather than override) individual and industry-led human rights initiatives, such as the efforts of Gap,

Nike and VF. Macklin and Simons support this view, arguing that the regular defeat of “hard law” initiatives demonstrates a definitive preference for “soft norms” (Macklin and Simons, 2014, p. 11). In the current environment, they conclude, “compliance with...human rights responsibilities is to be monitored and enforced by the courts of public opinion” (Macklin and Simons, 2014, p. 4).

The U.S. NAP has the potential to address, and substantially to improve compliance by U.S.-based MNCs with the standards and expectations set out in the Guiding Principles. In particular, future revisions of the NAP, building on its current strategies, could seek:

- To encourage greater consistency and comparability among the human rights-related policies and reporting of U.S.-based MNCs;
- To encourage the development of industry level best-practices and/or norms in the area of human rights-related policies and reporting;
- To improve the ability of consumers, NGOs and other stakeholders to access, directly or through service providers, human rights-related policies, timely reports and data relating to U.S.-based MNCs, and to compare and contrast such information; and
- To encourage greater (and ultimately full) compliance by MNCs with the Guiding Principles in terms of substantive scope, scope of application, due diligence/response/tracking, transparency, and effective grievance/remediation (and possibly other relevant matters).

Reforms: Disclosure, Public Procurement & Public Contracting

The NAP touches on three areas which,

arguably, hold significant promise for improving compliance with the Guiding Principles, and where reforms could be achieved with a relatively “light touch” approach, namely: disclosure-based legislation, reform of U.S. government procurement policies and reform of U.S. government contracting practices.

Disclosure-based legislation: The Guiding Principles state that, in meeting their duty to protect human rights, States should “[e]ncourage, and where appropriate require, business enterprises to communicate how they address their human rights impacts” (emphasis added) (“Guiding Principles,” 2011, p. 4). The Interpretive Guide suggests that governments can support efforts to improve transparency in relation to business and human rights by clarifying their expectations regarding disclosure of information on human rights due diligence and related impacts. Accordingly, the U.S. NAP process should review and consider the potential need for/benefits of new legislation requiring MNCs to make periodic disclosures regarding their human rights policies, performance and/or risks. Careful consideration should be given to the nature and scope of the information to be disclosed, the frequency of disclosures and the legal consequences of inaccurate or incomplete disclosure.

Any disclosure-based approach in the United States must be fashioned in a way that does not violate the right to free speech guaranteed by the Bill of Rights’ First Amendment. Based on recent precedents, the available theories for regulating disclosure by MNCs would appear to include: truth in advertising, aimed at protecting consumers; mandatory disclosure, aimed at informing the public generally; and securities law disclosure obligations, aimed at protecting investors. The issues associated with, and relative merits of,

each are discussed below.

Truth in Advertising: In *Kasky v. Nike*, a claim was brought against Nike under California’s competition and false advertising laws alleging that public statements made by Nike to the effect that it had not been complicit in the mistreatment of foreign workers were false and, therefore, actionable. Nike did not seek to establish that its statements were accurate, but argued that “even if it had made factual misstatements...they were fully protected under the first amendment” (Vladeck, 2010, p. 1050). The California Supreme Court decided that Nike’s statement involved “commercial speech” and, therefore, was entitled to less First Amendment protection than “political speech” (Vladeck, 2010, p. 1049). Nike appealed to the Supreme Court of the United States, but the court declined to consider the First Amendment issues. Nike then settled Kasky’s claim, reportedly for \$1.5 million.

Based on the California court’s decision in *Nike* (and assuming the U.S. Supreme Court does not, in some future case, reach a different conclusion), the U.S. federal and/or State governments could legislate to prevent misrepresentations by MNCs and others concerning human rights matters on the grounds of consumer protection. It is, however, unclear whether requiring disclosure of human rights information (e.g., the extent of a business’ compliance with the Guiding Principles) also complies with the First Amendment. There is a risk that courts would view attempts to require human rights disclosure on grounds of “consumer protection” as entering the realm of political speech. This is particularly true when (as is often the case) U.S. consumers are not harmed in any way by the human rights failings of businesses whose products they purchase.

Informing the Public: On January 1, 2012, California’s *Transparency in Supply Chains Act of 2010* came into effect (“CA Transparency in Supply Chains Act,” 2011). The law requires all retailers and manufacturers that do business in California and have revenues in excess of \$100 million (“CA Transparency in Supply Chains Act,” 2011) to disclose publicly their efforts to “eliminate slavery and human trafficking from their supply chains” (“CA Transparency in Supply Chains Act,” 2011). The law also requires that this information be available on websites and presented in a way that is easily accessible and understood (“CA Transparency in Supply Chains Act,” 2011). Interestingly, the law does not require companies to remedy any human rights abuses or adopt any particular human rights policies, only to disclose their practices (“CA Transparency in Supply Chains Act,” 2011). The law is focused on the provision of information, generally, and does not purport to be grounded in a need to protect consumers or other members of the public. It appears to be premised on the assumption that MNCs will be motivated to address human rights issues within their supply chains in order to avoid disclosing information that could damage their brand or reputation. While the California approach is worth considering in the context of the U.S. NAP, the legislation has clear “political” motivations and, accordingly, its constitutionality, which has not yet been tested in the courts, remains doubtful.

Protecting Investors: A limited but relevant precedent for addressing human rights-related issues in the context of U.S. securities laws is found in *The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010* (Dodd-Frank),¹⁷ which reformed U.S. financial regulations following the recent global financial crisis. Section 1502 of Dodd-

Frank imposed new reporting requirements on SEC-registered companies concerning their sources of “conflict minerals” and mandated the SEC to make implementing rules. This provision arose due to concerns in Congress “that the exploitation and trade of conflict minerals originating in the Democratic Republic of the Congo and adjoining countries...[was] helping to finance conflict characterized by extreme levels of violence in the eastern Democratic Republic of the Congo, particularly sexual- and gender-based violence, and contributing to an emergency humanitarian situation” (Ayogu and Lewis, 2011). The conflict mineral provisions in Dodd-Frank have been controversial, and the subject of numerous legal challenges. To date, the constitutionality of the provision and its related SEC rules has not been finally determined¹⁸. However, commentators have argued that the increasing potential for damage to investors’ interests in the context of human rights violations linked, directly or indirectly, to U.S. publicly-traded companies (especially MNCs operating in “consumer-facing” industries) provides sound basis for U.S. securities laws to require enhanced human rights-related disclosures (Ferlauto)¹⁹.

One disadvantage of addressing human rights compliance through enhanced U.S.

securities law disclosures is that this reform would not apply to private companies or MNCs whose shares are not registered with the SEC. For the same reason, reforms based on investor protection could be criticized for creating an uneven playing field in which listed U.S. public companies (such as Gap, Nike and VF) are subjected to a greater human rights compliance burden than their competitors. One answer to this criticism is that such a burden is the price of accessing the U.S. capital markets, which can only function properly if investors have full disclosure of all material risks.

Government Procurement Policies: The Guiding Principles provide that “States should promote respect for human rights by business enterprises with which they conduct commercial transactions” (“Guiding Principles,” 2011, p. 8). They further note that “States conduct a variety of commercial transactions with business enterprises, not least through their procurement activities” (“Guiding Principles,” 2011, p. 8). The UN Working Group recommends “[i]ntroducing human rights conditionality in public procurement” such as by making use of human rights due diligence, considering human rights when selecting contractors and including human rights

¹⁷Note, however, that these provisions have recently been targeted for elimination by the Trump administration for reasons unrelated to the Constitution (Ewing, 2017).

¹⁸The D.C. District Court originally upheld the rules for Section 1502. The D.C. Circuit court, although it upheld the bulk of the rules and the SEC’s administrative authority to promulgate them, struck down as a violation of the First Amendment the part of the rules requiring issuers to describe certain products as having been “not found to be DRC conflict free” (Ruane and Seitzinger, 2015, p. 1). On July 29, 2014, the U.S. District Court of Appeals for the D.C. Circuit overruled an earlier panel decision in *NAM v. SEC* to the extent that the panel held that a “rational basis standard of review” could not be applied to the requirements because the requirements were imposed for reasons other than the prevention of consumer deception. As a result of this ruling, a rehearing of the First Amendment questions posed by *NAM v. SEC* has been granted by the original appellate panel (Ruane and Seitzinger, 2015; Ferlauto)

¹⁹Gap notes “many companies have recognized that acting responsibly is now a basic expectation, and that lapses bring significant risk to their reputation and ability to operate” (“Gap 2011/2012 Responsibility Report,” 2012, p. 28).

requirements in all contracts (“Guidance on NAPs,” 2014, p. 22). The U.S. government, as well as State governments, are large consumers and have significant purchasing power in certain sectors. It would be relatively straightforward for procurement policies at the federal and State level to be amended to address human rights issues. One disadvantage of this approach is that it would not have any impact in sectors where government is not a major consumer, although measures to push due diligence and other obligations up supply chains might partially address this concern. Consideration should be given to ensuring that any federal procurement reforms include mechanisms to induce or encourage similar reforms at the State level (“Guidance on NAPs,” 2014, p. 24). In this context, the boycott of VF branded apparel by several State universities raises an intriguing question: What if every State university in the United States were to require suppliers of footwear and apparel products (including their popular branded sportswear) to comply with the Guiding Principles under the terms of their supply contracts?

Government Contracting Practices: The Guiding Principles also provide that “States should exercise adequate oversight in order to meet their international human rights obligations when they contract with, or legislate for, business enterprises to provide services that may impact upon the enjoyment of human rights.” The UN Working Group suggests that governments consider “[i]ntroducing human rights provisions into all [government] contracts with organizations that provide public services, especially where a risk of adverse human rights impacts is identified” at both the national and sub-national level (“Guidance on NAPs,” 2014, p. 23).

A comprehensive approach to requiring

human rights compliance in all U.S. federal and State-level government contracts would have the benefit of casting a wider net, and inducing greater human rights compliance, but might prove difficult to administer and/or enforce in practice. This problem could potentially be addressed by introducing minimum thresholds or similar measures. If federal and State-level governments in the United States were to set out publicly, and in a consistent manner, the measures that should be taken by business enterprises to meet their human rights-related responsibilities under the Guiding Principles, this would have an important “signalling effect,” and could accelerate development of industry-based human rights norms.

Conclusion

An evaluation of the human rights policies and reporting of three leading MNCs (Gap, Nike and VF) operating in the global footwear and apparel industry has identified numerous examples of material non-compliance with the Guiding Principles, which represent the international community’s definitive statement on the responsibility of business enterprises with respect to human rights. This evaluation has also disclosed significant divergence of human rights-related practices among the MNCs considered, each of which has long been at the “cutting edge” of developments in the field of business and human rights. In the current political and legal environment, it is argued by some that human rights compliance by MNCs must principally be judged “in the courts of public opinion.” If so, then the evident failure of human rights-related “best practices” to emerge within the footwear and apparel sector is concerning, insofar as consumers and other stakeholders seeking to understand and/or compare human rights compliance records

currently face difficult challenges. Future iterations of the recently-published U.S. NAP will provide an opportunity to consider and develop “light touch” reforms and other measures that, while not compelling compliance with the Guiding Principles, would strongly encourage it, while at the same time supporting the development of industry-based “best practices” and providing key stakeholders with the tools necessary to hold MNCs accountable. Such measures should, it is argued, include enhanced human rights-related disclosure requirements under U.S. securities laws and reforms of U.S. federal and State-level government procurement and contracting policies.

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