Occasions

A collection of prize-winning works produced by students of the Program for Writing and Rhetoric

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"Insomnia becomes a self-fulfilling prophecy that can persist indefinitely" - Janine Zeitlin

What the hell is wrong with my body? I often ask this question each morning I pull myself out of bed after another consecutive night of restless, inadequate sleep. Each a.m. resurrection brings a distinct feeling of nausea; I fight the urge to heed the advice of "following your gut" and resume the staring contest with the back of my eyelids. As it turns out, proper functionality depends on sleep. While my brain understands this fact, logic falters when I find myself awake in the early hours of the next morning. The irony becomes truly apparent when I consider my chosen academic and career path: molecular biology and neuroscience. Despite knowing the consequences of a lack of sleep—from its negative impact on hormonal balances to neurological functionality—I continue to stay up well past a reasonable bedtime.

Counting sheep isn't the issue, nor that I don't feel tired. In fact, I find that I spend most of my time tired; sleep deprivation has become infused with my very essence. Endless late nights are likely a consequence of overfilled days—the to do list grows and the boxes checked lag behind. Perhaps I stay up late because I dread another never-ending, stressful day that blends into the monotony of other days ending in "y." These days, I don't know whether it's the former or the latter.

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Those late October nights approached dawn more rapidly than one might expect. Some uneasy nights I anticipated—living in a new place, burdened with new responsibilities, sleep loss made sense. But one night turned into a few, and a few became a pattern. Was this a part of growing up? I sought answers from a blackberry flavored gummy; Melatonin, L-Theanine, and "Botanicals" (Chamomile, Passionflower, and Lemon Balm) promised to "soothe & relax." What started as a short-term fix became a long-term crutch. Did the asphyxiating pressure of self-imposed expectation keep my eyelids from closing? Perhaps the creeping feeling of loneliness that stalked me into the night? A myriad of possibilities, all of which likely contributors.

What to do when given only 24 hours in a day, 7 days in a week? Certainly, I cannot waste at least 8 of these precious hours nightly doing nothing. Too many chapters need to read, too many labs to prepare for, too many concepts to master. The need to do more gnaws at me—my inner perfectionist strives to do more with much less. When the sun sets, the intense glare of a desk lamp

replaces its rays. When the quiet of night falls, the laptop screen rises. Days advance relentlessly, not failing to break formation as I'm trampled underfoot. The clock follows a similar march, minute by minute, hour by hour, until the digital letters spell out another night come and gone.

Janine Zeitlin describes suffering a similar fate in "Sleepless in Any City," as she details her own clash with the monster called insomnia. Zeitlin struggles to obtain the sleep many take for granted, painting the picture of a woman driven mad by the incessant noise that plagues her as she seeks rest. When she authored the piece, Zeitlin lived in Madrid, studying Spanish and the poet Federico García Lorca. Lorca's work often revolves around one theme: suffering. Even in revealing the setting of her struggles, Zeitlin begins the placement of parallels between herself and Lorca: both living in cities of another country, having left romance to study another language, and both with a fixation on the sufferings the city brings. Later in the text, Zeitlin would detail her own suffering, drawing on Lorca's work, quoting, "'Those who are hurt will hurt without rest'" (1). Zeitlin's reference of his work reveals the hardships she endures; ironically, her hurt comes from a lack of rest, feeding into an endless cycle she later explores. This piece becomes centered on the anxiety and frustration that arises from this cyclic problem created by a lack of sleep.

As night rears its head, so does Zeitlin's suffering. The night reminds her of the battle she fights with sleep: "Here, in [Lorca's] country, the evening is my enemy" (2). Her personification of the approaching night shows the credible threat it poses, suggesting that her struggle resembles warfare. The anxiety provoked by her lack of sleep heightens as the battle rages on. Uneasiness translates to hopelessness, as she comes to believe, "I will never sleep. My life will end soon because you need sleep" (3). Her hyperbole exemplifies her feelings of exasperation from sleep loss, as she fears the worst possible outcome. The casualties build and the morale plummets in the losing war she has waged against her anxious wakefulness. Zeitlin's anaphora further reinforces the desperation she experiences, repeating more "I will" statements: "I will never get sleep [. . .] I will get acne [. . .] I will be ugly and dead" (4). Each assertion conveys her perception of the negative impacts her sleep deprivation will continue to have on her wellbeing, ranging from minor blemishes all the way to death. The enemy Zeitlin faces lays siege to her perturbed mind—the end of which may only from her demise.

The feeling of hopelessness that Zeitlin experiences translates to my own experience in chasing a restful night's sleep. Her rhetoric encaptivates the helplessness that derived from the whirlpool insomniacs get caught in. Zeitlin references the University of Maryland Medical Center's definition of psychophysiologic insomnia, that details, "'[a] patient broods over the inability to sleep, the consequences of sleep loss, and the lack of mental control. . .'" and that, once established, "'insomnia becomes a self-fulfilling prophecy that can persist indefinitely'" (5). Zeitlin chose this definition with intention; her inclusion of a quotation describing an insomniac as brooding over sleep loss implies a sort of animalistic relationship between the sleeper-to-be and a good night's rest. The obsession an insomniac has with sleep reflects the same obsession a mother might experience nurturing her eggs—and Zeitlin eagerly waits for her sleep to hatch.

The lens of the self-fulfilling prophecy best describes the loss of sleep I experience: I cannot sleep because I cannot relax, and therefore I cannot relax because I cannot sleep. The cycle persists, fueled by anxiety. The relentless tides of a restless night suck the insomniac back under, again and again. This feedback loop spirals the insomniac deeper into the waters of despair, threatening to drown them. As Zeitlin tries to capture the elusive sleep creature, she tells herself, "*Try not to think about sleeping*, I think, which means that's precisely what I'm thinking" (original italics, 6). Attention to the problem exacerbates her restlessness, worsening the cyclic nature of the sleep theft she experiences. Sleep deprivation creates stress; stress creates restlessness; restlessness creates sleep deprivation. The more mental energy consumed through focus on her insomnia, the more it afflicts her.

"Once darkness settles, the sounds begin" (7). For Zeitlin, the sound comes from her own heart, beating out a cacophony of anxiety and restlessness. For myself, the sounds reside within my own skull, the endless stream of thoughts and to-do's bouncing around and causing a racket. A symphony of sounds haunts the insomniac, a distinct tune assigned to each aspiring dreamer. Each consecutive night of tossing and turning feeds into the next; anxieties of another sleeplessness night become the self-fulfilling prophecy of the insomniac. The more effort expended in turning down the noise, the louder it seems to grow, until the volume deafens and sleep appears unattainable. Though it seems hopeless, one night of sleep could break the cycle. The harder one focuses, the harder that the goal of sleep seems to attain. Just one of these nights could hold the elixir to the timeless ailment. To taste the sweetness of a night's rest seems all but impossible. But could that night be tonight?

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JAKE LAMAZOR
The Age of Hubris: Risks and Benefits of Geoengineering
First-Year Long Form, 1st Place

Introduction

When humans first migrated out of Africa, they spread across the world like wildfire, disrupting and reordering ecology to their benefit everywhere they went. This change was so sudden and great that countless species were driven to extinction. Many animals simply couldn't compete with humans. But those who could compete or coexist with us entered into a radically different ecological era in which humans were the global apex predator. As apex predators, life on this planet has adapted to our presence and become dependent on us in many ways.

It's easy to hear this with the ears of a modern, ecologically conscious human and feel a pang of dread or guilt. Afterall, isn't the current instability of the global ecosystem our fault? Isn't it a result of our extreme manipulation of the natural world? Wouldn't the planet be better off if we just *stopped* interfering with the processes of nature?

The answer is not that simple. The fact is, *Homo sapiens* is a biological species, and as such, we have no choice but to participate in this planet's ecology. Even the current *geological* era—the Anthropocene—is defined by human activity on and manipulation of the planet.

Recently, our exploitation of the natural world has reached an all-time high. This has coincided with the production of some of the most advanced technology humans have ever created, some of which is powerful enough to begin reversing human caused climate change. This process of geoengineering, however, has been met with much skepticism and fears of playing god.

So, then why is it that we have second thoughts when we have the chance to save ourselves by manipulating our environment, but we have no problem manipulating our environment in obviously destructive ways? When we are destructive to the Earth on massive scales, it is not for the sake of destroying the planet. There is some practical, economic, and earthly motivation. Maybe people are so anxious about geoengineering because the goal is explicitly grand and divine: saving the human race and the planet. But if we don't embrace our role as god, and soon, we may witness the extinction of humanity.

The Great Chain of Being

  The notion of a Great Chain of Being dates all the way back to the days of Plato and Aristotle. This philosophy spread around Europe and became especially popular during the Renaissance. The key idea of the Great Chain is that the universe is structured hierarchically, with God at the very top, the angels below him, humans below that, and so on until we reach plants, rocks, and minerals at the very bottom of the chain. The Chain of Being has widely been accepted in Western thought, and we still feel its legacy today (*Britannica*).

  This is not just some gratuitous list. For thousands of years, people truly believed that to defy this "natural order" would bring enormous consequences. Many monarchs, for example, used the Great Chain of Being to legitimize and secure their power. The thought was that God created a social order on Earth as well handpicked the people (and lineages) who would hold power. To revolt against these rulers, or to try to seize power without God's blessing, would cause misfortune and suffering on a great scale.

  In order to understand how the Chain of Being affects the collective consciousness today, it's helpful to consider mythologies that are still widely circulated. In the famous myth of Prometheus, for example, the titan steals fire from the gods and gifts it to humanity. In return, Zeus sentences Prometheus to eternal suffering. As if his punishment were not enough, the gods also created Pandora, the first woman, and gave her as a gift to man. Included with her dowry was a mysterious, cursed box. Her natural curiosity led her to open the box, which released evil and disease into the world, ending the golden age of humanity.

  Consider too the story of Adam and Eve. God strictly forbids them from eating the fruit of knowledge. Eve eats the fruit, and, for her transgression, they are exiled from the paradise of Eden.

  In the modern era, this archetypal myth is repeated in the Mary Shelley's novel *Frankenstein*. Viktor Frankenstein figures out how to reverse the processes of death and reanimates a corpse. Clearly, he has wandered into the domain of God. His monster is the first person not born of a woman since God created Adam and Eve. As punishment for his sin, Frankenstein's monster kills everybody Viktor ever loved and haunts his creator for the rest of his days.

  What all these stories have in common is a warning. Clearly, for thousands of years, people have been wary of the hubris that so often accompanies the acquisition of knowledge and power. It is common belief that to defy the gods brings suffering and consequence. Of course, these myths, and the concept that new knowledge brings new danger, has never stopped human curiosity. It is human nature to wonder and discover (Peters).

Geoengineering

Geoengineering is defined by *Encyclopedia Britannica* as "the large-scale manipulation of a specific process central to controlling Earth's climate for the purpose of obtaining a specific benefit." It is a fairly modern notion, which didn't really emerge until after World War Two. There are two main schemes employed by geoengineering projects: Carbon Dioxide Removal (CDR) and Solar Radiation Management (SRM). CDR focuses on creating artificial CO_2 reservoirs, and attacks the root of the problem (namely, atmospheric CO_2). SRM is focused on increasing the amount of sunlight reflected back into space. SRM does not address the root issue but rather seeks to mitigate the damage done by a runaway positive feedback loop[1] (Geoengineering).

There are several notable CDR methods. One is ocean fertilization, which aims to increase phytoplankton populations. The more plankton photosynthesizing at once, the more CO_2 they collectively capture. When they die, they sink to the ocean floor, and eventually become fossilized. Carbon burial is another technique that would pump CO_2 into airtight reservoirs underground or under the ocean.

One SRM technique includes stratospheric sulfur injection, which mimics the cooling effects of volcanic eruptions. The particles and sulfur dioxide released by volcanoes disperse incoming radiation. An artificial aerosol layer could be created by launching sulfur particles into the stratosphere with canons or floating them up with balloons. Orbital mirrors could also serve as a less invasive alternative to stratospheric sulfur injection, although it would be difficult to create enough mirrors to reflect a considerable amount of sunlight. Launching a fleet of mirrors into space might also prove difficult and polluting (Boyd).

Aside from moral and ethical objections to these techniques, there are also very practical concerns raised by each of these methods. As we have never intended to alter the ecosphere on such a grand scale, there is no telling if these schemes could be equally as damaging as our rampant fossil fuel consumption.

The definition of geoengineering is in need of expansion if it is to become popular. Although geoengineering is a modern idea, *Encyclopedia Britannica*'s definition of it could be applied to human behaviors dating back tens of thousands of years. Ancient indigenous people from North America to Australia, for example, inadvertently sculpted their ecosystems with controlled burns.

Early on in the 20th century, the Martu, Australian Aboriginals, were removed from their ancestral land. Many animals disappeared with them. This seems counterintuitive. Wouldn't we expect an ecosystem to rapidly rebound and flourish without the

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[1] A positive feedback loop prevents a system from reestablishing equilibrium. In nature, we observe positive feedback loops when the product of a reaction leads to in an increase in that reaction. We are currently experiencing a positive feedback loop of CO_2 emissions in which increased CO_2 concentrations raise Earth's temperature, which releases CO_2 stored in ice and also reduces Earth's natural reflective surface area.

presence of humans? It turns out the idea of humans as antithetical to wilderness is unfounded. The Martu have been managing their desert ecosystem with controlled burns for approximately 48,000 years; plenty of time to establish themselves as an integral part of Australian ecology. Towards the end of the 20th century, the Martu returned to their ancestral lands and resumed their traditional hunting practices, much to the benefit of their ecosystem. Animals and plants that disappeared in their absence quickly returned, and balance was restored (Klein).

Native American hunters also utilized fire for hunting. In the North American grasslands, we find charcoal layers in the geological strata, which are indicative of drivelines. These fire drivelines were used to kill bison *en masse*, funneling them towards a cliff or other precipices. The fires also attracted new bison, who prefer to graze on recently burned patches. Small bands of hunter gatherers were able to actively manage vast swaths of land, without damaging the ecosystem (Roos).

Although these fire-hunting techniques are only one example, it is clear that humans have been managing ecosystems and manipulating very basic climatological forces for millennia. Humans continue to meddle in the functioning of the ecosphere to this day. On every continent, humans build massive dams to supply our ever-growing demand for water. These dams completely reorder the preexisting ecology by relocating the most vital resource. I do not mean to say that dams are a perfect technology, or that they benefit the ecosystem. Even though we have been building dams for thousands of years, they still occasionally collapse. They can also be very damaging to the watersheds that they alter. They can cause huge imbalances in the ecosystems they are situated within. And yet, we still build them. They are a practical technology that allow humans to inhabit previously uninhabitable lands.

Deforestation also affects the climate in massive ways, but that doesn't prove to be a moral obstacle. We chop down trees to clear room for agriculture and livestock, for timber, paper, etc. In both cases—dam building and deforestation—the motivation is far humbler than saving humanity and preventing climate change. Yet both these behaviors alter the biosphere. So why can't we change the climate intentionally, and for a noble cause?

One of the few plans that genuinely fills me with hope is Pleistocene Park. This national park in Siberia has some lofty goals and (mostly) realistic means of achieving them. The creator of this park, Nikita Zimov, plans to recreate the northern subarctic steppe grassland ecosystem, which reached its zenith in the Pleistocene epoch, during the last ice age. Zimov has been clearing trees and introducing grazing animals (which help prevent trees from returning) to the park in an attempt to extend the grassland's range. But why? The grasslands aid us in our bid to halt climate change in several ways. For one, grass consumes carbon as it photosynthesizes and stores that carbon in its tissues. Grass grows much faster than trees, and therefore consumes carbon much more rapidly than the forests Zimov wishes to replace. In the winter, when grasslands become covered by snow, they act as a natural mirror and reflect more solar radiation back into space. Forests are dark and absorb much of the solar radiation that hits them. This is consequential not only for our atmosphere but also for the permafrost, which rests under Pleistocene Park, the tundra, and the taiga. Permafrost is one of if

not the largest natural reservoirs of CO2, and it is beginning to melt all around the globe. If this happens, we will have truly reached the point of no return. While trees are natural heat wells, and expedite the melting of the permafrost, grass offers little to no insulation. This means cold could easily penetrate deep into the soil, preventing catastrophic permafrost melting.

Zimov hopes to one day have herds of resurrected woolly mammoths in his park, which could clear forests quickly and in an environmentally friendly manner. Obviously, to those worried about playing God, Zimov is the devil. And yet, he is untroubled by such accusations: "Playing God doesn't bother me in the least. We are already doing it. Why not do it better?" (Andersen).

Although genetically engineered mammoths could still be decades away, Pleistocene Park does not need them to succeed. Much like the park's name, I believe these mammoths are primarily a means of bringing much needed attention to the park's mission. Pleistocene Park is so elegant and simple; it does not require us to dump fertilizer in the ocean, or spray aerosols into the atmosphere, or launch mirrors into space. It only requires us to clear trees, something humans have proven very capable of doing.

Conclusion

Like it or not, geoengineering is about to become an essential survival tool. Our current climate crisis is too far along to be reversed or even mitigated effectively by passive measures such as regulations, and reduced emissions. Geoengineering is not a replacement for climate conscious lawmaking and behavior. But it is an active measure that, when coupled with regulations and other passive means of curbing climate change, could be powerful enough to avoid the massive droughts, wars, famines, etc. predicted by our most accurate models.

For many, the thought of geoengineering raises some serious concerns over playing God. Manipulating the environment on a scale proposed by most of these projects appears to be dangerously hubristic. While it's true that many of these projects would be the largest, most ambitious endeavors *knowingly* undertaken by humanity to alter the environment, this wouldn't be the first time we have left our mark on the ecosphere. Every day, we knowingly and willfully pump thousands of tons of greenhouse gases and pollutants into the atmosphere as a result of our fossil fuel dependency. Unless you disagree with the overwhelming scientific consensus, this has horribly adverse effects on the climate. What do we really have to lose by making an effort to maintain conditions that are hospitable for human life? Are we not already risking everything by continuing "business as normal?"

Yes, there are novel risks introduced with geoengineering. But when has unknown danger stopped humanity from chasing new knowledge and power? In some of our most widespread myths, it is acknowledged that acquirement of knowledge often comes at a heavy cost. Usually humanity is irreversibly altered by this knowledge. But these myths don't suggest that we stop pushing our boundaries, that we stop discovering and stop questioning. To do so would be to suggest that we stop being human. These myths are

meant as cautionary tales. I do not suggest that we dive headfirst into some ill-conceived geoengineering scheme. Rather, we need to begin taking calculated risks, beginning with the decision to develop geoengineering plans. We are not going perfect geoengineering on our first try. There will be many scary, dangerous hiccups along the road. But the sooner we can embrace geoengineering, the sooner we can fail at it. The sooner we fail, the sooner we'll know how to succeed.

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CLAIRE RICHARDSON
The Death of the Gender Dichotomy in Sports
First-Year Long Form, 2nd Place

Is competition fair when transgender athletes are allowed to compete? This is a question posed many times over the past 40 years and answered by people of all opinions and beliefs. As our society moves towards being more accepting and generally inclusive, we seek enormous steps to improve our answers to this question. In this progressive new world, where being inclusive becomes more of a must than a maybe, more people than ever support the inclusion of transgender athletes in sports at all levels. Even so, discrimination, harassment, and lack of consistent policies still run rampant, and dissenters fervently call for the barring of trans females from sports. However, for such a widely debated issue, there is a surprising lack of science to support either side of the argument. Going forward, in the interest of inclusiveness and fair competition to everyone, gender binary and non-binary alike, researchers and sports organizations need to continue research to clearly determine the effect of hormone treatments, surgery, and testosterone levels on performance. Drawing on this research, they must encourage informed conversation on the subject of transgender athletes in sport and help rewrite policies that eliminate discrimination and ensure fair competition for all athletes.

Participation in sports benefits every person, regardless of gender, through development of community, teamwork, stress reduction, and improved concentration. It is for this reason that we need inclusive policies and teams: everyone deserves to benefit from athletics. In a survey conducted by the Public Region Research Institute, researchers discovered that 83% of Americans generally agree that both men and women benefit from participation in competitive sports.[1] This represents a big step from 50 years ago, before Title IX was introduced, when women were barely allowed to compete at all. This survey clearly illustrates the changing mindsets of many Americans. However, these results beg the question: why should these statistics be any different for transgender individuals? There is nothing fundamentally different about transgender individuals that would prevent them from benefiting from competition and involvement. Sports are proven to have numerous positive effects on social, emotional, and physical well-being. While physical benefits are plentiful, such as reduced stress and increased fitness, they are simply the tip of the iceberg. There are also numerous emotional and social benefits associated with competition in sports. Through learning to work with a team, players develop community, socialize with each other, and discover ways to resolve conflict and disputes. Through the act of engaging with friends and peers, sports develop positive self-esteem and teach children, teenagers, and even adults about leadership and self-worth. Ultimately, competition and athletics provide an opportunity to better oneself, and this should provide a reason to continue conversation on transgender participation in sport, as well as an incentive to rewrite discriminatory policies. Everyone deserves a chance to play a sport regardless of their gender, whether that be at a high school level or in the Olympics.

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[1] Researchers from University of Nottingham Report Details of New Studies and Findings in the Area of Sports Medicine," *Medical Devices & Surgical Technology Week,* (June 4, 2017): 735. https://link-gale-com.colorado.idm.oclc.org/apps/doc/A493147241/ITOF?u=colo boulder sid=ITOF&xid=f157372f.

While support is growing for the inclusion of transgender athletes in sport, some still raise major concerns about the fairness of allowing trans participation, especially at elite levels. When transgender athletes first entered the competitive scene 50 years ago, they faced enormous amounts of backlash and a startling lack of support. However, with the changing political and societal landscape also came a shift in mindset, and for the first time, there is a large-scale movement encouraging inclusion and participation for all genders. This is where the problem begins. As this movement grows in force and influence, it also faces considerable conservative backlash. Transgender athletes, as well as other nonbinary athletes, pose a dangerous challenge to traditional ideas of gender and sex. Historically, sports have been used to enforce the notion of gender as binary. The perceived distinct biological differences between males and females, as well as the two clearly defined categories of sports, were viewed as conclusive proof that there were only two genders. Confusing the terms gender and sex, many people used sports as a way to halt transgender inclusion in society, stating that if sports did not recognize their existence, neither should the rest of society. As a result, any who didn't automatically fit into one of the two categories weren't allowed to compete in the interest of keeping sports segregated. Now, with increasing concern over equal participation and the gradual acceptance that gender does not have to be binary, it is time for new policies and mindsets.

Although there is increased support for trans participation in sports, fairness remains a major topic in discussions. There is some concern over trans males being injured in men's sports, but most of the concern over fairness arises from the participation of transgender females in women's sports due to the supposed advantage testosterone provides in competition. The public is incredibly divided over this issue, with 74% of people claiming that trans males should be allowed to compete while only 34% believe trans females should, especially at elite levels.[2] Much of the difference in opinion results from the perceived biological advantage men have over women, and many worry that allowing biological males to compete with women will set impossible standards for competition in women's sports – standards that biological females are unable to match.

These concerns over fairness bring to attention a very important fact: sports are not fair, nor have they ever been. Throughout history, sport has invited inequalities regarding wealth, opportunity, and natural advantages such as longer legs or greater lung capacity. Some people are simply better equipped to succeed in the world of competitive sports. For example, many athletes from poorer backgrounds are never given the chance to succeed. Training and equipment cost money and time that a lot of people do not have and playing at a competitive or professional level is often impossible. This fundamental fact raises several questions that supporters of transgender participation ask the world to consider: why worry about fairness only now? Are supposed biological advantages of males over females so different from natural advantages or differences in wealth? In order to give transgender athletes a fighting chance, these questions must be answered.

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[2] Ibid.

transgender females in women's sports. Some of their concerns are invalid, but some raise legitimate questions that require research and conversation to answer. The first concern is the incorrect assumption that trans women are not "real" women.[3] This stems from the notion of gender as binary and the assumption that people can only ever be one gender: the one assigned at birth. There are several problems with this particular concern, starting with the fact that it is discriminatory and implies that trans women don't deserve an equal opportunity to compete. It also tends to ignore the effect that hormone treatment and/or surgery can have on a body. Most studies have proven that hormone treatment for several years and sexual reassignment surgery change the body drastically, in such a way that most of what makes someone a male or a female disappears. A trans female may have been born male, but after undergoing medical procedures, she is for all intents and purposes a woman. In a world that slowly moves toward increased social acceptance and inclusion, this particular mindset is dying out, but it still remains an arguing point in this discourse.

The second concern is also largely unfounded, but some people worry that men might be tempted to pretend to be transgender in order to dominate competition in women's sports.[4] Aside from the required hormone treatments and the social stigma that dissuade people from doing this, there has not been a single instance of fraud in over 40 years.[5] As such, this assumption holds no ground.

The third concern, however, does raise a legitimate issue: the supposedly automatic biological advantage that trans women have over cis-women. Even so, there are several problems surrounding it, with the first being the word "automatic." It tends to assume that all men are biologically better than all women at sports, which is too large a generalization and ignores the overlap between male and female bodies. Strength, height, and weight differ within each gender, and some women are most assuredly stronger than some men. It also suggests that bigger and stronger always means better at athletics, which is simply not true. Even within men's and women's sports, there are large discrepancies among height and weight. Some females are much stronger and much taller than others, and some males are much smaller and much weaker than others. This doesn't necessarily mean that one body type is better than another in competitive sports. Perhaps the biggest issue with this particular concern, however, is that it perpetuates the correlation between female and frailty.[6] By assuming that men are automatically and always stronger than women, this concern reinforces society's ideas that women are "less than" and increases the likelihood that they will be seen as weak. However, in spite of the problems that arise, the legitimate side of the argument can't be ignored.

The concern that many people harbor over the unfair advantage that male bodies sometimes have in sports, especially those of strength or speed, must be addressed in the interest of fairness and equal opportunity. Studies show that biological advantage plays a

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[3] Helen Carroll and Dr. Pat Griffin, "NCAA Inclusion of Transgender Student-Athletes," *NCAA Office of Inclusion,* August 2011, http://www.ncaapublications.com/productdownloads/11INCL.pdf.
[4] Ibid.
[5] Pieper, Lindsey Parks, "Advantage Renée?," in *Transgender Athletes in Competitive Sport* (Abingdon, Oxon: Routledge, 2017), 15, https://search-ebscohost-com.colorado.idm.oclc.org/login.aspx?direct=true&db=nlebk&AN=1526860&site=ehost-live&scope=site.
[6] Ibid.

The concern that many people harbor over the unfair advantage that male bodies sometimes have in sports, especially those of strength or speed, must be addressed in the interest of fairness and equal opportunity. Studies show that biological advantage plays a role in performance, and the advantage that testosterone provides in some sports is unmistakable. One study in particular, published in Endocrine Reviews, established that differences in testosterone between males and females "largely account for the sex differences in muscle mass and strength and circulating hemoglobin levels that result in at least an 8% to 12% ergogenic advantage in men," meaning that testosterone provides a significant physical advantage in competition.[7] Men have higher bone density, different muscle distribution, and higher lung capacities by nature. Even with hormone treatments, which weaken these natural advantages, they still exist. In fact, after one year of hormones, trans females still have elevated levels of testosterone. The normal level of testosterone in cis-females is anywhere from 0–1.7 nmol/L, yet transgender females often have significantly higher levels of testosterone, usually around 8–10 nmol/L.[8] Another study notes that "after one year of hormone therapy, [. . .] muscle mass remained greater" in trans females than in a typical healthy female.[9] If testosterone is proven to provide a competitive edge in sports, is it fair to allow these athletes to compete against cis-women? Although the IOC and the NCAA deem this to be an acceptable gap, many people object on the grounds that cis-females are harmed and disadvantaged by the greater strength and speed of their trans female counterparts.

Perhaps the best example of this advantage is Fallon Fox, a trans female MMA fighter who has been the subject of many news stories. While Fox did not initially disclose her status as transgender to the public, a reporter eventually forced her to reveal her secret after several major and controversial victories.[10] Fallon Fox met the IOC requirements for a transgender female athlete, including hormone treatments for a year before competing and levels of testosterone below 10 nmol/L. Even so, in each and every fight leading up to the reveal, she dominated the competition. The sheer ease and grace with which she defeated her opponents, as well as the force of her blows, led many to claim that she should not be able to compete in women's sports. The public claimed that the advantage she was born with was unfair and unsafe to her competition. After the reveal, she faced immense discrimination and public backlash, and no competitor has been willing to fight her since. While this example showcases the legitimate concerns over biological competitive advantage, it does not mean that trans athletes should not have a chance to compete. It simply means we must discover a way to address the argument, which can only be done through more research. While it is worth noting that genital reassignment surgery has been proven to eliminate most of these natural advantages, surgery is invasive and expensive. Requiring it for competition is

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[7] David J. Handelsman, Angelica L. Hirschberg, and Stephane Bermom, "Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance," *Endocrine Reviews* 39, no. 5 (2018): 804. https://link-gale-com.colorado.idm.oclc.org/apps/doc/A586026044/AONE?u=coloboulder&sid=AONE&xid=ed9a0c33.

[8] Taryn Knox, Lyndley C. Anderson, and Alison Heather, "Trans Women in Elite Sport: Scientific and Ethical Considerations," *Journal of Medical Ethics 45,* no. 6 (2019): 396. http://dx.doi.org.colorado.idm.oclc.org/10.1136/medethics-2018-105208.

[9] Arne Ljungqvist and Myron Genel, "Essay: Transsexual Athletes--when is Competition Fair?" *The Lancet* 366, (Dec 01, 2005): S43. doi:http://dx.doi.org.colorado.idm.oclc.org/10.1016/S0140-6736(05)67844-0.

[10] Pieper, *Transgender Athletes in Competitive Sport,* 15.

controversial, and altogether less inclusive than many would like. However, questions remain. Is there a compromise that provides fair competition and inclusion all at the same time? Is there a period of time after which hormone treatments lessen natural advantage to a point where it becomes negligible? The answers to these questions have not been discovered yet, but with more research on the effects of hormone treatment, they may be. With this research may also come more regular policies regarding trans participation in sports.

Although there is a general lack of regulation regarding policies that concern transgender athletes, the IOC and the NCAA recently made strides to establish standard and inclusive policies. However, these policies may still promote discrimination and disadvantage. In 2004, the International Olympic Committee established relatively strict policies for transgender athletes. These included requirements for reassignment surgery as well as hormone treatments for two years. The science behind the effects of surgery and hormone treatments supported these policies. However, the IOC changed these guidelines in 2015 "to adapt to current scientific, social, and legal attitudes on transgender issues."[11] The new policy no longer requires genital reassignment surgery, and instead only mandates that trans female athletes must have declared their gender to be female for four years and must have demonstrated testosterone levels below 10 nmol/L for at least a year before they are allowed to compete.[12] For trans male athletes, the requirements are non-existent. The IOC stated that "those who transition from female to male are eligible to compete in the male category without restriction."[13] These new policies were designed to be more inclusive and generally less invasive. Indeed, they allow and encourage more transgender athletes to compete in the Olympics, but a fundamental problem remains: there is little to no science supporting these new policies. The evidence is inconclusive on how much of an advantage elevated levels of testosterone provide trans females, but it is positive that an advantage exists. As expected, these policies brought about a public outcry, and when the NCAA adopted identical policies, many dissenters were furious. These policies place female athletes at a disadvantage, they claim, and insist that they discourage fair competition in women's sports. While the IOC and the NCAA certainly have the right idea in promoting inclusiveness, they may have taken one step too far. Inclusion and equal opportunity are incredibly important, but so is ensuring that inclusion doesn't harm the sport or the other athletes competing. In order to be sure that the competition is fair, the IOC and other sports organizations *must* look into effects of hormone treatments on musculature, performance advantages, and male bodies. They must have science to support their new policies, and if the science suggests inequality, they must readjust.

In spite of this new movement towards more progressive policies, many transgender athletes frequently face discrimination and harassment in sports due to the lack of consistency in policy and the public's continued debate over whether they should be allowed to participate. One example of this is the remarkable lack of regulation high school athletes still struggle with. Whether or not

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[11]Associated Press, "IOC rules transgender athletes can take part in Olympics without surgery," *The Guardian,* January 24, 2016, https://www.theguardian.com/sport/2016/jan/25/ioc-rules-transgender-athletes-can-take-part-in-olympics-without-surgery.

[12] International Olympic Committee, "IOC Consensus Meeting on Sex Reassignment and Hyperandrogenism," November 2015, 2-3.

[13] Ibid., 3.

transgender athletes are allowed to play on teams of their chosen gender is determined by the laws and policies of individual states.[14] As there is currently no federal mandate regarding this, the policy varies enormously from state to state. In some states, more inclusive rules have recently been enacted, which comply with IOC and NCAA standards. However, in other states, genital reassignment surgery and hormone treatments are still required while in others, transgender athletes aren't allowed to participate on teams at all.[15] Even when these athletes are allowed to play, they still face harassment and bullying while on the team. They are forced to share locker rooms with their birth gender, which makes many very uncomfortable and even discourages them from playing. Beyond that, they experience backlash from the prejudices many of their teammates harbor, such as assumptions of weakness or bias against transgender individuals in general. These biases and misconceptions can be countered through conversations and discussions, but most people are afraid to discuss transgender issues for fear of offending others. Beyond that, because sports carry with them such strong support for the gender binary, discussions end in arguments and fights that have little to do with rational points. Plenty of people are too terrified of change, especially when it comes to established norms like gender, that they refuse to consider any alternatives.

In order to eliminate discrimination and encourage inclusion, there is a need for further research and more conversation on the subject of transgender participation in sports. While we are moving toward more inclusive and standard policies, there are still large problems with our system. Far too many people are afraid of conversation on the issue of transgender policies because some fear offending others and some, those who resent transgender individuals for the threat they pose to the gender binary believe that if we talk about trans rights as a legitimate issue, we are acknowledging change. Still others believe that we have already reached more inclusive policies, and there is no reason to continue. However, it is important to note that if we had already discovered the perfect, fair, and inclusive policy, then there would be nothing left up for debate. The fact that different organizations have different policies speaks to the fact that the best solution to the problem is still out there, on the other side of research and investigation.

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[14] Pat Griffin, "Developing Policies for Transgender Students on High School Teams," *The National Federation of High School Associations,* September 8, 2015, https://www.nfhs.org/articles/developing-policies-for-transgender-students-on-high-school-teams/.
[15] Ibid.

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ERIK HOVLAND
Corruption: A Congressional Pastime
First-Year Long Form, 3rd Place (tie)

Since the founding of the United States, government corruption has been a primary concern for many of the nation's people. After all, elected officials' first and most important duty is to the people. However, in today's age, the issue of corruption has become divisive. Elections are becoming more and more expensive in recent years, leading to more money being involved in campaigns than ever before. Though some of this money comes from everyday citizens, increasingly larger sums have come from corporations, political action committees, and wealthy donors. This development has led to many claiming that the current state of campaign finance has allowed politicians to be bought by these special interest groups while others, especially elected officials, claim that mere campaign donations are not cause for concern about corruption. This debate has been raging for years but is gaining more attention as an increasing number of politicians are choosing to reject the "dark" money that has been flooding elections. When candidates take money from special interest groups, they compromise their ability to faithfully serve the people; as such, campaign finance reform becomes a necessary step for the populace to protect the integrity of American democracy.

The current landscape of campaign finance was ushered in by two highly influential Supreme Court cases. The first of these cases came in 1979 with *Buckley v. Valeo*, in which the court determined that campaign finance regulations could not be used to ensure that the wealthy and the poor had an equal say in elections, citing the First Amendment protections of freedom of speech (Luckowski 124). With this ruling, the court established that by limiting monetary expenditures, they were also limiting free speech. However, that did not translate to a complete lack of regulation. While *Buckley v. Valeo* determined that limits could be set on campaign contributions, it established that the regulation of campaign expenditures is unconstitutional (Luckowski 125). This decision has led to the current state of elections where millions upon millions of dollars are being spent to get candidates elected. On its own, the *Buckley v. Valeo* ruling does not necessarily undermine election integrity, as it does allow for regulation of campaign contributions.

The decision that fundamentally undermined American democracy came in 2010 with the *Citizens United v. FEC*, a case that truly opened the floodgates for corruption, based upon the precedent set with *Buckley v. Valeo*. According to Bob Biersack, author for *Open Secrets News*, beyond the typical political action committee or PAC that is limited in its ability to raise money directly for candidates, *Citizens United* enabled the creation of "Super PACs" that, as allegedly independent organizations, can raise unlimited amounts of money from donors, corporations, and other special interest groups, and then spend this money getting candidates elected, so long as they are not coordinating directly with the candidate they support (9-10).

Unfortunately, especially with modern technology and communication, there is no realistic way for the Federal Election Commission to discover and enforce this ban on coordination between campaigns and PACs. Super PACs are essentially free to engage in political campaigning without any of the regulations placed upon actual campaigns. According to authors Robert McChesney and John Nichols, they are also able to hide the identities of their donors through the use of nonprofit 501(c)(4) organizations that grant contributors total anonymity as long as they give less than fifty percent of their income to the organization (11). There is little doubt that there are interest groups quietly gaining favor with politicians and buying elections without the public, or the FEC ever being aware. The *Citizens United* case is a prime example of the deregulation that has irreparably harmed the integrity of the American election process; as according to legal scholar Richard Epstein, it overturned the parts of the Bipartisan Campaign Reform Act of 2002 (BCRA) that had limited the ability of special interest groups to use general treasury funds to purchase campaign communications immediately before an election (641). From a relatively minor issue about an ad purchase that was too close to an election, a court ruling fundamentally changed the way campaigns can be financed by allowing for the creation of super PACs. In his dissenting opinion, Justice John Paul Stevens stated, "Because [super PACs] may be managed and controlled by nonresidents, their interests may conflict in fundamental respects with the interests of eligible voters. The financial resources, legal structure, and instrumental orientation of corporations raise legitimate concerns about their role in the electoral process" (394). Unfortunately, despite the clear rationale behind the argument, Stevens was in the minority on the ruling. However, his argument remains just as valid. Limiting corporations' influence in elections is a necessary step to ensuring that regular Americans can still have power in the campaign process, and not find their voices drowned out by PACs.

There have been plenty of instances in which the restrictions on coordination between super PACs and campaigns have been violated, with no punishment to either party. For instance, according to journalist Tim Murphy, during the 2016 Republican primary race, candidate Carly Fiorina and a supporting super PAC "CARLY" were able to coordinate by having Fiorina's campaign post an online calendar of events far in advance, at which point the super PAC would contact the hosts of the event and help run the event through them (32). While it may seem this is exactly the type of behavior the FEC forbade, unfortunately, Fiorina faced no repercussions whatsoever. Even more unfortunate is that Fiorina is far from an exception to the rule. During the same election cycle, Murphy discovered that a super PAC supporting Republican candidate Jeb Bush created a 501(c)(4) that was able to hire policy advisors and begin collecting money before Bush even filed his candidacy with the FEC (34). This meant Bush completely avoided the law prohibiting him from hiring staff before declaring while also allowing him to freely discuss policy and strategy with the advisors his Super PAC had hired. While it would be reasonable to assume the FEC put a stop to this blatant violation of the law, once again, neither Bush nor his Super PAC faced any sort of charges.

Unsurprisingly, violation of FEC regulations is a bipartisan issue. As Brian Taylor, contributor to *The Nation*, revealed, Goldman Sachs has donated hundreds of thousands of dollars to the Clinton Foundation as well as continually hiring Hillary Clinton as a speaker at events, despite her sizable $200,000 speaking fee (par. 1). By hiring her as a speaker, a private corporation is

essentially able to give enormous sums of money directly to a politician. The criticism Clinton faced during the 2016 election regarding her close ties to Wall Street certainly seems warranted when presented with such blatant examples of corruption. Goldman Sachs's thinly veiled efforts to buy influence demonstrate just how ineffectual campaign finance laws have been in the United States. However, Clinton did not stop there, as once again according to Tim Murphy, her campaign was able to coordinate with one of her many super PACs due to the fact that the organization existed solely online (33).

With so many ways for candidates to avoid laws, it is no surprise that special interest groups have gained such control over the United States' democracy. By donating enormous sums of money to political campaigns, corporations and other special interests buy influence in the legislative process, corrupting the representative democracy the authors of the Constitution had envisioned for the country. For instance, according to Tim Murphy, in 2016, the Koch brothers-- billionaire fossil fuel magnates--publicly announced their plans to spend close to one billion dollars for the sole purpose of helping elect Republicans (33). No one spends a billion dollars if they do not expect to get something out of it. The Koch brothers know that if they help elect legislators, those legislators will be far less likely to take any action against the fossil fuel industry for fear of losing out on a sizable amount of money next election cycle. For large corporations, buying legislative influence is simply a smart business move. From 2007 to 2012, the two hundred most politically involved corporations spent a collective $5.8 billion, which may seem like a steep price, yet in return, the same corporations received $4 trillion dollars in tax breaks and subsidies (Harkins, par. 1). Corporations spend a fraction of their profits and receive trillions in return. Clearly, there is something to gain from greasing the palms of congressmen.

The current state of campaign finance is an affront to the principles on which the United States was founded. The oppressive influence of PACs and dark money has resulted in average citizens being shut out of government decision making. An alarming study from Princeton, about the influence of various groups in the legislative process, concluded, "When the preferences of economic elites and the stands of organized interest groups are controlled for, the preferences of the average American appear to have only a miniscule, near-zero, statistically non-significant impact upon public policy" (Gilens 576). How could the U.S. possibly be considered a democratic nation when its own people have a statistically non-significant impact on its own laws? This shameful realization highlights the necessity of campaign finance reform, as well as demonstrating that congressmen taking money from these outside sources cannot be trusted to continue "serving" the public. Additionally, the Princeton study revealed that interest groups in particular had substantial impacts on legislation, despite not aligning with the views of the majority of Americans (Gilens 576). No nation can possibly claim to stand for freedom and democracy while at the same time ignoring the will of the people in favor of monied interests.

Of course, there are some in the United States who believe that contributions from special interest groups have no effect on elections. For instance, while defending the issue of accepting gifts from corporate lobbyists, Republican Senate majority leader Mitch McConnell stated, "It should trouble every senator to be slapped across the face with the insinuation that he or she has somehow been bought by a cheap bottle of wine at Christmas or a crab cake sandwich or an honorary plaque." ("Mitch Part 2," par. 5). While

McConnell seems certain that a few gifts from lobbyists would never influence his opinion, he conveniently glosses over the millions of dollars he has received from special interest groups. The issue is far greater than a "cheap bottle of wine", no matter how much he would like to minimize it. If McConnell truly thinks money does not affect the way he votes, he is deluding himself. A study done by political scientist Larry Bartels found that Senators are more responsive to the concerns of high-income constituents than middle income constituents, and are entirely unresponsive to the views of low income constituents. Unsurprisingly, senators go where the money is, and vote in ways that will benefit those that have the most to give them.

The majority of the American public would also disagree with McConnell, as according to the Pew Research Center, seventy seven percent of Americans believe there should be limits on the amount of money individuals and organizations can spend on campaigning (Jones, par. 3). The problem is that the people who have the power to pass laws to end this corruption are the very same people who are being corrupted. As long people like McConnell keep benefiting from corporate money and keep getting reelected, true change will be rendered nearly impossible. However, despite the fact that a majority of Americans oppose excessive special interest money, there continues to exist the well-known phenomenon of incumbency advantage. Clearly, Americans believe that despite their acceptance of special interest money, their representatives are still fit to serve in office. This view is exactly what has perpetuated the issue of political corruption. As has been demonstrated, the wealthy are the ones in control of legislation, not the average citizen. Continuing to reelect the same people simply demonstrates that they can undermine American democracy to make a few extra bucks without any consequences. When all the evidence points to the fact that the government is not working for the people, change is necessary, and that change is only possible if major reforms are instituted to limit the corrupting influence of money.

The primary argument against stronger campaign finance regulations involves the First Amendment. Once again examining *Buckley v. Valeo*, in which the court ruled that limiting expenditures was unconstitutional, the basis for the decision came from the idea that since corporations and other special interest groups are comprised of people, they are entitled to the same protections as individuals. As journalist Joe Albanese argues, "If we do agree that individuals have the right to speak freely and even spend money to spread their ideas, then why wouldn't that same right apply to two or more people pooling their resources to do the same thing? Americans don't sacrifice their liberties when they join together" (par. 5). Albanese's point of view reflects a fundamental misunderstanding of what is at stake. The corrupting influence of corporate money has already been well demonstrated, and placing limits on it does not stop any individual member of that organization from speaking and spending however he or she may please. Albanese also fails to recognize the fact that corporations may be comprised of multinational groups, and not entirely U.S. citizens. The truth is that the discussion around special interest money is not the black and white, freedom of speech versus oppression issue that Albanese paints it to be. As Justice Stevens stated in his dissenting opinion to the *Citizens United* ruling, "Congress has placed special limitations on campaign spending by corporations ever since the passage of the Tillman Act in 1907. . . . We have unanimously concluded that this 'reflects a permissible assessment of the dangers posed by those entities to the electoral process'" (394-95).

Stevens demonstrates that both Congress and the Supreme Court in the past have recognized that to ensure election integrity, it is necessary to regulate corporations differently than they regulate individuals. In the end, it comes down to a question of what is more important: ensuring the integrity of the election process, or allowing corporations to spend as much as they want in politics?

The American political system has been corrupted by the influence of outside money, robbing the people of power in both elections and legislation. Both parties have fallen victim to greed, and now do not represent the people who elected them, but rather the corporations and elites that paid them. As long as money is given a priority over public opinion, Americans will never get the changes they want or need. Campaign finance reform must be instituted, ensuring that the people will have their voices restored in the political process.

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KAYLIE STENBERG
The Rise, Fall, and Consequences of Norwegian Black Metal
First-Year Long Form, 3rd Place (tie)

This magazine article is intended to delve into the relationship between black metal and radical, typically far-right-wing ideologies. This article is meant to be developed through a series of stories that grip the audience through shock and near-disbelief.

During the mid afternoon, an explosion went off just outside the prime minister's office in Oslo; it was the beginning of the deadliest attack in Norway since World War II. From all the way down the street, people could hear the sound of two loud bangs[1] as the bombs detonated. There was fear and there was confusion; no one knew what was happening. Officials and staff made for the exits. Eight died. Many others were injured.

The explosions were only act one in Anders Breivik's two-part terror. A few minutes later, just about 20 miles away in Utoya, Breivik entered a Labor Party Youth camp wearing a police officer's uniform. Breivik opened fire on the campers, who ranged in age from thirteen to twenty-two. He shot at the campers as they tried to run away. Sixty-nine of them died. The body count from both attacks combined was nearly eighty.[2]

Before committing both acts of terror, Breivik sent out a manifesto, which was over 1,500 pages in length. This manifesto attacks multiculturalism and details advice to those who may follow in his footsteps on "weapons, bomb-making, body armour, physical training, and the potential use of chemical, biological, and nuclear weapons."[2]

One of the people that Anders Breivik sent his manifesto to was Varg Vikernes.

* * *

Seventeen years prior to Breivik's brutal attacks, Varg Vikernes was sentenced to 21 years in prison. He was found guilty of murder, the arson of three churches, the attempted arson of a fourth church, and theft of explosives.[3]

Varg Vikernes was no everyday crook. He is one of the forefathers of Norwegian black metal, a genre of music with a strong culture that is centered on Satanism, ethnocentrism, and anti-establishmentism. He was the founder of the influential black-metal band Burzum. His actions and his beliefs would go on to be some of the most influential to modern-day ethno-terrorists, many of whom were drawn to the black-metal community because of Vikernes and others like him. For better or for worse, Vikernes was in inspiration to plenty of others.

Both of Vikernes's crimes are wound tightly around the black-metal scene. So, to understand Vikernes, one must first understand the scene.

Before the church burnings, before Varg Vikernes, and before black metal, Norway was essentially as peaceful as any nation can be. The crime rate in Norway during the nineties was low. It was a good nation, with a largely Christian population that prided itself on being an egalitarian state. It was a calm place with long, dark winters, and few major problems[4].

Some rebellious teenagers in Norway found themselves with little to rebel against. They were stuck in Europe's tamest nation. Inspired by the English band Venom and other first-wave black-metal bands, Norwegian teenagers looked for a reason to rebel, and found it in the country's deep-rooted Christian heritage[4].

A black-metal musician from the band Kampfar, Dolk, said that "Christianity never suited Norway. . . . [T]he black-metal scene reacted to that. We needed to have something to be opposite to."[3]

This mindset began black metal's open march against Christianity. This opposition was at first demonstrated somewhat harmlessly through song lyrics and shocking images.

But the genre didn't begin to take off until Per Yngve Ohlin, whose stage name was "Dead" entered the scene with a band called Mayhem.

Dead would carry decomposing birds with him in plastic bags while he was on tour. Before a show, he would take breaths from the bag so that he could perform "with the stench of death in his nostrils."[4]

Dead decorated the stage with the severed heads of animals on pikes. During shows, he was known to splash animal blood onto the fans in the audience to "scare away posers."[4] This kind of dark intensity is what shaped the genre, and Dead was at the vanguard.

There were plenty of others; Gaahl of Gorgoroth received four convictions for severe violence and physical abuse.[6] Faust of Emperor stabbed a homosexual man 37 times on impulse.[7] Mobus and two of his other bandmates from Absurd strangled a young man to death with an electrical cord for no other reason than that they found him aggravating.[8]

As time went on, Dead became increasingly disturbed. His obsession with death developed to the point that he denied his own mortal existence and truly came to believe that he was, in both name and physical property, dead.[5] In the end, he slit his wrists and shot himself in the head and left a note saying, " excuse the blood."[3] It was a tragic and brutal suicide.

His roommate and bandmate, Øystein Aarseth who was called Euronymous, found the body. His response was not to call the police, but rather to run into town to buy a camera.

Euronymous took photos of the suicide and even went so far as to move and adjust pieces of the scene for better composition.[4]

Why did he take the photos? In short, he thought that the suicide was cool. One of the gruesome images was later used as the cover for Mayhem's bootleg live album *Dawn of the Black Hearts*.[4]

After the suicide, Euronymous had a smaller cult of his own known as the Black Circle, "whose meetings [were] held in a candlelight dungeon under [Euronymous's] record store."[9] One of the members of the Black Circle was Varg Vikernes. It was during his time with the Circle that he began his acts of terror.

The genre was already associated with all manner of unholy deeds; maybe burning the churches was nothing more than the next natural step for Vikernes. It was a step further, a stronger way to prove that he was opposed to Chritianity and all that it stood for.

He set fire to three, nearly four, churches before he was apprehended.

Vikernes would go say, "If you, dear European nationalists, really want to save Europe (as a biological term) you have to realise that the only thing to do is to cast aside all Christian other international nonsense and embrace only the European (i.e. Pagan) values and ideals and if you like the European deities as well."[10]

But not everything went Vikernes's way. No one knew who was behind the burnings, and, much to Vikernes's discontentment, the Black Circle seemed to want to give all the credit to Euronymous.[4]

Having had enough with Euronymous usurping the infamy that was rightfully his, Vikernes went to Euronymous's apartment. Euronymous let Vikernes, into his home where Vikernes proceeded to stab Euronymous twenty-three times. Varg Vikernes was later tried and found guilty of three church burnings and murder. In May of 1994, Vikernes was sentenced to 21 years of prison time.

From this point on, Norwegian black metal "was no longer perceived as a musical genre, but a murderous cult."[3]

* * *

There was an explosion of murderous anarchism in the black-metal scene during the nineties, epitomized by Vikernes' murder of Euronymous. From there on out, there was a certain draw to black metal. It began to attract those who were seeking something sensational and dangerous. There was also a draw for those that supported kind of nationalistic ideas that the church burnings promoted. As a result, the music became a base for people with radical ideologies, which grew and developed between the 1990s and the 2000s.

While he was in prison, Vikernes changed, too. For a time, he identified himself as a neo-nazi.[11] Though he remained sympathetic to many nazi ideals, he began to use the term "odalism" to define his far right-winged ideologies. Odalism meant to emphasize pagan values and reject capitalism, Islam, Judiasm, Christianity, and anything else that Vikernes believes to contradict the values of pagan society.[11]

In 2011, Anders Breivik killed 77 people in a bomb attack in Oslo and the shooting of a summer camp for kids. He sent his manifesto to Varg Vikernes on the assumption that Vikernes would join his war against Islam.[11]
Incidentally, Vikernes chastised Breivik-- not because of the mass murders that he committed, but because he killed ethnic Norwegians instead of muslims.

* * *

Then, in 2019, a man named Holden Matthews took some photos. He planned to use them as a cover for his black-metal album, *Pagan Carnage*.[12] The photographs were of St. Landry Parish—after Holden Matthews burned it down to its foundation and its contents were nothing but chalky ashes.

Two other churches shared the same fate: St. Mary's Baptist Church and the Greater Union Baptist Church. The three buildings that Mathews, a radically far-right white man, burned were historically black churches. The crime is not only against a religion, but race as well.

It was confirmed by a fire marshal that Matthews was a part of the modern black-metal community, and that this affiliation was connected to the church burnings.[13]

Matthews could face a total of twenty years in prison, according to CBS news.

The question becomes about how closely black metal and the culture around it are intertwined. There are plenty of black-metal fans and musicians that are not terrorists— who lead peaceful lives and who do not support destructive, radical ideas. There are also plenty of terrorists who are not a part of the black-metal scene.

However, it is also true that the link between violence and black metal is stronger than it is for other genres. There doesn't seem to be such a strong familiarity between violence and folk music.

Of course, in the 1950s, many people considered rock and roll to be evil, the Devil's music. According to Randall Stevens of the Harvard Press, "When rock n' roll emerged in the 1950s, ministers denounced it from their pulpits and Sunday school teachers warned of the music's demonic origins.[14]

Music is in some way always moving toward the biggest controversies and the most shocking aspects of society. In a sense, music is a tool to help society comprehend itself, hence why it blossoms around that which is new and not fully understood. For rock and roll, those origins were around war and "the antiwar movement."[14]

For black metal, the origins were centered on anti-Christianity. But more broadly, like rock and roll, it appealed to the rebellious youth. This broad appeal and the drama that surrounded it are what caused black metal to attract fans and media alike.

What makes black metal unique is that it, according to an expert on the subject, Tom Weeks, many of the original musicians, "Don't want people to listen to the music. They don't want people to like it. They want people to be afraid of it."[15]

Weeks adds, "Pushing people away draws people in. The music is not as scary anymore in the modern day as it once was. . . . [T]he popular culture ground down the teeth of the original music."[15]

If this is the case, then black metal today is something entirely different than black metal in the nineteen nineties. This is one of the main reasons that many of the original Norwegian black-metal musicians have vanished from the scene and stopped producing music.

"I am no friend of the modern so-called 'black metal' culture. It is a tasteless, lowbrow parody" said Vikernes on his website.[16] In an interview, he went on to explain that black-metal music has become something that is popular and trendy to be a part of. He mentioned that music is supposed to be unique[16]—that musicians should be looking to create new sounds instead of bandwagoning around popular sounds and statements.

The original culture has been more or less separated from the music. Both still exist, but they have changed and evolved since Norwegian black metal first came to be. Black metal used to be a base for certain radical ideas, such as Satanism and ethnocentrism. However, music cannot be owned or controlled in the way that a normal base can. Over time, black metal was shaped by a broader fanbase and the media, turning it into something that many of the original, radical musicians reject.

Their ideas have not died out. They too have changed to suit the values of those who have adopted them. Satanism, anti-establishmentism, and ethnocentrism have all been around before black metal. Ideas spread to where they are embraced. When the black-metal culture stopped truly embracing them, they moved elsewhere.

The history of black metal may still draw some extremists towards the genre, as it did with Holden Matthews. But music on its own cannot be evil. It can be a vehicle for a culture that propagates evil ideologies, or attracts evil people, but this is only a reflection of those that create and consume the music, not the music itself.

In the case of black metal, the music had the misfortune of becoming a base for those with evil ideologies. It feeds upon itself with one evil act inspiring another, all centered around the genre. Because of its origins and history, the music has become something for evil to come back to again and again whenever hatred is looking for company. It started in the nineties, first with simple rebellion, then with anti-Christianity.

The culture evolved from there to match hatred as it changed with time and place. For Breivik in Norway, it reflected radical ethnocentrism and racism geared against Muslims. For Matthews in the United States, it reflected radical ethnocentrism against African Americans.

Because of its history, black metal continues to attract evil. Each act of hatred creates an echo that will come back to be heard in the future.

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DANIEL GIRTEN
Dancing About Architecture: The Portrayal of Music in Verbal Communication
First-Year Long Form with Visuals, 1st Place

      "Writing about music is like dancing about architecture." This quote has been attributed to a variety of great minds despite its relative lack of a concrete source, but the essence of this message is still relevant and easy to grasp. Surprisingly, it's not a reference to *A Performance after Georges Perec's Species of Spaces*, an experimental dance composition created for the 150th anniversary of Architecture Education at MIT. Fundamentally, what the anonymous author intends to convey is the shortsighted nature of any attempt to explain the value of one artistic medium in the scope or terminology of another. There's a general understanding among most every artist and art critic that the value of any medium is subjective—that its meaning, while possibly alluded to by the artist themselves, is by and large up for personal interpretation. Based on this unwritten law of analyzing art, it seems that describing music in any form that attempts to explain its value or meaning is some sort of artistic irreverence, or disparagement of the audience's freedom to experience it themselves. In ancient Greece, Socrates spoke of this decay into writing, the concept that, once written down, an idea becomes somewhat dry and two-dimensional, stating,

      When it has once been written down, every discourse roams about everywhere, reaching indiscriminately those with understanding no less than those who have no business with it, and it doesn't know to whom it should speak and to whom it should not. And when it is faulted and attacked unfairly, it always needs its father's support; alone, it can neither defend itself nor come to its own support. (Qtd. in Plato, 551-52)

      But, despite this concern, there's an undeniable aspect of enjoying music, as with any art, that makes us want to share it with everyone that surrounds us. The emotional connection that music can foster, between the artist and the listener, or between listeners is practically invaluable. So, why is it that this powerful musical energy that any concert goer or frequent listener can attest to is so hard to express in language? To understand the shortfalls and possible remedies of communication on the topic of music, we must first understand the problem of creating a verbal description of musical works.

Imagine attending a gallery showing of painted visual art. You view each piece individually, taking some understanding of meaning or lack thereof from each canvas and then despite your eloquent facial expression, whether consciously or not, you pass judgement on the quality of each work. You decide that one of the paintings is markedly more beautiful or meaningful to you than the rest and proceed to try to explain it to a friend at a later time. You express to your friend the broad graceful strokes of the artist's brush, the rich magenta in the shadows of the sharply expressed visage of a man crying, and the vibrant fuchsia in the setting of a soft round sun in the background. With the use of such basic concepts as shape and color, you can express with some proficiency the experience you had as you looked upon this piece of art. But, to describe the music playing at this same gallery you might find yourself at a loss. Sure, you can refer to the genres that a piece of music might fit into or with a keen ear maybe even pick out the instruments that make up the ensemble, but I would contend that there's an important and substantial difference between the way we approach the representation of these two types of art. When it comes to music, it seems there are no easily describable common building blocks such as shape and color in visual art. And so, the problem stands: how should we go about communicating the intricacies of music?

Before I attempt to explain my position, I feel it's necessary to emphasize my motivations in this particular line of inquiry. I am by no means a musician; in fact, I've always struggled to see myself excelling in any form of musicality due to my relative tone-deafness and lack of ability to commit long-term to learning the practice of any particular instrument. I would categorize myself rather as an audiophile and music enthusiast. Put more simply, I listen to a ton of music. My father was a frequent listener of rock and roll throughout my early childhood, so I found myself in the unique position of being able to recognize the opening riffs to almost any classic rock anthem he would play by the age of six or eight. From early Pink Floyd and Led Zeppelin to far more obscure 70s era showmen, I was soaking up musical greatness like only a well-guided listener could do. Ever since I first discovered the joy of *Spotify*, I've been hooked, going always deeper into the rabbit holes of a constantly widening array of musical genres and subgenres. But, I've always felt that when it comes to sharing my musical tastes and recommendations, I'm swimming upstream. How can you describe the magical energy of freeform jazz to someone that's only ever enjoyed pop music? How can you express the emotional depth of one of Mozart's concertos to a listener who only understands trap beats and 808 bass? Or vice versa? So, many times, I've been at a loss to explain the greatness of a song that in my opinion is irrefutably moving, and so I began to wonder about the best way to communicate about music.

Additionally, I'd like to elaborate on a prior concept that there aren't *common* building blocks in music. From the perspective of a classically trained musician, with a thorough understanding of scales, pitches, chords, and chord progressions, the task of breaking a song down into its core components may seem much less daunting. But, the explanation of a song using these elements of music theory is less than accessible to a broader audience. I, at the time of my research, have completed almost a full semester of collegiate-level music theory education and still find myself relatively useless at understanding these components as utilized in

modern music. I think it suffices to say that the majority of music listeners find themselves in an equal state of alienation when it comes to the use of this sort of terminology. Thus, despite the existence of proper musical components, it doesn't change the fact that for a regular listener the task of dispersing a song into graspable ingredients seems almost insurmountable.

So, what's the best plan of attack? As a necessary precursor to the question of how music should be portrayed, we must address the quandary of how its currently portrayed in different settings and for different audiences. More specifically, the tactics used by musicians, music teachers, music reviewers and journalists, and the general public vary quite substantially in form and function. Each of these settings in which music is explained carries its own important implications to the overall endeavor of effectively conveying the nature of music.

Foremost, it's important to analyze the trends in terminology as used by the general public when referring to music. To entertain this question, I turned to the internet, particularly *Reddit*, a website used primarily for the public discussion of various topics. I decided that I would observe several ongoing discussions about modern music and hopefully find some noticeable trends in the terms used to describe artists and songs among this broader audience. In a thread about current music tastes among Gen-Z listeners, part of Reddit's "R/LetsTalkMusic" subreddit, 135 commenters weighed in on what sort of music they and their peers are currently listening to. Among these descriptions, there was a repeat use of several adjectives describing the nature of music. Most notably, and in descending order of frequency, were the words *popular*, *mainstream*, *obscure*, *chill*, *classic*, *loud*, *depressed*, *mellow*, *niche*, *angry*, *eclectic*, *weird*, and *artsy*. These descriptors can be broken down into several distinct categories, namely popularity-defining, era-defining, emotionally qualitative, and demographically qualitative. The most popular terms used to describe music in this sample group of responses were popularity-defining and emphasized not the music itself but, instead, how favorable those types of music were to the general populous. The next most frequent terms were a combination of the other three categories, but all alluded to a similar understanding. The only way people know how to talk about music is with vague, mostly non-descript vocabulary that, at best, communicates when the music was made and what basic emotion corresponds with its playback. There's much to be desired in the general public's description of music, but not all musical explanations offer such meager nuance.

In fact, in the systematic approach to educating young children on the topic of music, various useful techniques are employed. As expressed by Brittany Nixon May in her book, *Public School Early Childhood Music Education: Challenges and Solutions*, teaching music to three- to four-years-old students comprises far more than just singing "The Itsy-Bitsy Spider." Several particular practices made standard by The National Association for Music Education (NAfME) stand out as relevant to the understanding of verbal-music expression. One of the most compelling of these practices is the use of tone color, where essentially children are asked, after hearing a short, simple instrumental recording, to decide what color the instrument would be. Additionally, instructors can ask their students to draw what they imagine the music would look like, encouraging things like waves, dots, lines, and free-form shapes. Such a task seems somewhat contemptable to an adult, but a child can follow these directions effortlessly. And, while these interpretations are subjective and potentially antiquated, they allow us the ability to assign very tangible characteristics such as shape and color to musical sounds. Furthermore, as suggested by educational resources at Take Note Music, classical compositions such as Sergei Prokofiev's *Peter and the Wolf* can be used to help children understand the meaning behind instrumental tonality. Each character in the story is assigned a corresponding instrument, and thus the sound of each instrument portrays the antics of that character. The implications of this methodology are far reaching in that according to Prokofiev's vision, French horns are very capable of sounding menacing and wolf-like and strings are likewise able to sound curious and innocent like Peter in the story.

Musicians, regardless of classical training, go into slightly more detail when it comes to these descriptive notions of specific sounds and tones. According to the *Oxford Dictionary of Music*, the quality of sounds is described by several terms—namely, *timbre*, *dynamics*, and *tempo*. Timbre is essentially the same concept as tone color, the idea that each voice or instrument in a piece of music is representative of a distinguishable "color" or musical hue. The impact of timbre can be heard when two separate instruments—say, a piano and a guitar—play the same progression of notes. Just like the colors of the rainbow, these tone colors can be mixed and matched by a composer to create new more specific colors, or paired up to create intentional color schemes or contrasts. Dynamics are the musical term for the degrees of volume of a particular sound. The loudness or softness of a given instrument, as played alone or in conjunction with other instruments, can be measured through the dynamic degrees that commonly range from pianissimo (very soft) to fortissimo (very loud). Dynamics can also describe a change in volume, crescendo being an increase in volume from to soft to loud and decrescendo being a decrease in volume from loud to soft. Tempo describes the pace at which music moves, based on the speed of the underlying beat or pulse of the music. This qualitative characteristic has a major effect on the style or feeling of a piece of music and is generally described with Italian adjectives ranging from adagio (slow) to presto (fast). A gradual change in tempo is also commonly described in Italian musical terms with speeding up being *accelerando* and slowing down being *rallentando*. While these terms aren't usually part of the general public's lexicon, they allow for a better understanding of the quality of sounds and how to describe variability and changes in music.

Finally, led by the major influence of companies like *Rolling Stone*, *Billboard*, and *Pitchfork*, writing about music in various forms has become a niche and valuable style of journalism. Logically, it follows that those people who have committed their lives to describing music professionally would have the most well-devised and effective methods of doing so. Though the sheer extent of the superiority of these expressions that my research would reveal was unprecedented. As conveyed by famed writer Greil Marcus in his tell-all *Mystery Train*, a successful work of writing on music is, "not a history, or a purely musical analysis, or a set of personal profiles. It is an attempt to broaden the context in which the music is heard" (4). As an insight into this personally awe-inspiring profession of music journalism, I was graced with the opportunity of speaking to Steve Knopper, *Billboard* Editor at Large, former *Rolling Stone* contributing editor and author of *MJ: The Genius of Michael Jackson* and *Appetite for Self-Destruction: The Spectacular Crash of the Record Business in the Digital Age*.

During our conversation, Steve explained that in his 25 -30 years in the business, he's written pretty much every sort of musical journalism piece there is. From album and performance reviews, to broader scope contextual pieces, he's had a taste of an abundance of different writing challenges and, based on his prevailing status, proved his talent in each. He has a background in music but doesn't consider himself to be, by any means, classically trained. He played in a variety of bands in young adulthood as a keyboardist and admitted that it helps to know how music works but that technical strength isn't everything. He writes primarily consumer-oriented pieces and confessed that he wouldn't be suited to the task of writing a really technical, music-theory-heavy piece of analytical journalism. When asked about the difficulty of putting music into writing, Steve expressed a very insightful position on the subject. Initially, he acknowledged the truth in what I had said, that putting the very live, eccentric nature of music into words was a hard undertaking, but that he found the difficulty of the task all the more exhilarating. He expressed that there's a lot of clichés in writing about music, that he has to check himself constantly to keep his vocabulary and descriptions fresh. He also referred to some techniques he uses to express the quality of music in his writing. He spoke about using a lot of descriptors and comparisons, particularly about the interplay between instruments, and the importance of putting music in context, saying that some of his best work has relied heavily on the history of musical subgenres and their development. He also illustrated that much of his journalism comments on the cohesiveness of musical projects and that to him this is more important than simply making every song on the album catchy in its own right. When I asked him about whether he ever felt limited in his descriptions of music, he responded gracefully that despite not always fitting into the demographic of the artist on which he's responding, he "has ears like everyone else" and that as long as you devote yourself to the research of a movement and don't approach it in a shallow way, there's no limit to what you can express.

With this knowledge of the varying existing techniques of portraying music in verbal communication, I've come to understand some of the in's and out's and complications of effectively delivering writing on the topic of music. It seems that a balance must be achieved

between using technicalities and cross-sensory techniques and simply using similar musical elements to liken the song or project that you wish to describe. The notion of timbre and tone color, as with the existence of tone as a visual artistic term, suggests that by taking certain liberties in assigning specific colors to specific instruments you could, very well represent an orchestral ensemble as a constantly morphing interconnected web of hues. Or, perhaps you could utilize the nature of emotionally qualitative descriptors such as anger and calmness to express the nature of crescendo and decrescendo. It seems that if you wanted to express your opinion most understandably, you wouldn't mention the changing sounds at all and instead talk only of the obscurity of the music and how its complex contextual history brought it to that point. As futile as my efforts of reaching every audience with an effective portrayal of music might be, I embarked to express the learning defined by my research in a respectably cohesive concert review. I was given the opportunity to attend a hip-hop showing of the artist Wale and publish a response through an internet-based music publication called *Crave the Sound*. This is not to say that I have created the perfect reflection of the performance that I experienced; rather, I intend to emphasize the variability involved in creating an artistically accurate evaluation of music. As my University of Colorado Music Professor Devin Guerrero so aptly stated, "There's one thing I can't teach you about music and that's how to relate it to the world around you." And, while it seems my inquiry will lay relatively unresolved, there's also a beauty to the undefined edges of music's influence on humanity. Successful as we may be, and creatively as we may try, it seems only the day tripper and the synesthete will ever come close to describing the whole essence of musical sound.

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WILL ZIEGLER
Persuasion in the Anti-Vaccine Community
First-Year Long Form with Visuals, 2nd Place

Many people have forgotten the horrors of the smallpox virus because a global vaccination effort eradicated the disease. Vaccination has undoubtedly been one of the greatest advances in modern medicine, but since the inception of it as a practice, there have always been those who were skeptical. In 2019, 1282 cases of measles were reported, the highest since 1992. The majority of these cases were in individuals who were not vaccinated. The rise of anti-vaccine sentiment has been growing over the last several years, reaching a critical point in 2019. While the CDC website is certainly informative, the structure does not lend itself to the average person. The rhetoric used by those part of the anti-vaccine movement is specifically designed to exploit psychological and physiological characteristics by using fear combined with weak points in psychology. Examples can be found on webpages, advertisements, interviews, and even tweets. The numerous weak points in human psychology that are exploited by anti-vaccine propaganda include availability heuristics, negativity bias, loss aversion, celebrity endorsements, and inoculation theory. All play a part in the acceptance of misinformation as truth.

An overarching tactic used by anti-vaccine rhetoric includes the use of availability heuristics. According to the *APA Dictionary of Psychology*, availability heuristics can be described as "The more available and relevant information there is, the more likely the event is judged to be." For example, in an article from the *Guardian*, the extent of advertising is shown: "Two in five parents of children under 18 said they were exposed to negative vaccine messages on social media or in online forums 'often or sometimes.' That rose to half of parents whose children were under two and 47% whose children were under five." By exposing parents to the same or similar messages, "often or sometimes" significantly increases the likelihood it will influence their decisions about vaccination because that information appears more than the positive information or statistics from the pro-vaccine side. The frequency alone of the advertisements can help to bolster its own credibility. It is more convincing to hear negative vaccine messages from several different sources across periods of time than simply once and then never again. By creating the illusion of a consensus, the advertisements use each other to further their integrity. Furthermore, the relevance of the anti-vaccine advertisements makes it more effective in reaching those particularly vulnerable. By targeting "half of parents whose children were under two," the message is communicated to the most relevant group. Generally, the most vaccinations are given to a child when they are still very young. By targeting parents with children in that age, the information becomes much more relevant to them than to someone whose child is 16 and will receive only a small number of vaccines before adulthood. That relevance is a key component in availability heuristics: when the information shown to the parents is more relevant to their child, they are more likely to assume the likelihood of an adverse reaction happing to their child.

Looking at a specific example of an advertisement, it is worth noting that the primary audience is women between the ages of 25-44. Targeting women in the childbearing age makes this advertisement more persuasive as the compassion a mother feels for their children can often be taken advantage of. They truly want what is best for their child, even if it is not logical. In using the picture of a photogenic baby, the advertisement aims to persuade by being grounded in a strong maternal instinct in its target audience. This maternal instinct gives rise to guilt as the readers—presumably mothers or mothers to be—have not done their part to protect the children. Guilt is a very persistent emotion; it weighs on a person and eats at them. Constantly feeling guilt about vaccinations creates a feedback loop in which availability heuristics are continually "activated," which leads to conclusions that stray from reality.

The persuasion employed by those who argue against vaccinations is largely made up of fear-mongering and negative information. Psychologically tricking readers by activating strong physiological responses leading to fear of negative consequences is why anti-vaccine advertisements are so effective. In a study done by Nadia Hanin Nazlan, Sarah Tanford, and Rhonda Montgomery, it was found that negative information more strongly affects decision-making: "Negative information 'evokes strong and rapid physiological, cognitive, and emotional responses' and is therefore more available in decision making" (Nazlan 67). For instance, a quote directly from the website *Learn the Risk*, an antivaccine website, highlights the negative information tactic: "Did you know that CANCER IN CHILDREN is skyrocketing? It's now the leading cause of disease death . . . in KIDS. Guess what else TRIPLED in that same time frame? The childhood VACCINE schedule." The website disguises its own position under the identity of historical analysis. In doing so, they provide the credibility necessary to hook the reader and get them to continue reading while accepting their position. By proclaiming the direct cause of childhood cancer is the new vaccine schedule, *Learn the Risk* has created a scapegoat for a tragic diagnosis. It is easier for the reader to blame vaccinations than the accept the child was just unlucky. Furthermore, the website pairs its credibility with fear to push its reader further to their views. Words such as "CANCER IN CHILDREN" and "LEADING CAUSE OF DEATH IN KIDS" prey on the fear every parent has of losing their child. It is these particular words that activate the

strong physiological responses to the text. The fear tactics are particularly effective in this case because of the false credibility that was created by performing "historical analysis." The reader fears the precedent that *Learn the Risk* has created by demanding a direct cause-effect relationship from two unrelated statistics.

Table 1.
Serious Adverse Reactions to Vaccines

VACCINE	DOCUMENTED REACTION	APPROXIMATE RATE	POTENTIAL ALLERGEN
Diphtheria and tetanus toxoids and acellular pertussis (DTaP)	Serious allergic reaction[12-14]	1 per 1,000,000 doses[13]	Infanrix syringe contains latex[11]
Measles, mumps, and rubella	Immune thrombocytopenic purpura[14-18]	1 per 20,000 doses[19,20]	Contains neomycin and gelatin[8]
	Serious allergic reaction[14-18,21]	< 1 per 1,000,000 doses[18,22,23]	Contains neomycin and gelatin[8]
Measles, mumps, rubella, and varicella	Febrile seizure[14,15,17-21,24]	8.5 per 10,000 doses[20]	Contains neomycin and gelatin[8]
Meningococcal	Serious allergic reaction[14,25]	Rare[25]	Menomune and Bexsero contain latex[11]
Rotavirus	Intussusception[22,29]	1 per 20,000 to 100,000 doses[20]	Rotarix contains latex in oral applicator of diluents[11]

Information from references 8 and 11 through 28.

     Negative information tactics can also be paired with the loss aversion theory to better understand the concept. Loss-aversion theory suggests people seek to avoid negative consequences by assigning more weight to losses than gains. Because the nature of vaccinations is a risk-reward analysis, it is exploitable by those who oppose it. By showing readers stories of failures and rare side effects, the reader is more strongly swayed against vaccinations in a desire to avoid the potential negative consequences. In analysis of the serious reactions to vaccines, the approximate rate is very low. Viewing the complex medical jargon in the chart such as "Immune thrombocytopenic purpura" or "Intussusception" along with exposure to the personal stories causes loss-aversion to falsely inflate the danger of said side effects. While the chart is designed to be informative, factual, and to-the-point, once the reader has had external influence, the chart no longer serves to inform' it simply causes the reader to fear the side effects. Unknown and complex terms along with immense difficulty in overturning emotional beliefs with facts and figures prevent many from benefiting from data like this. In an interview with Melissa Wilcox, a former anti-vaccine parent, she shares how it was hard to convert: "For most people who have trouble believing in the science of vaccinations, it's an emotional reasoning, which is incredibly difficult to change. Facts don't always win. If people don't want to believe it, they're not going to believe it." Her emphasis on emotional reasoning stems from the strong desire to protect her children, whether it be from side effects or chemicals in the vaccines. This demonstrates the difficulty charts with statistics have when trying to persuade people.

Approaching the issue from a different angle, high-profile and outspoken individuals who are public figures have strong influence for members who are part of the anti-vaccine community. For example, examining Jenny McCarthy's statements regarding vaccines, it is important to remember her social status. She has been quoted as saying, "What number does it have to be for everyone to start listening to what the mothers of children who have autism have been saying for years, which is . . . We vaccinated our baby, and SOMETHING happened. SOMETHING happened. Why won't anyone believe us?" Her argument is strongly grounded in McCarthy's desire to do what is best for her child. This is a very common and relatable belief many parents can relate to. Her belief in strong family values and the protection of her son at all costs has caused her argument to take the shape of "listen to the mothers of children who have autism." She places particular emphasis on the ages-old idea that a mother knows her child best and her word should be taken above what others say. McCarthy's entire argument is based on the premise that through her motherly love, affection, and a protective style of parenting, she was able to help her son "recover" from autism. The danger of her argument comes from the fact that many mothers agree with her ideas of protecting their children, doing anything they can to help keep other kids safe. This translates into campaign to stop vaccination and protect the kids.

Furthermore, McCarthy makes use of the psychological theory of cognitive dissonance. People have an innate desire for consistency. By using her public image to spread the claim "vaccines can trigger autism," those who agree with parts of her argument, specifically on her family values of protecting her children, are subjected to psychological stress when they don't agree with the rest of her argument. In seeking to resolve this uncomfortable conflict, those who follow McCarthy go along with what she is saying rather than raise their own doubts.

Following the influence celebrities have on the public, examining the effects of the inoculation theory is of particular interest. The use of a weak and watered-down claims from the pro-vaccine side allows readers to manipulate themselves towards the end position the anti-vaccine groups desire. The inoculation theory holds that communicators may expose people to opposing opinions in order to better form counter arguments. This is evident upon examining the rhetoric used on *Learn the Risk*: "Herd immunity can only come from naturally caught illnesses—NOT from vaccines. Some people may be old enough to remember that just 20 years ago, measles and chicken pox were benign illnesses that, for centuries, were a rite of passage for children." The text suggests there is a perceived superiority in a natural condition like catching the disease over a vaccine. By exploiting the general distrust many people have for synthetic treatments as well as pharmaceutical companies, *Learn the Risk* is able create a false hierarchy in which catching naturally occurring diseases to acquire immunity is superior to getting vaccinations. The "history" of common illnesses and vaccines is conveniently reduced to a span of 20 years, which is incredibly small in the grand scheme. This allows *Learn the Risk* to cherry-pick a section of history in which many of the common diseases caught we not life-ending and paint a picture of a world that was safe without vaccines. The persuasiveness is further illustrated by using a direct appeal to the older generation's childhood experience. By reminding the reader of their own childhood and adopting the mentality that the younger generation needs to "toughen up" and go through the same common illnesses everyone else at the time did, *Learn the Risk* is suggesting in order to truly transition into

adulthood, children should catch preventable diseases. "What doesn't kill you makes you stronger." The loss of exposure in childhood is somehow making adults more vulnerable to disease. By weakening the position of the pro-vaccine side and leading the reader to a counter argument, the website has effectively tricked the reader into agreeing with their position while all the while believing they came to such a conclusion of their own accord. This makes further attempts to persuade them otherwise by the pro-vaccine community is more difficult as they "came to the conclusion through their own research" and were not influenced maliciously.

The persuasive techniques used by members of the anti-vaccine community have tricked many people. Exploiting psychological weaknesses, pairing fear with a clear-cut solutions, and appealing to common values have far surpassed what the pro-vaccine community is able to counter right now. It is important to remember many people simply believe they are doing what is best for their children and are not maliciously withholding treatments. Kelley Synder, once an anti-vaccine mom, described her reasoning: "At the time, the anti-vaxxer voices in my head said they were trying to coerce me into doing something dangerous for my child. They told me I was going to have to stay in the hospital longer for observation. I saw that as trying to force me to inject my child with this poison." Parents' desire to provide the best life possible for children has caused a twisted, warped version of this to emerge, one that rejects vaccinations for the sake of protecting children. It is this desire to do good that is ultimately being exploited by the anti-vaccine community.

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KNOWING
WORDS
COVER ART

GAURI ARORA
Untitled Paining

CLAIRE MASTRANGELO
Constructive Critique of Infectious Disease Prevention at CU / Boulder
Upper Division, 1st Place

If you walk into a lecture hall on the University of Colorado / Boulder (CU) campus in the winter, you will likely be greeted by a chorus of coughing. Anyone who has sat through a semester in one of these rooms has probably felt the unwelcomed mist of a sneeze from the seat behind them or pulled open a door handle that was previously touched by someone who had just coughed into their hand. College campuses tend to be a hot bed for infectious agents like rhinovirus, influenza, and even meningococcal meningitis, as seen at CU. Students' behaviors, like lack of sleep, sharing saliva, and excessive drinking, can weaken their immune systems, making them prime hosts for these pathogens. Their proximity and intimate contact with one another also allow pathogens to easily spread between students. Even though it may seem inevitable that students will get sick, there are many preventative measures that can be taken to reduce the incidence of infectious diseases on campus. While it is clear that CU has extensive plans in place to stop highly virulent infections, I suggest that the campus could implement several low-cost measures to minimize the spread of more common communicable diseases like Upper Respiratory Tract Infections (URTI).

In this paper, I will highlight the strengths in CU's current efforts to combat infectious diseases. I will then outline how we can reduce the incidence URTIs by forming a committee to oversee all preventative efforts, improving monitoring of URTIs, restructuring absence policies, and increasing the education students receive about preventing the spread of infectious diseases.

Current Infectious Disease Prevention on Campus

Public health at CU is currently divided between many departments including, but not limited to, Wardenburg Health Center, Health Promotion, and Residence Life. These groups, Wardenburg in particular, work closely with Boulder County Public Health to monitor disease outbreaks. Stacy Farman, BSN, Wardenburg's Infection Prevention Coordinator, has developed two sets of plans to control infectious agents on campus. Both plans are top-down policies and procedures: one outlines the campus response to a pandemic flu (like the H1N1 pandemic in 2009) while the other is more general for outbreaks of infections like meningitis, measles, pertussis, and even anthrax. CU was the first school in the state to hold a Point of Dispensing (POD) training to rapidly distribute antibiotics in the event of an anthrax outbreak. Currently, no overarching plan exists for the campus to prevent the spread of common infectious diseases like the cold and flu (S. Farman, personal communication, April 11, 2019).

CU students are required to get the Measles, Mumps, Rubella (MMR) vaccine series or sign an exemption form within their first month of classes. Currently, around 1,400 students have opted for an exception, leaving their vaccination status unknown to the school. If none of these students is vaccinated, that puts student vaccination rates at about 96%, theoretically enough to confer herd

immunity. Farman points out, however, that because Boulder County has such low vaccination rates, an outbreak of measles in Boulder could affect students. If that were to happen, Farman has a plan that includes contacting all unvaccinated students and offering free MMR vaccines. Currently, there are no vaccine requirements for campus employees, including those working in food service. The only exception are employees of Wardenburg, who are required to get MMR, Varicella (chicken pox), Hepatitis B, and Tdap as well as be tested for Tuberculosis. Additionally, Wardenburg employees who decline a flu shot are required to wear a face mask at work. In 2012, Farman began offering free flu shots for students. The program has continued to grow: during the 2018-2019 school year, almost 5,000 students received flu shots on campus. Still, this vaccination rate is not nearly high enough to confer herd immunity to the nearly 35,000 students on campus (S. Farman, personal communication, April 11, 2019).

CU's ability to rapidly and effectively respond to highly virulent infections was clear in fall of 2018, when a CU student was admitted to the hospital for meningococcal meningitis, a bacterial infection in the membranes around the spinal cord and brain. CU's infection control nurse was informed within a few hours and began implementing the plan to reduce impact of the outbreak. These measures included prophylactically treating everyone who had come in contact with the student's saliva. Though it has been associated with kissing, meningococcal can be spread whenever saliva is exchanged which, in this case, included sharing e-cigarettes, cups, and bongs. CU sent an email to campus the next day and began posting signs around campus with information about meningococcal. Despite the surprising number of students who were exposed, CU's plan was successful, and no other students were diagnosed with meningococcal (S. Farman, personal communication, April 11, 2019).

URTIs

Though CU was able to prevent the spread of a rare, highly virulent infection with the plans they have in place, there is still no master plan for preventing the spread of common URTIs. URTIs are often called the common cold; however, they can be caused by many different pathogens, including rhinovirus and influenza. URTI is an umbrella term used to describe infections in the throat, nose, and sinuses that all present with similar symptoms. These symptoms can include a cough, runny nose, headache, sore throat, sneezing, and congestion. Most URTIs are spread through droplets. This means that people can become infected if they come in contact with the mucus of an infected person, either through an uncovered cough or by touching an object that is contaminated. As the most common type of infection, it is estimated that adults in the United States will get an average of 2-3 URTIs every year (Arroll, 2008).

Consolidating URTI Prevention on Campus

There are many instances of communication breakdown between departments at CU in infectious disease prevention. Currently, all efforts for infection control fall under the Associate Vice Chancellor of Health and Wellness, which houses six departments including Wardenburg (medical services), Health Promotion, and the Rec (K. Daily, personal communication, April 29,

2019). The head of each department meets monthly to problem-solve in an effort to be more collaborative; however, with so many issues to discuss, infections prevention has fallen through the cracks. There is not a person or department that keeps track of everything being done to prevent the spread of infectious diseases on campus. As a result, there are redundant efforts as well as gaps in what needs to be done. With no one specifically in charge, many simple preventative measures to combat URTIs are not taken. For example, Health Promotion has begun putting up dispensers for hand sanitizer around campus. The hand sanitizers are all over 60% ethanol—most higher—which meets the CDC's requirement for inactivated most infectious agents. However, there does not seem to be a clear understanding of who is responsible for providing hand sanitizers across campus. The Housing and Dining department orders theirs separately from the Rec Center and Wardenburg; it is unclear who is responsible for refilling the dispensers in other buildings, which are often empty. Having empty hand sanitizer dispensers can be worse than having no dispensers. Consider a student who goes to use a dispenser to clean their hands before eating, only to find that the dispenser is empty. This student has already touched the pump, exposing themselves to every pathogen left by students before, some of which may have been trying to clean their sneeze-covered hands. There are also no signs around the dispensers showing their efficacy. Many students may not realize that hand sanitizers are most effective on hands that have just been washed (CDC, 2019). If students do not know how to properly use hand sanitizer, they may be using it instead of regularly washing their hands, giving them a false sense of security.

Perhaps if CU had a committee in charge of overseeing all infectious disease prevention efforts on campus oversights, like those seen with the hand sanitizer would not happen. This committee could be made up of faculty, students, and representatives from across campus like Wardenburg, Housing and Dining, and Health Promotion. This diverse group would be able to voice their concerns and troubleshoot solutions for preventing URTIs on campus. The notes from these meetings could be made public so everyone on campus could know what was being done to protect students. Having more transparency would also allow for administers, healthcare providers, faculty, and students to know their role in preventing the spread of infectious diseases on campus.

Increasing Data Collection and Analysis

Tracking URTIs on campus would offer more insight into the scope of the problem and help find more preventative solutions. In public health, monitoring infectious diseases is considered the first step in preventing them. Currently, no data are collected on prevalence of common URTIs on campus. It is hard to know what planning should be done when the scope of the problem is unknown. Wardenburg is required to report certain diseases, like meningitis, to the Boulder County Health Department, however, this does not include common cold or flu viruses (S. Farman, personal communication, April 11, 2019). As a result, we have no way of knowing how many students get sick, how often they get sick, or what factors determine why students get sick. When students check in at Wardenburg health center, they are asked to identify which symptoms they are experiencing. Though it is not in her job

description, Farman checks regularly to see if there seems to be an increase in the number of students coming in with the same symptoms. For example, if she sees an increase in the number of rashes, she may notify the medical providers that something is going around. This monitoring is a good start, but it is hard to see subtle trends in data without using statistics.

The symptom data collected are all digital and are also associated with students' demographic information. CU could easily begin checking those data daily and running statistical tests to see if there are any trends. Those data could be further subdivided into different demographics such as year in school, housing location, and sex to know which students may be at a greater risk. CU could also include a questionnaire about students' overall health, including URTIs, at the end of each semester along with the Faculty Course Questionnaires (FCQ). Improving collection and analysis of these data would help in several ways. First, it would help student health detect URTIs earlier, before they spread across the student body. Knowing about URTIs early would allow CU to target specific demographics, like certain dorms, with prevention campaigns. For example, if they noticed a spike in URTI symptoms in a specific dorm, they could increase the number of posters about hand washing and have Facilities Management disinfect the doorknobs in that dorm. Regular monitoring of symptoms would also give insight into patterns. These patterns can show when students are getting sick and why some students more likely to get sick than others. With this information, email campaigns could be targeted at specific students, and times when they will be most effective. Surveillance of infectious diseases on campus would offer more insight into the problem and help find more preventative solutions.

Improving CU's Absence Policies

CU's current absence policies are not conducive to preventing the spread of URTIs. There is currently not an overarching policy that applies to all classes; rather, absences policies are set by professors independently. Many classes include participation as part of their grade, incentivizing students coming to class when they are sick. Dr. Sara Sawyer, a professor and virologist at CU, counters the status quo by asking students to not come to class if they are sick, especially during flu season. As an expert in infectious diseases, Dr. Sawyer recognizes what many professors do not: there is value in students staying home when they are sick. There is a concept in epidemiology call the basic reproductive number, or R0. Generally used as a measure of how infectious a pathogen is, R0 explains the number of people each infected person infects. By staying home when they are sick, students are unable to infect their classmates, reducing the R0 for the infection. Stacy Farman notes that during the winter months, Wardenburg is inundated with sick students requesting notes to excuse them from class. In order to get these notes, students have to be seen at the clinic, even though most of their infections will resolve without medical treatment. When sick students come into the clinic, they are increasing the risk for exposing healthy students to their URTI, thus increasing the R0 for the pathogen.

Professors can adopt absence policies that allow students to miss class when they are sick while still maintaining a level of participation. For instance, in a large lecture with iclicker points, students who miss class could have the option of watching the lecture capture for the day and completing an online quiz. For a smaller class with group discussions, the student could complete a short response paper. By offering alternative participation credit, professors could minimize the number of sick students coming to class while still incentivizing the rest of students to attend class.

Increasing Student Education About URTI Prevention

Though there are many efforts on campus to educate students about communicable diseases, the current campaigns do not do enough to address URTIs. Stacy Farman has delegated outreach and education campaigns to Health Promotion (2019). These campaigns range from signs about handwashing in the bathrooms to posts on twitter about the risk of contracting measles over spring break. In theory, it makes sense to try and reach students though social media; however, it is unclear how many students are actually seeing these posts. The Health Promotion twitter, CUBoulderHealth, has over 800 followers and posts daily; however, it is rare for these posts to have more than two likes, if they have any. Even were all 888 current followers to see every post, that is still less than 3% of CU's student body. The signs in the bathrooms seem like an effective way to reach students as most students visit them every day; however, it is unclear how widespread these signs are and if they actually improve handwashing. These signs can be found in the University Memorial Center, a gathering place for students; however, they are scarce in academic buildings, including the library. Kathryn Dailey, the Associate Director of Health Promotion, notes that while it would be nice to know how effective the signs are, it would be almost impossible to conduct a study to find out because there are so many factors that can influence students' behavior (S. Farman, personal communication, April 11, 2019).

Still, I propose that putting more resources into educating students about how to prevent spreading their infections to other people would be a cost-effective measure that would reduce the incidence of URTIs on campus. I suggest that CU increase signage in bathrooms and around campus. It is easier for a student to ignore a sign or a post if they only see it one than if they see it every day. Specifically, signs on the onside of bathroom stalls would be unavoidable for students. These signs would include when to stay home, the best ways to cough or sneeze, how to properly wash hands, and even why it is dangerous to share vape pens. Though theses may seem like simple measures, they can have a big impact when they prevent infections from spreading.

Conclusion

Though CU has extensive plans in place to stop outbreaks of diseases like meningitis, more still needs to be done to reduce the incidence of common respiratory infections like cold and flu viruses. Across the country, more than 20 million days of school are missed each year because of URTIs (Adams, 1999). Additionally, it is estimated that URTIs, not including influenza, cost over $22

billion annually (Fendrick, 2003). CU should adopt a clear public health policy that will outline all the ways they will prevent the spread common URTIs. By implementing a more rigorous plan to combat URTIs on campus, CU will be saving money long term and will likely see an increase in attendance and productivity. The healthier students are at CU, the more productive the campus will be. CU has the opportunity to continue to be a leader in infectious disease prevention by adopting simple new policies to minimize the spread of URTIs on campus.

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MAX TODD
Saturday Musings from the Skull Corner
Upper Division, 2nd Place

And now we come to the skull corner, where this tour of the Morrison Natural History Museum, like every other, begins.

"It's not as ominous as it sounds," I joke to the group I'm about to lead through.

On display are three fossil skulls, all of unrelated animals from unrelated times. This might seem disorganized, but it's these differences that serve as the exhibit's teaching device. On the far left end is the skull of a relatively spry, 12,000-year-old American Bison, in the middle sits the enormous maw of a 70 million-year-old *Tylosaurus* named Sophie, and, finally, on the right sits a local, Morrison dinosaur named *Allosaurus,* 145 million years old and counting. I make sure to pause and turn to face my tour as we come to this final skull, giving them a moment to brace for what I find to be the most incredible thing about this exhibit yet:

"This animal is older than *grass*."

The older woman, maybe the grandmother, blinks. The adults with her appear to already be looking ahead to the next set of bones, while the child at their feet looks on attentively. I can tell he is listening, but his eyes don't convey the look of amazement or bewilderment that had struck me when I had first heard this—like an error message on a computer screen. I cringe inwardly. I'd delivered it wrong again.

Time and time again I say this, but rarely does it carry the impact it should, and while my first instinct is to assume the problem is my own, it has often crossed my mind that something much more profound is at work. In John Steinbeck's *Travels with Charley in Search of America*, the author finishes his road trip across the country in Redwood territory, where a similar experience awaits him. His mission: let his aforementioned dog, Charley, urinate on the trunk of the largest tree in the world, the Grandfather Tree. Instead, he is given a poignant lesson in perception when, having confronted the redwood itself in the climactic moment of their quest, both man and dog undergo wildly different experiences. Steinbeck experiences what Dr. Tom Cochrane, Professor of Philosophy at Flinders University, might call the mathematical sublime, one induced not by the power of a phenomenon like a storm but by the presence of an extreme manifested before one's very eyes. It is the scale of the feature that overcomes the viewer—its dizzying height, its sheer evenness, its incomprehensible vastness. Thus, as Cochrane puts it, "with regard to the mathematical sublime, the predominant effect seems to be one of alienation rather than fear," simply because of the individual's insignificance next to something of such immensity (130). Yet, no such sublimity possesses Charley—in fact, Charley seems unable to recognize that the Grandfather Tree is even a tree. One might assume that his canine brain would react similarly to Steinbeck's; after all, before him is a

marvelous structure bearing the implication of immense power's presence—power that no one dog or the united forces of dog-kind could ever hope to match. Anyone who has been in the presence of an organism of such goliath proportions knows the sort of "enthusiastic terror" that John Dennis described before the word "sublime" had even been conceived. Ye,t all of this seemed to soar above Charlie's head. It seems that the sublime is entirely subjective, at least on a species level—no dog had ever needed to develop perception of this scale, and thus, it never evolved. Only when his owner "cut a branch from a small willow tree . . . and stuck the little willow in the earth so that its greenery rested against the shaggy redwood bark" did Charley grasp some inkling of the monumental sight before him and let the floodgates open (Steinbeck).

With our all-too-short individual lifespans, we too were never given an evolutionary reason to perceive such immense scale, though our impediment exists in a more temporal sense. We can, at the very least, admire the magnificence of physically sublime phenomena, but when confronted with stories measuring in millions and billions of years, something seems to short-circuit. Cochrane would characterize this as symptomatic of the mathematical sublime, stating that "as we perceptually explore and reflect upon the sheer breadth of nature before us, a feeling of being lost or absorbed in the environment can result. One could describe it as being imaginatively spread much thinner, to the point of dissipation, as we relate ourselves spatially to what we perceive" (130). Yet, this dissipation seems to almost inhibit any reaction at all—the vacant blink of the grandmother, for example, seemed not to convey any understanding whatsoever, much less sublimity. Maybe there really is an error message, something that can only be ameliorated by ignoring the issue entirely, or else breaking it into more manageable chunks that can be processed in the moment. In this moment here in front of the skulls, both the museum patrons and I are right there next to Charlie—sitting at the foot of a great redwood tree.

Sharing Jurassic Morrison with the ancient *Allosaurus* is a redwood of a dinosaur—the herbivorous *Apatosaurus*. This creature's remains were discovered in 1877, within walking distance of the exhibit that now encases them, and they were some of the first truly giant dinosaur bones ever found. Of course, this is difficult to illustrate in the low-ceilinged lower floor of an establishment with the slogan "Small Museum, Big Discoveries," and the fragmentary exhibit at first glance reads like a gruesome crime scene—an arm here, a foot there, a disembodied head and neck hanging from the ceiling. Yet, this is the best anyone can do to represent the animal's enormity with the space provided; after all, at 80 feet on average, a single *Apatosaurus* could span the length of the entire building. Luckily for me and my tour, we all have some frame of reference for this dinosaur's size, unlike its time of death. I ask the child,

"How many school buses long do you think this guy was?"
He frowns pensively, but not for long.
"Twenty."
I drop my jaw, feigning an aghast reaction.
"Twenty?! Well thanks, now you're going to make me sound unimpressive."

It turns out, *Apatosaurus's* body length, despite rivaling the blue whale's, is only the equivalent of a measly three school buses. This, of course, is manageable—we've all seen convoys pulling in and out of school parking lots, clogging the lines of impatiently rumbling cars at dismissal. As paleontologist and director of the Morrison Natural History Museum Matthew Mossbrucker says, "Our species encounters the world in small figures. A family of five. Two tacos. Even a stadium of 20,000 people cheering a losing football team. We know what these small figures look like, and can therefore relate" (Mossbrucker). In other words, scale is the reason the school-bus analogy is successful where many similar attempts to relate larger paleontological concepts fail, for deep time operates at such a wholly different scale that, even when simplified, it is often incompatible with our own. Mossbrucker continues, "Simply counting to one million if an integer passed every second would take eleven and a half days. Counting to 150 million to develop an appreciation for the span of time between us and the end of the Jurassic during the reign of *Stegosaurus* would take 4.5 years, playing by the same rules. That's ridiculous! Wholly un-relatable" (Mossbrucker).

But, this has not stopped science communicators from trying to make so—in fact, so many have tried to contain the vastness of time within the constraints of a normal human activity that it might as well be a rite of passage for aspiring documentary writers. To some, geologic time is a 24-hour clock; to many, it is a "Cosmic Calendar," as featured in *Cosmos: A Personal Journey* and its subsequent series. My personal favorite, of course, is that of Reg Saner's *The Ideal Particle and the Great Unconformity*, which compares geologic time to the height of a human body. "On that scale a man's overnight growth of whisker more than equals humankind's stay on this planet." Saner muses. "Our presence as a species gets effaced with a morning shave" (402). This referential (and perhaps unfortunate) inclusion of humanity's existence is an essential element of every iteration of this allegory; on the Cosmic Calendar, recorded history begins on December 31st with 27 seconds until New Year's Day, and on the 24-hour clock, humanity arrives but 1.17 seconds from midnight. Though each of these models attempts to forge a personal connection pertaining to everyday human activities (with varying degrees of success), according to Professor Joel D. Parker of the University of Southampton, they all still fundamentally fail to accomplish their primary goal: translating scale. For though such measurements as 1.17 seconds are astoundingly miniscule, they are almost incomprehensibly so. In their quest to help the curious grasp something too big to comprehend, educators instead made the subject too small. As Parker puts it, "[these models] trade off the problem of grasping very long times for the problem of grasping very short distances. The result is an understanding of relative time [time abbreviated] with little comprehension of absolute time [the actual extent of time]" (1). His proposed solution takes into account that "the distances most easily understood by teachers and students are those most people can experience directly" (1). Astrophysicist and author Carl Sagan, creator of the original Cosmic Calendar, seemingly recognized this and addressed it in a later addendum to the analogy. This time, geologic time was represented as a football field, with human history being but the width of his own palm. These measurements fall within something of a perceptual goldilocks zone—not too big, not too small. This remains in keeping with the mathematical sublime that students and the curious should be swayed by, seeing that it, too, requires a precise scale in order to have its maximum effect. In order for a sensation of the sublime to occur, we must be "prompted by nature to encompass an aesthetic unit of measure appropriate

to the infinite," and in doing so, "we will be engaged on an impossible task that will sooner or later expose the limitation of the imagination, and so our power of aesthetically estimating the magnitude of things in the world" (Budd, 237). If the subject is too far from an incomprehensibly massive object, like the sun or the moon, this sensation fails to take effect, and the same can be said for geologic time. Sagan's revision takes this into account; however, Parker believes we can safely go even bigger and still induce a simulated sublimity. Given the assumption that the maximum distance a student reasonably experiences on a day-to-day basis is one that can be driven, he annually sends his class on a mission to the birth of the Earth. Placing a marker on the floor to represent the current moment, he tells students that they will only have to walk back 6.5 inches to reach the biblical moment of creation, and 3 feet to enter a time when we still coexisted with Neanderthals, but in order to reach our planet's genesis, they will have to drive 75 miles—in this case, to Big Ben. This representation seems to be the most engaging of them all and can be copied and pasted to any other classroom setting with the resources and a notable landmark within a 75-mile radius, give or take. Although unfortunately it cannot be applied to a museum environment, this is largely a success story in science education, and a point won for the versatility of the human mind.

Chenoa Ellinghaus, the resident paleontologist at the Morrison Natural History Museum, would optimistically agree. She believes that the barrier obstructing any given person from comprehending the nature of geologic time is partially within their own heads. To her, there are three ways in which this mindset can manifest. Conflict can occur due to an individual's faith or belief, their underestimation of its relevance, or their lack of effort to learn induced by the overwhelming nature of the subject, often followed up by their subsequent dismissal of said subject. Needless to say, the nauseating depths of time taken as they are would be unquestionably too much for the human brain to process—like *The Onion's* exclusive interview with God, the unfortunate soul who dared try would undoubtedly crumble into a wailing mass, begging "I'M SORRY! THANK YOU! I UNDERSTAND!" before dissolving away entirely ("ONN Exclusive: One-On-One Interview With God," 00:00:24 - 00:01:10). Yet this perspective should by no means lead to an underestimation of the wily human mind, which, when given the right tools, can deduce significant conclusions. A struggle to conceptualize is not, as I had assumed, the end-all, be-all of the issue; rather, it simply requires a reassessment of the tools at hand. As Mossbrucker puts it, "[a]t best, we can use literary or mathematical tricks to engender awe for these figures" (Mossbrucker).

Then again, even if we tried, there is no force at our disposal that could ever display the history of Earth or life in its entirety. Even as we progress through the tour, we leap over gaping chasms in the timeline, jumping ahead 30 million years by walking upstairs to the Cretaceous room and again more than twice that as we walk through the doorframe towards the Ice Age room. Beforehand, I try to make the transition as smooth as possible, talking at length about the extinction of the dinosaurs, and the diversification of mammals in the vacuum that they left behind. Nonetheless, there is no way to transition smoothly through a gap this large, and I cave, settling on a joke:

"So, as we conveniently skip 63 million years of history…"

This, I think, is a flaw that no one in particular is responsible for, and one that is not just endemic to our museum—in fact, it's a problem that every museum, every school, and even every geologic timeline poster has to work around. One needn't look hard for the evidence, whether it be confusion brought about by the dinosaurs' extinction and the ice age being presented sequentially or the lack of knowledge that there were many vertebrates on land well *before* the dinosaurs, this problem is universal. Despite this, I find it articulated nowhere better than in *All Yesterdays*. The fruit of collaboration between authors John Conway, C. M. Kosemen, and Darren Naish, this book is an experiment in speculative evolution, and an exercise in breaking every stereotype in the portrayal of prehistoric creatures. After a long October week where the snow and the homework had both fallen far too early, I sat down to relax and read the book, not expecting the re-emergence of a pseudo-sublime experience. Obviously, my interest in paleontology is persistent, but it ebbs and flows, and this book rekindled the wonder I had for the wild world of Earth more than anything else had in years. I was humbled by the abyssal portions of time, information, and memory claimed by the fickle fossil record, enough to make the hair on the back of my neck stand. Some semblance of the mathematical sublime had manifested, though it was missing a key element, for I felt not alienated by but rather in awe of the treasure trove of discoveries to never be made. I felt closer than ever to the countless ghosts of our planet's past, something the book's soberingly beautiful thesis evokes better than I ever could: "Imagine the richness, and the strange wonder of animal life today. The eerie, ululating songs of whales, the elaborate middens of bowerbirds and the surreal spectacle of a peacock's display could never be deduced from inanimate remains. Likewise, some of the most spectacular sights of the past will never be seen, or even guessed at" (Conway et al., 20).

This, at its essence, is the tragedy of paleontology: for every one discovery unearthed, ninety-nine will remain forever buried, reduced to the very grains of sediment that will erode yet more rock and fossil material. Nature, it seems, is inherently in opposition to the persistence of memory, for in addition to the near miraculous conditions required to preserve a fossil, those fossils that remain present a biased picture of the environments they represent. For example, given that fossils are far more likely to be preserved in environments that cover specimens near instantaneously, we have far more evidence of animals in swamp or floodplain biomes than anywhere else. Thus, our perception of the past, already fragmentary at best, is tainted by an ideally avoidable second bias, stemming directly from the scientists who describe them. These specimens themselves, being only husks of the animals they belonged to, are entirely up to the subjective (though qualified) interpretation of those who study them, and inevitably, some will gain more scientific attention and significance in the public eye than others. As Matthew Mossbrucker would say, "there is a cultural tendency to boil everything down into a greatest hits list," and the power of popular opinion should not be underestimated (Mossbrucker). After all, it is the fault of one stuffy Englishman that professionals and pedestrians alike viewed dinosaurs as lethargic, lumbering lizards for nearly one hundred and fifty years, despite the fact that a lesser-known contemporary on the other side of the world had rightly stated that giant birds once roamed these lands in reference to the very same creatures years earlier. Put simply, "Your focus determines your

reality," and our cultural and scientific fixation on certain aspects over others has birthed more than a few misconceptions about the timeline of life (*Star Wars Episode I: The Phantom Menace*). If our only hope of perceiving the vast past is whittling it into exponentially smaller exhibits more palatable for the human mind, then it would seem that who chooses these vignettes and what they choose is of utmost importance.

This raises the question: where *is* the definitive list of the top 10 most pivotal moments in the history of life? The power of bias can be strong, but surely, like-minded science educators would have come together to mitigate this and produce a more accurate but concise timeline streamlined to maximize educational value. Seeing as it evidently has not been done before, I graciously took it upon myself to undertake this daunting task just last week. This was a mistake. For, as I sat back and thought to myself what might be worthy of making the cut, fingers twitching above the keyboard with anticipation, the only response that I could muster up was "Dude, I don't know." I was defeated, blindsided by the very thing that was the genesis of this essay: the enormity of my options. Sure, I could include the time that oxygen caused a mass extinction, or the time when organisms could be trilaterally symmetrical and there were no fundamental differences between plants and animals, or the time when life on Earth nearly ended before the dinosaurs had even evolved. But, how does one prioritize one event over the next, and what makes each one more or less valuable than the other? Why does any of this matter at all?

There are good tours and bad tours, and it seems today's is one of the latter. As it putters to a stop inside the paleo lab to give the guests a behind-the-scenes look at where the real science happens, I can't help but feel a little empty. Here before us are the remnants of sandstone boulders from downtown Morrison, whose grip on late Jurassic fossils volunteers have been trying to relinquish for over 15 years. Spotting the surface of one such boulder are five footprints, some of which are currently the smallest *Stegosaurus* tracks on record, and others of which belong to an enigmatic, long-toed animal whose footprint tells us that it was moving fast. Some say these tracks indicate cooperative, communal behavior between *Stegosaurus* and another small herbivore named *Othneilia*, while others suggest that these animals were simply sharing food, as is evidenced by the fact that these tracks were left on a sandbar bordering a river. The truth is, each and every one of us may be greatly overthinking these tracks entirely and reaching for information that simply is not there, for though contemporaneous down to the day, these two dinosaurs might have simply interacted by coincidence. While it is altogether the wrong mindset, sharing this information with a disengaged tour feels as if I'm rolling over belly-up, exposing the vulnerabilities in my credibility. The man in the group, who has maintained a safe distance from the tour through its entire duration, chuckles to himself. He is a molecular biologist, which lends some unfortunate credence to what he now says with a laugh:

"Only in paleontology can these kinds of stories be seen as actual scientific inquiry."

And it stings. I laugh along, but I can't help but feel that it's a jab with legitimate criticism behind it. On top of being difficult to comprehend as a subject, a wealth of information is missing, and what little there is at first seems to bring no short term reward to the table for civilization as a whole. In fact, some scholars like Martin Rudwick believe that the last time paleontology contributed significantly to science was with Cuvier's discovery of extinction. If it is so difficult to communicate and has such an abysmally low turnover of useful scientific information, then why bother teaching paleontology in the first place?

The first paleontologists were dragon hunters. No one knows how long humans have speculated about relics from the past, but for a relatively new science, paleontology's roots run deep. In ancient China, the fossilized teeth of local dinosaurs were thought to be the bones of the winding, serpentine *Long* of their mythology, who fell from the mountain but still possessed magical power. These teeth were crushed up and sold, as they were revered for their medicinal properties. While it can be somewhat anxiety-inducing to wonder what countless important specimens were destroyed in this era, some comfort can be found in the fact that, in some backwards way, this defacement was out of reverence. Instinctively, though we knew not where they came from, humankind was aware that these bones belonged to something much bigger than ourselves. Only in the minutia can one really separate the idea of an elder god whose race carved out rivers and created the four elements from the work that we now know nature automatically does itself over boundless stretches of time. But, unlike the desiccated dragon skeletons of a bygone era, these forces are still very much alive, and we have experienced but a freeze-frame of their capabilities at work in our time on this planet. Realistically, we may not know much, but what we do know is that history is cyclical. According to paleontologist Chenoa Ellinghaus, revealing this is an integral part of this field's purpose; to her, paleontology is "just another brick in the wall" of science (Ellinghaus). In other words, petty criticisms about the lack of quantitative contributions to science and short-term utilitarian gains that paleontology has provided are missing the forest for the trees. Here, a clock analogy is much more applicable—all of the sciences have a common goal of advancing the knowledge of humankind, and without one, the others would be missing a vital component, like a watch missing a gear. According to Matthew Mossbrucker, "Paleontology's greatest significance lies in helping humanity to understand its place in the chain of life through time. It offers perspective, in the delicate balance of ecology, inevitable change, death, and the endurance of life, both literal and metaphorical. Paleontology at its best is the vocal reminder of our past and connection to all life. The multidisciplinary approach to the study of ancient life is also a gateway to other specialized areas of inquiry, from physics and chemistry to medicine or modern natural sciences." To him and many others in the field, "We should all look at our world through the lens of paleontology" (Mossbrucker).

So, what does it matter which events we choose to speak of, or what stories we choose to tell? The greatest story of them all, the entire story of the Earth, seems to be little more than the sum of its parts. It's quite predictable, but only if you're paying attention; the vignettes time has provided us are not so much important in their content but in their context. "Is one more mass extinction more important than another?" asks Mossbrucker. "No, because the loss and gain of biodiversity through time cannot be appreciated from a singular event but through a continuum of one event flowing into the next" (Mossbrucker). In other words, it is not which events we choose to highlight that is important but which concepts we can use them to teach. Though the fossil record may not exactly be

copious, it gives us far more insight into the pliability of ecology than the snapshot of the natural world as it is today. Paleontology can show us the ebb and flow of life on Earth, its oxymoronic resilience and fragility. It shows us that, like a singular organism, life responds in predictable ways to different stimuli; it grows, it changes, it sheds its skin from time to time, but on a scale like no individual today could ever bear witness to. I wish I'd known then at the *Stegosaurus* tracks, as I do now, that paleontology is just as credible as it is cryptic. Though some clarity on this fossil puzzle and many others might be nice, it matters not that it is enigmatic now. What matters is that my guests know, just as I do, that however these animals lived, they likely lived quite a lot like those that we have today, and their behavior and responses to changes in their environment can act as glimpses into the future of our own flora and fauna. The mere fact that they are ordinary is extraordinary, bridging the yawning expanse in time and allowing all of us to feel a little bit closer to these creatures. Of course, there is sublimity in recognizing the billions of generations stretching before us, though it actively counteracts the alienation that is inseparable from the mathematical variety. Perhaps it is a new sort of sublime that grips us, the sublime of the known—experiencing relation and familiarity to something so impossibly far away. Now, more than ever, we need it—our children hold power so unimaginably vast that the changes they make may outpace evolution entirely, like a caldera event or a meteor strike. Though there are still things far beyond their very comprehension, deep time among them, learning paleontology is still crucial in helping them understand the weapon that they will collectively wield like their parents before them. Extinction, obviously, is a reality, and one the coming generations may watch unfold before their very eyes, but adaptation, regrowth, and resilience, too, are all concepts to be gleaned from the history of life. Fear not to gaze into the abyss of time, for all one will see is potential.

I finished this tour like I finished all the others—and like I would finish many more. This one was not a success, but this Saturday was a busy one, and there would be many more Saturdays to come. I was sure, this time, that I was the one at fault, just as I now believe Steinbeck was at fault, with his narrow view of Charley's mind. Steinbeck is human, Charley is not, and neither has any point of reference for what constitutes recognition in the other's mind. Dogs urinate strategically, demarcating the boundaries of their territories. In this way, peeing on a tree is not so much a mark of recognition, but a mark of ownership—something Charley did not leave on the Grandfather Tree. Only on the willow branch would Charley exercise his dominance. By whittling something down to its bare essentials, in effect dumbing it down, we, too, are expressing a sort of ownership over an object. A known specimen is a problem tackled, a case closed. Keep them coming, open fire. But, severed from its context, its relationship to the rest of the tree, what meaning does a branch have? Removed from its body, it cannot teach us what the rest of the tree could. No matter if the great redwood extends far beyond our sightline, we may not be able to take it in its entirety, but there's no harm at all in giving it a blink and trying to glean what we can from its mighty sublime trunk.

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STELLA GERSON
Safe Injection Sites: Addressing the Opioid Epidemic through Harm Reduction
Upper Division, 3rd Place

As Patrick lay limp on the ground, with a needle sticking from his arm, his face quickly turned from dull grey to bright blue. Patrick was no longer breathing. His body began to shut down as his lungs failed to provide his brain with much needed oxygen. Paramedics, surrounding the body, jabbed their own needle through Patrick's tattered jeans and into his thigh, delivering four doses of Naloxone. When Patrick awoke, he was disoriented, weak, and yet angry at his rescuers for the "wasted hit" and "ruined buzz" (Daly, 2016). He stumbled away into a dirty alley where his mates gathered for their next hit, after refusing to be taken to the hospital. Two days later, and with no one to save him, Patrick was found sprawled on his bedroom floor, dead from an apparent overdose (Daly, 2016).

In 2017, over 47,000 Americans died from an opioid overdose (CDC, 2018). This astounding number averages to nearly 130 deaths per day and includes overdoses resulting from prescription opioids, heroin, and fentanyl (ibid). The practice of injecting drugs and the associated burdens on the wellbeing and health of individuals has rapidly become a critical public health concern in the United States and across the globe. Historically, illicit drug use in the U.S. has been primarily treated as a criminal activity and seen only secondarily as a public health concern. Safe injection sites[1] (SIS) are a recent intervention that exists to decrease the negative health impact for high-risk injection drug users as well as improve their quality of life. While SIS may be controversial to some, they provide essential and effective public health interventions. Community-based public health interventions that embrace a harm-reduction approach, such as SIS, are extremely necessary in light of the opioid epidemic, and their establishment will significantly reduce the adverse health outcomes associated with injection drug use. The unique characteristics and specialized goals of these facilities lead to a proven track record of successful interventions worldwide. There are several epidemiological implications of SIS in regards to decreasing blood-borne viral disease transmission rates. Finally, SIS not only minimize fatal drug overdoses but also lead to more favorable treatment outcomes by connecting PWID to vital health and social services.

SIS reduce both social and health related harms associated with injection drug use by providing basic health care services to people who inject drugs (PWID). An aspect of these services includes access to safe spaces for PWID to use pre-obtained substances. PWID are provided with sterile injection equipment, real-time education on safer injection practices, and a guarantee that police will not intervene (WHO, 2004). People can freely visit SIS to inject drugs under specialized nurse supervision. Several health

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[1] These facilities have several different titles: 'safer injection facilities,' 'supervised injecting centers/sites/rooms/facilities,' 'drug consumption rooms,' and 'supervised injection services' For the purpose of this paper I will be referring to these facilities as Safe Injection Sites (SIS).

professionals will always be present in the injecting room and have been trained in overdose prevention, injecting techniques, and other harm-reduction principles. The leading researchers on SIS in Europe describe the general layout of a facility:

> In general, Centres contain a cafe, a counselling room and a clinic for primary medical care. The injecting rooms are discrete rooms within the centres, and are often small with a —sterile ambience. Injecting rooms often contain several tables where clients sit to prepare and inject their drugs. Injecting paraphernalia such as needles and syringes, a candle, sterile water and spoons are provided, along with paper towels, cotton pads; Band-Aids and rubbish bins are nearby. Tabletops are made of stainless steel, to facilitate easy cleaning. (Dolan et al., 2000)

SIS offer respite from the streets by creating a non-judgmental space that encourages safer and healthier lifestyle choices. The facilities also provide injection drug users more than just a place to use. They are a place where users are not seen as criminals or social deviants, but simply as people. SIS embrace a human-centered approach to mitigating the negative consequences associated with drug use and provide a much needed and supportive community for injection drug users.

SIS are more than just a facility that encourages safer drug use practices, as they have become a crucial component in countries' approaches to public health and drug abuse. SIS reduce overdose mortality by providing access to specialized health professionals and medical monitoring to PWID. They also appear to be relatively sustainable for long-term operation and can alleviate the financial burden related to injection drug use. A recent analysis of the cost-effectiveness of SIS has estimated that introducing a new facility could save its state an upwards of $3.5 million in expenses related to healthcare, emergency services, and crime (Irwin, Jozaghi, Bluthenthal, & Kral, 2017). In several studies interviewing street users, the majority of respondents reported a preference for SIS facilities, rather than having to inject alone or in public (Kerr, Small, Moore, & Wood, 2007). Additionally, one of the main goals of SIS is to attract the target population of high-risk drug users, those who are most at risk for overdose and disease infection. Studies have found common characteristics and behaviors among those who most frequently utilize SIS include younger age, homelessness, the experience of a recent non-fatal overdose, and daily cocaine or heroin injection (Wood et al., 2006). These facilities provide to be a harm-reduction intervention aimed at addressing stigma and health concerns for underserved high risk drug users. Nonetheless, the establishment of SIS in the U.S. has been impeded by conservative opponents worried about the effects it will have on their community.

Proposals of SIS are often met with heavy opposition from the local community and moral outrage from conservatives. Yet, years of data do not support their projected concerns. "Not In My Backyard" is a term used to describe the neighborhood opposition to these public health interventions. Many communities desire a solution to the drug problem—but one that does not involve the establishment of SIS as part of their neighborhoods. Their concerns mainly revolve around the concept of the "honey pot effect," in which establishing these facilities would lead to an influx of drug users to the area and subsequently increase drug-dealing, crime, and

public nuisance (Kolla et al., 2017). However, the establishment of SIS is not correlated with any increase in drug trafficking or drug-related crimes (ibid). Another common objection to SIS is that the establishment of these facilities would normalize and encourage drug use among the general public and for users themselves. However, a meta-analytic study of the leading 75 research articles on SIS failed to "find any significant increase in the total number of local PWID" (Potier, Laprévote, Dubois-Arber, Cottencin, & Rolland, 2014). As for the concern of increased public disturbance, SIS actually reduce public nuisance and associated risks to users overall. In a study from Insite, over 80% of clients who regularly used the facility said that they always or often have to rush injections in public. More than 90% reported that if the site did not exist, they would have to inject in a public space such as restrooms, streets, or parks (Kral & Davidson, 2017). In Sydney, Australia, surveys of neighborhood opinions found that residents and business owners reported a "sustained decline in exposure to public injection and discarded syringes following the opening of the SIS" (Beletsky, Davis, Anderson, & Burris, 2008). For PWID, having a facility to inject safely eliminates the need to rush injections and contributes to better health outcomes. SIS are an alternative to public injecting and, in turn, provide an effective solution to both users and the community.

SIS have long existed in international settings and over the years have become widely accepted and integrated within communities and legal institutions outside of the U.S. The first SIS was established in Switzerland in 1986, and since then, over 100 facilities have been implemented across 10 countries around the world (Gordon, 2018). Throughout Europe, SIS are incorporated into the public health response to drug use and repeatedly have proven to be an evidence-based strategy in reducing the detrimental consequences of injection drug use. In Australia, special legislation mandates SIS to be open for a certain period of time in which researchers, health committees, legislators evaluate its effects (Dolan et al., 2000). The success of SIS so far is in part because of the laws and guidelines that structure its operation and require it to take part as comprehensive scientific research. The founding of the first SIS in the Western hemisphere would go on to provide years of valuable research on the public health benefits of such facilities.

Vancouver, Canada, is the home of Insite, the first SIS in North America. Insite demonstrates how SIS can be successfully implemented in developed countries and serves as a model for the international community. The Canadian model of SIS, which began as a public-health scientific research project, provides much of the existing research on the effects of these facilities. On September 21, 2003, Insite opened its doors to the extremely disadvantaged and high-risk population of injection drug users in the area referred to as Downtown Eastside (DTES) (Marshall, Milloy, Wood, Montaner, & Kerr, 2011). Home to one of the largest sex industries and illicit drug markets in Canada, this area has the highest level of concentrated poverty, unemployment, homelessness, and drug-related overdoses (Kerr, Mitra, Kennedy, & McNeil, 2017). Insite functions as a way to address the unique issues for one of the sicker, needier, and more marginalized populations. Now a doorway for healthier and longer lives for local PWID, Insite has effectively become integrated into Canada's healthcare system.

The advocacy of Health Canada, Vancouver Coastal Health, and the federal Health Minister played a significant role in supporting the creation of Insite. Without the assistance of key legislators and the Health Minister's exemption to Canada's Controlled Drugs and Substances Act, the implementation of Insight would have been nearly impossible. In 2011, after legal opposition was brought against Insite, Canada's Supreme Court ruled to keep the facility open, stating that "Insite has been proven to save lives with no discernible negative impact on the public safety and health objectives of Canada" (Kerr, Mitra, Kennedy, & McNeil, 2017). In fact, between March of 2004 and February of 2008, over 766,486 injections were completed in the SIS, and of all of those, not a single one resulted in death (Marshall, Milloy, Wood, Montaner, & Kerr, 2011). Insight provides a clear example of how SIS successfully function as part of a health care continuum, in which marginalized people can participate in a community space with clinical support. Although there is ample documentation on the successes of Insite, advocates and opponents still battle to reach a consensus on the future of SIS in the United States.

Historically, the predominant approach to illicit drug use in the United States promotes abstinence and zero-tolerance criminal-justice policies. Punitive approaches to drug use also increase stigma and discrimination against drug users and become a barrier to accessing essential health services. When drug use is deemed as an illicit activity, users are forced into unsterile environments and pressured into risky behaviors (Zlotorzynska, Wood, Montaner, & Kerr, 2013). Drug criminalization policies undermine public health and create stigma towards people who inject drugs. These types of approaches are costly and vastly ineffective at reducing the number of drug users, the availability of drugs, the spread of diseases, and the occurrence of overdoses (Chandler, Fletcher, & Volkow, 2009). Instead, harm-reduction interventions to health issues have consistently shown to have far fewer negative consequences than abstinence-based approaches. Harm reduction embraces a humanist stance on drug use and helps address the social determinants of health inequalities. While SIS may not currently exist in the United States, the introduction of harm-reduction interventions such as safe syringe exchange programs has proven to be a controversial yet highly effective step in minimizing harms for PWID and their local communities.

First established in the United States in the late 1980s, safe syringe-exchange programs have exhibited immense progress in reducing negative health outcomes for people who inject drugs. Over two decades of research on these programs has demonstrated the efficacy of providing such community-based interventions that include access to and disposal of sterile injection equipment and referrals to health care services (CDC, 2019). Here in Boulder, Colorado, the county of public health created the WORKS Program, in which professionals provide "outreach, education and syringe exchange services to reduce incidences of HIV and hepatitis among people who inject drugs" (M. Evanoff, personal interview, November 13, 2019). Madeleine Evanoff discusses how the public was similarly apprehensive about these programs, which are now considered widely successful and a large aspect of the drug treatment infrastructure: "there's a higher rate of recovery and treatment in places with safe syringe programs, and no increase in overall drug use" (ibid). SIS are a small step beyond syringe exchange programs and will likely have to follow similar state laws. For SIS to operate effectively and at a broader scope, legislation and law enforcement practices must stop undermining harm-reduction programs.

Drug use is part of our society as a whole, and harm-reduction interventions efficaciously minimize harmful effects rather than ignore or condemn the users. The uncertainty and conflict around the political and social ramifications of SIS currently impede the progress of this intervention in the United States.

      With the researched successes of established SIS in Europe and Canada alongside the increasingly devastating impacts of the opioid epidemic, the United States government is pressured to embrace harm-reduction programs in drug policies. While SIS have not been federally funded or approved in the United States, since the summer of 2018, thirteen cities across the country have pushed proposals to open these facilities (Bogel-Burroughs, 2019). Philadelphia is most likely to become the first U.S. city to have a legally sanctioned SIS due to overwhelming necessity to decrease the city's overdose rates. In 2018, over 1,100 people died of opioid-related overdoses in Philadelphia, amounting to an average of three people per day, a statistic triple the city's homicide rate (Gordon, 2018). There are really only two options to respond to these devastatingly shocking statistics: we can either seek out ways to encourage safer ways to use drugs such as SIS or we can keep doing what we are doing and allow people to continue to die. Despite increasing public support, advocates for SIS face barriers related to the current Trump administration and their conservative approaches to drug policy. Since 2014, the University of California / San Diego, has been conducting research at an undisclosed and unsanctioned SIS in the United States. The researchers have found that in two years of operation, there have been nearly 2,600 injections among mainly white, male, and homeless users (Potier et al., 2017) Similar to the observations at Insite, only two overdoses occurred on-site, and both were quickly interrupted by nurses using Naloxone (ibid). Not only does this demonstrate that SIS have practical demand here, but it also proves that the general guidelines behind these facilities can also work in the U.S. As the epidemic of hepatitis and HIV continues to grow, especially among PWID, SIS appear to be the most integrated approach to combating the spread of diseases.

      SIS respond to the emergence and severity of two epidemics: injection drug use and blood-borne disease infections. People who inject drugs are one of the most vulnerable groups to be exposed to infectious diseases such as HIV and hepatitis C. Every four minutes, one person injecting drugs becomes infected with HIV (UNAIDS, 2017). The CDC estimates that out of the global 16 million PWID, over 1.2 million (1 in 5) are infected with HIV, while 50% are living with hepatitis C (CDC, 2018). Despite increased risk, health services are kept out of reach, as this population remains stigmatized and marginalized. Policies that criminalize possession and drug use result in more risky forms of drug use, such as the sharing of drug paraphernalia. In fact, needle-sharing is the second leading risk-behavior for contracting HIV (CDC, 2018). Syringe sharing is the lowest among those who obtained their equipment from an SIS or safe syringe program (WHO, 2014). Studies also demonstrate that when PWID have access to public health programs such as SIS, incidences of new HIV infections drop significantly among that population (Semaan et al., 2011). By addressing the risk factors associated with injection drug use, SIS can be a component of HIV prevention and treatment. The notion of SIS as an appropriate and effective response to the epidemic of blood-borne diseases among PWID also influences the wide range of health services provided in these facilities.

SIS can reach marginalized populations of PWID who are often the least likely to have access to essential medical and social services, which therefore serves as a crucial health promotive public health intervention. Recent studies suggest that SIS can be a component for treating substance use addictions and a bridge for accessing health and social services. Negative health consequences stemming from injection drug use place a strain on emergency services, as users tend to utilize these services rather than conventional health care (CDC, 2018). The use of SIS as a preventive measure for ER visits relieves burdens on our health system because it addresses problems before they become too severe. In addition to this, PWID often face multiple barriers that limit their ability to access health care services. These barriers include an inability to afford health care and a lack of insurance, long wait times, societal stigma, and a lack of knowledge on available services. (McNeil & Small, 2014). Consequently, these barriers make it extremely difficult to support PWID with fundamental health care services. For some people, SIS become the starting point for recovery and a healthier future. The framework of SIS is inherently rooted in the practice of meeting people where they are and treating individuals with dignity and compassion. Health personnel at SIS give clients independence in the decision-making process about their health, and this freedom encourages more people to seek out help.

SIS are an alternative mechanism for providing treatment and support to those who struggle with substance use and other social and health problems. SIS significantly increase access to essential health care services for PWID and entry into substance abuse treatment (Kolla et al., 2017). The year after Insite opened, researchers found a 30% increase in the uptake of detoxification services in the surrounding area (Gaddis et al., 2017). Moreover, staff at Insite during 2015 referred 464 users to addiction treatment, and more than half of them fully completed the program (Potier, Mitra, Kennedy, & McNeil, 2017). Additionally, the CDC found that when PWID utilize SIS, they are five times more likely to obtain treatment for substance use disorders and detoxification services (CDC, 2017). It is not out of the question that SIS could also have on-site detox services as part of the facility. Furthermore, SIS allow health professionals to provide education to users on safe injection practices during their visits. Since SIS do not allow assistance with injections, nurses have opportunities to educate clients about safer techniques. The more frequently people have access to health services and professionals, the more likely they are to use such services and develop health-promoting relationships. SIS effectively act as a referral mechanism for health and social services, including treatment for diseases and rehabilitation for substance use disorders amongst injection drug users.

Dramatic increases in overdose rates, especially among injection drug users, have prompted a need for more effective public health interventions. SIS can play an integral role in providing PWID with basic on-site health care services and emergency treatment for overdose to prevent fatalities. Between 1999 and 2014, fatal opioid overdoses nearly quadrupled in the United States (Kennedy & Kerr, 2017). While Naloxone, an opiate antagonist that can be used to reverse an opioid overdose, many witnesses and fellow drug users hesitate to call first responders for fear of any legal consequences (Beletsky, Davis, Anderson, & Burris, 2008). Since licensed health professionals can monitor users in SIS, the likelihood of a fatal overdose is largely reduced. Similar to lifeguards, the staff at SIS monitor clients for signs of trouble. Among the millions of injections performed at SIS worldwide, there has not been a single

reported overdose death in a facility, and the number of non-fatal overdoses within facilities remains relatively low to the number of supervised injections (Kerr, Mitra, Kennedy, & McNeil, 2017). Even in the vicinity surrounding Vancouver's SIS, there has been an impressive 35% decrease in fatal overdose (ibid). Staff at Insite interviewed a woman who was visiting the facility frequently in 2007, and she remarks "I think it's bad [injecting alone]. That's when people get into lots of trouble, eh? Dead people are found in their rooms. They are not found at Insite" (Kerr et al., 2007). From a moral standpoint, evidence of SIS in mitigating fatal overdoses is compelling enough to warrant action, or our failure to act lets more people die. Opioid overdoses are serious global public health issues yet continue to receive inadequate attention to health interventions.

Patrick's tragic story is an insight into some of the failures within our health and legal system when it comes to drug use. The institutions tasked with addressing opioid-related mortality continue to fall short as the opioid epidemic and this public health crisis steadily worsen. In the United States, legislators, and public health officials must expand existing interventions to high-risk drug users. SIS are a humanistic approach that is effective in reducing harm. They mediate the harmful effects of injection drug use and replace fear and shame with care and compassion. SIS can have an immense positive social impact on the stigma and discrimination that feeds the opioid crisis. The public health benefits of having SIS far outweighs any possible negatives. Years of research have demonstrated the efficacy of SIS in reducing overdose fatalities and incidences of blood-borne infections and facilitating contact with health care providers for treatment and other services. These facilities bring new hope to communities and assurance that the rising mortality from the opioid crisis can begin to decline.

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COLIN CRAIGHEAD, CAM FIELDS, PATRICK GRUBER, AND MARLO TERR
Career Building in Computer Science
Upper Division Collaborative, 1st Place

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Executive Summary

Adequate career preparation is a growing concern for students at the University of Colorado / Boulder (CU). Although there are career services available to all students, Computer Science majors require more in-depth career preparation; specifically, their need for elaborate portfolios. The Computer Science industry is increasingly expecting graduates to be productive immediately. This then requires CU to fill an identified gap in the Computer Science Department. The goal of this project is to define and implement a Computer Science course that better prepares Computer Science undergraduates for job searches and potential career paths.

The proposed course content includes—but is not limited to—resume drafting, cover-letter drafting, mock interviews, and industry orientation with guest speakers. In order to quantify urgency, we designed a survey targeted for undergraduate Computer Science students that queried the desire for a Computer Science-concentrated professionalism course. Not only was this survey sent to Computer Science students but also to other students to see if they think a professionalism course will be helpful. The results showed the majority of Computer Science respondents felt neutral in their professionalism preparation and believed a one-credit preparation course would be helpful.

Along with the primary research conducted by the survey, we conducted both background and comparative research. The background information dealt with a current course at CU that deals strictly with Mechanical Engineers' professional development; the comparative research was done on researching other R-1 Universities that offer similar courses.

Positive support for this potential course was received from Amy Richards, the Event and Network Coordinator at the Department of Computer Science, who supplied us with a CU Course Proposal template. This template was completed by December 2nd and has been submitted to the Curriculum Committee for their review. The process for which a course may be implemented into a particular department is rigorous and requires pertinent background research, supporting evidence, and ideas about the learning objectives of the course.

Introduction

Given its importance as a major within Engineering, the Computer Science Department at CU has over 1,200 students in the College of Engineering and another 1,100 students in the College of Arts and Sciences.

Seeing that the great majority of engineering grads are employed in corporations rather than academic careers, at CU, there are other departments that require a professionalism course. These departments include Mechanical Engineering and the Business school. The Mechanical Engineering Department requires every student to take MCEN 2000, which is a fall-offered course. After talking with

a couple Mechanical Engineers, they have stated that they have come out of this course more prepared in applying for internships as well as seeing an increase in their ability to talk to recruiters at career fairs. Talking to some of the Mechanical Engineers who took MCEN 2000, they have stated that "It was a great start to enhancing my resume and cover letter which is a main focus when I am applying to internships."

Yet, unlike other CU Engineering majors such as Mechanical Engineering, Computer Science does not offer a professionalism course that provides students the ability to enhance their readiness for industry. The goal of this project is to implement a one-credit course that enhances students' ability to understand industry needs and requirements. This course will be a one-credit graduation requirement for all Computer Science students at the CU. According to document and comparison research, CU's Computer Science Department ranks average among other schools in their preparedness for industry.

Our goal for this course is to provide sophomore level Computer Science students with one-on-one help from industry professionals, interviewing practice and resume/cover letter workshops to encourage students to start working on their professionalism skills. By offering the course at the sophomore level, students will have ample time to build their industry skills before applying to job calls. This course will be offered during the fall and spring semesters and will encourage students to start applying for internships at the sophomore level. Students will be able to grow their resume and cover letter for a couple years before graduating.

The Stakeholders

We received support and advice from two main stakeholders: Amy Richards, Events and Networking Coordinator for the Computer Science Department; and Ben Weihrauch, Senior Director of Student Professional Development for the College of Engineering. Both Amy and Ben were able to help us understand the process of getting a course implemented, what deliverables were needed, and other potential resources.

Amy was able to guide us through the thought process of the committee members that will be considering our proposal. She gave us suggestions for what deliverables we should provide and why they will help our case. These topics include a potential course syllabus and a schedule providing proof that there is enough material for this to be an essential course. Amy provided us with the needed course proposal template to fill out in order to officially propose a course to the Computer Science Department. Before filling out the template, Amy supplied us with the pros and cons for some of the sections, including the idea around making the course optional instead of required).

Ben was helpful in introducing us to resources and walking us through CU's thought process when implementing a new course. Through Ben, we were able to look at some of CU's survey statistics that come from companies, alumni, and current students. In terms of students resumes and interviewing skills/preparation, we were able to see that Engineering students were considered "average" according to companies. This was provided by Tableau, a statistical resource that was accessed through Ben. Ben is in charge of the new ProReady program, which is a site that directs students to professionalism-enhancing events and provides a calendar of events such as hackathons and career fairs. We came to the conclusion that the College of Engineering and CU as a whole would be more accepting of this course if it fits in with ProReady. He gave us ideas on how to design our proposal so that it has the ProReady motto and gave us suggestions on what type of supporting evidence we might need for our proposal.

Overall, the stakeholders provided a new perspective. We had been focused on the student perspective but never had a clear idea of what CU wants in a course. By combining what CU already has to offer with some more computer science-specific material, this course should set students up for success when applying for jobs and internships.

Background and Comparative Research

Our idea originated with a member of the class who noticed a desperate need for CU to prepare Computer Science students for taking on the professional world. The process of entering the field includes a series of challenging hurdles, including—but not limited to—producing concise resumes, writing compelling cover letters, and solving challenging coding problems during a technical interview. Our group was fortunate to have a member who has taken a course titled MCEN 2000, which proved to be the key to shaping our solution. MCEN 2000 is a course offered exclusively to Mechanical Engineers and is a required part of the curriculum. This course prepares undergraduate engineers for a position in the professional engineering world. This course has three deliverables: a resume and cover letter; a mock interview (either in person or over the phone); and a page report of a conversation with an industry professional, chosen by the student. Because our peer has hands-on experience, we were able to accurately imitate the professionalism development course in the scope of Computer Science.

In terms of comparison research, we looked for other R1 schools that have similar programs in place. In the search for other schools that have a similar course, we came across Carnegie Mellon University's program 15-221; although a mundane title, the course schedule is rich with pertinent content. On the official Carnegie Mellon website, we were able to find a broken down and detailed day-by-day task list. This invaluable resource helped our team model our current syllabus and course content. We also learned information we didn't expect, including appropriately spacing major assignments and optimizing course content to maximize

usefulness of the topics. Designing a course is not so easy as throwing important topics on a calendar and hoping it works; from our comparative and background research, we learned the value in quality course content and properly spacing that content out. MCEN 2000 and Carnegie Mellon's 15-221 were both pivotal research topics when crafting the new course "Career Building in Computer Science."

Method and Justification of Survey Design

We needed to use obtain primary research in order to form a stronger argument for the creation and induction of the Computer Science professionalism course. To do so, we wanted to use students to answer two main questions. The first question was, do students notice the same problem that we did? In other words, do students believe they need more help with their professionalism. The second question was, do students think our solution will help them? We used *Introduction to Primary Research: Observations, Surveys, and Interviews* by Dana Lynn Driscoll in order to understand how to properly perform the research.

According to Driscoll, a survey is the best way to reveal general observable trends in a population. To properly create a survey, we needed to make sure our questions and provided choices were unbiased. This was done using guidelines set out by Driscoll. We didn't lead surveyees to certain answers with any questions. We made sure there weren't any double-barreled questions, which are questions asking about two concepts. Question vocabulary was kept consistent across the entire survey, and for responses recorded on a scale, the scale was evenly balanced with a neutral option available at the center of the scale. This scale was kept consistent for each question with that type of response. And, lastl,y when creating closed questions, we made sure to account for all reasonable answers, including an "other" option in certain cases so that students could fill in their own responses. We chose a software called Qualtrics to create the survey because students can use a link to access our survey and it provides built in options to maintain confidentiality and anonymity in survey responses.

To distribute this link, we used a group of emails sent out to all class sections of our WRTG 3035 teacher. These emails were focused on getting general students' survey responses from both Computer Science and non-Computer Science majors. The second group of emails were sent out to the Computer Science-opportunities email list. We used this email chain to focus on getting responses from Computer Science majors. Both emails were sent out with a brief background of our goals which is in Appendix D.

Survey Results

|	
Total responses recorded	87
Computer Science Majors	54
Freshman	8
Sophomores	18
Juniors	37
Seniors	24

It was important for us to receive enough responses to form valid conclusions about the overall population. Of that group, we also needed a large subgroup of Computer Science majors because we mainly wanted to form conclusions from their specific feedback. Because the questions for general students and Computer Science students formed semi-normal distributions, we felt confident we had enough responses from these groups. In contrast, we only had 10 responses from students who had previously taken a professionalism course. These data were non-normal and was not used in analysis. We also needed data from all grade levels to represent the school adequately. Even though there was less feedback from freshman compared with upperclassmen, freshmen are thinking about professionalism the least. This is due to the fact that they are not at the point where they would be applying for internships and are more worried about school than working, so we are not missing crucial feedback.
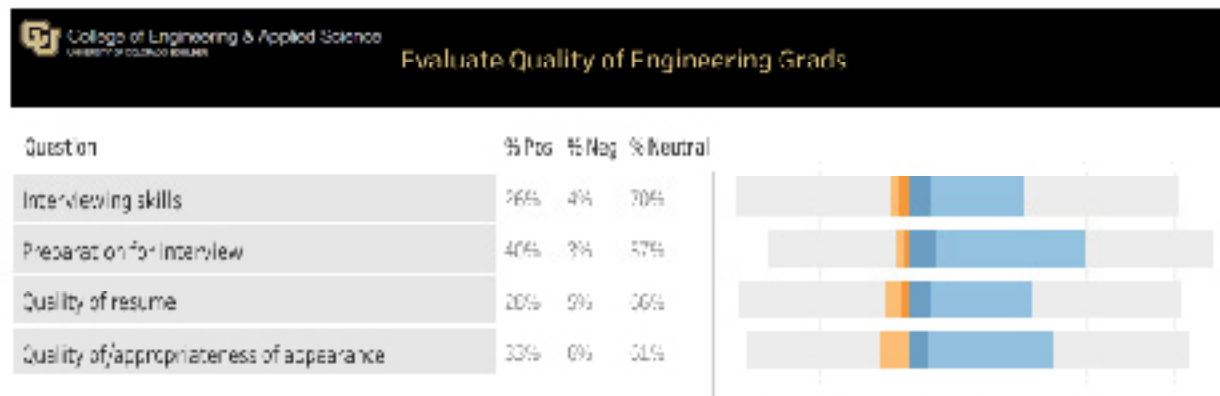
One of the main questions we were trying to answer is if Computer Science majors want more help improving their professionalism.

How well did Career Services help you for your specific needs? - Computer Science Majors
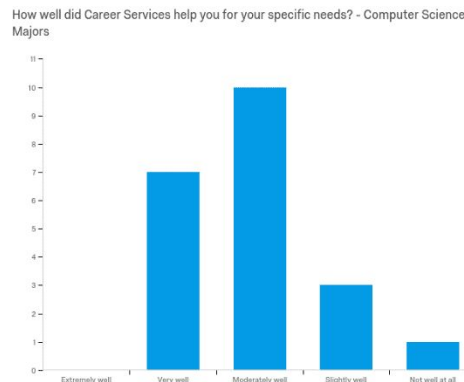
32 out of 54 Computer Science majors that we surveyed have been to career services, the main professionalism help center on campus. Even though a large percentage of students felt that career services helped their specific needs "very well," the majority of the students fell into the range of "moderately well" to "not well at all." This leads us to conclude that there is a large number of Computer Science students who are seeking help with their professionalism and a majority of them want to be further help.
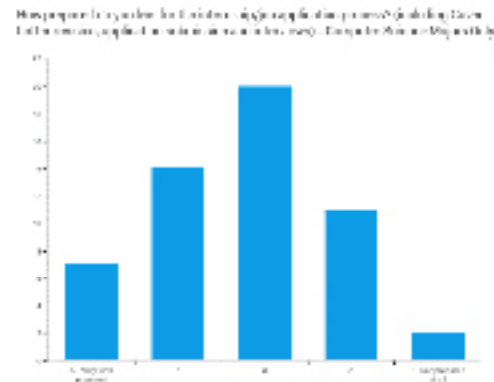
37% of Computer Science majors feel neutral about their professional preparation and 24% feel negative about it.

Question	% Pos	% Neg	% Neutral		
Interviewing skills	26%	4%	70%		
Preparation for Interview	40%	3%	57%		
Quality of resume	20%	9%	06%		
Quality of/appropriateness of appearance	33%	0%	01%		

The data above, given to us by our stakeholder Ben Weihrauch, give us a perspective from the companies about CU students professionalism. These results could not be narrowed down to Computer Science majors only; instead, it is the College of Engineering & Applied Science as a whole. In all four categories, students primarily performed neutral. The Aerospace Engineering and Mechanical Engineering Departments are considered the top-ranking departments in this school. If Computer Science is somewhere in towards the middle of the rankings, we can deduce that the students fall in the middle of the data and are also performing neutral.

For a Computer Science Department that aims to prepare students for professional work and place students at companies, we believe that they would be unsatisfied with their students feeling mainly neutral or negative in their professional preparation as well as performing neutral in the view of the company. This is a major reason why students should be provided with more to enhance their preparedness for industry.

The other main focus of the survey was to gain feedback from students on our solution of a one-credit course to help them with professionalism and what they want out of the course.

83% of Computer Science students reported that they would find a one-credit course helpful. Because a majority of Computer Science students responded positively to this question about taking a one-credit course to help them with their professionalism, we can justify that our solution is in the correct form.

82
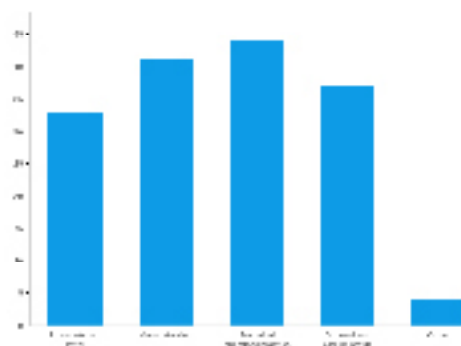
- This question is multiple select -

Other Subjects filled in by students

Other

Portfolio projects

Personal Projects

Help determining desired area of computer science to pursue

Good networking questions. Email etiquette. What do ask about when you receive an offer. How do tailor your resume to each job you're applying to and then having exercises to do so.

Computer Science students wanted all suggested subjects shown by each subject being chosen by more than 60% of the students. The "other" select provided a place for written feedback, which students requested projects, career planning, and networking. These results gave justification for us to include all subjects in the suggested syllabus and the course proposal.

Syllabus Criteria and Design

Our recommended syllabus splits the semester into lectures and recitations so that students can learn new skills and see examples of what the professor expects, followed by practice and feedback from the instructor. Because this course will be only one credit, the required assignments will be limited. Even though there will be very few assignments, they will focus on the main topics that correlate to the learning objectives which are mentioned in Appendix C.

Because CU already offers some great resources through ProReady, we think that teaching students about ProReady would be a good supplement to this course, which will show students where they find beneficial events and help. Almost all job and internship applications require at least a resume and, usually, a cover letter, too. Most companies won't even look at your application if someone does not write a cover letter. Having students make their own resumes gives them the opportunity to get instructor and peer feedback and provides a good starting point for their future applications. Cover letters can be tricky to write because they have to make you stand out but cannot be too verbose. The cover letter unit could compare and contrast good and bad cover letters and can teach students what keywords they should pay attention to in job calls.

Many undergraduates do not have much experience negotiating and communicating in a professional setting. Companies obviously want what's best for them, and sometimes that can be paying their employees less than they deserve. It is important for undergraduates to know their worth and how to respectfully negotiate the terms of their contract, salary offers, and benefits. General professional communication before and after the hiring process is a crucial skill to have. Having students reach out to companies will require students to practice their professional communication and will force them to think about what questions they need to ask potential employers.

The assignments due in the course are listed in Appendix A, with points correlated to grade calculation. When choosing these assignments, we decided to follow the learning objectives. The resume/cover letter assignment provides students an introduction to the first step in applying for job applications while the small programming assignment that is pushed to the students GitHub prepares students for possible programming questions asked during the interviewing process. Another assignment that focuses on the last learning objective is the write-up about a conversation with an industry professional. Talking with said professional will allow students to get a taste for what a person in the industry does on a day to day basis, as well as advice for students in college.

We designed our syllabus and schedule similarly to the Professional Development course MCEN 2000 and Carnegies Mellon's 15-221 and adapted it to fit the needs of Computer Science students. The suggested schedule and deliverables for the course are meant to create a foundation for students so that they feel prepared and know what needs to be done when they start going to career fairs and applying to jobs. While the course is designed to help students prepare for professional communication and job applications, it also warms up students to feeling comfortable asking companies questions and seeking help when they need it.

Course Proposal

By the Computer Science Department standards, the process for which a course is implemented into its department begins with a written course proposal. This particular document outlines questions pertaining to the needs and wants for the desired course. The proposal that was drafted by the team in late November was passed along to Amy Richards, who then submitted this proposal on December 2nd to the Computer Science Department. The steps that are out of our hands, which follow submitting the course proposal form, are the following:
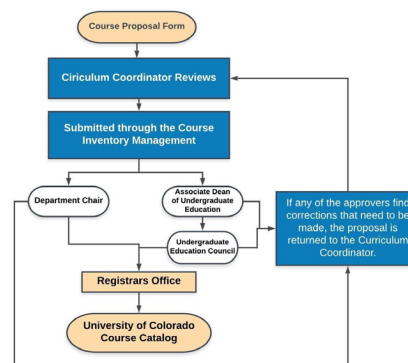
The process is rigorous and time consuming, so the use of a formal proposal and a consulting report is crucial in supporting evidence to every board and committee involved in the approval of the course. This process may take months for the Department or Registrar's Office to decide whether to add a course to the curriculum.

The Course Proposal template provided by Amy was analyzed thoroughly by us in November. The complete Course Proposal Form is attached in Appendix C, which provides information of the faculty member joining our decision, course description, course title, enrollment number as well as a reason for why this course should be implemented.

Faculty

The first main objective of this Course Proposal was to find a faculty member in the Computer Science Department who agrees with the what the outcome of the course will be. The faculty member whom we chose was Alan Paradise, who teaches "Software Development Tools and Methods and Data Systems." Alan has countless hours of project-management experience and focuses on preparing students for industry. Before asking Alan to be the faculty member representative, the team had to reiterate that he was not signing up to teach the class but is only a reference to someone in the Computer Science Department who agrees this course shall be implemented. The team decided that Alan would be a suitable fit in being a reference for this course.

Course Title

Following finding a faculty member, the team was posed with the question, "What will the course title be?" After many months of brainstorming ideas, the team decided to leave it up to the course instructor or the Computer Science committee. The team provided four different course titles, each correlating to the learning objectives of the course. This entailed involving key words like *profession* and *career building* in the titles.

Enrollment

There were over 400 Computer Science students enrolled in the 2019-2020 Semester, which posed a problem for the teams original idea of offering this course only in the Spring Semester. Based on this number, if there were 18 students per recitation, then there would be 22 recitation period which may be extreme given that this will only be a one-credit course. Earlier this semester, Ben suggested that this course should be offered only in the fall, but after analyzing the enrollment size, the team decided it would be beneficial to offer this course both Fall and Spring Semesters to allow all sophomore students the ability to take this course. Even though the course proposal states that this course will be offered both semesters the team proposed the idea to only offer the course during the fall semester.

The course will include one lecture of no more than 225 students and 15 recitation periods, which includes no more than 18 students per recitation. The lecture will provide students with an overarching theme and broad ideas about industries, cover letters, and interviewing skills while the recitation periods will allow students to work closely with TAs, professors, and other students. The lecture and recitation will alternate every other week so that this course can maintain the one-credit requirement. This outline is very similar to that of MCEN 2000.

Learning Outcome

The most important question asked in the Course Proposal Form was about the Student Learning Outcomes. We decided to take ideas from MCEN 2000 and Carnegie Mellon University's course to create three main take-aways of the course. These outcomes include the following:

a. Integrate professional communication skills into daily interactions with faculty, staff, and peers, and potential future employers.
b. Utilize successful strategies in resumes, cover letters, technical interviews, and elevator pitches.
c. Understanding the career options in the Computer Science industry and which courses best prepare students for their desired path.

These three take-aways hit every aspect for which a student in the Computer Science Department should be learning in their college career. Theses aspects are related to the recommended syllabus which was drafted and attached in Appendix A.

Appendix A

Course Syllabus

Objective

This lab is designed to prepare students for internship and job applications, technical interviews, and networking.

Learning Outcomes

1. Understanding of professional communication skills and the ability to integrate those skills into daily interactions with faculty, staff, and peers.
2. Knowledge of resumes, cover letters, technical interviews, and elevator pitches.
3. Understanding the career options in the Computer Science industry and which courses best prepare you for your desired path.

Course Components

1. Class participation
   a. 15 points
2. Small programming assignment that has been pushed to your GitHub
   a. 10 points
3. Resume/Cover Letter Assignment
   a. 20 points
4. Mock Interview
   a. 20 points
5. ProReady Event
   a. 20 points
6. Contact an industry professional (in person, over the phone, or at a career fair)
   a. 15 points

Class Participation: This category will be based on clicker questions and contributing to class discussions and activities.

Appendix B

Tentative Schedule

Week	Topic	Deliverables
1	Potential Computer Sciene career tracks and courses	
2	GitHub and small programming assignment introduction	Students create a GitHub
3	Resume and Cover Letter	
4	Resume tuning, cover letter and job search	Resume, cover letter, and job description
5	Elevator pitch (this should be moved to when a large technical career fair is taking place)	60 sec presentation
6	Career Fair/Company reach-out	Summary of reach-out
7	How to handle technical interviews and whiteboarding	
8	Mock interviews etiquette	Mock interview
9	Job terms negotiation - salary, start date, moving expenses, etc.	
10	Programming assignment group workshop	
11	ProReady seminar	ProReady Event
12	Profession interactions	Alumni Connection

13	Conflict Resolution	
14	Programming Assignments presentation	Programming Assignment/Email professor your GitHub link
15	Programming Assignments presentation	

Appendix C

CSCI Course Proposal

Faculty contact: Alan Paradise
Faculty contact email: Alan.Paradise@Colorado.EDU
Faculty contact phone: (303) 735-8098
Semester for which this new course is intended to be active: Fall 2020
Course Prefix (i.e. CSCI): CSCI
Course Number: Upon course approval. Suggested 2000 level.
Academic Level (Undergraduate or Graduate or both): Undergraduate
To be cross-listed or double-listed with (prefix and number): N/A
Long Title (prints in catalog):
   a. Building a Career in Computer Science
   b. Professional Development in Computer Science
   c. Career Building in Computer Science
   d. Computer Science as a Profession
* Course title can be decided upon approval. Above are some suggested titles.
Short Title (29 characters and spaces; prints on transcripts, study lists and schedule of classes):
   a. Building a Career in CSCI
   b. Pro Dev in CSCI
   c. Career Building in CSCI
   d. CSCI as a Profession
* Course title can be decided upon approval. Above are some suggested titles.
Anticipated enrollment size
 Option 1: (recommended) 225 person lecture with 15 recitation periods with no more than 18 people per recitation. This is based on alternating between lecture and recitation every week. Similar to MCEN 2000.
Option 2: If the class is easier to implement with 40 people per recitation period then implement 6 recitation periods (Not recommended due to the little amount of 1 on 1 interaction with teachers/TA's).
*Based upon 2019-2020 Sophomore Computer Science enrollment of 400+ students.

Final exam or final project presentation in class during finals week (yes or no): No
Credit Hours i.e. Fixed (3) or Variable Credits (1-3): 1 credit

Department or Instructor Consent Required (yes or no): No

Term(s) to Be Offered (fall, spring, both, or no set pattern?): Both, but recommend in just Fall.

1) **Course Description (60 words or less, beginning with a verb):**

Prepare students for career development by enhancing students' resumes, cover letters, interviewing skills and professional portfolios. Teach students about professional communication and potential career paths.

2) *Enforced* **Requisites (includes prerequisites, corequisites and other restrictions):**

Restricted to students with 27-100 credits (Sophomores, Juniors, Seniors) Computer Science (CSCI) students only.

3) *Recommended* **Prerequisites and Corequisites:**

N/A

4) **Other Recommended Restrictions:**

N/A

5) **How does this course fit within the existing curricula?**

Because the stated mission of the CU's Computer Science Department "is focused on real-world, interdisciplinary experiences for our students," this proposed course, "Career Building in Computer Science," serves to focus the currently existing curriculum upon the ultimate goal of professional employment and strategies to establish a viable career in CS.

6) **List the Principal Topics Covered in This Course:**
   a. Professional Writing
      i. Resume
      ii. Cover Letter
   b. Professional Communication
      i. Elevator Pitch
      ii. Interviewing
   c. Industry
      i. Career Paths
      ii. Job Terms Negotiation

7) **Required Readings:**

N/A

8) **Kinds of work required of students in the course. Be specific and indicate the percentage weighting of each type of assignment or work required in determining students' grades:**
   a. Class participation
      i. <u>15 points</u>

b. Small programming assignment that has been pushed to GitHub
    i. 10 points
c. Resume/Cover Letter Assignment
    i. 20 points
d. Mock Interview
    i. 20 points
e. ProReady Event
    i. 20 points
f. Write up after contacting an industry professional (in person, over the phone)
    i. 15 points

>93 A, 92-90 A-, 89-86 B+, 85-83 B, 82-80 B-, 79-76 C+, 75-73 C, 72-70 C-, 69> Fail

9) **If this course is double-listed (4000/5000), indicate the kinds of work that will be required of the graduate students and the undergraduate students separately. Please include the percentage weightings of each type of assignment or work required in determining students' grades:**
Graduate Students are not recommended to take this class.

10) **Student Learning Outcomes:**
    a. Integrate professional communication skills into daily interactions with faculty, staff, and peers, and potential future employers
    b. Utilize successful strategies in resumes, cover letters, technical interviews, and elevator pitches.
    c. Understanding the career options in the Computer Science industry and which
    d. classes best prepare students for their desired path.

11) **Overlap, Duplication or Impact on Other Courses:**
CSCI 1000: There would be an overlap in content that introduces students to potential career paths and guest speakers' topics. CSCI 1000 is focused on introducing Computer Science curriculum, learning techniques, and time management skills to first year students. Building a Career in CSCI will be aimed at helping students enhance skills like conducting technical interviews, building a code portfolio, and writing resumes/cover letters and internship/job applications. CSCI 1000 would be a very good intro class to get freshmen to think about their future, but "Building a Career in Computer Science" will prepare them for job/internship calls. CSCI 1000 would be a gateway leading into this new class. It would not be required for students to take CSCI 1000 before this new course but would be recommended as it leads with some of the same topics.

CSCI 3010 & 3308: Both of these courses teach students to use GitHub and have students add projects to them. GitHub is a great skill to practice and adding more projects to your GitHub is a positive, not a negative, these classes should not be affected by Building a Career in CSCI having content on building a portfolio on GitHub. CSCI 2830—"Building a Career in CSCI"—will not cover any ethics in industry or programing so there should not be overlap here.

12) Additional Information for Approvers:

As listed so far, this course shall be a required one-credit course offered by the Computer Science Department. This is important because the student surveys in the CS department show a strong desire for the type of professional preparation that Mechanical Engineer students currently receive in a similar mandatory one-credit class. If a mandatory course is not possible, then making it optional would be a beneficial outcome—although this may not be a course that most students would take voluntarily. There will likely be a dramatic decrease in student enrollment if this is implemented as an optional course.

When complete, please email this form to Elizabeth.Webb@colorado.edu--thank you!

Appendix D

Survey Email Format
Hey everyone,
I'm in a WRTG 3035 group trying to help Computer Science majors prepare for internships and jobs. We are working with our stakeholder Amy Richards, who is a member of the Computer Science curriculum board, to potentially set up a one-credit course that offers Computer Science students the ability to improve their professionalism. This class could include helping students with: resumes, cover letters, a professional GitHub, technical/coding interviewing skills, and networking skills.
This anonymous survey (takes less than two minutes) will help us assess students' views on professionalism courses and the potential course itself.
Thanks!

Survey Link: https://cuboulder.qualtrics.com/jfe/form/SV_1G4pj4huQ4zbipD

Survey Questions

What year are you?
- Freshman
- Sophomore
- Junior
- Senior
- Graduated

Are you a Computer Science student?
- Yes
- No

Have you taken a professionalism/career building class in college before?

- o Yes
- o No

How helpful was the professionalism course in teaching you how to make a resume/cover letter?

- o Extremely helpful
- o Very helpful
- o Moderately helpful
- o Slightly helpful
- o Not at all helpful

How helpful was the professionalism course in teaching you how to search for jobs or internships for which you might want to apply?

- o Extremely helpful
- o Very helpful
- o Moderately helpful
- o Slightly helpful
- o Not at all helpful

How helpful was the professionalism course in preparing you for interviews?

- o Extremely helpful
- o Very helpful
- o Moderately helpful
- o Slightly helpful
- o Not at all helpful

Where do you search for internship/job calls?

- ▢ Career Fair
- ▢ Handshake
- ▢ LinkedIn
- ▢ CU Career Services
- ▢ I don't
- ▢ Other _____

Have you been to Career Services in the C4C/Engineering Center to get help?

- o Yes
- o No

How prepared do you feel for the internship/job application process? (including Cover Letter revision, application submission and interviews)

o 5 - Very well prepared
o 4
o 3
o 2
o 1 - Not prepared at all

What did Career Services help you with?
- Finding a position to apply for
- Recommending Events at CU
- Mock Interviews
- Resume or Cover Letter
- Directing you to their online resources
- Other _____

How well did Career Services help you for your specific needs?
o Extremely well
o Very well
o Moderately well
o Slightly well
o Not well at all

Why haven't you attended Career Services?

_____

_____

_____

Would you find a single credit Computer Science professionalism/career building class helpful?
o Yes
o No

What subjects would you want in this course?
- Resume/cover letter
- Mock interview
- Technical questions practice
- Professional GitHub setup
- Other _____

MACKENZIE LALLY, SHELBY TILLEMA CHRIS TAYLOR, AND JILL WETZEL,
Know More, Do More: Design Proposal for Sierra Club and PWR Sustainability Committee
Upper Division Collaborative, 2nd Place

Cover Letter

Dear Dr. Dickson and Dr. Colley:

Enclosed is our *Know More, Do More* design proposal, which outlines our poster campaign encouraging Generation Z to reverse climate change.

Our cohesive poster campaign centers on combating Gen Z's apathy toward climate change to encourage small, sustainable lifestyle changes. The placement and content of the posters we propose are in alignment with Gen Z's preferences, as identified by extensive research, which is also included. The example poster we provide gives you a clear idea of what to expect from *Know More, Do More*.

We hope that our design meets the needs of the Sustainability Committee and Sierra Club to educate, engage, and empower Gen Z to act on climate change. We welcome your questions and look forward to continuing our work with you in the coming weeks.

Sincerely,

Chris Taylor, Jill Wetzel, Mackenzie Lally, and Shelby Tillema

Members of Team 2: *Know More, Do More* Enclosure: Design Proposal

Table of Contents

Overview

Generation Z knows about climate change; they understand, on a basic level, what is happening to our planet. However, they feel apathetic toward the issue; they feel the problem is too big to tackle. Our poster campaign, titled *Know More, Do More*, is designed to educate Gen Z that their daily actions can positively affect climate change. They will no longer feel as if what they do will not matter. The small actions we encourage Gen Z to do will engage them in making the planet more sustainable. Our posters empower Gen Z to make informed decisions about what they do and buy. Gen Z knows to follow through because we cite hard facts from credible sources on every poster. As a result, they learn to trust us.

The cohesive poster series we suggest capitalizes on these opportunities and covers a wide variety of topics. For example, some posters advertise local events centered on sustainability while others recommend sustainable brands. Gen Z will not have to spend an excessive amount of money or time in order to implement the small, easy changes.

What makes our posters distinctive is their cohesiveness. On every poster, we provide the *Know More, Do More* logo. This acts as a "seal of approval" and signifies that the tips and information we provide are only pulled from credible, unbiased sources (such as

NASA or the IPCC). In addition, because we value transparency and Gen Z is very digital, we provide QR codes on every poster that link to the source of our information so they can learn more on their own if they wish to do so. Our posters even showcase that they are printed on recycled paper.
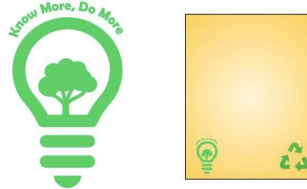
Design Challenge

Gen Z recognizes the threat that climate change poses, and they want to act but are unsure how; we set out to solve the design challenge of how to educate Gen Z on ways they can help in preventing climate change. We created the "3 E's" to embody our design challenge.

Educate

First, we hope to *Educate* Gen Z on the effects of climate change with the use of credible sources that Gen Z can trust and reference when making lifestyle choices. We believe that educating Gen Z with necessary and feasible information is the first step towards combating climate change. This will allow our generation to fully understand climate change and see the importance of the issue.

Engage

Second, we hope to *Engage* with Gen Z by calling their attention to different pressing issues with the use of incentives and QR codes. We believe that it is necessary to provide Gen Z with incentives in order for them to want to engage in preventing climate change and to realize that little steps can go a long way. Gen Z rarely dedicates themselves to something that doesn't serve them in return, so we engage them strategically.

Empower

Lastly, we want to *Empower* Gen Z to participate and spread the word to ensure a brighter future. Once Gen Z is educated on the direct effects of climate change and engaged to make the world more sustainable, they will likely feel empowered to get involved by making easy lifestyle changes. We feature sustainable initiatives to further excite and empower Gen Z to get involved.

Users: Gen Z

In order to meet this design challenge and educate, engage, and empower Gen Z to act against climate change, we needed to have a better idea of how Gen Z feels about climate change. The 20 students in our Technical Communication and Design class conducted interviews with Gen Z regarding their views on climate change, resulting in a total of 74 students surveyed. The questions we asked are as follows:

* What is your own attitude toward climate change?
* How engaged are you in addressing climate change?
* What are your reasons for your level of engagement?
* What have you observed about Gen Z's attitudes and engagement towards climate change?
* What are your sources of information about climate change?

From the written responses, our team developed a system to quantify them. We identified general values that were trends throughout all the answers, and we ranked everyone on how much they agreed with these values on a scale from 1 to 5, 5 being the highest level of agreement. We then averaged all of these numbers and counted how many members of Gen Z specifically stated their agreement with each value in order to see the sample size that the average was taken from. This is because many members of Gen Z did not specify in their interviews whether or not they agreed with a certain value, since we did not specifically ask them about the values. Thus, "Count" refers to the number of Gen Z members that specifically stated their agreement with a value.

The core results from this data collection are shown in Figure 1. We looked into many other values besides these, and these other values and the specific results of all our data are located in Appendix A.

Figure 1. Summary of Results from Quantification of Gen Z Interview Data.

Value	Count (out of 74)	Average (1 = low agreement, 5 = high agreement)
Climate change is real.	74	4.74
Climate change is a very important issue.	68	4.28
Personal level of engagement in addressing climate change (5 = political activism, rallies, etc. 3 = reusable water bottles, recycling, etc. 1 = essentially nothing.)	71	2.59
Personal engagement in the issue makes a legitimate impact.	28	2.57
Feelings towards current climate situation (5 = hopeful, 3 = apathetic, 1 = hopeless)	30	2.67
Has credible sources of information about climate change. (5 = university classes, scientific studies, 3 = common news sources, 1 = social media, word of mouth)	68	3.26

Feels like lacks the time to help with climate change.	19	3.37
Feels like lacks the knowledge to be able to help with climate change.	22	3.14

From this data, we can identify several overarching trends concerning Gen Z. These tends follow.

Apathy

Gen Z is very apathetic about climate change. They tend to think that the problem is too large for any of their contributions to make a difference, that someone out there who is smarter or more qualified than they are is working to solve the problem, or that they may forget about the problem because it is not one that is commonly in their own backyards. Many members of Gen Z, on the other hand, feel hopeless about climate change. They feel like there's no solution, so climate change is fated to happen.

Time

Gen Z feels like it lacks the time to do anything about climate change. Most solutions to climate change presented to Gen Z involve political campaigning, but that often sounds daunting and very time-consuming. Hence, they don't bother doing anything other than recycling, the most common method of preventing climate change among the interviewed members of Gen Z.

Ignorance

Gen Z is ignorant about what is physically happening to cause climate change, the possible adverse effects that will happen to the Earth as a result, and what actions they can take to help prevent it.

Subtlety

Every member of our group agrees that Gen Z does not like to be presented information in an intrusive manner. They dislike when people stand around campus with clipboards asking if they wish to talk about issues like climate change. Gen Z will even lie or make excuses to avoid talking or ignore these people despite agreeing with their message. Bombarding Gen Z with information is not an effective way to communicate; they prefer information that is subtly presented to them in a pressure-free way.
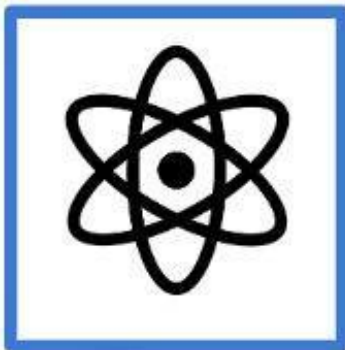
Facts

Gen Z lacks credible sources of information about climate change. They often get their information from biased news articles and social media posts while we would prefer they get their information from more credible, objective sources such as NASA or the United Nations.

Design Goals

Based on our understanding of our users' needs, we have derived four clear goals that our design should meet to be most effective in targeting Generation Z to engage in the fight against climate change. Our design goals follow.

Provide credible information

Generation Z lives in a world where information is often distorted or inaccurate, making all information a potential source of distrust and confusion. Due to this, we believe it is paramount to cite only credible information from trusted and unbiased sources and provide links to all information we use so that Gen Z can evaluate the sources themselves.

Empower Gen Z to act

Due to Generation Z's increasing sense of apathy and hopelessness regarding the current climate change condition, we believe it is vital to persuade Gen Z that they have the ability to make a meaningful change in the world through multiple avenues: buying power, voting power, trending influence on social media, small lifestyle changes/swaps, etc.

Supply accessible changes

Generation Z values convenience and is overall unwilling to make major lifestyle changes, so we believe it is crucial to supply only tips that are accessible, easy to implement, and will not radically shift lifestyle habits. For example, it is unrealistic to ask Gen Z to grow their own food, but it is feasible to encourage increased shopping at local farmers markets.

Educate subtly and concisely

Generation Z is constantly on the go, is bombarded with media, and spends limited time on any one thing. Due to this, we recognize the importance of not overloading Gen Z with information or giving them more information than they are willing to take in. We will simply provide them with only the most relevant, concise facts and give them information on where to learn more if they wish to do so.

Design Concepts

Based on our design goals, we have developed five key design concepts that we believe will be most effective in targeting Generation Z to engage in the fight against climate change. These design concepts follow.

Release a series of posters united by a common logo

We propose to release a series of posters— united by the *Know More, Do More* logo—which will cover a variety of topics revolving around climate change. Each poster has a theme (see example posters below) and centers on a different topic: tips to reduce overall waste, sustainable brands to purchase, current sustainability initiatives, etc. The suggestions we offer are easy to carry out and will not require huge lifestyle changes because Gen Z values convenience. This series of posters—again, connected by the common logo—allows a wide variety of useful information to be dispensed, so Gen Z can take action in several ways.

Focus on credibility and transparent information

Central to our *Know More, Do More* campaign is providing Gen Z with reliable, accurate information they can trust. The facts we cite on posters are from credible, unbiased sources such as NASA or the IPCC, without extra fluff or misleading redactions. At least one QR code on each poster will link to our sources so students can learn more at their leisure and confirm its accuracy. As discussed, the *Know More, Do More* logo will make Gen Z recognize the "seal of credibility" that goes along with our campaign. Because credibility also goes hand-in-hand with "practicing what we preach," these posters will also be printed on recycled paper, a fact we'll display proudly at the bottom.

Utilize QR codes to connect Gen Z to this design digitally

Utilize QR codes to connect Gen Z to this design digitally

Gen Z loves interacting with technology, so every poster includes at least one QR code that links to the source of our information, allowing Gen Z to evaluate the data for themselves. Additional QR codes link students to current sustainability events they can participate in or link to coupons for local businesses as a way to incentivize Gen Z to read and interact with our posters.

Attract attention in subtle ways

Our posters attract needed attention but can be ignored if desired, which is different from intrusive approaches such as petitioning around campus. Most students will choose to read on because we will strategically place our posters in common areas where Gen Z does not have much else to do—places such as university bathrooms, waiting areas outside offices or classrooms, lobbies of residence halls, etc. Even in other areas where our posters are placed (local apartment complexes and dining halls), they are eye-catching and will stand out.

Launch new information in a timely manner

It takes a matter of days for a new poster to be created and posted in dining halls, residence halls, or apartment complexes. Because we also want to connect Gen Z to the community, our posters are a perfect way to quickly get information out about local, upcoming events centered on sustainability or fighting climate change. In addition, using the QR code and the website it links to, Gen Z can access a master list of "Current Sustainable Events" so they always stay connected to what's happening around them. People who have seen our logo before will be more likely to attend these events.

Four example mock-up posters are show below in Figures 2-5.

Figure 2. Example Poster 1 for Know More, Do More*. Campaign. Sustainable Brands.*

Figure 3. Example Poster 2 for Know More, Do More*. Campaign. CU Initiatives.*
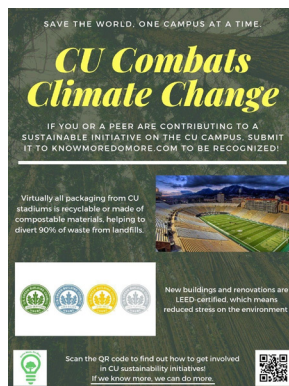
Figure 4. Example Poster 3 for Know More, Do More. *Harness Voting Power.*

Figure 5. Example Poster 4 for Know More, Do More. *Sustainability Event Promotion.*

Benefits

Our design will provide several benefits specific to your interests. A poster series unified by a recognizable logo will be an effective means of empowering Generation Z to act and dispensing information that you deem valuable in a subtle yet effective manner. By utilizing this design, you can accomplish a number of objectives:

Get word out about key events and initiatives

A poster series (*Know More, Do More*) with a reputation for spreading credible, quality information will allow you to advertise events and initiatives centered on sustainability all over campus; in a few short days, posters can be produced and hung around campus for all to see. The "sponsorship" from our recognized and trusted poster brand that people have seen and engaged with previously will also increase credibility in the event/initiative itself, thereby increasing anticipation and attendance.

Cultivate a generation that understands climate change's severity, but has hope

A key benefit of our design is that it strikes that delicate balance between doom and hope. Our poster series presents objective facts that relay the danger and seriousness of climate change, yet they end with reasonable solutions and tips that strike a more hopeful note in order to combat Gen Z's sense of apathy concerning the issue. In no way do we wish to downplay the severity of the world's climate change situation, but we want our posters to persuade people that not all is yet lost and that they have the knowledge and power to turn the tide.

Empower Gen Z and increase their desire to act

Gen Z will be more likely to join Sierra Club and sustainability initiatives on campus after they have regained a sense of empowerment and believe that their actions can make a meaningful change in the world. Our design will first encourage Gen Z to make small, accessible changes in political, domestic, and consumer realms, increasing their sense of competence in sustainable practices. The poster campaign gets our "foot in the door"—Gen Z will gradually feel more empowered and more likely to make a slightly bigger step, such as participating in a local sustainability initiative or joining an organization like Sierra Club (allowing you to benefit from increased involvement from this influential demographic).

Next Steps

To ensure the successful implementation of this design project moving forward, we propose carrying out the following steps.

* Gain approval from the University of Colorado to hang up our posters in campus bathrooms and residence halls.
* Foster relationships with local businesses in order to gather coupons, merchandise, or other items that we can use as forms of incentive to encourage people to interact with the QR codes on our posters.
* Continue to create additional posters that would be part of the *Know More, Do More* series (perhaps one covering tips for reducing

meat intake and excessive consumerism, or one detailing ways that Gen Z can use their political influence to vote in the environment's favor) and release a new poster every 1-2 months to continually attract attention and interest readers.
* Create a small focus group composed of members of Gen Z who can deliver feedback on poster content and design.

Summary

In order to successfully engage Generation Z in combating climate change, we must educate, engage, and empower them. Our cohesive poster campaign educates Gen Z in a non-intrusive way about the effects of climate change using credible sources, engages them with QR codes, and empowers them to act using easy, sensible tips. This motivates Gen Z since they are apathetic toward climate change, lack credible information and sources, do not have time to partake in inconvenient events and actions, and dislike intrusive marketing and campaigning. These posters spread the word about events and initiatives Gen Z can participate in, show how severe climate change is while providing them with hope, and empower them to act against climate change regardless of how small or meaningless an action may seem. If Gen Z knows more, they can do more.

Team Biographies

██████████ is a junior at the University of Colorado / Boulder, where she is pursuing a bachelor's degree in Ecology & Evolutionary Biology and Anthropology. She is particularly interested in studying topics related to zoology and the culture of gender. ██ has been working as a Resident Advisor at CU since 2017 and continues to oversee the health and success of the many young people she mentors, as well as design fun social programs and informative bulletin boards for them. ██ was previously an intern with Nature's Educators and will soon be joining the "Animal Ambassadors" team at the Denver Zoo as an intern. She hopes to eventually find a career teaching the general public about animals because she enjoys designing methods that allow people of all ages to connect to, appreciate, and protect the natural world. ██ enjoys practicing yoga and crocheting blankets in her limited spare time.

████████████████ is a sophomore pursuing a secondary teaching certificate and a mathematics degree at the University of Colorado / Boulder. He has been working as a Learning Assistant for introductory undergraduate mathematics courses at CU for two semesters, where he supervises students' group interactions and problem solving. ██████ is also a Customer Service Manager at Walmart, where he evaluates, critiques, teaches, and monitors associates on the Front End. ████ has an eye for detail and professionalism and through his career at Walmart, has developed substantial problem-solving skills. As a Noyce Scholar, he observes secondary-math classrooms and looks for ways to innovate education by providing solutions and studying the effects. In ██████ limited spare time, he enjoys exploring cities and the outdoors, especially through skiing.

████████████ is a senior finishing up her last semester at the University of Colorado / Boulder. ██████████ studies Integrative

Physiology and hopes to eventually continue on to Physical Therapy School. Specifically, she hopes to work in a sports-medicine-oriented clinic and maybe move on to work for a professional sports team. ▇▇▇▇▇▇ is very aware of environmental issues and does her part in contributing to the prevention of climate change. Personally, she recycles, uses reusable water bottles and coffee mugs, and chooses to ride her bike or carpool when possible. She definitely agrees that Gen Z needs to be more educated on subtle ways that they can contribute to preventing climate change. ▇▇▇▇▇▇ is excited to see this design challenge in action. When ▇▇▇▇▇ is not studying and working towards her degree, she enjoys skiing, attending concerts, and being around friends and family.

▇▇▇▇▇▇▇▇ is a sophomore at the University of Colorado / Boulder pursuing a bachelor's degree in Environmental Engineering with a minor in Global Engineering and a certificate in Engineering Leadership. Her professional interests include water and wastewater treatment, resource recovery, and engineering for developing communities. She is also considering becoming a graduate student in Materials Science and Engineering to pursue her interest of creating more sustainable and economical alternatives to many environmentally harmful materials used today, such as styrofoam. She understands the dangers of climate change while also understanding that people do not like solutions that greatly interrupt their daily lives and thus finds much relevance in this project and this proposal. In her spare time, ▇▇▇▇ enjoys knitting and making pottery.

Appendix A - *Results from Quantification of Gen Z Interview Data and Explained Flaws in this Data Collection Method*

Figure 4. Complete Data from Gen Z Interview Quantification

Figure 4. Complete Data from Gen Z Interview Quantification

Limitations in Data Collection Method

* The Values were not specifically asked to members of Gen Z, and they did not give a direct answer as to how they felt about them. All numbers were assigned on a subjective basis based on the responses they gave in the interviews.

* Many people did not explicitly state how much they agreed to each of the Values. If people did, that is often because they felt so strongly about it that they felt they needed to. People of moderate opinion in some of these categories have thus been systematically left out of the data.

* Some of the numerical scaling systems are a bit flawed and a bit subjective. For instance, those with scales specified more specifically than just 5 is strong agreeance and 1 is strong disagreeance were created in a very subjective manner, and those scales do not accurately represent the large array of values that truly exist.

LAUREN NETZEL
Dear Addiction and Depression, Please Give Me My Brother Back
Creative Nonfiction First Year, 1st Place

"Why are you and Andrew always fighting?" I asked my mom.

"You don't need to be involved in it, Lauren." She would say whenever I asked.

The matter of the fact is, I was involved in it. It affected me. The screaming, the secrets, the sirens, the smells. I was young, but I was not dumb. I knew something bad was going on.

My brother, Andrew, has had trouble with his mental health from very early on. He is my older brother, by three years, but even when I was little, there had always been a lurking sense that something was off with him. He was always searching for something to distract from what he was feeling inside. Many young boys get into a stage of trouble, but Andrew's was deeper than wanting to rebel. He wanted to escape from his own mind. I did not know this at the time, but looking back, it's all so clear.

My family has a long history with mental health issues and addiction, so, naturally, those issues got passed down. My brother has had depression and anxiety since he can remember. What did he do to cope? Initially, it was marijuana, but as time went on and his struggles became deeper, alcohol and Xanax became his other coping mechanisms. Andrew started using marijuana at a young age. Middle school, I think is when it began.

Why is Andrew always in his bathroom blasting music? Why does the basement always smell weird? Why are Mom and Andrew fighting? Why is Andrew screaming at Mom and slamming doors? These are the thoughts that would fill my mind.

Andrew began using marijuana every day. In high school, when I would tell people who my brother is, they would usually say, "Oh! Andrew Netzel? I've smoked with him before!"

That is what he was associated with. The thing is, though, my brother was and is so much more than what he uses. That's the frustrating part. The use takes over and that's all that is clear to see after a while.

As time went on and I understood the culture around marijuana, I became less worried about Andrew's use. He moved out to Colorado to go to college. He was among the marijuana culture, and in some ways, he fit into it. He was a stoner; however, he did not fit the usual stereotype. He dressed nice, was motivated, academically successful, etc. He graduated high school with honors classes and a 4.0 GPA. Also, not many stereotypical stoners would be able to get into Colorado College, which has a 16% acceptance rate. Though, no academic success could make him happy.

"I don't want secrets anymore, Lauren." My mom said with a shaky voice. She finally felt she could open up to me about everything going on with Andrew, as I was a bit older at the time.

"I am so scared for your brother. He uses marijuana every day. Every time I hear his bathroom door shut and music starts to blast, I know what he is doing. It makes me feel sick. I can smell it all the time too, even in the morning."

"Me too . . ." I thought to myself.

"Addiction runs incredibly high on both sides of the family. I don't want this to manifest into something even worse." My mom said, looking around the room rapidly. She does this when she is intense in thought.

I could see how tired she was. She felt she had to fix this for Andrew. He needed to be saved, but only he could save himself.

At the time my mom was saying all of this, I did not understand addiction, but I reassured her, "Andrew is not that kind of person though. He does really well in school, he has a serious girlfriend, he has a good relationship with the family. He is not addicted. He knows when to stop. He can control it." But at that time, what did I even know? To me, addiction was only in people who were clearly a mess. My brother wasn't. What I did not realize at the time was that he was an expert at hiding his feelings and looking put together while he was falling apart.

Flash forward to the fall of 2018. Andrew was a senior at Colorado College. He had recently broken up with his girlfriend of three years. To cope with this and other life struggles, he drank, smoked weed, and used Xanax. I was in college in California at the time. I got a call from my mom, and when I answered, the first thing I heard was her sobbing. "Lauren, Andrew is in danger. His

therapist called me saying Andrew showed up to the session drunk and suicidal. His therapist took him to the hospital but once they got there Andrew ran out. The police are trying to find him now."

My heart sank, and I felt sick. I had no idea my brother was in that bad of a place. As I said, he hides his feelings too well. That day, Andrew ended up just walking home. He felt bad for what he had done and told us that he wouldn't do it again. We somehow believed him.

Thanksgiving Break came around, and Andrew and I flew home to Minnesota to stay at our mom's house. Andrew ended up losing his phone and almost missed his flight because he was so drunk at the airport. When he finally arrived home, he looked different than what I remembered. He had bags under his eyes, he was angry, he was never sober. For the first time, his outside appearance matched how he felt on the inside.

Even though I grew up rarely seeing my brother sober, this time it was different. It was like his addiction became his whole identity. I no longer recognized him. I wanted the brother who used to look out for me and care for me. I knew he wanted to still do that for me because that is just the person he is; however, his addict mind has taken over. Because of his addiction, the roles had been reversed. Since the roles had reversed, I was the one who would find him passed out drunk and had to figure out what to do. Be the one to try to talk to him when he was intoxicated because he did not want our mom or dad to be around him. Give him a place to live when he got kicked out of his Sober Living treatment home. Be the okay one while he was falling apart.

On Thanksgiving Day, I was at my friend's house for dinner. I received a text from Andrew that read, "You've been a great sister, it's nice to have grown up with you. Goodbye, I love you."

I immediately called him. No answer. I called my mom, no answer. I called my dad, no answer. I was panicking. Finally, my dad called back. "Andrew has locked himself in his room. He is drunk and suicidal. The police are on their way. Your mom and I need your help. Maybe he will answer you."

So, I drove home. When I arrived home, police cars were parked in my driveway. I ran down to the basement to where my brother's room is. I put my face up against his locked door. "Andrew. Please don't do this. I need you here. We all do. Please open the door." Tears were streaming down my face.

He did not answer me. I did not know if he was already dead. Was I talking to nobody or was my brother still alive in there and listening to me but refusing to answer?

The police were able to get through the door. Andrew was passed out on his bed, drunk and drugged up on Xanax. He said everything the police wanted to hear, so they didn't take him to the hospital.

The next day was no better. Drunk and paranoid, feeling that everyone was against him, Andrew set off the smoke alarms in our house as an "escape" to run out. "BEEP! BEEP! BEEP!" The fire alarms screeched.

Andrew came up from the basement and ran out the front door. My mom and I looked at each other, confused and concerned. My dad ran after him. Andrew ran down the street and started banging on street signs. It was freezing out, and he wasn't even wearing shoes or a coat.

I got in the car to drive to where he ran off to. When I pulled up near him, he began smacking the hood and windows of the car. He was swearing and yelling at all of us. I drove away because my dad said it's upsetting him more that I'm there. I drove around the block, and just a few minutes later was when I get a call from my dad. "Stop! Andrew put the knife down!" I hear my dad scream in the background of our phone call.

"Dad, where are you guys? Are you still out on the street?" I asked.

"No, Lauren, come back to the house. Help!" My dad's voice was in pure panic, and I could hear Andrew screaming and crying in the background. I hung up.

I walked into the house to see my dad trying to hold Andrew back as he's was reaching for a knife in the kitchen cabinet. Andrew gave up when he realized it was a losing battle.

He ran to a different door in the house to try to escape again. My dad ran after him and was holding him back in the entryway of the door. I grabbed onto Andrew's hand, trying to pull him back into the house. My dad was crying. I had never seen him cry like that before. "Andrew, stop! You're scaring me, you're scaring Lauren, you are scaring all of us."

Andrew fell back onto the hardwood floor. "I don't want to feel anything anymore. I'm done. I'm just done." He said as he looked at the ceiling blankly.

I'll never forget his face as he was laying there. He looked so defeated. So numb. My dad and I sat on the ground with him. I was holding his hand tight, afraid of ever letting it go.

"I just want to take a knife," Andrew says as he holds an invisible knife in his hand and motions it into his chest, "and put it right here."

I could understand the pain he was in. How much he wanted to give up. All I wanted was to take away all his pain for him.

I wanted my brother back. Seeing the pain he feels breaks my heart. I miss my brother. This wasn't my brother.

I'm still searching for him.

DANIELLA BRUZZONE
The Calm after the Storm: Making Sense of Hurricane Sandy
Creative Nonfiction First Year, 2nd Place

     I blink and change happens. That's my impression of time passing. These changes in my life have impacted who I am and how I live. The everyday obstacles I encounter sometimes feel out of my control, but it gives me a sense of security to think about what my father always says: everything happens for a reason. In one specific experience of mine, I struggled to believe something so tragic would ever have a positive outcome. I learned that no matter how bad things seem, or how many things change, there is always a silver lining. Seven years ago, change came like a tidal wave; it rushed in and devoured everything under its tumultuous current. Hurricane Sandy would forever change the lives of Long Beach, New York, residents like me. Life as we knew it was swept out to sea.

     It was October 28, 2012, the night before Superstorm Sandy struck my city by the sea. It was my brother's birthday, and the smell of my Italian grandmother's homemade pasta gave me a sense of serenity as we sat in complete darkness. Our entire house was swaying like a tree in the wind. We watched from our windows as the waves crashed over the dock and charged towards our house, eventually seeping through the doors of our first floor. It was impossible to keep the water out as the waves increased in power and speed, flooding our home.

At that moment, we realized we were in trouble. It was too late to leave town because the cars were submerged in seawater, but my parents, concerned about our safety, thought we should go to a neighbor's house, which was sturdier than ours. We headed out and found ourselves swimming through the water with my parents, trying to keep my head above the surface. I will never forget the fear and panic I felt at that time; I was only eleven years old. We returned to our house once we saw furniture, street signs, and trash floating towards us.

By the time we returned back to our home, the entire first floor was flooded with water. Our most cherished belongings were floating with fish swimming beneath them. Everything from my clothes to memorable family photos was afloat in twenty feet of filthy, salty water. We were exhausted, cold, speechless, and frightened. We decided to climb to our attic to sleep. My mom thought we would have to be saved by a helicopter on our rooftop.

The next morning, all the water was gone. It disappeared as if being sucked down a drain. That moment would mark huge changes in my life. My heart felt heavy in my chest as we drove down what used to be our vibrant neighborhood. My school was shut down for weeks until they finally transferred me to another school where I continued fifth grade. The shock from that night replayed itself again and again in my mind. No one expected the ocean to meet the bay on our barrier island.

Friends who immediately offered help taught me the power of community. They gave me strength to rebound after such a horrible disaster. I learned the power of family, as I was sent to live at my aunt's house for weeks and didn't see my parents, but she managed to keep a smile on my face. I realized that if the storm never happened, Long Beach wouldn't be as beautiful and safe as it is now. The ocean has never been so clean, the aquatic life has never been so thriving, and the architecture has never been so strong. The storm, in all of its destruction, became a rebirth for Long Beach. The storm revealed the beauty and strength of the Long Beach community.

Just as the physical landscape of Long Beach transformed before my eyes, so did my perspective. As my neighborhood was being slowly built up, so was my outlook on life. The storm made me realize how fragile we are and how quickly things can be taken away. Good people, great friends, delicious food, a warm bed to sleep in, a place to call home: these are the things that matter to me. I realized how important they were only after the devastation of Hurricane Sandy.

The many people who offered to help, donate, and open their homes to those affected by Superstorm Sandy opened up my eyes to the warmth and kindness of the human spirit. With a second chance came an opportunity for me to be grateful and remember what's truly important to me. It allowed me to realize who I can count on. In some ways, this huge, rough, angry storm brought a sense of tranquility to my life.

Now, I try to be calm in the storm of everyday experiences. I take a deep breath and try to find a grounded, centered place within myself, even when life gets more than a little bit hectic. I don't fear change as I might have before the storm. Now, I look at change as an opportunity to embrace life in all of its ups and downs. Surviving the storm has given me a new perspective; with great change comes great potential.
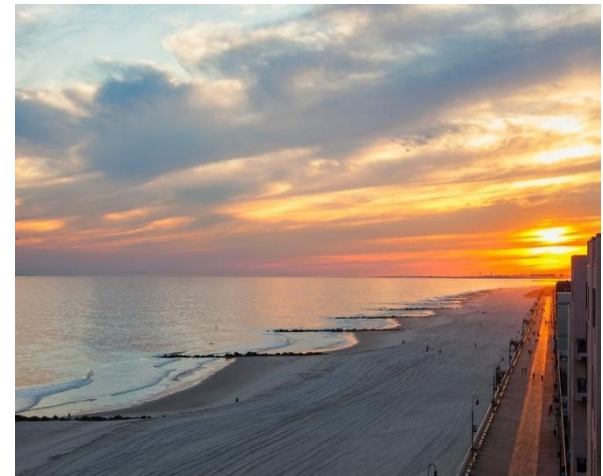
ALEXANDRIA NASH
New Normal
Upper-Division Creative Nonfiction, 1st Place

Picture this: you're in your senior year of high school . . . ready to take on the world, graduate, go to college, and then—BAM—you get cancer and have to leave school for the whole year. Sounds great, right? Wrong. Sounds like something made up for a dramatic fiction series. I wish I could say it was, but this was my reality in 2015.

I started my senior year feeling like I was on top of the world. I had my friends by my side and was ready to take on the best year of high school. Senior year, we got our own parking lot, we wore decorated painter pants, had our own senior gear to wear to the sporting events. I had spent my whole summer designing the shirts and the jerseys and the tank tops and ordering them and distributing them. THIS WAS MY YEAR. Everything was in place and college was just around the corner, I was going to make this year count. I had set the bar very high for how my senior year would play out, and that was my first mistake.

Senior Year Picture, 2015 (Taken 1 month before diagnosis)

October 10th, 2015. I was doing my usual "bedtime routine" of washing my face and brushing my teeth, like I would any other night. This night wasn't like other nights, though. After drying my face, I looked in the mirror and noticed a huge lump at the bottom of my neck. My heart immediately sunk. Lumps and bumps are notoriously bad, and I now had a lump in my neck. I told my family I was worried, and my mom had me in my pediatrician's office the next morning.

My pediatrician began testing me for everything possible like mono, tuberculosis, and even "cat scratch fever." Yes, that is a real disease. All the tests came back negative and there was no answer in sight. My pediatrician suggested I get a core biopsy of the lump to determine if it was benign or malignant. At that time, I had never heard of the words "malignant" or "benign," so I went straight to the internet to find out what they meant. Google wasn't my friend because it took me down a wormhole of terrifying outcomes, all of which I feared. The biopsy came back "inconclusive," which I believed meant I was free of this nightmare and could go back to my normal life. I soon learned that "inconclusive" in the medical world didn't mean what I thought it meant. The medical report of my biopsy stated that malignant cells were seen, but it was "inconclusive" which type of cancer. My family and I didn't understand what that meant for me, so my mom reached out to some of our relatives who were doctors. All my relatives suggested we meet with an oncologist/hematologist so rule out the possibility of cancer.

Children's Hospital / Colorado is one of the best hospitals in Colorado for oncology, so that is where I headed. They were all booked up, but my mom managed to leave a voicemail on every machine in their Oncology Department, and shortly after, I had an appointment. My mom picked me up from school, and we drove to the hospital, with the mindset that this was just a formality to rule out cancer. Within 15 minutes of meeting the oncologist, she told me she thought I had lymphoma. I had never heard of this word, and I hated this doctor for introducing me to it. She told me I would need to get the lymph node removed for testing and then they would be able to diagnose me. I got out of that place as fast as I could and cried the whole drive home. The thought of cancer was petrifying and so was surgery. I was only 17 . . . I had barely started living my life, how could I have cancer? Cancer is for old people, right? I decided to go through with the surgery to do more testing on the cells of this lump and waited 7 long days before we got an answer. The cells were malignant, and at the ripe age of 17, I had cancer. Hodgkin's Lymphoma, to be exact.

You'd think that I would have been worried about dying, but no. In my hormonal teenage girl state, I was most concerned with the prospect of losing my hair and missing my senior year of high school. Just a few weeks prior to finding this lump, I spent $200 and four hours at the salon perfecting my sun-kissed highlights for the school year. Sadly, I had to face the reality that the chemotherapy I was going to endure was known to cause hair loss the most, so I tried to prepare myself. The regimen I was on was intense, and I was at the hospital six days a week, receiving IV chemo and taking 100mg of steroids daily. The exhaustion I felt from chemotherapy was unlike any feeling I've ever experienced before. It was like the flu symptoms and mono symptoms had a baby, and I could barely get out of my bed.

Three weeks into treatment, Thanksgiving was right around the corner. A holiday about being thankful seemed like a slap in the face to me right then because I wasn't particularly grateful. I tried to fix my mindset to find something to be grateful for, and it turned out I would be finishing my first cycle of chemotherapy two days before Thanksgiving. I felt grateful that I would have the holiday off from treatment and got excited at the thought of celebrating with my family. Cancer had other plans for me, though. I woke up the morning of Thanksgiving, excited to see my family and eat good food, but instead I woke up extreme nauseated and felt like I'd been hit by a bus. To top it all off, my hair was completely matted together to the point that I couldn't take it out of the ponytail it was in. I guess it was finally time to shave my head. My Dad shaved my head for me that morning, and it was so impermeable that it came off in one clump that looked like Davey Crocket's hat. I not only felt like a cancer patient, but I now looked the part too. About a week after Thanksgiving, I was due to begin cycle two of treatment. I was told I would be done in time for Christmas and my 18th birthday. After knowing how I felt after cycle one, I didn't get my hopes up that I would be feeling great for either event, though. This cycle went by faster than the last, and before I knew it, it was over. I was free until the end of January, when I would repeat my scans and see how I was responding to treatment. I got to experience a true Christmas, and I felt the best I had in weeks on Christmas morning. I got to eat breakfast with my family, open presents, and watch Christmas movies all day. It was the first day in two months that I didn't need a nap and stayed awake the whole day. My old self started to shine through again, and it was good to see her.

When it finally came time for my repeat scans in January, I was terrified. I hoped and prayed that this nightmare would finally be over because I was just starting to feel "normal" again. I had two different types of scans, a PET scan and a CT scan. My PET scan came back negative, meaning it didn't light up on my lymph nodes like it had on the first scan. My CT scan, however, showed that the affected lymph nodes were not so small as they would like them to be. This mean that treatment wasn't quite over yet. My oncologist said the protocol was to do mantle radiation therapy, and that would be done at a different hospital with a radiation oncologist. I had really grown to like my oncologist and was surprised that I was going to miss her. I didn't have time to dwell, though; I needed to keep moving along so I could put this chapter behind me.

I went to my next appointment to meet my future radiation oncologist and go over the next steps. The initial appointment was 90 minutes so I could go through all the details. I anxiously sat in the room, waiting to meet this new doctor, and, boy, did I wait. Eighty-five minutes later, the doctor strolls on in and gives me a half-hearted apology that his last patient made him run behind. I began to ask him questions to which he gave short, disinterested answers to. He then proceeded to tell me the potential complications of radiation, which included thyroid cancer, skin cancer, breast cancer, and heart-valve damage. I asked him how common these secondary cancers are, and he said he didn't know the data. After 15 short minutes spent with me, he informed me that he needed to get to his next patient. I was taken aback that this doctor just told me I could potentially get three other types of cancer to "cure" the present cancer I have, show up 85 minutes late, and then just leave because he had another patient waiting. I left the doctor's office and knew that would be my first and last time going there.

I called a meeting with my oncologist and nurses back at Children's Hospital and told them that I didn't feel comfortable doing radiation with all the complications and explained to them how awful that doctor made me feel. My oncologist was very understanding, but that was the protocol at Children's, so we weren't sure what was next. My mom reached out to a family friend who worked at the hospital to get advice and he told us about a Lymphoma specialist out in Kearney, Nebraska. I couldn't believe that my options right then were do nothing more, do radiation with that awful oncologist, or go to Nebraska. Ultimately, I chose Nebraska, but because my immune system was not good enough to fly, my mom, sister and I drove there.

My family has never been big on road trips, but there we were, driving to Nebraska for nine straight hours. I met with the lymphoma specialist and she was a wealth of knowledge. Without any papers or computers in front of her, she rattled off study after study about treatments for lymphoma, survival rates of each one, side effects, and risks. She knew lymphoma like the back of her hand and left me speechless. My mom slyly crumpled up her list of questions because this doctor had answered them all before we could ask. She explained how radiation was horrible for young people with cancer and how in the adult world, you have four cycles of chemotherapy minimum. This left me with two options: do no more treatment or two more cycles of chemotherapy. I used the nine-hour drive back home to debate with my family what I should do next. I finally decided that I should do the two more cycles of chemotherapy. Ultimately, the final decision was up to my oncologist back in Colorado because this wasn't the in the protocol.

My oncologist was shocked to hear I wanted to call another meeting with her, but she obliged. She liked my idea and spoke with the specialist in Nebraska about how to execute this new plan for me. Within a week I was back at Children's getting chemotherapy pumped back into my veins, but this time it was only two times a month vs. eight times a month. I didn't love going back to treatment, but I had a gut feeling that this was going to work. I pushed on through the two cycles and by the end of April 2016, I was officially cancer free. This terrible chapter in my life was finally coming to a close, and I was ready to slam it shut and lock it away. I still managed to graduate high school on time with my classmates and was accepted into CU Boulder. I somehow managed to slip through cancer's grip and still had my whole life ahead of me.

I was ready to go back to my old self, with my long hair, my best friends, and so much life still left to live. I was naïve in my thinking because I truly believed that my life was going to back to normal. Once you see the things I saw on the oncology floor of Children's Hospital and feel the way you feel during chemo, you can't exactly just bounce back. A certain innocence of mine was stolen by cancer, because my eyes has been opened to the hardship in life that is cancer. I watched children ranging from a few months old, a few years old, or 18 years old—like me—battle cancer.

I felt unable to relate to my friends and family anymore, I felt misunderstood, and I felt like maybe this chapter wasn't really over yet. I started college and lived in the dorms, I went out with my friends, I made new friends, but I still didn't feel like myself. No one told me tha, post-cancer treatment was going to be hard, too. I still had residual "chemo brain," which made me feel stupid

because all my 1000-level classes felt like 4000-level courses. I took notes and studied like I did in high school, but I was getting average and belo- average grades. I ramped up my studying, but nothing changed. I felt like I didn't even know myself anymore because my brain wasn't functioning like it had for the first 17 years of my life. I felt alone and angry because no one else around me was struggling with school even though they, too, were studying like they had in high school.

After I first semester at CU, I was ready to throw in the towel. Maybe I rushed this whole college thing, I mean I had just finished chemo only three months before starting college. I decided I'd give it one more semester and then decide. My second semester was just as bad as the first one: I couldn't concentrate, my long-term memory was almost non-existent, and my grades were slipping. I couldn't figure out why my brain was still in such a fog because I was almost one year in remission now. I reached out to professors to explain to them my situation, but I was told over and over that college is much more difficult than high school so that is why I was struggling. I believed them, too: maybe my study habits from high school weren't as good as I thought and maybe it's just because college is hard.

I spent the summer after freshman year researching my symptoms and feelings post-treatment. I found out that survivors of cancer, especially when you are younger, often struggle with going back to their old lives. Side-effects like "chemo-brain," fatigue, anxiety, and depression are common in those who are in remission and sometimes they are present for years after treatment ends. I felt a little better knowing that what I was experience wasn't totally out of the ordinary, but still the sterile cancer websites weren't totally comforting.

After about two years of remission, I was still experiencing these side effects and struggling academically, socially, and mentally. It felt like I might not ever get better and that I was alone once again. I was on one of my favorite fashion blogs websites, and I saw an article about a young girl who was a Hodgkin's Lymphoma survivor and how cancer changed her life. It felt like a sign. I found her Instagram, and it turned out that she was an active advocate for young cancer survivors, for whom she had formed a community of people who survived many different types of cancer. Reading their stories, hearing how they still have lingering side-effects from treatment, and seeing that they've gone on to live great lives was inspiring, I felt hopeful for the first time in a long time that I would get through this residual pain of cancer.

I was hesitant at first to join this community of survivors because what if it brought back trauma of treatment or made me sad to talk about cancer? It had the exact opposite effect, though: it made me feel so grateful to be alive and grateful to hear stories of other people who survived cancer. So often we see the other side of cancer, those who were taken too soon from us, and we forget that there are many people who are still alive after beating cancer. While it is very sad to hear the stories of those who've passed away from this disease, to go on living in the world when you've experienced the cruelty of cancer is very difficult, too. I learned through this community about survivor's guilt and how it is very common for those who've survived cancer to feel this way. I have family

who have passed away from cancer and had met children at the hospital who I later learned passed away from cancer, too. I felt guilt for the first few years of my remission because I didn't understand why I got to live, when there were other children around me being taken away from their families. This community of survivors online helped me cope with these feelings and so many more. I finally had somewhere that I felt I could be honest, without burdening or worrying the people around me with these feelings. This community understand my feelings and reassured me that it is all a part of the process of grieving your old-self and old life.

Now I am almost four years in remission, and I have meet and talked to so many young people who have survived cancer and listened to their stories. I have also met many young people from my high school, neighborhood, and CU who have been diagnosed with cancer and have been able to talk to them. Social media have connected me with the majority of these people because we've heard about one another through mutual friends. I am thankful for the opportunity social media have given me to meet these young people and watch them go into remission or hear their stories about treatment. I felt so much less alone by hearing that my struggles were also felt by so many others too post-treatment. I have also been told by people I've met who are going through treatment that it felt so good to know someone who "beat" cancer and is living life still. If it weren't for social media, I'm not sure if I ever would've connected with people who understand what I am going through or been able to help people currently going through it.

Seattle, Washington, 2019 (3.5 years into remission)

EMILY BURNER
Reading List
Creative Nonfiction Upper Division, 2nd Place

1. Bread and Jam for Francis, by Russel Hoban
She is a toe-headed curly-haired girl. She pulls numerous books off of her mother's glass protected bookshelves and devours them one after the other. It smells like dust and old craft supplies, and her mother has to come and fetch her for dinner because it has been hours. She prefers the picture books about food. She is ashamed of her preference, though she doesn't entirely understand why.

2. Junie B. Jones series, by Barbara Parks
She still hasn't learned to read well, but Junie B. is easier for her to understand. She likes that Junie plays similar games on the playground with her friends. She is inspired to write her first book, one that is just like Junie B. Jones. She doesn't get very far. She finds she prefers the planning part of the writing process—the part where she gets to create ornery and exciting characters—more.

3. Belle Prater's Boy, by Ruth White
She is placed in the highest reading level at her elementary school. It makes her feel special, like when adults refer to her as "mature for her age." She tries to understand the hardships of the characters within the pages but falls short. She wants to understand. She wants to be "mature for her age." Reading helps her feel like she is. She wants to read everything she can get her hands on.

4. Percy Jackson series, by Rick Riordin
The clock says it's past midnight, but she doesn't care. She doesn't care that she has been laying under her heavy comforter long enough to make her fleece pajamas feel hot and uncomfortable. She doesn't care that she will be exhausted the next morning. She can't stop reading these books. She wants to be unique, just like the demigod teenagers tackling monsters in the stories.

5. The Midwife's Apprentice, by Karen Cushman
She hates this book. The boys in her seventh grade class were getting to read a different book than the girls, one about adventure and danger. The girls were being forced to read a book about a midwife's apprentice. She doesn't want to read it. Why do the boys get to read a different book, one more exciting, anyway?

6. Betrayal, by Aaron Alliston

Her obsession begins. Her big brother recommends these books to her, the *Star Wars* Legacy of the Force series. Brother always makes the best book recommendations. She wants to be like him; wants to prove that she is different and nerdy and everything that she thinks he is. The books are six dollars a piece at Borders Bookstore; the smell like that of old paperbacks. She has a different Star Wars shirt for every occasion. She isn't like other girls, or at least, she doesn't want to be.

7. The Seven Realms series, by Cinda Williams Chima

She emails the author at thirteen. She wants to know just how she came up with all of the different names for her characters. Cinda Chima responds. Chima is happy to hear that she is a young woman wanting to be a writer. She never deletes those emails.

8. Mr. Pancake Man, written by Debbie Callis, illustrated by Emily Burner

It's her freshman year of high school, and her favorite art teacher recommends her to an author who needs help illustrating a children's book. The story isn't very good, but she is proud of her work. Now, she can't wait to illustrate her own story about a cave dwelling sheep and his best bat friend. She loves telling stories.

9. The Fault in our Stars, by John Green

Her high-school boyfriend likes John Green. She likes the romance John Green writes. She cries easily; books have always been able to do that.

10. The Way of Kings, by Brandon Sanderson

Another brother book recommendation. He has read it multiple times. He says she should read more books that are mature. She wants to read it; she loves fantasy. It is over 1000 pages long and bores her. She reads her favorite series again instead.

11. The Seven Realms series, by Cinda Williams Chima

She loves Hanson Alister. She wants to create stories like this. She wants to make other people feel the same way about her writing as Cinda Williams Chima makes her feel. She has a story planned. One about dragons and wizards and complex female characters. She never starts it.

12. Ouran HighSchool Host Club, by Bisco Hatori

It makes her laugh. She loves the boys, all dorkishly vying for the attention of one oblivious, bookish girl. She loves to draw herself as a cute, bookish anime girl. She wants to write and illustrate stories about her.

13. The Hobbit, by J. R. R. Tolkein
The smell of her Tolkein paperbacks is her favorite scent. If she were a character from Middle Earth, she would be a hobbit, all fat and happy and content in her hobbiton cottage, tending to her pumpkin patch. She loves to read Bilbo's stories. She likes to think that he would like to read her stories too.

14. Juicy Writing, by Brigid Lowry
She has always wanted to write a book. She has poured over this book for hours, using it to plan out adventures and introduce feisty heroines with minds of their own. Her notebooks are full of blueprints for faraway places of her own design, with the inked smudged in places. She has always wanted to write a book. She hasn't started writing one, though.

15. The Seven Realms series, by Cinda Williams Chima
She wants to be more like Raisa ana' Marianna. She wants to be tough, and to speak her mind. She wants to stand up for herself and flirt with cute wizards. She wants to be a warrior. She *wants* to write.

16. Uprooted, by Naomi Novick
 She sits in the coffee shop on the hill above the college campus she attends. Her best friend is working the counter, and she partially listens to middle schoolers present their poetry at the front of the room. She is engrossed in the fantasy novel in front of her, unable to put it down. Is this one of the more "mature" books her brother talked about? She actually finishes this one.

17. The Fellowship of the Ring, by J. R. R. Tolkein
She loves her Tolkein books, she loves the world of Middle Earth and beyond, but it is a slow read. She feels bad for not being more engaged, but it's harder to keep her attention than it was when she was younger. It's harder to openly embrace the things she loves when her passion has dampened somewhat over the long years. She likes the *Lord of the Rings*, but she isn't one for finishing things, remember?

18. La Reina, by Pablo Neruda
She looks at her reflection in the mirror every morning and repeats her mantra to herself: "Eres una reina." She loves romance, she always has. She knows she must love herself first. She is working on it.

19. Spinning Silver, by Naomi Novick
She wants to be more like the strong female leads in this novel. She wants to get in the face of her opponents and tell them to go to hell. She wants to fight for herself. She also wants to read more romance novels. The last two chapters of this one are left unread.

20. Things I Would Like to do with You, by Waylon Lewis

She likes to read books by people who inspire her to write. The summer before her junior year of college, she is working as a gelato barista. The line is out the door; it is unbearably hot outside. A man who she recognizes as the best friend of Redford and the author of this book walks in to get some vegan chocolate gelato. It is his birthday. He tells her she should write for his online journal. She is elated. She never does. She's not sure what is stopping her.

21. The Seven Realms series, by Cinda Williams Chima

She is still determined. She *will* write that fantasy novel. She will start that story about magical queens and wizards behaving badly. She puts off reading the fourth book of the series because she is afraid that, once she has finished it, her motivation and inspiration to write will disappear. She wants to write something. She wants to be able to walk into a book store and find her work amidst those seen here. She *will* be able to find herself.

NATASHA KOSMISKI
Unreal Expectations
Creative Nonfiction Upper Division, 3rd Place

The doorbell rang, and I jumped off the couch, grinning with excitement as I ran to the front door to greet my older cousin. It was Saturday, the day of our weekly sleepover and my favorite night of the week. After a long week at school, I was ready for some fun, and with Tanya, I knew I would have it. I opened the front door, and my smile grew when I saw my aunt standing in the doorway in front of me. "Hi, hun," she said as she walked past, continuing to mumble along until she entered the living room for a better conversation with my parents. Tanya followed behind but instead of going to the living room, made a bee line for my room upstairs, and I ran after. She was fast, her long brown hair flowing behind her as she cut corners and jumped stairs to the top. "Guess what," she said as she swiftly closed the door behind us. "Guess what, guess what," she repeated: "I have a boyfriend!" With raised eyebrows and growing wide eyes, I listened with anticipation as she explained her exciting news. She talked quickly and efficiently about the boy she had met on IMVU.

When I was younger, I loved to play games. Aside from Xbox, Playstation, and Nintendo, I remember computer games such as Toontown, Webkinz, and Club Penguin, all of which made up a good portion of my childhood. But, I had never heard of this site before, and like Tanya was to me, IMVU was the "big girl" version of these games. After downloading the app onto my computer, she logged into her account and continued to explain how she met him through this interactive game, beginning by showing me the character she created, Sierra. Now Sierra was a tall brunette with brown eyes, busty and tan in complexion. She didn't look much like Tanya, but perhaps what I imagine she wished to someday look like when she was older. She toggled between physical features in the edit mode, showing how we were able to change the character's appearance to our liking, alternating the hair color, eye color, clothes, etc. I was too young at the time to realize, but the game encouraged some unrealistic beauty standards and exposed us early to the negative effects of social media. Although you could change the "skin" of your avatar, this only included the height and color of your character. At no place was there an option to alter the weight or body type of your avatar. The only thing the character could be large in was her breast size, and each avatar was "curvy in right places" with some variation of a small waist—two factors that do not usually coincide. Options for men did not stray away from one aspect: being physically fit. Another problem I noticed within the game was with the element of skin color itself, with only two or three options resembling a person of color and several others for light skinned options. I wish that there was an equal amount of representation for minorities, supporting the idea that every race is beautiful and just as important. It doesn't seem to matter where we look in the media, whether that be magazines, newspapers, or Instagram, ads, we are bombarded with "ideal" images of what it looks like to be beautiful. And, being a kid doesn't separate you from this exposure.

After creating your character, you could travel to different "hang out" areas, where you could interact and communicate with real life people. This is where Tanya met Zach, her online boyfriend. Connecting it to my life now, more than a decade later, this portion of the game reminded me of scrolling through social media. With each avatar I saw, I subconsciously made judgments according to how they looked, comparing them to other avatars, as one oftentimes does to themselves when looking at photos online. We continued to navigate through the game, having light conversations with strangers and getting lost in our new online "reality." That is, until her boyfriend logged on, and wanted to know Tanya on a deeper level. On the internet, you can be whoever you want, and Tanya chose to be Sierra. So, when her online "boyfriend" asked for a real-life photo of herself, she scrambled to find one that fit her new character. Although Sierra's personality was Tanya's, she didn't think her looks fit her online facade. I have to wonder now if she didn't feel good enough compared with the counterfeit avatar she had created. Although we were young, our parents had let us use and experiment with makeup and hair accessories, so we got to work to try and take a photo she was comfortable with sharing. However, transforming from an awkward middle-schooler to a "model" was harder than we anticipated, and no matter how many self timer photos we took of her on photobooth, Tanya never felt secure enough to send a photo. She noticed a flaw in each picture, whether that be her teeth not white enough, her smile not straight, her hair not falling perfectly, etc. Instead, we searched the internet for a "pretty girl" and found one that better fit. It's funny that even at such a young age, we can feel insecure.

Fast forward five years, and I'm sitting on the couch once again, smirking at the poor guy being catfished on my TV. Almost every episode of this MTV show ends in the same way, with the victim falling trap to lies and deceit. I've never understood how someone can fall for a stranger online, despite never meeting face to face, or how someone can lie about such big parts of their lives, as many catfish do. But, what I've learned from the show is that there are many reasons people pretend to be someone they're not, and the internet makes it easier to do so. Whether it stems from insecurities, mental illness, harassment, sexual exploration, etc, catfishing is a real problem in the world today. As defined on *Wikipedia*, "The person uses catfishing in order to appear as a better version of themselves by using a fake identity." Although I've never been a catfish myself, I feel that I can relate to the term as well as most

other people. Because isn't that similar to what we do daily on our own social media accounts? We present ourselves online in a way that we believe will impress others, putting only our "good side" forth. As said by Hubbard, "Technology allows us to produce a narrative of our lives." We show only what we want, and we don't post on bad-hair days or days we're feeling insecure or down. Many of us show only the side of us we want others to see and hide the parts of ourselves we deem unworthy because of societal standards, even though every aspect no matter negative or positive contributes to our identity.

Like the episode I had just watched, Tanya's story was an entertaining one. Not only did she catfish a boy named Zach, but he catfished her right back. To my surprise, her online relationship continued for several years after, and eventually, after three years of communication (mostly through texts and phone calls), Tanya had finally shown her true self to him with a simple selfie she had taken at the mall. He was accepting of her, told her she was beautiful, and later that night, they had Facetimed for the first time. Tanya was surprised to see that the person on the other end was not the same person as he had claimed to be years before. Although just like he had, she accepted him for who he was, and they continued their relationship for years after. They are not currently involved romantically but remain good friends to this day.

Even though growing up, you become more exposed to unrealistic body standards and expectations, you also begin to realize just how "unreal" they actually are. From photoshop to filters, people are constantly editing their photos and online lives to improve their sense of identity and image of one's self. But, the internet doesn't have to be used in this way. Just like it brings negatives, social media can be a positive thing. Tanya met through the internet a great friend, who helped her grow more and more comfortable with being and accepting herself. I've watched her use social media to find not only love in another person but self-love as well. Growing up and becoming your own person feels as though you are a child again, creating an avatar. Now I'm navigating through my own life, realizing it's okay to edit and improve my character as I go along.

SELF-LOVE IS THE NEW #RELATIONSHIPGOALS

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KELA FETTER
The Wisdom in Walnuts
Creative Nonfiction Sustainability, 1st Place

In the courtyard of the 300-year-old former customs office, I found an easy peace under the walnut trees. Days were short due to the valley's depth; sun didn't strike the corrugated tin roof of la Casona el Resguardo until 9 A.M. and vanished as early as 5 P.M. Residents of this shallow crevasse worshipped the fleeting light. Nyctinastic desert plants opened their leaves and drank sunbeams. Mobs of cows willed themselves up the steep embankments to stand blinking in a patch of warmth. After the sun erased the morning chill in the courtyard of la Casona, I parked a worn cushion on red patio tiles that had withstood centuries of earthquakes. Seven bulging sacks of autumn's walnuts awaited my hammer. It was rhythmic labor: a learned tap was more effective than a forceful smote. The cracked nuts fell one after another into an awaiting bucket. Then the work was intricate and meditative. My fingers found the punctured ends of shell and worked them off, bit by bit, to expose the naked nut inside. Chileans know the halves as *mariposas* (butterflies), but to me they more closely resembled the headless, plucked, prone and golden-brown carcass of a rotisserie chicken.

More than anything, though, walnut-hulling is tedious. Over the course of a month, I filled a large Styrofoam tank with halves. A small child could swim through my payload, but I barely put a dent in the total harvest. Señora Esolina told me not to worry: the leftovers would feed the birds and insects that frequent the garden. All foodstuff at la Casona was precious. No resource went underutilized. Eighteen miles from the nearest city, the complex was squat and self-reliant, the only access road a crumbling causeway that zigzagged up five thousand feet over a mountain pass and eventually into Argentina.

An ethos of sustainability is hewn into the very fibers of the building. Constructed as a customs office over 300 years ago, la Casona has weathered centuries of earthquakes and blizzards. Throughout the 18th century, commerce flowed through the ledger of the former customs office as merchants transferred goats, cattle, leather and yerba mate to and from Chile, Argentina, and Peru (Abel and Mardonez, 2009). In 1822, Chilean liberator Bernardo O'Higgins declared this mountain passage the only legal one between Chile and Argentina, elevating la Casona's importance to national significance (Ross, 1984). An 1860 description of the compound survives:

> The rooms [of the customs office]…They are new, comfortable and I think enough for the commander and 3 or 4 more guards who accompany him. In the front and north of these there are some browns and in the same direction some paddocks, but, to the west are some vegetables, preceded by a large courtyard where some fruit trees grow, and I think that to the south it also has cultivated land. . . . (De La Cruz Villarroel, 1870)

The building remained the Customs of northern Chile until the Trans-Andean Railroad superseded trade by foot in the early 1900s (Fifer, 1994). By the dawn of the 21st century, the customs office had been converted into a bed and breakfast for the traveler desiring

solitude. There are no solar panels, composting toilets, low-flow faucets, or LEDs. El Resguardo is most distinctive for what it lacks. The small stone swimming pool is filled by mountain run-off. Clothes are hung on the line to dry in the up-valley breeze, in view of the occasional condor on high riding the same current.

La Casona sources much of its foodstuff from within miles of its gates, a feat all the more impressive to a veteran of United States supermarkets. In *el campo* (the countryside), localization is necessary; the grocery store is a long bus ride away. For breakfast, we sliced a loaf of bread baked up the road by a neighbor. We clothed our toast in avocado slices or jam—both sourced steps away from la Casona's courtyard fruit trees. Eggs, served scrambled or soft-boiled, were purchased from another neighbor by the dozen. Oranges were a special gift from the garden, their fresh-squeezed juice a complement to the smoky taste of walnut butter and the acidity of the coffee. Even the beans of that coffee, admittedly far from their harvest in Colombia, traveled significantly less to arrive in the north of Chile than the center of the United States. Wine, however, was vine-to-table. The semiarid region of San Esteban boasts some of the nation's most esteemed vineyards. Crushed, pulped, seeded, and fermented, the grapes become *vino*—internationally acclaimed and perhaps second only to the Pisco sour as a Chileno's drink of choice.

Even the kitchen scraps possessed a noble destiny. Potato peels, celery heads, spinach stems and the like ended up in a bin for the chickens—four friendly hens with an appetite for lettuce. In several months, weaned on the kitchen's waste, they will grow large enough to produce fresh eggs. Cèsar the donkey also received his fair share of produce scraps, to the chagrin of the horses. Walnut shells are saved and used to feed a different beast: the stove fires inside the house. Central heating is forgone for heavy wool blankets. To tame the immensity of the walnut trees themselves, branches are frequently hacked off, gathered, and chopped for firewood.

In this way, we internalize the near environment by eating and drinking the edible parts of the orchard's plants and using their inedible parts to warm our bodies.

Once, around midnight, Pato saddled his horse for a journey several miles up the mountain road; a neighbor's cow needed rescuing after falling into a ditch. Reciprocity is a tenet of life in the Cordillera. Neighbors help neighbors. In the more remote reaches of the sector, people graze cattle. The animals are free-range to the wildest extent of the word; I followed cattle trails up to the highest peaks in the vicinity, startling when a large brown body brayed from behind a cactus at my approach. After trekking for several hours up a ragged peak, I stumbled across the outpost of a cattle herder under a slab of granite, replete with campfire and cooking pots. He must perform his labor exposed to the elements for days or weeks. His herd's beef must be world-class.

Despite the chill of early winter, we held a traditional *asado* (outdoor barbecue). We adorned the table with the bounty of the garden and orchard as the dogs circled, drooling. Too often we forget to look backwards in our quest for ecological harmony. The idea of sustainability is forward leaning: balance and endurance in perpetuity. But continuum stretches in the opposite direction. What

sustained life in this valley hundreds of years ago—simplicity, reciprocity, and thriftiness—sustains it today. Some "green buildings" exchange human touch for gadgetry. La Casona el Resguardo quietly makes the case that homegrown meals shared with guests might be the most enduring thing we have.

There are many other regions in Chile more well-known and dramatic than this one. The same modesty of El Resguardo is embodied in the scattered cacti and thickets of thorns of these sandy hillsides. It's beauty that doesn't self-advertise. We shared wine and meat and turned our eyes to the mountains. In the immaculate stillness, a condor circled its cliffside home, a black ghost in the dying light. By imperceptible degrees, the Cordillera caught the residues of the setting sun. The sunrays expired and an alien luminosity struck the mountain flanks. Alpenglow bleached the peaks for a handful of heartbeats and then the technicolor display was spent. Suddenly the landscape transformed: the white thorns swayed like gnashing teeth, each pebble cast the shadow of a boulder, and the dusk bled moans and howls.

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CLAYTON MONTGOMERY
How to Pack for a Wildfire
Creative Nonfiction Sustainability, 2nd Place

Stuff. We've all got it. Cardboard boxes full. A piled-up corner in the garage. Closets packed to the ceiling with clothes we haven't worn in a decade. Storage lockers, crammed wall to wall with spare parts, receipts, forgotten family heirlooms, and random assortments of objects that should've been tossed in the trash long ago. We've all got stuff. Some more than others. In our hyper-consumerist society, we're encouraged to hoard—to collect. We're indoctrinated into the belief that buying things will make us feel better about ourselves, our lives, and the places we reside. That compulsion to collect isn't our fault, but that doesn't mean it's a good thing. July 4th, in the summer of 2018, I was forced to confront the things I own and how I value them. As a wildfire blazed towards my house, stoked by gale-force winds, I had very little time to pack everything I could before being rushed out of the house by a forced evacuation. In those panicked moments, I was forced to decide what to bring and what to leave behind. The decisions I made that night redefined how I valued 'stuff.'

My room in my childhood home wasn't clean. It was far from clean. My desk was littered with papers, random cords & electronics, T shirts, old homework assignments, and gimmicky souvenirs from places I've been. On the floor next to my bed sat a few pairs of earbuds, an empty iPhone box, and a cologne I'd only worn twice. Under my bed were two old baseball bats from little league, more T-shirts, and a bike wrench that had been there for years. There were little piles like these scattered all across the room—messy and unorganized. The closet, however, was by far the worst. Clothes everywhere. An ungodly number of shirts, jackets, pants, and shorts were crammed into every nook and cranny of the small closet. "Unnecessary" wouldn't even cut it. I loved spending my hard-earned paychecks at various online retailers. I would spend and spend on new shoes, over-priced socks, pairs of pants I would hardly wear, and of course, more T shirts. Over the years, those purchases kept piling up until I'd practically ran out of space to put everything. And that was the state of my room come July 4th, 2018.

The fire began at the Basalt, Colorado, gun range by a young couple firing tracer rounds into dry brush. That was July 3rd, and the fire grew rapidly, stoked by high winds and bone-dry vegetation. The fire grew that afternoon and that night until it was clear that containing it would be very difficult. On July 4th, it worsened still. It encroached on the town of Basalt, and threatened hundreds of homes. Thanks to airdrops of water and fire-retardant, the homes were saved. But the fire was still growing. I wasn't too concerned, considering the winds were pushing the fire away from my house. I felt sure we'd be fine. The night of July 4th, however, took everyone by surprise. The winds switched and increased drastically. The intense winds began pushing the fire directly towards my

house. That night after 8:00 PM, I stood on a street near our house and watched the fire climb a ridge towards us. Our eyes squinted as the wind howled in our face, blowing smoke and ash with it. After just a couple minutes of standing there, a state patrol officer drove past with its lights on. From the loudspeaker, the officer inside yelled, "everybody off the street, you're next to evacuate. Go!" And with that, we rushed home to pack.

When I got home, I felt a wave of panic wash over me. I had no idea what to pack. I didn't know how much time I would have before we were forced to leave, and whatever I brought would have to fit in the back of my car. I started by grabbing the important stuff – passports, social security cards, etc. I figured I would need some clothes, so I stuffed a duffel bag with a few sets of pants, shirts, and whatnot. What would I miss if the house burned down? I threw my laptop in my bag along with a couple chargers. I packed a toothbrush and some other toiletries. And then I grabbed a few sentimental objects that I wanted to bring along. I threw my ski gear in the car as well. But after that, I had no clue. I walked into my room and felt ashamed knowing that I wouldn't really care if I never saw most of that stuff ever again. I didn't think twice about bringing most of the clothes that I'd spent so much of my hard-earned money on. I didn't even glance at any of the stuff on my desk, under my bed, or on the floor. In that moment, I had all that I really needed, and everything else was unnecessary. I had hardly a moment to wonder why I even owned all that extra stuff before the official evacuation notice came in. It was time to go.

In the end, our house was fine. It didn't burn down, and all my stuff was fine. After we were allowed back in house, I had some time to think about what I packed that night—none of the clothes I'd spent my paychecks on, none of the pointless objects and items that filled up my room. In a way, it made me realize that all of that stuff was peripheral—completely unnecessary. Since that night, I've a spent a lot more time getting rid of those things rather than accumulating more. Not to say that I'm all aboard the ever-trendy minimalism train, but I've tried to be less of a consumer/hoarder that society wants me to be. And it feels good. I've saved a lot more money and managed to refine my definition of value even more. I've learned that deep down, I don't really care about the actual things that I own, but how they make me feel. More importantly, I've learned that there are so many other ways to obtain those feelings without purchasing anything at all. Without the constant spending, I've saved up enough cash to take a trip to Mexico to learn how to surf. I have a feeling that'll make me feel a lot better than a few new pairs of jeans. It may have taken a forest fire for me to learn these things about myself, but I'm glad I learned them nonetheless.

CYDNEY JARDINE
Cultural Competency Programs: Decreasing Health Disparities Resulting from Implicit Biases
Diversity, 1st Place

America's demographic population has changed dramatically over time. Projections of what America will look like in 2040 and 2060 support the fact that non-Hispanic Whites will become the minority (Lombard). In fact, the percentage of non-Hispanic Whites in 2016 was 61.3% and is predicted to be at 43.6% in 2060; that's almost a 20% decrease in the non-Hispanic White population of America (Kolko). Despite the growing percentage of minority groups, such as blacks, Hispanics, Native Americans, and Asian Americans, these groups experience a seven-year difference in life expectancy than non-Hispanic White Americans ("Creating the Healthiest Nation: Advancing Health Equity"). Differences between racial and ethnic groups can be caused by genetics, income, and the availability of healthcare. However, the American Public Health Association is one of many organizations that includes racism and discrimination as a social determinant of health. An example of discrimination in healthcare is the significant difference in deaths in childbirth between black and white mothers, with black mothers dying at three times the rate of white mothers ("Creating the Healthiest Nation: Advancing Health Equity"). Both explicit and implicit biases and associations of a racial or ethnic population can influence the quality of care. How can health professionals address health disparities and differences in quality of care stemming from discrimination?

Guidelines, accreditation standards, and training approaches have been provided by well-known professional institutions in attempts to increase cultural competency across the nation and in medical schools ("Cultural Competence in Health Care: Is It Important for People with Chronic Conditions?"). The Institute for Diversity in Health Management, amongst other institutions, know that cultural competency programs aim to "provide care to patients with diverse values, beliefs and behaviors, tailoring health and delivery to meet patients' social, cultural, and linguistic needs" ("Becoming a Culturally Competent Health Care Organization: AHA"). Most research that has tested the effects of these cultural competency programs states the positive outcomes of having an increased education of diverse cultures, which is offered in cultural competency programs ("Becoming a Culturally Competent Health Care Organization: AHA"). Even if this research has proven helpful in understanding useful ways to become more culturally competent, cultural competency programs are only required in a few states, and is not always a requirement for medical school graduation ("Cultural Competence Training for Health Care Professionals").

I would like to suggest that a regional-specific cultural competency program for working healthcare professionals, in addition to a required Implicit Association Test and more diversity training in medical schools, will substantially decrease health disparities resulting from implicit bias and increase the quality of care for racial and ethnic groups.

What Is Implicit Bias and Its Role in Healthcare?

Oftentimes, Americans who believe race relations have improved in America are referring to the end of Jim Crow laws and the passing of progressive legislation, such as the Civil Rights Act of 1964, which ended segregation in public places. However, the General Social Survey (GSS) taken in 1990 and 2010 shows negative associations, biases, and even levels of racism continue to exist in America. In fact, only 1 in 5 (or fewer) whites agreed that African Americans are intelligent. Further, the GSS also found an increased association of words such as "lazy, violent, dangerous, and unintelligent" with African Americans ("Becoming a Culturally Competent Health Care Organization: AHA"). Many people can reflect on this survey and claim they do not believe these things or would never act on these clearly stereotypical explicit biases. Some physicians may even make this claim. But, implicit biases are unconscious and are not exclusive of physicians, judges, and other professionals who claim to be unbiased ("Understanding Implicit Bias"). Negative words, images, or teachings of racial and ethnic groups can lead to implicit bias and can conflict with a professional's desire to deliver impartial care. The process of diagnosing and treating a patient can differ based on these biases, overall affecting the quality of care a health professional provides.

There is evidence that African Americans, Hispanics, and Native Americans experience health inequities due to a low income and little-to-no access to healthcare. A 2003 study by the Institute of Medicine concluded that "even after differences in income and in access to health care and health insurance are controlled for, racial and ethnic minorities still experience a lower quality of health[-]care services" ("Unequal Treatment"). In *Unequal Treatment*, the behavior and attitudes of the evaluated health professionals were taken into consideration. This points to the fact that these racial groups are receiving a lower quality of health care due to their race/ethnicity. The implicit bias of these health-care professionals reduces the standard of care provided. The differences in treatment that lead to health disparities are addressed in the book and suggestions to "improve patient-provider communication and integrate cross-cultural learning within the health professions" are made ("Unequal Treatment"). Cross-cultural education and diversity training are essential parts of cultural competency programs, and *Unequal Treatment* outlined multiple ways to improve communication, such as "availability of language translation [and] community-based care" ("Unequal Treatment").

The Implicit Association Test was developed as a way to measure "attitudes that are introspectively unidentified" (White-Means). There are many different tests one can take, including associations of religions, genders, weight, and race. The IAT measures implicit associations between differences in one of the categories above. For example, the race IAT will measure an unconscious preference for Whites over Blacks. Looking at results from the race IAT test in 2004, more than 75% of whites have an implicit preference for whites over blacks (White-Means). Another report published in 2017 focused on physicians who had taken this test. The results are similar, with the majority of the tests proving an "implicit bias for White patients, especially among white physicians" (Horowitz). These results encompass only the physicians who are already practicing. What if these tests were required in medical school, so a future physician is aware of their biases and can better work to resolve them?

Can IAT Results Change Behavior?

Some argue that taking the Implicit Association Test may not influence the explicit attitudes or behaviors that result from these biases. A meta-analysis published in the Journal of Personality and Social Psychology concludes that "changes in implicit measures did not mediate changes in explicit measures or behavior" (Forscher). It would be hoped that explicit behaviors (we can refer to these as openly racist actions) would be punished in healthcare professions. On the other hand, implicit biases can be changed through the right measures and certain unbiasing techniques, as noted by the Kirwan Institute for the Study of Race and Ethnicity at Ohio State University ("Understanding Implicit Bias"). Even in the meta-analysis, it was found that implicit associations can be changed, though minimal. Regardless, the research suggests procedures that could have larger effects on implicit behaviors, including the association of sets of concepts (Forscher). Knowing one's biases can lead to self-awareness, and in the case of doctors, who are supposed to prevent harm and distribute resources justly, IAT results would allow for self-reflection.

Designing a Beneficial Cultural Competency Program

As we know, implicit biases, as well as a lack of diversity training, are two factors that affect the quality of care provided for racial and ethnic groups. Lack of diversity training can decrease "the ability to engage and educate patients" ("Becoming a Culturally Competent Health Care Organization: AHA"). This alone can prevent a physician from providing the best quality of care possible. The American Hospital Association published an article in 2013 that provides multiple ways in which becoming a culturally competent organization has social, health, and business benefits ("Becoming a Culturally Competent Health Care Organization: AHA"). On top of "increased respect...from patients," an organization can also see decreased costs while decreasing the number of health inequities in their community ("Becoming a Culturally Competent Health Care Organization: AHA").

Figure 1. Benefits of Becoming a Culturally Competent Health Care Organization

Social Benefits	Health Benefits	Business Benefits
• Increases mutual respect and understanding between patient and organization • Increases trust • Promotes inclusion of all community members • Increases community participation and involvement in health issues • Assists patients and families in their care • Promotes patient and family responsibilities for health	• Improves patient data collection • Increases preventive care by patients • Reduces care disparities in the patient population • Increases cost savings from a reduction in medical errors, number of treatments and legal costs • Reduces the number of missed medical visits	• Incorporates different perspectives, ideas and strategies into the decision-making process • Decreases barriers that slow progress • Moves toward meeting legal and regulatory guidelines • Improves efficiency of care services • Increases the market share of the organization

Source: American Hospital Association, 2013.

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Reasoning for a region-specific program is based on the racial and ethnic group that is most represented in that area. For example, there are more Hispanics along the Southern border, with 91.8% of the population of McAllen, Texas, identifying as Hispanic; 49.0% identifying as Black in Jackson, Mississippi; and 41.7% identifying as Asian in Honolulu, Hawaii (Kolko). Because of the different racial and ethnic populations that occupy different parts of our country, requiring the attendance and completion of a regional-specific cultural competency program would provide the most benefit to health-care professionals. Including the community around a hospital or other institution would result in better education provided to professionals that would align with the specific needs of the demographic population ("Becoming a Culturally Competent Health Care Organization: AHA"). It's important that "hospitals and care systems seek advice from individuals and groups in the communities they serve" (White-Means). It would also be responsible for a regional-specific program to consider the many differences within a population. The Latino population includes a variety of different groups that vary in age, citizenship status, and even nationality that lead to different ideas of health and different habits affecting health ("Cultural Competence in Health Care: Is It Important for People with Chronic Conditions?").

While cultural competency programs include diversity training amongst working physicians, requiring an Implicit Association Test earlier on in medical training can provide a better conscious understanding of a physician's bias. One suggestion of cultural competence studies states the acknowledgement of such biases and "deliberately practicing perspective-taking and individualization" is important in building better doctor-patient relationships and improving communication (Williams). Taking an IAT would benefit a physician who is interested in providing a standard quality of care to all patients. By identifying the biases, which could hinder this standard of care, medical students and physicians could better educate themselves during a cultural competency program and outside of training.

African Americans, Native Americans, Asian Americans, and other racial and ethnic minority groups are oftentimes at the blunt end of implicit biases and cultural incompetency. Given the demographic changes we're seeing as a country, professionals and policy-makers need to discuss what programs would provide the right tools for a professional to give the best quality of care to these groups. A health professional's duty is to treat a patient fairly and provide a standard of care that doesn't vary based on the color of a person's skin. By undergoing a cultural competency program and understanding what implicit biases one might have, we can decrease health disparities, leaving a healthier and happier majority population in our future. Health-care professionals should strive to decrease health disparities resulting in implicit bias and increase their quality of care by becoming more culturally competent.

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GUILLERMO J. REYES MARTINEZ
Puerto Rico: La Verdad Después De María
Multilingual, 1st Place (tie)

Cover Letter

September 20, 2017 is a date that for the majority of the people is a typical date, but to the population of Puerto Rico, it is otherwise. On this date, the catastrophic category-five hurricane María made landfall in the island of Puerto Rico. After this hurricane, many news outlets in the mainland were sharing information that was taken out of context and gave the American people the impression that the Puerto Rican people were helpless and dependent on the help of the United States government. In this paper, I will discuss that this was the total opposite of what really happened, and I will use testimonies and my own pictures to show you as my reader that what was covered on the news was not accurate to the reality

Text

September 20, 2017, is one day the Puerto Rican community will never forget due to the presence of the natural demon in disguise named María. This category-five hurricane caused thousands of deaths, such as the heart attack of a man that was left floating on the streets. Although it brought destruction during that one day stay, it brought, unintentionally, the humbleness that was thought to be lost inside the Puerto Rican community. People in the mainland and across the world thought they knew exactly what was happening and the humanitarian crisis we (yes we, because I was there) were living. President Trump said at a press conference in Puerto Rico covered by CNN and said, "the effect of Hurricane Katrina in New Orleans on August 29, 2005, was worse than what Puerto Rico went through" (President Trump). This comment from President Trump's part was based on untrue data from Puerto Rico's government officials showing a premature death toll of only 64 deaths caused by the hurricane when in reality, according to a study from *The New England Journal of Medicine,* "4,645 deaths were hurricane related," which is 72 times what was first calculated (Kishore, et al.). Others thought the Puerto Rican people were helpless and weak, when, in reality, the Puerto Ricans helped each other to rise up from this crisis. Due to this misinformation, I will address the effort from the Puerto Rican community side using my experience as a victim of the natural phenomenon called María. I will also bring up testimonies from psychologists I worked with after the hurricane so you as my reader can understand that, in reality, a life testimony says more than what you hear on the news.

On September 28, 2017, a CNN reporter, Jill Disis, released an article sharing that officials suggested that the aftermath of the hurricane may set back the economy for decades. In addition, Disis shared that the result of this catastrophe caused a significant amount of the population to move out of the island and the majority left were the ones who were too poor to move elsewhere. The writer also said that this catastrophic event left the Puerto Rican community "scrambling for food, water, fuel, and cash." Lastly, she

commented about the different cost of damages caused by the hurricane, including how "Moody's estimates a 40-billion-dollar loss in economic output because of impassable roads and lost power." Disis ended the article by saying that the sum of the damages could be close to a total of $95 billion for the island to fully recover. Another article published by writer of NPR, Adrian Florido, on August 9, 2018, shared that the government of Puerto Rico submitted a report to Congress in which it summarizes a total of $139 billion for a full recovery from the aftermath of Hurricane María. Florido said that the damage on the island was enormous with destroyed bridges, roads, and other infrastructure. Furthermore, he added that the hurricane tore off the roofs of thousands of homes. Other articles reported the crisis the island was going through such as one from the time, which started by describing a picture of a man riding a bicycle on an empty road in Toa Alta. The writers from this article, Lisa Segarra and Kim Bubello, later mentioned that the island was already devastated from Hurricane Irma, which had passed two weeks before and had resulted in many reported deaths. Segarra and Bubello also interviewed the mayor of Cataño, Felix Delgado, who said, "Months and months and months and months are going to pass before we can recover from this." Moreover, there was an article from the time (María's destruction across the Caribbean) that used several pictures showing the crisis such as people collecting water from creeks and people sleeping on cots inside the Coliseum Roberto Clemente. Lastly, a press conference covered by the *Washington Post* where the mayor of San Juan, Carmen Yulín Cruz discussed the inefficiency of the US government in distributing the relief supplies to the island. Yulín Cruz said on the border of tears, "We are dying here." Yulín Cruz said that the island will make it through with or without the help of the United States government. Yulín Cruz also used her time to respond to President Trump's comment on twitter. Trump's accusations were "Totally incompetent mayor of San Juan." She responded that some of the supplies destined for San Juan were shared among other municipalities across the island.

In all, these articles represent my main concern, which is that out-of-context interviews make people believe that the Puerto Rican community was helpless and weak to rise up after the hurricane. In the case of the first two articles, which talk about the sum of damages, they make the people believe we were helpless because the writers of the articles said that due to the hurricane, a significant number of the population left the island and the majority left were too poor to leave. This kind of wording causes the wrong impression in people in the mainland, and that is what I am trying to change with this essay. The article from time used pictures of people collecting water from creeks, people sleeping on cots inside a coliseum, and the picture of a man riding a bike on a desert street, which makes people believe that the island is under an extreme crisis, which is true, but making the people of Puerto Rico look weak is untrue. The last article from the *Washington Post* that used the expressions of San Juan's mayor, Carmen Yulín Cruz, during a press conference is an article that shows my precise point of view—that Puerto Rico will make it through with or without the help of the United States government. However, she also mentions the phrase "We are dying," which was. not surprisingly, the headline in the newspapers. Instead of the media showing how the Puerto Rican people are overcoming the disaster, the only thing mentioned was the thing where we look weak to the world. This out-of-context material is the one I will prove false across my paper.

This paper would not use the typical interview process in which I ask the same questions to several people who lived the experience because it would not be personal enough, and what I want to show is the individuality behind what people would like to share. Instead, I will use the testimonies from people I helped while working as a volunteer inside the mental-health clinic from the University Carlos Albizu. Additionally, I will make use of my own pictures to represent the aftermath of the hurricane when I worked inside the mental-health clinic as well as pictures of the motivation behind some citizens to keep working on the hurricane relief task. In addition, I will address one picture that travels around all social media that made people think that we were helpless.

To begin with, the part that you probably heard in the news regarding the destruction and the force of Hurricane María (Figure 4) was true. However, the news outlets only focused on the destruction and made it seem as if the whole country was suffering by spreading pictures (Figure 1) instead of showing the labor of Puerto Ricans inside the island to rise again. This is seen more clearly on a press conference Yulín Crúz, mayor of San Juan, gave to the *Washington Post* because this newspaper used as their headline a phrase of the mayor that said ("We are dying here") instead of quoting what she said last: "We will make it through, with or without the help of the United States government." The difference shows how the citizens of Puerto Rico are hard-working instead dependent on government relief. The truth is that the majority of the communities in Puerto Rico helped themselves and did not wait for the federal government. My community is an example of this because, after the hurricane, my apartment complex neighbors and my family did not wait inside our apartments for help to come in. Instead, we as a community organized ourselves to get rid of the debris surrounding our neighborhood and blocking our streets (Figure 2 and 3). Our community gave their best to make our community look as it was before the hurricane. For instance, my neighbor, Gisela de Jesús Jiménez, with the help of other neighbors, used a machete to cut down the trees that fell in Figure 3 and then replanted them again to allow them to regrow. After they were done, we got together and enjoyed a nice cup of hot cocoa with bread at our apartment. The day after, everyone went to their respective companies to figure out if the stores were open because there were not yet any cell towers up so driving was the only and risky option because gas stations were not open yet.

Although some companies were not open, the task that awaited my dad, William Reyes Laboy, boss of a few employees in charge of power line operations for the power company of Puerto Rico, was harder than you would expect. The island power system was 100% down and even concrete poles fell, blocking the streets. Due to the lack of materials, Reyes Laboy had to improvise to fix the system in his district. He spent 17 hours a day working to restore the system with no breaks. He took one month to solve the outage in his district, which was incredible because his district, Caguas, was one of the first districts to fix their system. Although he fixed the system, the central power plants were still weak, and the lines connecting to the district were, too, so power outages were common. This caused him to have to go to every sector all over again to restore power. The director of the islands' power company was surprised with his efficiency given the lack of materials and gave him a raise, which also meant he was the leader of an elite group that worked around the island to bring power to every district he was assigned to.

Although his task was very important, there was another person who made a big difference and that was my aunt, Dr. Gilda Rodríguez Díaz, a clinical psychologist who works for the Program for Victims of Sexual Abuse and their Families (PAF). She offered me the opportunity to join her in the journey of distributing supplies and the offering of psychological services across the island. There were a few heartbreaking cases encountered such as the one in which children did not want to get close to any water source because they had a water phobia caused by the experience seeing their homes get flooded while they were still inside. Another case encountered was in an activity called "Caravana Violeta," which was organized to provide women with medical services and psychological services (Figure 8). In this activity, a tired old woman approached our tent (Figure 9) and Dr. Díaz treated her. After the activity ended, I asked Dr. Díaz why that woman looked down. She responded that the patient was most likely under the effect of antidepressants. I asked her how she knew that if she never asked, and she explained to me her method. First, you cannot ask a patient if they are under the influence of medical substances; instead, you use key questions. Dr. Díaz told me that she noticed that she was speaking "Spanglish," so her hypothesis was that she was not from the island. Then, to prove her hypothesis, Dr. Díaz asked her if she remembered when Hurricanes George and Hugo (late 1900s) passed through the island. The patient confirmed that she was there, so Dr. Díaz rejected her hypothesis. Then, she asked more questions regarding Hurricane María's aftermath, and she told her that she lost everything she had. Dr. Díaz got to the conclusion that she was under some kind of antidepressant medication because the majority of the people she treated in the past few weeks showed some kind of emotion (laughter or crying) when asked to open up about their experience during and after the hurricane. I asked Dr. Díaz why she kept asking questions if she was under the influence and she told me that in this kind type of cases of post-traumatic disorder (PTSD) what is best is listening to the patient because that makes them feel heard and important, which is a key point in helping them get back to normal.

I used Dr. Díaz's method in another activity we participated in the municipality of Yabucoa, inside the sector Mariana. In this activity, we gave out medical supplies, clothes, and meals (Figure 10). The clinic organized the staff (Figure 11) to help in different ways; some were assigned to register the people that came in and see if they needed psychological services. Others, myself in this case, had the task of helping senior citizens with the supplies they collected in every station and ask them friendly questions and give them psychological support if needed. One case that was very touching was while I was helping an old woman get her belongings to her car, she was telling me about how worried she was because she has not heard from her adult children since the day before the hurricane. In talking, she mentioned something that some may consider as insignificant for treatment and that was the way she kept praying to God for their safety. Given that she mentioned God, I knew that I could use religion to help her. So, I told her that God is always with them and that she does not have to worry when he is around because he will take care of them as if they were his children. After I said that, she gave me a tight hug, and we kept walking to her car talking about nice things we have lived after the hurricane. This activity was a complete success because I had the chance of sharing things with the most needy and helping them rise up with me. This labor was recognized in a press conference for the office of the first lady thanking all the institutions that made that happen, and in that conference, I was chosen as the main representative of the clinic (Figure 12). This press conference never saw the eyes of U.S news, which is a shame because it shows how the people of Puerto Rico after a big tragedy can rise up together.

Talking was not the only method the clinic used to help people; sometimes we used drawing and game activities. We went to a community in Old San Juan, La Perla, and instead of asking questions we gave the children the task of drawing a mural of what they considered to make Puerto Rico beautiful (Figure 5). In the case of adults, we offered them board games to distract them because we understood that it is stressful being at home all day figuring out how to distract their children. Some adults preferred to talk about their feelings, and we gave them the opportunity (Figure 6). After the activity, the community offered to give us a tour of the community and they showed us the wonders of La Perla. At the tour, I had the chance of noticing that although Hurricane María was a category 5 full of power, it did not have the power to eliminate the beauty of Puerto Rico (Figure 7).

Lastly, although we were a mental health clinic, Dr. Díaz coordinated the arrival of first aid supplies, baby food, clothes, hygiene articles, and canned food to distribute to a very poor community located in the central part of Puerto Rico (Figure 13). For this task I was in charge of organizing the supplies received and classifying those in several categories so when we arrived at the destination, the distribution was easier (Figure 14). Once we got to the place where the activity took place, we organized everything in different stations (Figure 15) to make it easier for the distribution. On this activity, I was in charge of registering the people that came in and calling them up to pick up the supplies. Although we were distributing supplies, the owner of the locale we used had the kind gesture of making food for the people that came in. This represents how among a tragedy, kindness is not lost and we see each other as equals.

The labor of William Reyes Laboy and Dr. Gilda Rodríguez Díaz for their island may never be known outside the island of Puerto Rico due to the covering of news outlets in only showing how the federal government was taking care of the aftermath, but inside the island, their job is being honored. Their job involved a lot of pressure because, literally, the island depended on them to recover. In the case of Reyes Laboy, he had the pressure of giving power to certain sectors of the island in a set timeframe, which was stressful. Also given that Reyes Laboy was working 17 hours a day without break, his situation was hard mentally and physically because he was in charge that none of his employees die by electrocution. His wife, Johan Martínez Massa, a retired X-Ray technician, understood his situation and took more responsibilities in the household to make him more comfortable when he came to the household to get his five hours of sleep, such as the maintenance of the industrial backup batteries that gave the apartment 24 hours of power and the maintenance of the power plant. Johan Martínez Massa did not only help her household, but she also used her privilege of having power 24 hours and refrigerated neighbors' perishable meals. Dr. Díaz's contribution is admirable because she had a baby weeks before Hurricane María, and although her baby needed her the most at that time, she left for work because she wanted to give her child an island she could be happy and live without necessities (Figure 16). Dr. Díaz's husband, Rafael Martínez who is an executive employee in the island's power company in charge of distributing materials to island districts, took care of the baby when his wife was working in the activities described before. However, his job was very important, so they sometimes left the baby with Johan Martínez Massa while they worked for their island. In summary, this tragedy brought destruction but never brought the weakness the media were interpreting and spreading around the United States. As a matter of fact, this tragedy brought people together

and got rid of the superiority some people had and brought back the sense of community that was thought to be lost. Even though some may consider the María's aftermath is over, the economic problem of the billions of dollars that were lost due to this hurricane has not been resolved yet and that is the next step to take care of, but that is something that is out of my power and should be taken care of by both the federal government and the government of Puerto Rico.

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Comment: In this press conference, the governor of San Juan addressed the federal government about their lack of hurricane relief response. Yulín Cruz talks about the way her municipally had shared supplies with other communities and she finishes by saying the phrase "We are dying here" and that Puerto Rico will make it with or without the federal government.

This press conference is important because the *Washington Post* used the phrase "We are dying here" as their headline which makes the Puerto Rican people sound weak instead of making "we will make it" as the headline which shows an audience that the island is resilient and does not let a natural phenomenon get in the way of success.

In this paper, I will use this interview as evidence that the media only used the part of the story that sounded tragic, which for them is a benefit because those outlets will gain more viewers, but it affects the real story, and defunding an untrue story could, over the years, be part of a history book and after many generations the real truth will disappear.

Fig. 1. Written message asking for food and water in Spanish (Díaz).

Fig. 2. Day after the hurricane and an image of the deforestation caused by it (09/20/2017).

Fig. 3. Trees that fell due to the strong winds of Hurricane María (09/20/2017).

Fig. 4. The way palm trees moved in the middle of the Hurricane (09/20/2017).

Fig. 5. Activity for children to distract them from the catastrophic event (10/19/2017).

Fig. 6. Conversation with people from the community of La Perla to understand how they managed the first rough weeks after the hurricane (10/19/2017).

Fig. 7. Waves shot from La Perla, showing how the beauty island of Puerto Rico was not completely lost.

Fig. 8. Caravana Violeta, organization before the arrival of women (11/2/2017).

Fig. 9. Caravana Violeta, activity made for women from Puerto Rico and República Dominicana to distribute food, medical care and offering of psychological services (11/2/2017).

Fig. 10. Distribution of supplies in Barrio Mariana. (11/19/2017)

Fig. 11. Organization of the mental health staff before the arrival of the community (11/19/2017).

Fig. 12. Main representatives of institutions that made the activity happen (11/19/2017).

Fig. 13. Arrival of supplies for a different community (02/23/2018).

Fig. 14. Organization of supplies received (02/23/2018).

Fig. 15. Organization of supplies in the facility used for distribution (02/24/2017).

Fig. 16. The birth of Dr. Gilda Rodríguez Díaz and Rafael Martínez's daughter weeks before hurricane María and Irma, gave them the motivation to work harder in the hurricane relief task to give her a childhood with no necessities.

Fig. 17. Seven months after the hurricane and William Reyes Laboy (works for the island's power company) used my mom's love and support to keep working in the reestablishment of power in the island (05/12/2018).

URIA SHRESTHA
Newari Language Extinction *JoJo Lapa* 'Hello' in Newari would be *Namaste* in Nepali.
Multilingual, 1st Place (tie)

Language is an essential part of a culture and tradition; preservation of language is what keeps the tradition going and passes down over generations. There are many different languages spoken all around the world; however, there are few languages that are valued and spoken more than, most notably, English. Language is equivalent to an identity of people in that culture; therefore, the preservation of language should be valued. Out of the many different languages, this paper focuses on Nepal and a specific language in that country named "Newari." Nepal is a small landlocked country located in Asia, and it's a very diverse country: there are a little over 120 ethnic groups, and the majority have their language that represents their caste. This paper focuses on the Newari language, which is a specific language spoken by the Newar castes who are inhabitants of Nepal. Newari is slowly starting to disappear as a language due to globalization and more demand for people who can speak the main language, Nepali, and the internationally recognized language of English. Due to these reasons, minor languages like Newari are at high risk of becoming extinct. In this generation, fewer people value the language because children do not think it is of any use to learn Newari because it is not considered to be valued language. This paper will focus on the endangerment of the Newari language and the reason for its disappearance, the trend of learning languages and how it impacts minor languages such as Newari, how the lack of not learning minor languages like Newari affects the tradition negatively, and what can be done to make the language sustainable.

Nepal is a small but diverse country; there are many ethnic groups in the country, which therefore means that there are many different languages in Nepal. However, most of the minor languages are disappearing or have already disappeared due to fewer and fewer people speaking the language. "The percentage of Newar speakers in the Kathmandu Valley dropped from 75% to 44% from 1952 to 1991" ("Newar Language"). This shows a huge drop in the number of people speaking Newari 20 years ago but now it is even more problematic than before. According to UNESCO, one of the reasons for the disappearance of the Newari language is because "the majority of the Newar live in urban areas, especially the Kathmandu Valley, where the influence and use of Nepali are all-pervasive in daily life, through education and the media." Living in the city does have a negative impact on minor languages like Newari because the official language of Nepal is Nepali; hence, everything is promoted in Nepali, so, therefore, living in the valley means you must know Nepali and majority of the children being born and raised in the valley are not interested in learning Newari due to its insignificance in communicating outside of their own home. Newari has also been listed as being "definitely endangered" by UNESCO.

Birendra Bhaila, in his report on Language Death, discusses many reasons why Newari is becoming endangered such as people not wanting to learn the language, most adults in Nepal fluent in Newari are in their 30s, which means that Newari as a language has a higher chance of disappearing in about 30-40 years; this is because the life expectancy in Nepal is about 60, and if adults aren't

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teaching their children Newari, it means that soon the language will be extinct. Bhaila also discusses the use of Newari and the reason for its lack of popularity. Newari is only used at home or in small groups of people; therefore, when you leave that bubble and go out in the real world, Newari is not used at all. Because of the diversity in Nepal, many people are not from Newar ethnic background; hence, they do not know Newari, and the official language of Nepal is Nepali, so, therefore, everybody knows and speaks Nepali. Another reason discussed by Birendra in his report for the disappearance of Newari language is because of inter-caste marriage (Bhaila). Marrying someone from a different caste means different languages between the couple; hence, the language barrier is created and therefore, using the official language is the only solution, and/or English. This results in children learning Nepali and English and excluding the ethnic language from both their parents, which also creates a barrier between grandchildren and grandparents, as some of the older generations are not fluent in Nepali and majority don't understand English; therefore, communication is lacking within the household.

Currently, due to globalization, more and more children are being taught English so that they can communicate with tourists, which is useful if children want to go abroad to study and also due to status in the society. Currently in the capital city, being fluent in English is said to make you of "higher" status because it shows that you have the resources to learn the language. Due to globalization and the constant change and influence from the western world, people in Nepal are forgetting about their ethnic language and caring more about western culture and adapting to it. This is causing a language barrier between younger and older generations; nowadays, the majority of the young people cannot communicate with the older generations, who can only speak their ethnic language, thereby creating barriers between different generations and most importantly within the family. Tension within the family is more prominent now due to discussion about language; older people are not very familiar with English, and younger people are not familiar with Newari. In my family, my paternal grandmother was not very good at Nepali and didn't know any English. Therefore, when I was young, we were not very close as we couldn't communicate with each other. I can understand the language a little; however, I am not able to reciprocate, so I would reply in Nepali. Eventually, both of us were able to communicate better as she started understanding Nepali a little better and I started understanding Newari a little better. In my family, rather than causing tension and arguments, we started getting more distant as older generations want the language to be sustainable whereas younger people are caring less about their ethnic language, risking endangerment and caring more about enriching themselves in the western culture.

My maternal grandparents can communicate in Nepali as well as English; however, my grandmother was always adamant in having us communicate in Newari as she wanted the language to pass down the generations. When I was younger, she didn't allow us to speak in English in front of her as she wanted us to learn how to speak Newari. Until today, she doesn't like it when I talk to my sister or cousins in English because she is scared that we will forget not only Newari but also Nepali. My younger cousins are less familiar with Newari as for them, Nepali is already difficult to speak and understand, which shows how Newari is slowly starting to

disappear from households. My grandmother tries to say a few words in Newari every time we talk so that at least my sister and I can still understand. Even though I am unable to reply to her in Newari, she tries to teach me now and then and reiterates how important Newari is for our culture.

Impacts of the endangerment of Newari language is more than causing tension and being distant within the family; it also impacts the entire country and culture. People are caring less about the culture like Newari clothing, festivals, and food due to being immersed in western culture and media, which have a huge part in the influence of western culture. Nowadays, most shows contain few English words or sometimes are entirely in English; therefore, this is making people want to learn and understand western culture. There are very few Nepali TV channels and even fewer Newari or other ethnic language channels.

Along with language, Newari culture such as food, clothing and festivals are also disappearing. Young people nowadays are caring less about traditional clothing known as *Hakupatasi* which is a clothing item worn by Newari women. Due to immense influence by western culture, western clothing causes fewer people to wear traditional clothing or learn about it.

Likewise, traditional festivals are seeing fewer people involved compared with many years ago as young people are more influenced by the western lifestyle, celebrating western holidays more compared to the traditional ones. *Jatra* is one of the biggest road festivals, where Newars gather wearing traditional Newari clothing to sing and dance. There are different types of jatra and every jatra is a celebration for different purposes. Indra Jatra is a celebration "in honor of Indra: a deity known as the King of heaven in Hinduism" (Indra Jatra). The significance of this festival is in honor of Lord Indra; however, it is also "celebrated in memory of the family members who were deceased in the past year. People go around various temples with incense sticks and light butter lamps in their memories" (Indra Jatra). This festival consists of masked dances and music and later on, a chariot with a living goddess named Kumari, is pulled by people in the crowd. Nowadays, there are fewer people involved in jatras; therefore, not many young people are in the crowd to pull the chariot. The significance of the festival is not understood by younger generations due to lack of interest in Newari culture by the youth.

When I was young, my grandparents would always take me and my sister to these festivals so that we are aware of our culture. I remember feeling frightened by the masked dances as the mask was not an ordinary mask; it was a big scary-looking mask that terrified me as a kid. Looking back, I am glad that I was able to be part of such festivities because nowadays there are fewer people involved or have desires to be involved in such festivities. The joy of being in the crowd watching masked dances, and witnessing people wearing traditional clothes and singing in Newari was a good experience as that made me appreciate our culture. As a kid, my grandmother always made sure to involve us in many traditional cultures as possible such as cooking Newari food, taking us to traditional festivals, and speaking Newari. Out of all the traditions slowly

disappearing, Newari food is one tradition that seems to be holding the Newari culture together in society today. Food is a huge part of not just Newari culture but Nepali culture as a whole; therefore, people are aware of Newari cuisine such as *samay baji* which is a set that consists of beaten rice, beans, vegetables, meat, pickles, lentil pancake, garlic, ginger, egg, and many more; however, the main component of the dish has to be *aaila,* which is a homemade rice wine; a must-have for every Newar household. It is traditionally served in a banana leaf or in a *bota,* shown above in the picture, which is a container made by leaves.

Preservation of Newari culture—especially Newari language—is very important to be sustainable because language is one one of the key components in showcasing different cultures. The ways in which it can be sustainable is through other components such as food, clothing which will help bring attention to Newari culture hence, attracting people to the language. Media have a huge part in determining how the public views certain things like trends; therefore, if the government puts in an effort by focusing on adding programs to attract the Newari language on the TV or social media, this can help preserve the Newari language. Celebrities have a huge impact on the public; therefore, speaking up about issues like language extinction or bringing in other components of Newari culture like food, and clothing can help with the preservation of language as well. Designers incorporating Newari culture into their designs will help spread awareness about the culture, as most fashion shows are participated in by celebrities and they are broadcast on TV. Seeing designers and famous people wear and talk about the culture can make the public aware about Newari culture and language. Private companies are also seen putting in effort to preserve culture as there is a food channel that showcases different food items that can be found all around Nepal. The presenter trying the food and giving their feedback makes the public want to try it out; therefore, going to traditional places where they sell Newari food can be showcased which would attract people to want to go to those places, spreading awareness about Newari culture. Additionally, the government could build language institutions where different minor languages can be learnt without a fee or at a very affordable price which can attract the public and make them want to take advantage of it. Building language institutions and promoting on social media or media will be beneficial as most teenagers are active on social media. The government or any private company can build language institutions in cities and places where the Newar community is large; location is very important as that will determine if it will be a success or not. The government can not make Newari a part of the primary school curriculum because of the diversity in Nepal, as everybody is not from a Newar background. However, adding after school language clubs will give all children opportunity to learn their ethnic languages, hence making the language sustainable.

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CASSIDY CORTRIGHT
Crafting a Feasible Rainwater-Catchment Project in the Cyanika Sector of Northern Rwanda
Mackison, Fall 2019

As of last year, 2.1 billion people worldwide lacked safe access to water (Barleson and Kendra 1). In rural villages of the Cyanika Sector of Northern Rwanda, women and children walk upwards of four hours per day to either wait in a line at a distant government tap stand or to scoop water from the dirty shores of Lake Burera (Cortright et al. n.pag.). Having clean, reliable access to water may allow families to enjoy greater food security, have time for work or school, maintain adequate sanitation, and avoid waterborne disease (Cortright et al. n.pag.). The discipline of Environmental Engineering aims to address this issue with technology that brings cleaner, more reliable water access to under-served communities around the world. This technocentric approach to the issue of water access has received criticism in the past few decades, however. Critics point to short water infrastructure lifetimes and poor community uptake of new water access technologies (Thomas 34).

A student-led organization at the University of Colorado Boulder, Engineers Without Borders (EWB), aims to apply engineering solutions to issues of basic human need. This organization allows engineering students to practice their skills while bringing a proposed benefit to communities around the world. The CU EWB Rwanda team focuses specifically on reliable water access in the Cyanika Sector of Northern Rwanda, where it has been working on a rainwater collection project since 2013 (Cortright et al. n.pag.). While this project has provided some visible benefits, it has room for improvement. This paper aims to explore how the CU EWB Rwanda team may improve its project approach before the implementation of a new rainwater-catchment system in summer 2020. It will first look into the common concerns in the field of international water engineering, lay out a plan for improving EWB CU Rwanda's project, and, finally, present counterarguments against the proposed benefits of this plan. The sustainability and longevity of the CU EWB Rwanda rainwater-catchment project depends on three goals. These include forming a partnership with a local Rwandan University, collaborating with a non-governmental organization that lives and works in the Cyanika region specifically, and gathering groups of local caretakers in charge of the systems implemented.

Background

Defining Humanitarian Engineering and the current work of EWB CU Rwanda

Humanitarian Engineering is a focus within the discipline of Environmental Engineering that applies technology and engineering solutions to meet basic human needs in under-served communities (Thomas 34). Clean-water access is one of the most critical categories within the Humanitarian Engineering disciplinebecause it is so essential to all aspects of life. Common technologies

include water filters, piping networks, and hand pump wells (Thomas 34). The EWB Rwanda team is currently designing rainwater-catchment systems. These are large roofed structures that capture and store water in tanks with taps for community access.

EWB CU Rwanda works in one specific sector: Cyanika, a collection of small rural villages in Northern Rwanda. Cyanika is incredibly remote. Some villages are accessible only by foot along narrow dirt paths, and water access is scarce (Cortright et al. n.pag.). Based on EWB community surveys performed in summer 2019, people in Cyanika walk an average of 2.5 hours per day to collect water (Cortright et al. n.pag.). They collect it at either Lake Burera, a large surface water source, or a government tap stand, which supplies treated water pumped from a nearby city. Lake Burera is reliable, yet unclean, because people bathe and bring their animals to the lake alongside water collection sites (Cortright et al. n.pag.). The government tap stands typically have long lines, charge a hefty price, and sometimes fail to provide water at all. Figure 1 below shows one such dilapidated government tap stand (Cortright et al. n.pag.).

Figure 1, Cyanika Tap Stand: This photo was taken in the Cyanika sector of Rwanda in summer 2019. It depicts the current state of water access infrastructure and is one of the few government taps in the region to which community members are walking hours daily (Cortright et al. n.pag.).

EWB CU Rwanda has partnered with the Cyanika community since 2013 with the goal of implementing rainwater-catchment systems in at least 12 different villages. So far, the team has implemented five rainwater-catchment systems, each with a capacity of about 40,000 liters (Cortright et al. n.pag). The next system, to be built in summer 2020, will have a 60,000-liter capacity and aims to serve a larger population in the more isolated village of Gasiza. While these systems are assumed to provide improved water access, the EWB team has major room for improvement. The team has largely neglected monitoring and evaluation procedures, has never properly performed adequate water-quality tests, and does not know how often taps are breaking or tanks are falling into disuse. Poor

communication both with the community and with previous members of EWB CU Rwanda means that current members are unaware of the real situation in these communities. Emphasis is often placed on engineering additional systems rather than truly evaluating the systems' impact or ensuring that existing systems are functioning properly. The common criticisms of Humanitarian Engineering water projects may be applied directly to the EWB CU Rwanda team.

Suggestions for improving water projects from Environmental Engineering literature

Literature in the field of Humanitarian Engineering expresses similar concerns about poor project longevity. One of the common suggestions for improving these projects is to take more time in the planning phase of project development (Nieusma and Riley 36). This involves improving community interaction and cultural understanding before drafting designs and involving the community in the engineering design process itself (Nieusma and Riley 38).

Some articles highlight pre-implementation efforts by arguing that successful Humanitarian Engineering projects must emphasize the process over the product and decentralize technology (Nieusma and Riley 36). One article points to the high community adoption of a renewable energy project in Sri Lanka, whose engineers put technical expertise to the side in early project planning and focused on establishing community ownership (Nieusma and Riley 45). A similar idea is presented in another article, which argues that engineers working on humanitarian projects need additional training on community interaction (Harsh et al. 1154). This article claims that engineers lack interdisciplinary knowledge and must be trained to consider sociocultural issues before they may begin drafting designs (Harsh et al. 1159).

Following similar reasoning, some scholars go so far as to suggest that community interaction in the project planning phase isn't enough and that full community collaboration in the actual engineering process is essential as well (Burkey 194). The key assumption here is that people in these developing communities understand the needs and social structures necessary to make good engineering designs, yet they lack the technical knowledge to do so. Emphasis should be placed on teaching some of these technical skills through collaborative engineering design (Burkey 199). This is a unique argument that empowers the community.

These suggestions for improving the pre-implementation phases of project development by spending more time with the community, learning about their needs, and even collaborating with them directly on the design process are useful when considering improvements to be made to the EWB Rwanda team specifically. The team is currently failing in these aspects because the design process is rushed, and high turnover in the club itself means that most current members at any given time have a poor understanding of the cultural aspects and needs of the community.

Another common suggestion for project improvement is to focus on post-implementation features of project development by establishing long-term financial and operational frameworks and by improving the monitoring and evaluation process. One article looks into the failures of international drinking-water projects and attributes them to a lack of long-term planning (Burleson and Kendra 1). It assesses three different drinking-water projects in Uganda, of which two failed within about one year of implementation (Burleson and Kendra 5). In one case, chlorine tablets were simply handed out without a structure for renewal of supplies, and in another, lack of funding to support operation and maintenance led to the downfall of a biosand filter device (Burleson and Kendra 4). The only successful project observed was a treatment facility that was backed by long-term economic planning, including emergency funds from community microfinance efforts and economic participation from the local government (Burleson and Kendra 5). A similar study attributes the success of a water filter distribution project in Rwanda to its system for continual funding (Barstow 17). This project was funded through revenue from carbon credits and also partnered with local officials and community health workers to visit more households and put the community itself in charge of technology adoption (Barstow 4). A section of the book *Science and Technology for Development* also explores improvements in post-implementation by discussing the success of an Indian-based NGO in implementing simple water pumps in Bangladesh (Smith 77). This project was extremely successful in that it distributed about 1.5 million treadle pump units and was well-received by the community (Smith 78). The author attributes this success to the fact that community members sold and distributed the pumps themselves (Smith 79). Each of these examples demonstrates incredible dedication towards post-implementation efforts.

Another post-implementation suggestion for project improvement is to give more effort towards the monitoring and evaluation phase of project development. One article explores the concept of improving frameworks for checking project success after implementation. This article suggests that monitoring the sustainability of a project over time must look beyond the simple functioning of the technology provided (Whaley and Cleaver 58). Social, political, and economic conditions around the technologies should be monitored, paying attention to issues such as which members of households are expected to fetch water from new systems, how maintenance funds are collected, and what the addition of these new systems might do to local power dynamics (Whaley and Cleaver 63). By enhancing monitoring and evaluation and taking the time to truly evaluate community impacts, long-term adoption is much more likely. The EWB Rwanda team at CU Boulder is currently failing in these post-implementation aspects, including long-term funding or operational structures and monitoring and evaluation efforts.

Assumptions

After looking at the common criticisms of international water engineering projects, and before using these suggestions to propose a new plan for improving the EWB rainwater-catchment project, it is important to establish the assumptions made in this argument. The success of this plan depends primarily on one underlying assumption. This is that the EWB project is focused on an important issue, yet it is currently being handled poorly. This is a plausible assumption because the Cyanika community lacks reliable

water access and has specifically asked the team to implement another rainwater-catchment system. Based on surveys taken by the EWB team in summer 2019, community members in the village of Gasiza are currently walking upwards of five hours per day to gather water and have proposed that a new water catchment system can ease their struggles (Cortright et al. n.pag.). There is also no doubt that the project is currently being handled poorly because the team has very little data or understanding of the project impacts, and some tanks in previously implemented systems are falling into disuse. No previous CU EWB Rwanda team has taken bacterial tests beyond simple qualitative field tests, and some old EWB water systems have been damaged and moved for unknown reasons. This lack of understanding of the water quality and the needs of the community suggests that the current model of the CU EWB Rwanda team needs to be modified if the water systems are expected to last long-term. The assumption that the current EWB project is focused on an important issue yet is being handled poorly is crucial for the central argument of this paper because if the project was focused on an unimportant issue, there would be no need for the project in the first place, and if the current project systems were adequate, there would be no reason to chart such plans for improvement.

Another inherent assumption is that the Cyanika community will accept and value the three changes proposed. If the community does not see the value in making these changes to the project model, the project will not be accepted properly into the community and therefore will not be well-adopted or long-lasting, as claimed (Harsh et al. 1156). Some articles warn against making this assumption in the field of Humanitarian Engineering, arguing that forcing western ideas and opinions can cause great harm to communities and the rejection of new technologies (Stam 437). If the community feels as though they are a part of the decision process and fundamentally agree with the methods proposed, project success is more likely (Harsh et al. 1156). It is reasonable to assume that the Cyanika community will accept and value the changes proposed because each change aims to enhance community involvement in the planning process, giving the community a voice and allowing their ideas to be incorporated into the project.

The final assumption followed in this paper is that the proposed changes to the project model can be realistically implemented by engineering undergraduate students in EWB. If these changes were not possible for students to handle, then they would simply overwhelm students and distract them from the engineering process necessary to complete a project. It is reasonable to assume that EWB students can handle these new improvements because none of them are incredibly time-consuming beyond the current EWB time commitment. Some of the suggestions should even make the engineering student's job easier by having the community complete tasks such as monitoring and evaluation that would typically be done by the student. Implementing such changes is also possible due to the communication that EWB students have already established with the community through email and phone conversations. This allows such proposed changes to be made remotely throughout the school year before the team travels.

Core Argument

Taking each of these literature suggestions and assumptions into consideration, it is evident that the sustainability and longevity of the CU EWB Rwanda rainwater-catchment project depends on three goals. These include forming a partnership with a local Rwandan University, collaborating with a non-governmental organization that lives and works in the Cyanika region specifically, and gathering groups of local caretakers in charge of the systems.

Establishing a partnership with INES, a local Rwandan University

Enhancing community collaboration is an obvious theme explored in almost all literature in the field of Humanitarian Engineering (Harsh et al. 1154). The EWB Rwanda team plans to approach this goal by establishing a partnership with a local Rwandan university, the Institut d'Enseignement Supérieur de Ruhengeri (INES). The primary intentions of this partnership are to enhance cultural exchange, establish a system for collecting water-quality data throughout the year, and involve Rwandan students directly in the design process. Currently, water-quality data are collected solely during the few weeks that the EWB team is traveling, and designs are crafted by students and engineers living and working in the United States only. Working directly with people in the communities on the actual engineering practices ensures that designs meet the community's needs and expectations while also allowing them to take direct ownership of projects (Harsh et al. 1159). Better meeting the community's needs and encouraging ownership allow for longer-lasting, sustainable projects.

The relationship between community participation in project planning and overall project longevity is evident in a study done on handpump projects in rural Ghana (Marks et al. 276). This study collected data from 200 rural communities, surveying over 5,000 households (Marks et al. 278). Each of these communities had similar handpump projects implemented, with similar water-committee structures for operations and maintenance, so the main variables tested were the breadth and depth of community involvement (Marks et al. 278). In this case, breadth of community involvement was defined as the percentage of households involved in planning or construction whereas depth was measured by the amount of money put into the project, the number of planning meetings attended, and whether or not the community felt as if they had an influence (Marks et al. 279). Communities with greater depth of participation were more likely to have long-lasting, properly maintained projects whereas breadth showed no observable effects on longevity (Marks et al. 285). In Rwanda, deep community participation and involvement in project planning may be realized through the help of local students who have the capacity to contribute to the actual engineering processes and construction planning. By allowing for this collaboration, communities may feel more influential in the process, increasing their capacity for operation and maintenance and allowing them to enjoy a system that fits their cultural needs. This promotes system longevity overall.

Collaborating with a local non-governmental organization

Community collaboration will also be beneficial in longer-term operational structures after implementation. The EWB team plans to facilitate such collaboration by working with a non-governmental organization whose members live in the Cyanika region, rather than working with an American-based NGO. This new NGO is called Développement Rural Durable, and they work to improve the lives of Cyanikan citizens through water and food access. The idea of working with such an NGO is to create a greater sense of trust and partnership, which improves communication and allows for better structures for operation and maintenance of the system after the team leaves. Partnering with a local organization may allow the EWB team to assign specific tasks for operations and maintenance, such as tank cleaning, water-quality evaluation, and water-demand assessment. This may allow the projects to last longer, be properly maintained, and better adjust to the changing needs and expectations of those concerned.

In similar international engineering projects, local NGO collaboration has shown to enhance project success by providing engineers with more interdisciplinary and culturally aware consultants and for facilitating the exchange of knowledge between engineers and communities. Engineers often lack the interdisciplinary training necessary to plan such large water access projects, but they are currently expected to do so. This may overwhelm the engineer and cause the need for a collaborator (Schneider et al 309). A study done in Ecuador looked at how a partnership between Belgian engineering students and indigenous Ecuadorian farmers was facilitated by a local NGO to improve the smoothness and impact of their joint irrigation project (Dewulf et al. 175). The NGO facilitation not only allowed for knowledge to be spread both directions, but it also gave engineers the resources they needed to contract specific help and to pull resources from the Ecuador community (Dewulf et al.183). Such benefits may also be realized by working with Développement Rural Durable because its connections in-country may provide resources such as specialized laborers or water engineers with knowledge pertinent to the codes and regulations of the specific area. Having them working directly in the region also allows for the systems to be checked in-person more often and ensure that communication about the preferred methods for monitoring and evaluation is clear and well-adopted.

Forming groups of Community Collaboratives to care for and maintain the systems

One of the key suggestions for improving the longevity of international development projects is to provide a more reliable and consistent source of funding to ensure that the infrastructure can be supported and repaired (Thomas 34). EWB Rwanda plans to do this by forming groups of community members and local government leaders, called Community Collaboratives, to be in charge of the systems and responsible for managing its community interface. Having such Community Collaboratives not only makes the community more accountable for its own systems, but it also allows for a more solid post-implementation funding strategy. Having more reliable funding promotes greater project longevity because it gives the proper financial backing for repairing the system (Thomass 34). Currently, one village chief is put in charge of the systems, and a small fee is collected every time someone takes

water, but this funding is not even sufficient for repairs as small as a broken tap, and it puts too much strain on the sole caretaker (Cortright et al. n.pag.). By having a group of stakeholders with a mix in both the private and public sectors, the Community Collaborative may have enough power to gather greater funds. This should allow for systems to last longer and be better utilized.

A study that looked into community engagement in water projects in Ghana and Nigeria provides evidence that such a Community Collaborative may provide these proposed benefits by offering a "co-production" strategy (Mangai et al. 81). This study conducted over 700 surveys in Ghana and Nigeria to gauge the involvement of citizens and their effect on the financial feasibility of projects (Mangai et al. 82). It defines the term co-production as a collaboration between public administration and citizens to deliver services to the community, requiring participation from citizens in the form of knowledge, skills, income, experience, and capabilities (Mangai et al. 82). The study found that, in general, Ghana was better at co-production than Nigeria was by organizing more meetings and being more systematic about the community's financial involvement (Mangai et al. 94). It also found that Ghana enjoyed more widespread and continual water access and argued that greater co-production made its communities more willing to pay for repairs, operations, and maintenance, causing them to see it as their own responsibility (Mangai et al. 93). The Community Collaborative model that EWB has proposed aims to achieve this type of "co-production" strategy. Creating Community Collaboratives should enhance co-production in the Cyanika region by getting public administration and ordinary citizens to work together in maintaining systems, creating a more consistent funding source, and promoting system longevity overall. Because water access issues in Ghana are similar to those in Cyanika, following a model that was deemed successful in Ghana may help in Cyanika as well.

Counterarguments

Questioning the benefits of Humanitarian Engineering projects in general

One counterargument to the claim that proposed methods will improve the longevity of EWB rainwater-catchment projects is that Humanitarian Engineering projects are inherently harmful (Stam 429). The idea behind this argument is that attempts to make improvements cannot make up for the damage that these projects do to society, and therefore will not lead to longer-lasting water infrastructure. At the 2012 Global Humanitarian Technology Conference, Gertjan van Stam, an electrical engineer from a rural village in Zambia, argued that the technology provided by western engineers tries to force western ideals in an area that lives by ubuntu tradition (Stam 437). He argued that the Humanitarian Engineering framework itself suggests that the west is the epitome of advanced technology and fails to recognize the positive characteristics of the communities it serves (Stam 435). Another article takes this idea one step further to claim that the presence of westerners to implement projects creates a dependency that impairs the community's capacity for self-sufficient development and problem-solving (Vandersteen 41). The argument here is that the presence of westerners imposing their technologies is a flawed system in itself, so attempts to improve it will do little to enhance project longevity.

This argument, however, is flawed because it assumes that Humanitarian Engineering projects solely follow western ideals and impose a power dynamic that places engineers above the community in all cases. This assumption is invalid because the proposed attempts to improve EWB water projects aim to increase cultural understanding and establish a truly equal partnership with communities, allowing for infrastructure that matches ubuntu ideals. Humanitarian Engineering projects have the capacity to empower, rather than subjugate, people in these developing communities, and some projects have already shown to do so. For example, the aforementioned treadle-pump project in Bangladesh provided the opportunity for community members to sell and distribute pumps themselves, simply providing the resources necessary for communities to rise to their own challenges and be empowered to make a change (Smith 79). With the kickstart of foreign resources and engineering expertise, approached through partnership and collaboration, communities may be empowered to take ownership of their new water infrastructure and begin to solve problems from the inside (Harsh et al. 1159). By eliminating the assumption that engineering projects force western ideals, the benefits and potential for longevity in international water projects are obvious.

The argument against attempts to improve EWB projects

Because this paper assumes that the current EWB model needs to be improved, some may argue that the proposed improvements are unnecessary. The point of this argument is that the benefits seen by students in EWB make up for any potential harm done to communities. One of the key ideas behind organizations such as Engineers Without Borders is to educate the engineers of the future to be civilian-oriented, giving them the skills necessary to address the complex geopolitical and economic problems of the future while also taking on more humanitarian attitudes (Amadei et al. 1088). Simply being a part of such international engineering projects gives students skills they would not otherwise obtain in engineering coursework, including writing, communication, and an understanding of social structures and societal needs (Schafer and Bryce 143). It also encourages attitudes that emphasize sustainability and social justice, potentially influencing the way that these engineers approach their projects in the future and contributing to the improvement of the human condition and resources for the world overall (Shafer and Bryce 151). This argument suggests that if students are already gaining these benefits and becoming more socially minded engineers with the potential to bring great benefit to society in their professional careers, then the current model does not need to be improved.

However, this argument is flawed in that it assumes that a western engineer's education is more valuable than the health and safety of a few thousand people living in the developing world. This assumption is ethnocentric and ignores the possibility of creating projects in which both communities and engineering students benefit. A review of student-led international engineering projects shows that slight changes from students, such as improving collaboration with communities and considering monitoring and evaluation structures, can transform these projects from being detrimental to communities to being highly beneficial (Amadei et al. 1090). To remain static in current models for Humanitarian Engineering projects would be to ignore the effects of the engineering students' actions on real human beings in other countries and to brush away the possibility of providing mutual benefits for all parties involved.

Conclusion

In the Cyanika region of Rwanda, water access is an important issue that needs to be addressed. Community members are walking for hours each day to collect water from unimproved sources and have verbally expressed the desire for greater water access. The work of Engineers Without Borders helps in solving water access issues while also giving CU students the opportunity to practice real-world problems and improve their social and cultural awareness. In order to see benefits on both sides however, international water engineering projects need to be done properly. The CU EWB Rwanda team hopes to improve the longevity of its projects by forming a partnership with a local Rwandan University, collaborating with a non-governmental organization that lives and works in the Cyanika region specifically, and gathering groups of local caretakers in charge of the systems.

By striving to improve its project model, the CU EWB Rwanda team is working to maximize benefits both for the Cyanika community and for the students involved. If this model is successful, it may eventually be communicated and applied to other EWB projects from different schools around the world, enhancing the EWB model overall and ensuring that more people in developing nations are truly receiving the benefits promised and desired. By seeing longer-lasting, better-adopted international water engineering projects, people in these communities may enjoy a reduction in waterborne disease, more time for work or school, and greater food and water security. Students working on these projects benefit from becoming more socially minded engineers who understand the value of resources, conservation practices, cultural dynamics, and the creativity necessary to make real change in a world that will continue to present unique challenges. Being humble in the impacts of projects, stepping back, and finding creative improvements to current models enhances the student experience while also ensuring that communities gain the benefits proposed and advertised by these projects. If the engineers of the future are trained in such a way, they may continue to implement such well-thought-out projects in their professional careers as well, leading to an improvement in the infrastructure and health of communities around the world.

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JULIA HARLAN
Genetic Enhancement and the Unknown Future
Mackison, Summer 2019

Introduction

Just seven months ago, the first two genetically edited human embryos were born in China. In secret, He Jiankui conducted a clinical project in which he used in vitro fertilization and CRISPR-Cas9 to modify the CCR5 gene in these embryos [4, p. 85]. Jiankui announced his experiment in November 2018, causing worldwide controversy and criticism. Although he reported that the babies were born healthy [4, p. 86], the implications that were brought to light from the first occurrence of genetically edited babies had surfaced and were not going away [14, p. 85]. Genome editing is a set of technological tools that are used to make specific changes to the DNA of an organism. Technically, these tools target DNA sequences by engineering protein complexes to bind and cut those DNA sequences [10, p. 168]. Genetic engineering is used for many things in our world today, from preventing viral infections to increasing the rate of crops to scientific research. In 2013, a new mechanism, CRISPR-Cas9, was found in the bacterial species, Streptococcus pyogenes (Strep), which led to the most recent and used approach of precise genetic modification [10, p. 168]. The CRISPR-Cas9 is the technology used to genetically alter human embryos, which is a form of genetic enhancement. For example, a CRISPR with a Cas9 protein finds a specific gene, the target gene, in the cell's genome and cuts the DNA at a specific point, the target site [10, p. 168]. These cuts are what allows the gene to mutate or edit itself. The cell then begins to repair the break, or a genetically engineered DNA fragment can be added to help the repair process. The fact that genetically editing human embryos to full term has only been performed once shows the lack of information the world has on the technique. We still do not know if the actual editing of the gene was even successful in the one experiment that was performed, and we do not know when we are going to discover the long-term effects. This incident emphasizes the magnitude of what we do not know about germline genetic enhancement. The controversy over genetic enhancement stems from the ethical issue over consent, future generational disruptions, and the little knowledge we have on the technology and its effects. Given the number of future implications that are unknown, genetic enhancement should not be legal clinically.

Assumptions

For the purpose of this paper, we are assuming that governments will act in favor of public-health safety. The point of a government is to take care of its country, and one of the factors to take into consideration is the dangers that new technology poses to the public. We believe that most governments would try to protect their country from future danger if given the choice because this has been seen in the past with new technologies. Another assumption of this paper is that this technology will eventually be proven safe, and research will most likely continue despite the proposed ethical concerns. If genetic enhancement technology follows the

same pattern as similar technologies before it, it will be used at some point in the future. This is a very reasonable claim to make because of the previous technologies that were controversial but were eventually legalized. There is not a question of if it will be used, but there is a question of when and how it will be used.

Background

Genetic engineering is especially important in today's society because it allows researchers to discover the function of a specific gene. Organisms are genetically engineered to produce drugs, vaccines, better plants, etc [10, p. 168]. An organism is an individual animal, plant, or single-celled life form, and genetic engineering can be applied to any organism. From flowers to viruses to humans, genetic engineering is an integral part of our world. The most common use of genetic modification of embryos is in vitro fertilization (IVF), which is a process of fertilization outside the body. It is used commonly for women who cannot have children or cannot get pregnant. When this type of genetic modification was first discovered, it was widely controversial, as well as being illegal in many countries. Because the technology was new, there was little research on it, which produced fear in the world. After more research was done, IVF gradually became legalized and accepted in society [9, p. 30]. Genetic enhancement, a specific type of genetic engineering, is regulated differently in each country. "Some countries ban it under the context of assisted reproduction while others ban it under the law of bioethics" [11, p. 46]. There are even some countries that seem to be underprepared for when, or if, genome gene editing becomes more frequently used [11, p. 46]. On the other end of the spectrum, there are a few countries that are creating and improving the technology that can genetically enhance organisms. With new information and technology increasing on genetic enhancement, the controversy over the issue is growing in ideas and popularity. It is very important for these controversies to be discussed and taken seriously. If this technology follows the pattern of IVF or cellphones, it is going to be used in our future, and there is no way to "undo" the discovery of this technique. While this new technology gives us many options in going forward with genetic enhancement, the actual use of CRISPR-Cas9 technology is extremely controversial [3, p. 36]. There are many ongoing debates on multiple issues regarding genetically modifying an embryo. One key debate is over consent; some believe it is violating the unborn person's rights when the embryo is genetically modified before birth while others believe an embryo does not count as a person yet. These people believe that if we, as a society, do not have enough information on the risks, we cannot make informed consent. This controversy puts the liability of affecting future generations up in the air because an unborn person cannot take responsibility [15, p. 793]. Another controversy is over the possible misuse of the technique [7, p. 1788]. The misuse can range from a scientist using the technology inappropriately to the mutations that happen from disruption of a gene to turning the technology into a discrimination tactic. All these possible scenarios of misuse are prospective and determined by instances of misuse of previous technologies. The debate over clinical genetic enhancement is increasing with magnitude as we continue to lack the answers to the questions that society is asking. Due to our lack of knowledge, genetic enhancement has too many unknown future implications to be available for clinical use.

Reasons

  Unknown aspects of future implications can pose a risk to public health because of the little knowledge and research we have [7, p.1787]. Because the first instance of genetic enhancement was just performed in 2018, the long-term effects are not yet known. This is a safety concern because no one knows the accurate risks of the process [2, p.1187]. We can propose what could happen, but until we see them play out, we cannot know the effects the technique has on humans or society in the future. In order for this technology to be available clinically, it has to go through three phases [12, p.26]. The first phase is preclinical research, where the technology must pass safety and other regulations [12, p.26] in order for research to start on the technology. After passing the first phase, the technology must be approved by the FDA for clinical use [12, p.27]. This is determined through clinical trials to determine the safety and effectiveness of the technology. The last phase is the post-approval distribution. There are regulations on the distribution of the technology. After passing the first two phases, "the technology may be distributed via IVF clinics" [12, p.27]. The process for a technology to be available for clinical use is long but effective. Until the research greatly increases on effects of germline gene editing (GLGE) on human embryos, genetic enhancement will not be available for use because it will not be able to pass the regulations against it. The unknown implications are the most concerning aspects of genetic enhancement because they put people at risk to problems we are unprepared to act against.

  Unequal access to clinical genetic enhancement could increase the inequities between societies. Access to genetic modification, if ever allowed clinically, would differ depending on location and the ability to afford it [6, p.51]. Third-world countries as of right now are progressing in development with aid from more developed countries. Because all countries are consistently growing, less-developed countries and countries with lower economic status will most likely be trying to "catch up" with those ahead. This is a reason that the access to technology would potentially be limited to specific countries. There are many factors that would come into play when deciding which countries are granted access to this technology [10, p. 168]. The cost of the technology will eliminate indigent countries, limiting it to countries that can afford to handle the technology. The education level of the country will impact the access because certain countries do not have enough research, interest, careers, etc in the genetic-engineering field. If there is not a large enough group that has a highly developed understanding of the technology in the country, the technology will likely not be granted to that country because of the lack of knowledge on genetic enhancement. It is also likely that the technology will be granted to countries with strong governments because they can regulate it more strictly and with more control. The unequal access could create larger differences in the amount of exposure of a certain condition; genetic disease could change from one society to the next, reducing our exposure and resistance to certain diseases. Along with differences of exposure, the inequities that would come from clinical use of genetic enhancement are a reason that we cannot implement this technology yet.

The future implications from genetic enhancement have the potential to drastically change society as we know it [7, p. 1788]. Genetic enhancement could infringe upon social equality among the world [7, p. 1788]. Social equality is when all people within a specific society have the same rights and equal access to resources. Social equality is a very complex topic due to a multitude of concepts, including economic equality, equal opportunities, and social securities. For this paper, we are focusing on health equity. Health equity is not the same as health equality. It is impossible to achieve health equality worldwide due to the factors that humans cannot control. Health equity is equal treatment of societies in the same situations, and it would decrease with the introduction of genetic enhancement at the clinical level due to the implications of unequal access and discrimination. We would not be able to have worldwide clinical use of this technology if we cannot control the inequity that will follow. From random mutations to societal conflicts to unintentional alterations of a gene, many possible outcomes of genetic enhancement are dangerous to health equity. If genetic enhancement becomes clinically available, parents could have the ability to choose the height of their child, elongate the life span of their child, or prevent against infections. But only certain people would have access to this array of options, automatically putting those without access at a disadvantage. This disadvantage would grow as genetic enhancement becomes more valued in societies. If society continues to put importance on genetically modifying an embryo to "perfection," those who cannot, or have not, done this will be ostracized. There are many instances in history of this type of ostracization. African Americans were ostracized for their race through slavery, discrimination, and racism. Jews during World War II were ostracized for their religion through concentration camps, extermination, and discrimination. Although those are two very extreme events, they both originated from assigning a group of people with a lesser value. This is exactly what genetic enhancement has the potential to cause, if not handled correctly and carefully.

Besides inequity, clinical genetic enhancement poses a risk to society due to on and off-target effects. On-target effects are pharmacodynamic effects—the effects the drug has on an organism—while off-target effects are the unintended modifications that occur through nuclease technology, the technology used in genome editing. On-target and off-target effects occur when the "targeted gene, during genetic modification, protects against the targeted disease but increases the risks on a different disease" [7, p. 1787]. For this paper, we are discussing the risk that off-target effects pose and not including on-target effects. These sudden modifications made by the gene itself are potentially dangerous to the individual and the future generations. The modifications, depending on what gene they are in or the timing, can cause limitless outcomes such as the development of cancer in a child, an exceptionally large growth spurt, or a different eye color than both of one's parents. The few experiments with germline gene modification on human embryos, viable or not, shows how the technology is still not safe to be clinically legal [7, p.1778]. In an experiment by Ma. et al to remove a disease mutation through gene editing, 50% of the embryos in the experiment maintained the mutation, despite the efforts to repair them during the genetic modification [13, p. 1]. This shows that even in an experiment to remove a mutation, the mutation persisted half the time. Furthermore, "such off-target effects could affect the entire body of the offspring, unless the designed gRNA in CRISPR/Cas9 display specificity," [11, p.49]. Because this method is heritable, one mutation from an off-target effect can be passed down to all future generations. This is a risk to the genetic disparity of our world because it weakens our gene pool and causes

mutations in the following generations. As research progressed on CRISPR-Cas9 technology, the occurrence of off-target effects decreased as scientists started to discover how to prevent these effects from happening. If genetic enhancement is available clinically with the research we have right now, the high risk of off-target effects can cause many future generations to have a mutation passed down from just one person.

Giving society the ability to select specific physical traits could potentially be detrimental to society itself. Clinical genetic enhancement opens the door for society to pick and choose what traits are better than others. This could lead to societal dilemmas, discrimination, and racism [8, p.412]. If the ability to "play God" through selection of traits is available worldwide, society would change indefinitely. For example, the Holocaust started out as one group of people assigning another group of people a status as below them on the social hierarchy. When new scientific discoveries were happening in the 1900s on natural selection and evolution, new ideas of injustice formed in societies [14, p. 195]. Inequality was at a peak because of the assumptions that were made from these discoveries; men were smarter than women, people with larger brains were more intelligent, whites were smarter than African Americans, etc. Soon enough, people of one race or religion were considered lesser in value. Specific to Germany, the Nazi regime was gaining political power. Once they had a certain amount of power, they formed the idea that it was scientifically proven that races besides white and religions other than their own were lower in the social hierarchy. This idea spread as they continued to gain power, and soon enough, the lesser value was assigned to many more groups of people according to the Nazis [14, p.193]. The inequalities between races and religions grew, and shortly after, the Nazis had enough backing to execute their plan of one master race's ruling the world. This is just one example of how selecting traits as "better" can lead to discrimination and sometimes worse. If we look at the Nazi ideology of discrimination against those deemed "racially inferior," it is very similar to the idea of selecting traits. If we give some people enough power to change the traits of their own, we are giving them control over many people if we take into account the future generations they would be affecting. The selection of traits could turn into a way to change "lesser" traits. The stigma of having those lesser traits can potentially lead to discrimination or, in reference to the Holocaust, genocide. It is wrong for people to have this ability to "play God" because it gives certain people too much power over others and the ability to make their inequalities more prominent. This power can lead to social dilemmas, potentially due to the power being in the wrong hands or from the ideas that emerge. For genetic enhancement, the name explains it all: genetically altering to better one's self. Through gene editing, genetic enhancement is able to specifically find a gene and edit it, making it possible for selection of traits.

The unintentional consequences of heritable genetic modification are negative implications of genetic enhancement. The unintentional consequences of heritable genetic modification are variable because they change with each specific gene. One example of the unintentional consequences is related to the CCR5 gene. Normally, the CCR5 gene displays no serious abnormalities. During an experiment conducted by Kennedy A. Webb, the intentional removal of the CCR5 gene with genetic modification was hypothesized to prevent insulin resistance and inflammation. Despite the hypothesis being incorrect, the researchers found that a CCR5 deficiency led to glucose intolerance in one group of mice [1, p. 897]. The disruption of the CCR5 gene helps prevent against HIV, which is why it is

clinically used. The consequences of this gene disruption are apparent in both mice and humans. In humans, "CCR5 mutations increase the risk of West Nile Virus infection." [11, p. 49]. In genetic enhancement, these alterations that are made are heritable, which means that one mutation would affect all the subsequent generations. In this case, the mutation that is passed down to future generations will increase the risk of West Nile Virus in the future generations as well. Although we know what the disruption of the CCR5 gene causes, we cannot apply this to all genes. We do not know all the consequences of altering every gene in the human body because we have not researched it entirely. There is still so much unknown about the human genome that it is almost impossible to correctly claim that a certain effect will happen without effective research. These mutations can cause consequences that we cannot prevent against because we cannot prepare for an outcome that we have not experienced yet.

Counterarguments

There are many possible objections to the legal status of genetic enhancement due to the benefits that the correct use of the technology provides. Many people argue that we will never know the long-term effects until we start using genetic enhancement more. There is no way to research a new method without using the new method. Practice makes perfect; we cannot perfect genetic modification unless we increase experiments using its technology. Although this perspective is correct, the policies against genetic modification do not allow usage until there is more research. It is not possible for genetic enhancement to be legal clinically without a significant amount of research into the future safety and social concerns, which we are not close to having yet. As stated before, CRISPR-Cas9 embryonic technology would have to pass three phases of trials to be available for clinical use. The research, which we do not have, would show us the specific long-term effects, leading us to conclude on how to progress forward with the new technology. There are ways to research the long-term effects without experimenting on humans; it is commonly experimented on mice because this is an efficient way to determine the consequences. For example, an experiment by Weber et. al to mutate large gene sets "provided a high-throughput analysis of gene function and functional annotation of cancer genomes in mice." [16, p.142]. For this specific experiment, using CRISPR-Cas9 gene editing technology, the researchers were able to research the functions of genes. This technology also allows us to discover the effects of altering a gene, but it cannot be researched on human embryos yet. This is just one of the many experiments of gene editing on mice in order to further our knowledge on the effects of this new technology. Depending on the findings, the researchers can attempt to compare what happens to the mice with what would happen to humans. Because we can relate the effects this technology has on mice to the effects it might have on humans, we are able to research without implementing this technology for genetic enhancement.

Another argument is that any type of reproduction affects following generations, and there is nothing we can do to stop it. All reproduction is heritable, passing down genes and mutations to the following generations. We do not try to prevent against mutations in sexual reproduction, so we should not prevent against mutations from a different source. It would be unfair to do this because only certain people will be able to access this protection from mutations, depending on location, economic status, and the country's

regulations. Although it is fair to believe that the world should have equal access to mutation prevention, it is almost certain that this technology will not be available for clinical use worldwide soon. Besides the risk of unequal access, we do not prevent against sexual reproduction mutations because the mutations that are passed down from sexual reproduction are inevitable and usually undetectable. In order to detect a mutation, an individual must have a genetic test given which DNA sequences are searched for the specific mutation. For example, as of right now, there are around 350 mutations that have been identified as causing the development of cancer [17, p.218]. Out of the estimated 20,000 genes in the human body, these 350 identified mutations seem very insignificant. Although we know some mutations, it is important that we continue to research and prevent against unidentified mutations. The mutations that would be passed down from genetically edited embryos are preventable because they would have been caused by the genetic modification, excluding pre-existing mutations. We can stop the mutations from genetic modification because humans are the ones conducting the experiment to alter the gene that inevitably can cause the mutation.

Limitations

There are several key limitations of our argument to take into account. One of the reasons that genetic enhancement is not legal is also one of the limitations of the claim. Because it was discovered in only 2013, there is very little knowledge on genetic enhancement. This also means that everything long term on genetic enhancement is unknown, so the aspects of our argument are all prospective when in terms of future consequences. The articles referenced were found from a five-year time period, from 2014-2019. Because the technology was discovered in 2013, the first year left out did not impact the argument too much. We are also highlighting the negative implications of genetic enhancement while only touching on the benefits. If researched correctly and in a safe way, this technology shouldn't be dismissed. There is just not enough knowledge on it at this time [8, p.415].

Conclusion

Genetic modification is used worldwide; its significance in our world is great because it helps produce food, prevent diseases, improve reproduction, etc. Genetic enhancement is a recently discovered technology, yet it could be significant in our society soon. Because CRISPR-Cas9 technology is more efficient and cost effective than other gene editing technologies, it will become more economically appealing to countries that have access to it. As our society grows and improves its technology, the desire for more efficient techniques increases. Special interests could potentially come into play as CRISPR grows in popularity. Companies might start manipulating the truth of these risks in order to benefit financially from the technology. Genetic enhancement may become prevalent in our society, but without the right research of the future implications, we will not know how to handle the changes that will come with it. By choosing specific traits to keep or remove, we are deeming certain traits or characteristics as unfit and lesser. This signifies that differences are not what we, as a society, desire. This issue of "playing God" can send the message that we value certain traits, and certain people, over others. This could cause major societal issues, and the controversy would grow with the increased

usage of genetic enhancement. It is important that traits are not given a lesser value because this increases the inequalities between people. Every person has rights, and it is taking away basic human rights when assigning someone a lesser value just because their appearance is not "desired" by a society. Genetically modifying embryos can put future generations at risk to unknown outcomes just for an attempt to prevent a disease. Health equity will be challenged when CRISPR is clinically available, which will automatically put certain people at higher risk than others. Overall, the benefits of altering genes through genetic modification of human embryos, if the experiment is successful, do not outweigh the consequences that this technology could produce in the future yet.

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LAUREN DANIELS
The Grand Jupiter Hotel: White Paper on Space Tourism in the 21st Century
Mackison, Spring 2019

Cover Letter

The Rocket Company™
26 April 2019

Dear Mrs. Smith:

Thank you for reaching out to me inquiring about whether The Rocket Company™ should invest in starting up a space-tourism program. As you know, our company has always been an industry leader in pursuing innovative ideas. As a consultant, I firmly believe that space tourism is yet another area in which our company can offer the solutions that customers are looking for in a way that no other company can.

The attached white paper describes many of the problems associated with space tourism (and space travel in general) as well as the solutions that other companies have developed. Included at the end is what I believe to be the right solution for our company. While other companies might have flashier trips with bigger price tags, the solution provided will make sure The Rocket Company™ is known for safety as well as out-of-the-box thinking that leads to increased customer satisfaction.

Let me know if you have any further questions. I can be reached at (123)-456-7890 or at iloverockets@therocketco.com. Thank you for your time.

Sincerely,

Lauren Daniels

The Grand Jupiter Hotel: White Paper on Space Tourism in the 21st Century

Abstract

Space tourism is already becoming a part of the future. After examining the history, safety, cost, access, methods of funding, and alternatives to traditional ideas about space tourism, the author concludes that The Rocket Company™ should move away from rocketry towards balloon satellites, which offer increased safety at a lower cost. Additionally, the author argues that engineering companies should be careful to engineer space tourism to be a public good rather than a private benefit.

1. Problem Statement

Space tourism is an up-and-coming industry in which aerospace companies will send citizens to space in order to provide them with an incomparable vacation. Ranging from a few hours in which one can experience weightlessness up to a week and a half living in a space hotel, these incredibly expensive vacation packages are all about the location. But, beyond the obvious appeal of the experience of being an astronaut, what are the benefits and detriments of sending civilians to space? Such an action will undoubtedly have economic, social, and scientific consequences. The question is how can space tourism be engineered to do more help than harm to humanity? How can The Rocket Company™ transform this industry into a public good rather than just a private benefit? What is the company's role in all of this?

2. Background

The space-tourism industry began in 2001 when Space Adventures sent the first private citizen, Dennis Tito, into space. Since then, the company has sent six other civilians to the International Space Station (ISS), where each has been able to spend approximately ten days during which they were "free to do as [they] choose" (Space Adventure). All have had excellent experiences—in fact, one man, Charles Simonyi, enjoyed it so much that he paid millions of dollars in order to go to the ISS twice. In 2004, the first private spaceship, SpaceShipOne, was created by Scaled Composites. In addition to being the first non-government spacecraft, SpaceShipOne was the first reusable ship, and as a result, it won the Ansari X Prize (Sharp).

While Space Adventures and Scaled Composites are busy providing multi-million-dollar rides to space, many other companies have also been hard at work developing their own programs. SpaceX, Blue Origin, Virgin Galactic, Orion Span, and The Spaceship Company are all busy designing, testing, and marketing in hopes of making space tourism more common (Prosser). Each company has a different strategy. For example, Blue Origin is waiting until they have had successful crewed test flights before they sell tickets

whereas Virgin Galactic sold tickets 14 years ago for flights that will hopefully take place this summer. Providing private events and vacations to founder Richard Branson's private island for those who have already bought tickets, Virgin Galactic recognizes that this waiting period is the perfect opportunity to create a loyal community of customers (Culliford).

However, 14 years is a long time to wait. What is making the wait so long? The biggest problem is that space travel is not yet safe. To date, 20 out of 536 astronauts have been killed in space flight and testing (Borenstein). This simplifies to a 3.7% chance of death. Compare this to base jumping, which is arguably the most dangerous sport in the world, where the odds of dying from it are 1 in 2317, or .004% (Rules of Sport). To put this in perspective, these numbers mean that space tourism is 925 times dangerous than base jumping, making it the most extreme sport of all.

After launch, people experience a variety of safety hazards. Exposure to radiation, bone loss (arthritis, osteoporosis), worsening eyesight, worsening hearing, muscle atrophy, and stress are all effects of long-term space travel (Frost). Combined, these symptoms of space behave similarly to advanced aging. This is the reason that astronauts are usually young, healthy individuals who can bounce back from such issues. However, it is important to consider that serious protections would have to be made against these symptoms. One can only imagine how outraged a billionaire would be if they paid one million dollars to go to space just to get cancer from radiation they were exposed to during their trip. Fortunately, most tourist trips are less than ten days, so although tourists are exposed to some radiation, it is by no means a lethal level. The question of human health in space is one that almost all aerospace companies are trying to address right now, so it is likely that innovative solutions will be created in the near future, resolving this issue quite nicely. Still, sending already elderly astronauts to space could have different results from what previous, young astronauts have experienced.

The risks involved with space travel cannot be underemphasized. Any company that decides to start its own space-tourism program must take extreme care to make the experience as safe as possible and must also have an incredible legal team in order to handle all the liabilities and risk involved. Excellent training programs will be essential in order to make sure astronauts are prepared for whatever might happen. It is important to take note of the fact that when things go wrong on professional missions (for example, on the ISS), there is already a team of scientists and engineers aboard to fix whatever might break. In a tourist situation, it is possible that none of the passengers will have experience in engineering. Therefore, it would be wise to have at least one "tour guide" on each trip who is a highly skilled engineer who understands how everything aboard works, so that the guide can fix anything if need be. Given the importance of mass limitation in space flight, it might not be logical to have a full crew for all tours, but whenever possible, the more crew members, the better.

Besides tourists not knowing much about engineering, another important problem to address is that the demographics of the people who can afford space travel are quite different from those of the average astronaut. Though certainly not all tourists will be billionaires (some people have actually remortgaged their homes in order to come up with the money) , the high price of travel will certainly make it much more accessible to the ultra wealthy than the common people (Culliford). Current companies are charging astronomical amounts for even the shortest trips to space (See Table 1). Orion Span's 12-day stay at the Aurora space hotel costs $9.5 million—equivalent to $9.16 per second in space (Prosser). Blue Origin offers one of the cheapest, and shortest, trips at $100,000 for a trip that is under an hour, making it at least $27 per second (Prosser).

Table 1: The High Price of A Trip to Space

Company	Cost	Trip Highlights
Blue Origin	$100,000-$200,000	Experience weightlessness
Virgin Galactic	$250,000	Experience weightlessness
Orion Span	$9.5 million	12 days in orbital hotel
Space Adventures	$20-$52 million	Week on the ISS
SpaceX	Not yet released	Fly around the moon

Source: Prosser

Clearly, this is not an activity that the middle class can afford, and demographically, the wealthy are quite different from the average astronaut. For example, "Ninety-three percent of the world's billionaires are over 45 years old" (Willett). In contrast all astronauts have been "between the ages of 26 and 46, with the average age being 34" (NASA). The reasoning for this, as explained above, is that younger astronauts can better handle the strains and stresses of outer space. The only solutions to this problem are to create an age limit on space travel, thereby drastically reducing the customer base, or to spend more time developing safety measures that would make space safe for customers of all ages.

However, beyond asking just if the rich can travel to space given their average age, the more important question is whether they should be the only ones to go to space and what efforts should be made to make space more accessible. Suppose space tourism remains an expensive, unforgettable vacation for the ultra wealthy. What impact would that have on the world?

For starters, it would create lots of aerospace jobs. Most large aerospace companies (NASA, SpaceX, Blue Origins, etc.) employ thousands of people. The growth caused in the aerospace industry by space tourism would have the potential to easily create hundreds if not thousands of jobs in a variety of areas. Beyond this, the money generated by the commercialization of space tourism could be used to fund other scientific projects, especially research for the sake of research. Seeing as NASA is getting nowhere near the funding it got in the 1960s, it desperately needs some fundraising; space tourism could do just that. (Sidenote: NASA's science budget in 2018 was the same as the DOD's air-conditioning budget. Yikes! [Daniels and Thaller].) Finally, the more expensive the ticket, the more research and development can be put into the rockets that send tourists to space. The research done in developing these rockets could then be applied to other rockets used for scientific or interplanetary missions. The R&D required to make a comfortable, safe trip to the ISS might just be the same technology that helps make a comfortable, safe trip to Mars.

This is all good, but it can certainly be made better by including the general public in space tourism. For example, one of the easiest ways to broaden the reach of the industry is to offer low-cost rides to space for small payloads so that students can send cubesats and other experiments into microgravity for a relatively small price. An example of this is how Blue Origin boasts that "for less than the price of new football uniforms, schools around the world are now developing their own space programs. From STEM outreach with younger kids to graduate level research, our student NanoLabs offer a uniquely affordable way to access space" (Blue Origin). This sort of program is excellent because it allows students the chance to actually access space at a low cost, encouraging students to develop a passion for STEM.

There are many benefits to this solution, but what if we took it a step further? What if students didn't have to pay for their payloads to be launched? What if wealthy philanthropists paid $210,000 for a ticket instead of $200,000, thereby providing the $10,000 needed to fully fund a student project so that schools didn't have to pay a cent? That sort of generosity would change lives. Imagine if inner-city public schools could start a space program where high schoolers got to design a payload and send it to space. How many kids who thought they hated math would decide to go into STEM because they realized what hands on science looks like? Especially for younger students, this could be the chance of a lifetime to discover a new passion and possible career. The world needs more people in the STEM field. According to *US News and World Report*, "the manufacturing sector alone predicted to need about 3.5 million jobs by 2025—but up to 2 million of these positions might go unfilled due to the difficulty of finding qualified workers" (Radu). An investment in future engineers is clearly needed. Very few other projects will get kids as excited about STEM as the possibility of sending something to space.

Sending kilogram payloads up is certainly exciting, but an even better opportunity would be to send the students themselves, or at least a teacher, up to space with the payloads. Ideally, every aerospace engineering student should fly in a rocket at some point in their career. In fact, aerospace is one of the only transportation fields in which the engineers have never experienced using their product. Imagine a car designer who has never actually driven a car before, or an airplane designer who has never flown? Would you

want to use one of the vehicles they designed? Probably not! How on Earth would they know about what the user experience is truly like, or what would matter to the end user? Certainly, they can ask their users, but it would be incredibly beneficial to the aerospace engineering community if the engineers actually knew what it felt like to fly to space. One way to do this could be through a scholarship/grant/donation given by ultra-wealthy tourists that could then be used to fund sending a STEM student or professional into space. Though this would raise costs, the target market for space tourism is so wealthy that it is likely the price difference would not bother them, especially given that they could use the donation to improve their reputation and get good publicity. One way of doing this would be to create a sponsor system, in which wealthy customers have the opportunity to sponsor a scientist and pay fully for their ticket. For someone who can afford a $200,000 excursion, it doesn't seem extreme to think that they could afford to spend $400,000 in order to help a middle-class scientist. This would be a fantastic way for the wealthy to help their communities, in addition to being great publicity. Another way of doing this would be to start a mentorship program, where the ultra-wealthy are partnered with successful students with similar career interests to them. The mentor paying for the two of them to go one a trip to space could be an exciting way for them to initially meet and start their relationship.

Is asking people to essentially buy an extra ticket a realistic approach? Yes and no. As of 2017, the US had approximately 10.8 million millionaire households out of a total of 323 million people (Elkins). This means that if every person in the US wanted to go to space, each millionaire would have to fund about 30 people. Assuming the lowest projected price of $100,000, this would mean each millionaire would have to pay $3,000,000. Considering 87% of millionaires have between 1 and 5 million, asking this much of them is clearly absurd (Elkins). Even for billionaires, it seems absurd to ask them to fund the vacations of others. Mentoring one person is reasonable; mentoring 30 people is financially illogical.

This still leaves the question, what about everyone else? Space tourism would be beneficial to a broad audience of people, including science teachers, students, engineers, scientists, artists, movie makers, and more. The rich cannot pay for everyone to go to space, so the future of space travel must be cheaper if it is going to include non-millionaires. This brings up the question, what does the future of space travel look like?

In terms of spacecraft, companies are trying to make spaceships as reusable as possible in order to reduce costs. For example, SpaceX has been experimenting with reusable boosters through their Falcon Heavy (Whitman). By reusing boosters, they are able to save considerable amounts of money, making each launch less expensive because they don't have to start over from scratch. Another strategy being used is reducing fuel in order to cut back on costs. Virgin Galactic's SpaceShipTwo uses a plane to carry it to high altitudes where the plane then releases the spacecraft, allowing it to begin its launch at a much higher altitude, therefore requiring less fuel (SciNews). As time progresses, more innovative solutions are sure to appear that will reduce costs even more.

In regards to what the trips themselves will look like, each company has a different plan. Virgin Galactic plans on a "90-minute flight, during which passengers will be able to experience a few minutes of weightlessness and see the Earth's curvature" (Culliford). SpaceX is planning "on a voyage around the moon" (Culliford). Orion Span plans on releasing a space hotel called the Aurora Station where customers can stay for weeks, and eventually condominiums that people can buy and use as often as they'd like (Orion Span). On all these trips, travelers are free to do as they please, though some trips are more structured than others. (See Table 2).

Table 2: A Summary of some of the currently offered trips

Company	Total cost/ cost per second	Length of trip?	Training?	See Earth's curvature?	Weightlessness?	Scientific focus?	Scientific payloads?	Is it safe?
SpaceX	Not yet released	One week	Yes	✔	✔	?	?	✘
Blue Origin	$100,000-$200,000	Experience weightlessness	One day	✔	✔	✔	✔	✘
Orion Span	$9.5 million	12 days	3 month	✔	✔	✔	?	✘
Virgin Galactic	$250,000	A few hours	?	✔	✔	✔	?	✘
Space Adventures	$20-$52 million	Approx. 16 days	?	✔	✔	✔	?	✘
World View	Not yet released	5-6 hours	None	✔	✘	?	✔	✔

"?" means either no information is available online or that the feature is optional. Source: Prosser.

3. Recommendation

In order to prioritize safety and democracy, I propose The Rocket Company use both VR and BalloonSats to encourage accessible space tourism with lower fatality rates. Morally, one must always argue for safety over profit. Given the state of current rocketry, it seems unwise to send tourists into space. They will carry with them the assumption that the more they pay for a trip, the safer it will be. That is not something we can guarantee. Further down the line, when failure is less common, space tourism in which private astronauts cross the Karman line will be a wonderful thing, but for now, it is too risky. In the meantime, we ought to stick to safer methods.

Ranging from $10 Google cardboard VR sets to $400 Oculus Rifts, virtual reality is a budget friendly way to achieve the visual experience of traveling to high altitudes to see the Earth below and the stars all around, all from the comfort and safety of home (Clark and Smith). It is perfect for people who don't have a spare $200,000 lying around, or for those who want to avoid the risk associated with rockets. Though it is unclear if even the best virtual experience would elicit the same emotional response as going to space and experiencing the original Overview Effect, Virtual Reality is still a powerful tool that could be used to promote scientific education and provide incredible experiences. Additionally, it would be a cheap solution for our company. On an already planned launch, we could include video cameras and easily record enough footage to make a virtual experience. For an even more exciting option, we could follow the lead of SpaceTime Enterprises and do a livestream from one of our orbital missions (Clark).

Another company whose lead we could follow is World View. For customers who are looking for a more middle-of-the-road option, World View is developing a flight called Voyager which will utilize a massive High-Altitude balloon to lift a cabin full of six passengers and two crew up to an altitude of about 100,000 feet (above 99% of the atmosphere). The flight will take a total of 5-6 hours, and while it won't expose passengers to microgravity, it will allow them to see the Earth from an entirely new perspective. Two hours of this time will be at 100,000 feet, giving tourists ample chance to take pictures of the curvature of the Earth and giving scientists a chance to do longer-lasting experiments than balloon satellites have traditionally offered.

The benefit of using a balloon is that it is much safer and much more affordable than traditional rocketry. Commonly used for small payloads, balloons eliminate the danger of explosion at launch. One of the biggest safety concerns is that the balloon could accidentally deflate, causing the cabin to suddenly fall rapidly. However, there is a parachute prepared to deploy in such a case, slowing down the fall. Another advantage is that no training is necessary to ride on this flight, and anyone over the age of ten years old would be able to buy a ticket (World View). This is because although 100,000 feet gives the illusion of being in space, it is still about 200,000 feet below the Karman line, the official beginning of space, meaning that a lot of risks are easier to deal with. Besides, in the

event of an emergency, each flight will have two fully capable crew members to address whatever issues might arise. While World View has not yet announced the price of a flight, it is sure to be much smaller than the cost of a rocket, seeing that balloons are cheaper than titanium alloys and that helium is cheaper than rocket fuel (Smithsonian).

We should follow World View's lead and develop a balloon program. Its low cost and safety make it appealing in that it will have a larger market and fewer lawsuits. Tourists will gain the trip of a lifetime. They will experience the overview effect, get fantastic pictures, and hopefully learn more about this blue marble we all live on. Scientists will benefit from the incredible opportunity to not only send their payloads up to 100,000 feet but also to be able to interact with them directly for two hours. This will give college and high-school scientists the ability to conduct experiments they never would have dreamed of doing with the balloons of the past.

In marketing this product, we should go above and beyond World View by offering specific trips. Imagine a scientific tourist trip in which one of the crew members explained exactly what you were seeing and experiencing in scientific terms, allowing you to experience geology and astronomy in a brand new way. Imagine an art trip, in which the beauty of the Earth is exemplified at every altitude. Imagine a history trip, pointing out historic sites from above but also showing how all the boundaries we have started wars over do not exist from 100,000 feet above. Take this one step further. Imagine leaders of countries traveling to space to make diplomatic decisions. One can only hope that the overview effect would provide them with a new perspective of humanity, thus encouraging peace and cooperation instead of destructive nationalism. Our world could be improved drastically by this new view of the world, both literally and figuratively.

The goal of space travel should always be to benefit humanity as a whole. As a leader of the aerospace industry, it is our job to engineer the future to make sure it meets this goal. With this in mind, it is our duty to bring space tourism in a new direction. Let us make it accessible and safe. Let us unify nations rather than divide classes. Let us promote progress instead of profit. Let us remember our frailties and our strengths. Let us bring students to new discoveries and leaders to new solutions. Let us make this a public good, a shifting point in travel that the history books describe as the beginning of an era rather than a greedy money grab. Let us pave the way to space, and at every step of the way, let us act with morality, honor, and wisdom so that we may bring about a brighter future.

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Alternative Education in Computer Science
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Introduction

The Software Engineering industry is growing at a rapid rate, projected to have around a 21% increase in new jobs by 2028 (US Bureau of Labor Statistics, 2020). Colleges are under-producing the raw number of Computer Scientists needed to fill those jobs, so alternative education has emerged as one solution to help provide qualified talent to the industry. Many colleges offer completely online Bachelor degrees in Computer Science, and others like MIT and Stanford offer their entire computing course catalog online for anyone to self-study at their own pace. Bootcamps have popped up in and around Tech Hubs, promising an end-to-end understanding of topics such as web development or data science for those looking to switch careers. MOOC (Massive Open Online Courses) companies are surging in popularity, offering a plethora of freemium courses for anyone to study in their free time. Alternative education in Computer Science makes the great appeal that it's possible to learn Computer Science without a traditional degree. Software companies have become more accustomed to hiring self-taught and bootcamp software developers, so it seems an enticing opportunity to take a trade-school like approach to enter the field instead of paying the hefty cost of attending college.

Additionally, computing suffers from a diversity issue. The stereotype of the nerdy, antisocial, ill-dressed brainiac being the perfect Computer Scientist is harmful and turns people away that would otherwise excel in the field. Males compodr 80% of the undergraduate enrollment in Computer Science at CU according to the Office of Data Analytics (2020). In 2015, women received 18% of all awarded bachelor's degrees in Computer Science (US Bureau of Labor Statistics, 2020). This number is down from 1986, where women received 26% of awarded degrees (US Bureau of Labor Statistics, 2020). Recent improvements have been made to combat the problem, but the gender gap is still one of the major issues computing faces. Bootcamps specifically market towards underrepresented groups in Computer Science, giving them another chance to enter the industry. This push has lead to a 40% enrollment from female and non-binary participants, significantly more than what typical degrees have achieved (Course Report, 2016). Alternative dducation aims to make computing careers more accessible to underrepresented groups.

The "rags to riches" dream that alternative education unlocks sounds wonderful; however, it's important to understand how the education from these sources differ from a college degree. A degree is not required to enter the Software Engineering field, but most employers still prefer college-educated graduates, even when that degree is not directly applicable (Thayer & Ko, 2017). Those who succeed through alternative education often have some other significant experience to level the playing field. Depending on personal circumstances, this can make alternative education more or less viable. It's important to understand what place alternative education has in the overall computing industry as it becomes more popular.

The Appeal of MOOCs

MOOCs (Massive Open Online Courses) initially surged in popularity around 2012, when a Computer Science Professor at Stanford University, Sebastian Thrun, co-founded *Udacity* after the major success of its pilot course, *Introduction to Artificial Intelligence* (Corbeil et al., 2019). Since then, a plethora of other similar companies have popped up, all providing MOOCs for Computer Science and other subjects. A typical MOOC is a smaller, self-enclosed course, expecting 2-3 hours of work per week for around 10 weeks. Some platforms offer focus areas that suggest a few similar MOOCs to teach a broader subject, acting as a sort of mini-degree (Corbeil et al., 2019). Some MOOCs act more ambitiously, implying that the entirety of a bachelor's in Computer Science could be learned for free from their online courses. The primary audience of MOOCs are college graduates filling gaps in their education or learning specific technologies for their jobs (Beştaş, 2017). MOOCs have shifted from general education to offering training for specific workforces (Corbeil et al., 2019). A holistic Computer Science degree focuses little on specific languages and technologies, opting to cover much more theory than would be applicable to a typical software engineering job. This theory, while important to teaching problem-solving and soft skills as well as providing a glimpse into academia, does not cover many important technical skills needed on the job. MOOCs are great to fill this gap. MOOCs also work well to provide a quick introduction to a topic of interest. One of the benefits of my internship last summer was a premium account on one of these MOOC sites, which I used extensively. It helped me get a crash course in the technologies I was working with and got me interested in other subjects of Computer Science that have since affected which classes I have chosen to take.

Where MOOCs Fail

One of the main problems with MOOCS is their low completion rate, ranging from 0.7% to 36% from a selection of courses (Khalil & Ebner, 2014). Obviously, this statistic is somewhat misleading because many who sign up for MOOCs were not intending to complete it in the first place, but there's still a significant number of people who try and fail to learn from the course. The students who tend to finish these courses are older and already have a degree (Guo & Reinecke, 2014). MOOCs are typically entirely self-paced, with no incentive for a student to finish the course other than personal gain. MOOCs suffer from the fact that they don't compare well to normal college courses (Spieler et al., 2019). MOOC courses are not accredited. There's incentive for students to finish college courses because they're receiving credit from an institution for it while MOOCs have no such backing. It's an entirely different statement to say you've taken Operating Systems through a college than to say you've taken Operating Systems as a MOOC. It's hard to verify that a MOOC teaching similar content reaches the same academic rigor, so programmers who teach themselves through MOOCs lose a bit of credibility. Using popular course-quality review tools, a case study done by Lowenthal and Hodges (2015) found that all six of the MOOC courses they analyzed would not receive "high quality" grades (Lowenthal & Hodges, 2015). Completion of a MOOC course shows interest in a subject yet does not guarantee a strong understanding in the topic as a college course would.

MOOCs offer paid certificates on completion of a course as an attempt to gain credibility. While these certificates have been shown to improve completion rate, there is no supporting evidence that employers view applicants with MOOC certificates differently than those without (Heath, 2017). Additionally, it's been found that the majority of students awarded with a certificate already hold a bachelor's or postgraduate degree (Guo & Reinecke, 2014). The higher completion rate could be explained by the fact that the students seeking certificates are already more experienced and have developed better study habits. While the certificates themselves don't hold much value, MOOCs have been shown to be a good study tool for tests or certifications that do hold value, such as Advanced Placement tests (Riddle, 2012). In these cases, MOOCs are simply a tool to help pass more important tests.

MOOCs like to market themselves as a way to change careers and be qualified for better jobs, some going as far as to say one can learn the entirety of a Computer Science degree from MOOCs. Various sites offer study guides for ordering MOOCs with the promise that anyone starting with no previous Computer Science knowledge could get the equivalent of a degree through self-study (Computer Science Zone, 2017; Open Source Society University, 2020). One of these guides, Open Source Society University, stresses that the courses should be completed in a project-focused way (Open Source Society University, 2020).Becauses there is little verification for the quality of the classes, projects are the only thing an employer would be able to use to assess the qualifications of someone who completed them. This may work for some, but it takes immense dedication to even complete the courses, and those projects have to really stand out for employers to seriously consider a candidate with no formal verified education in the topic.MOOCs, while being a free source of education, have serious drawbacks. Because their content isn't easily verified and they rely on a self-study model, they are not good for learning critical subjects of Computer Science. Candidates with only MOOCs for a Computer Science education can be seriously flawed. MOOCs are a wonderful choice for getting a quick introduction to a topic of interest, to learn specific languages or technologies, or as a study tool for other tests. They work well to augment education from other sources, but as a standalone option, they leave much to be desired.

Bootcamps

Around the time I was applying to colleges, I had the opportunity to tour the Galvanize campus in Denver. Galvanize, along with offering office space for startups, is a bootcamp company that teaches cohorts of Software Engineers and Data Scientists. Their classes currently cost $17,980 for a full-time, 13-week curriculum (Galvanize, 2020). These classes directly teach "hard skills," focusing on specific modern technologies used in the area. This curriculum leads the graduates to be qualified for only specific jobs that relate directly to their bootcamp experience. For some companies that produce a high-volume of relatively basic software, these bootcamp graduates can be ideal (Burke et al., 2018). Knowledge of recent technologies is valuable, and the mathematical background colleges provide can be unnecessary for certain jobs. Some industries, such as the more mathematical side of Computer Science or any sort of academic research, are totally inaccessible to bootcamp graduates (Burke et al., 2018). These jobs require an academically rigorous background that can't be recreated in the short bootcamp curriculum. Bootcamps are an industry-focused source of education.

Bootcamps are open for all to enroll i, but are better tailored towards those already holding a college degree (Burke et al., 2019). One of the main failings of bootcamps is the lack of soft skills in their courses. While employers do consider specific languages and technologies that an applicant knows, the majority of a hiring decision is based on soft skills (Burke et al., 2019). Applicants with an unrelated degree, loosely applicable work experience, and a bootcamp education are vastly more competitive than applicants with only the bootcamp certificate. Most students who find success from bootcamps already hold an undergraduate degree (Burke et al., 2019), meaning bootcamp enrollment right out of highschool is likely a bad idea. Bootcamps are not trade schools; their certificates do not replace a degree. Employers value the soft skills taught in a degree highly. While it is possible to find entry level jobs without a degree, advancement opportunities will be extremely limited.

Because bootcamps are most successful for students already holding a degree, many students considering a bootcamp education should also consider a professional master's degree instead. Many masters programs will accept students with no prior experience in Computer Science. Choosing a two-year accredited degree over an unaccredited bootcamp has a higher financial and opportunity cost, but the accredited degree will be much more general and won't pigeonhole graduates into a very specific area of software engineering. Additionally, many companies expect higher degrees in order to transition into senior or management positions. While a bootcamp education could get entry into a software company, advancement with no computing degree will be much more difficult. The impression many have entering a bootcamp is that the industry views them as the equivalent of a trade school and that everyone will accept their qualifications afterwards (Thayer & Ko, 2017). The reality is that bootcamps are privately run, not accredited, and vary greatly in effectiveness, so interviewers will look at bootcamp graduates with more scrutiny. Because bootcamps focus so heavily on recent technologies over general skills, bootcamp certificates quickly depreciate. Many bootcamp graduates feel a stigma against their certificates (Thayer & Ko, 2017), the industry as a whole typically preferring traditional degrees.

Graduates also face massive financial obstacles after their bootcamp. Bootcamps pose as the quickest way to enter the software industry, but it still takes a third of graduates more than 90 days after graduation to find a job (Course Report, 2016). Four months of unemployment and a median tuition cost of $12,000 (Course Report, 2016) puts bootcamps out of the financial range of many who would benefit from them. For this reason, most people enrolled come from middle- or upper-middle-class households and need to rely on the financial support of others to complete the camp (Thayer & Ko, 2017). Students enrolled in bootcamps accept a large financial risk that their education may not pay off, and many are surprised at the expected unemployment duration (Thayer & Ko, 2017).

Bootcamps seem attractive to those looking to enter the computing industry as they initially appear equivalent to trade schools. That analogy breaks when considering that bootcamps are most beneficial to those already with a degree. A standalone bootcamp education is not enough for most to enter the field. Bootcamps are good for college graduates looking to switch careers, provided they can afford around four months of unemployment. A lot of care should be taken when choosing which to attend. Sentiments from graduates have ranged from considering it the best professional decision they've made to talks of organizing a class-action lawsuit

against the bootcamp for their biased and misleading statistics (Thayer & Ko, 2017). The reality is that learning any subject in such a short timeframe is incredibly difficult. Students struggled with completing the camp and preparing for interviews all while discovering the stigma against their certificates and dealing with the longer-than-expected unemployment. Bootcamps could be vastly improved if the industry absorbed more of the risks and costs students accept when they enroll, but as they stand, bootcamps are only a good option to the very small proportion of people who can accept those risks and already hold an undergraduate degree.

Job Search and the Interview

A major challenge anyone attempting to enter the computing industry faces is getting and passing job interviews (Thayer & Ko, 2017). Interviews for entry-level software engineering jobs focus heavily on data structures and algorithms, often requiring candidates to write code by hand on a whiteboard, giving them the nickname of "whiteboarding" interviews. These interviews are structured to see if candidates have any obvious deficiencies in their programming ability. They typically require either a good grasp on theoretical Computer Science topics or sufficient self-study on the types of questions to pass. These interviews are fundamentally the same for everyone, but college graduates certainly have an advantage with them. Many companies, if given enough college graduates to choose from, will not even interview candidates from bootcamps (Burke et al., 2018). A Computer Science degree has classes that build critical thinking skills that directly apply to answering whiteboarding questions while Bootcamps and MOOCs focus on skills that apply on actual work but don't translate well to these sorts of problems.

Burke et al. (2018) conducted a case study focusing on the difficulties bootcamp graduates face after graduation. Bootcamps often assist with whiteboarding preparation, but many of their graduates still express difficulties passing them and needing to use additional online resources to study. The bootcamp graduates expressed feeling a stigma against their certificates while interviewing. Additionally, many bootcamp graduates felt that in order to land a full-time job, they had to "get a foot in the door" by first looking for internships or contracting work (Burke et al. 2018). This can be difficult as internships are often biased towards college students. This means that bootcamp graduates often have to compromise on their initial jobs, accepting more volatile contracting work instead of a full-time job. Bootcamp graduates without a college degree can face additional difficulty because many companies will only hire applicants with a college degree regardless of other education (Thayer & Ko, 2017).

The bright side to interviewing is that the skills needed to pass one can be self-taught. The internet has many great resources for interview preparation. Most applicants, college students included, take advantage of websites like LeetCode and HackerRank which offer online versions of popular whiteboarding questions. Whiteboarding questions can be studied for, so the main challenge Bootcamp graduates face is simply getting the interview in the first place.

Diversity and Alternative Education

Computing suffers from an identity issue. Stereotypes around what the ideal programmer looks like pushes those away who would otherwise be well suited for software engineering. These stereotypes misrepresent what work in the software industry is like. Male-dominated workplaces can create unwelcoming environments that make others feel as if they don't belong (Paul et al., 2018). More than 45% of women who choose computing as a career leave the field in less than 10 years, a rate double that of men (Paul et al., 2018). Developers across the industry express feelings of "imposter syndrome," a phenomenon where they feel as if they don't belong when they are perfectly competent. Girls often feel as if they don't fit in with the male-dominated field, citing Computer Science stereotypes, which contributes to their questioning whether their abilities and interests are in line with the field (Spieler et al., 2019). With all this in mind, it is incredibly clear that change needs to be made to the industry as a whole to promote more inclusion. Alternative education is one front where effort has been made to make careers in computing more attractive to underrepresented groups.

Bootcamps have made significant progress in encouraging more underrepresented enrollment. Some bootcamps are structured to only accept female and non-binary applicants, and bootcamps as a whole currently average a 40% enrollment from female and non-binary students (Course Report, 2016). This is significantly better than enrolment statistics for undergraduate degrees. Disappointingly, female enrollment in Computer Science MOOCs is consistent with their enrollment in undergraduate Computer Science degrees (Guo & Reinecke, 2014). This tells us that the solution to this problem isn't simply making resources accessible, but creating a more inclusive culture. It will take systematic change to bring in more currently underrepresented developers.

As has been shown previously in this paper, bootcamps are not an ideal source of Computer Science education. Students enrolled in Bootcamps take on large risks for an education that has no guarantee to pay off. It is not good for the software industry that the groups they want more representation in the field are often relying on a worse source of education. This educational gap contributes to the fact that women are disproportionately in junior roles, assigned more menial tasks, and see less frequent job advancement opportunities (Paul et al., 2018). It is no surprise that a higher proportion of women leave computing because they become more pessimistic about their career opportunities. If bootcamps were able to address these issues better and take on more of the risks their enrolled students face, they could contribute to the eventual solution of this diversity problem. However, as they stand, students are much better off pursuing traditional degrees.

A more productive solution would be to encourage more diversity in college degrees. One approach focuses on understanding why teenage girls begin to show disinterest in Computer Science (Spieler et al., 2019). Spieler et al (2019) created a MOOC course with the explicit goal to get more teenage girls interested in Computer Science. Their course attempted to combat the existing stereotypes by having all the explanations given in the course by women, and including discussion on famous female Computer

Scientists (Spieler et al., 2019). Having visible female role models helps spark interest in computing careers from women (Buhnova & Prikrylova, 2019). Another proposed way to increase female enrollment in the Computer Science major is to treat introductory Computer Science courses more like courses that lay the foundation for other subjects (Spieler et al., 2019). The additional exposure to Computer Science in a more inclusive environment can help change perception towards computing careers.

Conclusion

Alternative education is here to stay, and we need to understand how to best utilize it. Bootcamps have been shown to be successful for those already holding an unrelated degree and some other significant experience, but it's important to thoroughly vet the program and understand that bootcamps are not trade schools. The reputation of the individual bootcamp is important to how the industry will view their certificates. MOOCs are a great way to find a quick introduction to a topic of interest, but hold extremely little value by themselves. They can be used as a way to get a crash course in a specific language or technology for a job or as a study tool for interviews or important tests. MOOCs should never be the centerpiece of a Computer Science education.

For everyone not already holding a degree, a college education seems to be the best pathway to enter the computing industry. Bootcamps are extremely risky for their cost, and their certificates do not hold value over time. MOOCs are almost completely unverified and have not shown to be an effective way to learn the content required to get employed in the computing industry. MOOCs do not effectively address the diversity issue, and while bootcamps have shown promise in getting more underrepresented enrollment, the flaws in their education subjects the very same students to a costly and risky education for worse credentials than their peers. The solution to the diversity problem in Computer Science should focus on diversity in College degrees. Steps have been taken in that direction, but much more still needs to be done to make computing an inclusive field.

Because interviews for entry-level positions typically follow a whiteboarding style, anyone can self-study and pass them. While it can be more difficult for students in alternative education without the critical thinking classes that a Computer Science degree offers, self-taught and bootcamp developers have been able to succeed in initially finding jobs. Many of the issues alternative education have don't appear in this initial payoff but in the long-term career opportunities. Companies prefer degrees for job advancement, and there simply isn't any replacement. Alternative education has a permanent place in how Computer Science will continue to be taught, its their flaws mean that we should still consider a traditional degree to be the best and most consistent way to learn Computer Science and enter the computing industry.

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