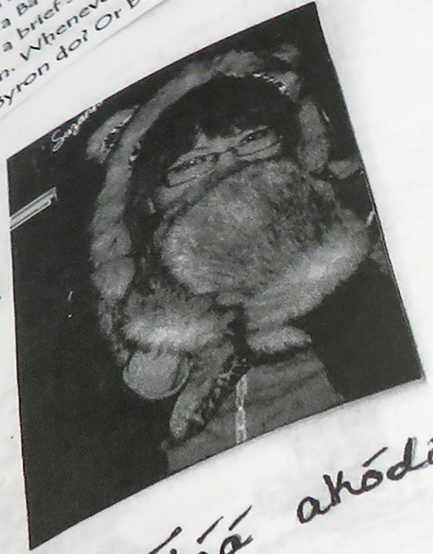


Yá'á'í'eeh! **DIOS**
Shi é Melania éy yínishyé!

Melanie is an interesting connection of Navajo, German, Italian and hopeful writer that was spawned in Tuba City, AZ. She grew up in Flagstaff, pursued a Bachelor's degree in English from Arizona State, had a brief stint in Japan and now resides in Portland, Oregon. Whenever in doubt, she asks herself, what would Lord Byron do? Or better yet, what would Frida Kahlo do!



*Naakáá Dine'é níshk'é.
Italian báshishchú'n.
Táchii'níí dashicheéí.
German dashináli.*



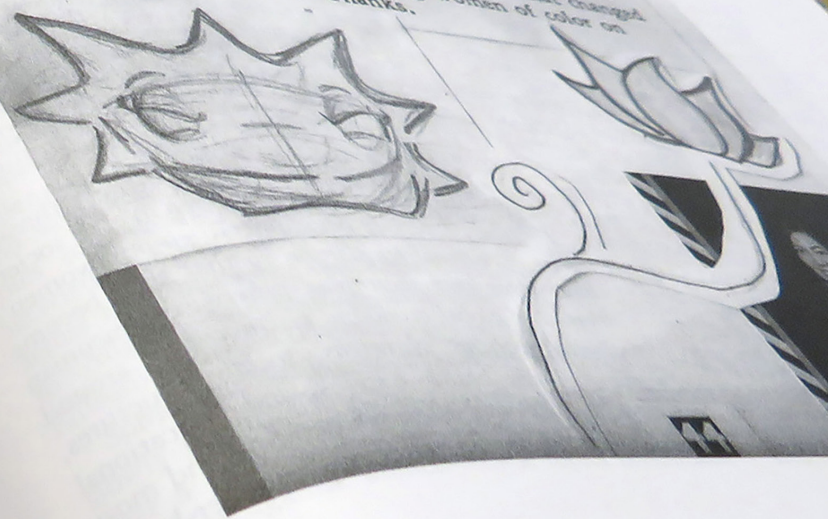
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*T'áá akódi.
Ahé hee'!*

INCITE Journal of Undergraduate Scholarship Vol. 14 (2023)

*Ashijíí dashicheéí.
Ta'neeszhníí dashináli.
Ahé hee.*

My name is Amber, I like to listen to Mozart when I write and sometimes feel sorry for myself in my room with my humidifier on full blast. I enjoy a good cup of tea and a cute dress. Also this side project would not be possible without my room, the works of Kathleen Hanna and the book that changed my life "Colonize this! Young women of color on today's feminism." Thanks.



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Cook-Cole College of Arts & Sciences

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The Journal of Undergraduate Scholarship, Volume 14, 2023

Longwood University

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From the Director

Dr. Amorette Barber, Director,
Office of Student Research

Longwood University strives to develop citizen leaders and an important part of this process is the participation in independent or group research and creative inquiry. Participation in research and inquiry promotes a culture of curiosity, scholarship, and student engagement, prepares students to address the unsolved problems of the future, and supports the development of citizen leaders. Students who go beyond the classroom to develop their scholarship improve their communication skills, build their determination and perseverance, develop creativity, practice problem-solving, cultivate a sense of shared purpose by working for faculty mentors and peers, and foster intellectual independence. Students also have a great sense of accomplishment when the project is complete. While this happens throughout a Longwood student's education, publication in *Incite*, Longwood's undergraduate journal of research, is considered a crowning achievement in a student's development of their personal scholarship. This volume of carefully reviewed and selected student publications highlights the best student work at Longwood University. These articles demonstrate a high level of academic achievement and are evidence of the outstanding dedication and efforts of the student authors and their faculty mentors and collaborators.

On behalf of the Office of Student Research and the three academic colleges involved in this publication, I would like to acknowledge and thank the student authors who permitted their work to be published in *Incite*. I also would like to thank the faculty members for mentoring the students in the completion of the research and inquiry project and writing of the manuscript. Finally, I would like to thank the *Incite* faculty board and editor for their efforts to publish this exceptional volume.

I hope you enjoy reading through this volume of *Incite* and that you come away with an appreciation of the extraordinary accomplishments of the students included in this collection.

From the Editor

Dr. Larissa “Kat” Tracy

Department of English & Modern Languages

After the Covid-19 pandemic disrupted the process for publishing *Incite* during the 2020-2021 academic year, *Incite* returned with a bumper crop of excellent student research in 2021-2022. Now, *Incite* is back in full force, as evidenced by the exceptional selection of essays featured in this issue.

Last year, the colleges of Education and Business joined the Cook-Cole College of Arts and Sciences in sponsoring *Incite*. We added faculty from each of these colleges to the Board, and we are now collaborating with the Office of Student Research. These Board members worked tirelessly to review and comment on the student submissions, ensuring that each piece is of the highest caliber. I am extremely grateful to all who have been willing to serve: Dr. Corey Call, Leslie Cook-Day, Dr. Christopher F. Labosier, Dr. Hua (Meg) Meng, Dr. Tim Ritzert, Dr. Benjamin Topham, and Dr. Erin Wallace. Dr. Amorette Barber, director of OSR, has been a staunch supporter of the journal, and together we implemented Faculty Mentorship Awards in addition to the student prizes for best papers, and have publicized the journal across the university community. The student work and faculty mentorship is recognized at the Research & Creative Inquiry Showcase in the spring. We are now accepting student submissions from all university colleges and this issue features articles from the Honors College as well. Other faculty members stepped up when asked to review submissions within the various disciplines over the 2022-2023 academic year, namely Dr. David Geraghty, Dr. Scott Grether, Dr. Elif Guler, Dr. Renée Guitierrez, and Dr. Leigh Lundsford.

In 2019, we implemented a new design by students in the Design Lab under the supervision of Chris Register and Wade Lough, and even though this year's issue was not produced by the Design Lab, we intend to remain faithful to their design concept.

Like last year, the student contributors were a pleasure to work with; they met deadlines and they worked in the spirit of cooperation to get their pieces in publishable form. It would not have been possible to produce this journal without the *Incite* faculty and student volunteers.

This issue of *Incite* is my last as general editor and I will be stepping down once it is published. Since 2018 it has been my honor to edit this journal, and to work with the fantastic student authors and members of the Faculty Board. I am delighted that, in conjunction with Dr. Barber, we were able to broaden the purview of the journal to include student work from across campus. I have no doubt that the next editor of *Incite* will continue the tradition of excellence that has been built over the years.

This journal is truly a team effort. From the students who submitted their work, to the individual faculty advisors who spent the time outside of class to help them revise and professionalize their submissions, to the Faculty Board members who vetted them, to the Printing Office that met our deadlines and delivered this amazing volume, to CCCAS Dean Roger Byrne and Provost Dr. Lara Smith who have given this endeavor their full support, Dean of the College of Education and Human Services Dr. Angela McDonald and Dean of Business and Economics Dr. Timothy O'Keefe who joined our team last year, and Dr. Barber in OSR who has made furthering the reach of this journal her mission, we could not have done it without you. Especially at this time, when we are still slowly emerging from three years of a global pandemic, it is important to showcase the outstanding accomplishments of our students and the faculty who mentor them. We rely on the dedication of faculty, students, and staff to promote the best of undergraduate research at Longwood University so that this journal, *Incite*, can continue. Thank you very much for all your hard work in making this possible.

From the Designers

Rachel English

Rachel Hanson

Longwood University

Graphic Design, 2019

Welcome to the redesigned *Incite*. The changes we made were intended to give this academic journal a new design voice. As designers, our intention was to create a journal that would communicate its purpose as an academic publication, but also please its audience visually. There is an established format that journals and scholarly articles tend to fall into, but we have learned in our design study at Longwood to bring a fresh perspective to established design. Without the guidance and assistance of our professors none of this would have been possible. We are thankful to everyone who helped make this journal possible, and grateful for the opportunity to help craft the eleventh edition of the undergraduate academic journal. We hope you enjoy it.

Hungry Like the Wolf:

The Wolf as Metaphor in Paramount Network's *Yellowstone*

Ireland Seagle

Faculty Advisor: Dr. Heather Lettner-Rust

Department of English and Modern Languages

Awarded first place Humanities paper

Abstract

The presence of wolves in the cable television show Yellowstone is an ambiguously positive and negative metaphor for the central characters in this series, the Dutton family as a wolf-pack. Utilizing metaphoric analysis, the verbal and visual appearances of wolves in the show's episodes were selected and measured. After rewatching several selected episodes with wolf references, Season 3, Episode 2 was chosen for analysis since this installment contained the most scenes with wolf appearances, dialogue about wolves, and characters' wolf-like behaviors. Contextualizing this metaphor argument in Carolyn Miller's (1984) seminal concept of "genre as social action" reveals Yellowstone's use of language, including the wolfpack metaphor, conforms to that of the Western genre to promote nostalgia and close communal relations. My findings suggest that this wolfpack metaphor anthropomorphizes humans while concurrently making the human characters less mortal. Additionally, this metaphor allows viewers to see their own values, including loyalty and teamwork, reflected in the characters' protective and murderous actions. Future areas of research might suggest whether the Western genre has shifted its cultural work to reflect man's inhumanity.

According to Samuel Levin's interpretation of Aristotle's arguments, a metaphor involves "the application of a strange term...transferred...from one species to another or else by analogy" (Levin 24). When the use of metaphor is combined with visual arts of cinematography, these metaphors "can affect our thought and experience of reality" (Foss 287). So, how do the subjects of metaphors in Westerns and the collections of the specific vehicles influence the rhetor's and audience's mindset? The presence of wolves in *Yellowstone* is an ambiguously positive and negative metaphor for the humans in the television show, specifically the central characters, the Dutton family. The characters' animalistic actions and interaction with real wolves depict the Dutton family as a wolfpack. Consequently, this metaphor allows viewers to connect with characters' positive attributes emphasized by that relationship. Moreover, this abstract concept justifies the characters' negative behaviors simply as natural instincts rather than conscious, manipulative actions. Finally, future fields of research might suggest whether the Western genre has altered its cultural work to represent man's inhumanity.

In this essay, I analyze Season 3, Episode 2 of the television series *Yellowstone*, which chronicles the Dutton family's modern-day struggle to protect their family ranch near Paradise Valley, Montana from outside developers. Screenwriters Taylor Sheridan and John Linson created *Yellowstone*, which first aired in June 2018 on Paramount Network. Sheridan's inspiration for the show derives from several experiences, such as directing the film *Wind River* (2017) and growing up on his family's Texas ranch (Fox). *Yellowstone* is also quite popular among viewers. Media analysts consider the show "the number one series across broadcast, cable, and premium for 2021" (O'Rourke). Season 3, Episode 2: "Freight Trains and Monsters," aired on June 28, 2020. In this episode, members of the Dutton family and several ranch hands spend time at their "summer camp," a remote area of land away from the ranch (Salvi). John Dutton, *Yellowstone* ranch owner and patriarch of the Dutton family, hosts the camp while Jamie Dutton, adopted son of John Dutton, starts his job as Livestock Commissioner. Rip Wheeler, lead ranch hand of the *Yellowstone* ranch, begins searching for a new worker to replace Avery, their first female ranch hand. Finally, Livestock Agent Steve Hendon lands himself in jail after murdering two men.

In this paper, I use metaphoric analysis, an analytical method in which "artifacts that contain some obvious surface metaphors—whether verbal or visual" (Foss 289) are evaluated. In this type of rhetorical criticism, a critic typically follows four stages: studying the artifact as a whole, separating the metaphors in the artifact, and then dividing these metaphors into categories based on their vehicle or tenor. In metaphors, the tenor is the inherent topic or subject, while the vehicle is the euphemism that accompanies the tenor. The interconnection of the tenor and vehicle creates the metaphor's meaning. Finally, a critic interprets the artifact using their analysis and categorization of its metaphors (Foss 290).

In addition to the type of analysis, I chose *Yellowstone* as my artifact because of my personal interest and knowledge of the show. After selecting this artifact, I followed a methodical process, analyzing Episode 2, Season 3 through a metaphoric lens. First, I listed metaphors, both visual and verbal, that resonated with me due to their associations with various animals, including wolves, bears, and fish. Next, I searched the Internet Movie Database (IMDb) for *Yellowstone* episodes to confirm the specific occurrences of these animal-related visual and verbal metaphors. After discovering that wolves appear or are mentioned at least three times in specific *Yellowstone* episodes, I chose to analyze the appearance of wolves as a possible metaphor. I then rewatched the episodes with these visual and verbal examples of wolves. I settled on Season 3, Episode 2 because this installment contained the most scenes with wolves and the most character dialogue about wolves. Next, I rewatched Episode 2 of Season 3, closely recording wolf appearances, dialogue about wolves, and characters' wolf-like behaviors.

Along with the appearance of a lone wolf in Season 3, Episode 2, other characters exhibit bestial behaviors that continue this pattern of a wolf as a metaphor. First, there is an emphasis on characters watching or observing other characters. Early in the episode, Rip Wheeler fixes breakfast for Beth Dutton, John Dutton's daughter and Wheeler's love interest, and he says he wants to watch her eat since he ate earlier. Then, when Kayce Dutton, John Dutton's youngest son and the ranch's foreman, encounters the wolf a second time, John carefully observes his son's statement to the wolf, unbeknownst to Kayce until after the exchange is finished. Both Rip and John attentively watch their respective subjects in close proximity and avoid engagement with the subjects until a certain point. Then, as Kayce walks back to his tent, John states, "My father could do that, talk to animals, and they would listen" (Kay and Sheridan). This revelation suggests that Kayce has an innate ability to understand and communicate with animals, positioning Kayce as a member of the animal and wolf community. Later in the episode, when Beth meets with Market Equities stockholder and outside developer Roarke Morris to discuss his commercial plans for Paradise Valley, she intently watches Morris as he paces back and forth explaining his methods. Beth's attentive observation mimics an animal eyeing its prey, and Morris is prey in this metaphor since he threatens the Duttons' territory. Through this behavior, the Dutton family is a wolf pack that carefully monitors their surroundings to protect one another, such as Rip does for Beth, and to detect potential enemies, including Morris.

At the end of Episode 2, Beth Dutton continues to exhibit animalistic behavior, howling like a wolf. To provide some context, while Rip Wheeler sits on his front porch, he hears a wolf howling. He grabs his shotgun and sets out on foot to find the animal. Wheeler then approaches the cattle pen where he finds Beth running around the pen and mimicking a



Figure 1. Rip Wheeler intently watches Beth Dutton eat breakfast (“Freight Trains and Monsters Behind the Story,” YouTube).



Figure 2. As Kayce Dutton (foreground) stands up from speaking to the wolf, John Dutton continues to watch his son from afar (“Freight Trains and Monsters,” Peacock).



Figure 3. Beth Dutton silently and carefully observes Roarke Morris as he explains his real estate clients' plans for Paradise Valley ("Yellowstone Season 3 Recap in 17 Minutes," YouTube).



Figure 4. In the wolf's first appearance in the episode, the animal is placed in the left side of the frame to suggest the wolf's isolation and to create unease in viewers ("Freight Trains and Monsters," Peacock).

howling wolf (Kay and Sheridan). This bestial conduct further establishes the wolf metaphor in this episode; Beth howls in this scene to communicate not only with other members of the Dutton pack, including Wheeler. Beth's howls act as a social call to locate and attract her mate, Wheeler. While Wheeler is the only character who hears and reacts to the noise, her howls also warn the Dutton family and the ranch of impending threats. These howls protect the Dutton wolfpack and display Beth's loyalty. Ultimately, these actions further develop Beth's character as an untamed yet loyal pack member.

In Season 3, Episode 2 of *Yellowstone*, a wolf appears several times, suggesting that the animal is an extended visual metaphor. In these appearances, it becomes clear that the wolf represents something larger due to the amount of screen time and the amount of the frame dedicated to the animal, making the wolf the central visual. Initially, the wolf appears when Kayce and Monica Dutton, husband and wife, are having an intimate moment in an area of the woods on the Yellowstone ranch. Before Monica meets Kayce in the woods, Kayce was searching for wolves, according to their son Tate Dutton. Foreshadowing potential future harm to Kayce and the Dutton family, Monica responds, "That sounds ominous" (Kay and Sheridan). Then, Kayce and Monica meet in the woods and begin kissing. As they lie on the ground, a lone gray wolf appears in the background. Startled and scared, Monica asks Kayce



Figure 5. As Kayce speaks to the wolf in this long shot frame, both the animal and Kayce are visible, suggesting a connection between the two characters (Muller 35).

twice, "What do we do?" (Kay and Sheridan). Meanwhile, Kayce acts casual and unconcerned, cheekily telling Monica, "If he wants to watch, let him watch" (Kay and Sheridan). As Kayce and Monica continue their romantic endeavor, the wolf watches them, lying down in the grass with its paws stretched out in front. The animal also appears to tilt its head, suggesting its curiosity about Kayce and Monica's actions.

A few scenes later, Kayce encounters what is presumably the same wolf. While camping with his family and the Yellowstone ranch hands in an area of the estate, Kayce hears cattle vocalizing more than usual and leaves his tent with his shotgun. As he vacates his tent, Kayce spots the wolf looking at him as it stands at the edge of the wood line between two trees. As he looks at the wolf, the animal flicks its right ear backwards. Then, Kayce speaks to the wolf: "Lost your pack, huh? ... Looking for friends? Look at me and know that I'm not your friend. I'm your enemy" (Kay and Sheridan). This quotation parallels Kayce's previous experience of isolation from other Yellowstone ranch hands and the Dutton family, including when he and Monica lived on Broken Rock Indian Reservation neighboring the ranch. Furthermore, emotionally and physically positioning himself against the wolf suggests Kayce's territorial feelings about relationships and his ability to work cooperatively only with his family or those connected to the Yellowstone ranch. Thus, this emphasis juxtaposes Kayce's actions with wolves and their pack behavior, further extending the wolfpack metaphor. Following Kayce's direct statement, the wolf continues to silently stand and observe Kayce as he continues addressing it: "These cattle are mine. If you try and take them, I'll kill you" (Kay and Sheridan). As Kayce finishes, the wolf runs off, yet it does not cower in fear before retreating.

In Kayce's encounters with this wolf, cinematographers strategically position the animal primarily in the left frame of the screen. This intentional placement suggests that the wolf is isolated from its pack or "from the world [it] exists in" (Maio). In addition, the wolf's eyes tend to emerge in the middle of the vertical frame. This positioning makes the audience feel at eye-level with the animal, allowing the viewer to see themselves as "equal with the character" (Maio). Moreover, the wolf often looks offscreen to the left side of the screen. In its second encounter with Kayce, the wolf retreats offscreen toward the left side of the frame. This conscious movement of the animal from right to left across the frame causes the audience to experience "more negative feelings," inducing viewers to feel apprehensive about the wolf and its existence (Renée). Since many Western societies are taught that movement from left to right is natural and acceptable, motion in the opposite horizontal direction can prompt uneasiness in individuals living in these societies. Moreover, *Yellowstone's* primary audience includes people living in the United States and the cinematographers use the wolf's movement to provoke anxious or nervous feelings in these audience members about the wolf's existence



Figure 6. *During Kayce and Monica's encounter with the wolf, the cinematographers position the wolf to utilize most of the frame, allowing the audience to identify with the character or to show the wolf's potential emotions (Muller 34).*

and the subsequent actions of characters ("The Audiences Behind 'Yellowstone's Success").

This complex wolfpack metaphor is a contemporary element of the shifting Western genre. According to scholars Anis Bawarshi and Mary Jo Reiff, genres are "complex ... cultural objects" that standardize practices, allowing individuals in certain discourse communities to engage in these procedures "in fairly predictable, familiar ways" (79). In other words, genres create familiarity through the formation of customary activities. Carolyn Miller contends that genre is "a conventional category of discourse based in large-scale typification of rhetorical action" ("Genre as Social Action" 163). More specifically, genre is one of many categories that are part of a broader class of rhetorical strategies that produce action. In the context of this argument, films and television shows depicting life in the American West are categorized under the Western genre, and this classification assists viewers in recognizing how to engage in the actions of the Western community. Furthermore, several scholars agree that genre is variable because its constraints, communities, and members can shift and expand (Miller, "Genre as Social Action" 153) (Bawarshi and Reiff 79). Moreover, with the existence of the Internet and digital spaces, the concept of genre has become further complicated. As Miller states in a reflection on her original 1984 conclusions, genre has developed into "a multidimensional

social phenomenon, a structural nexus between action and structure ... between past and future" ("Genre as Social Action Revisited" 69). Thus, genre has transformed into a storehouse for texts and objects belonging to the listed contrasts.

As with narratives of other genres, Western stories typically include multiple modes and conditions of a narrative, such as iconography and themes (Pye 242). These characteristics and their intentional arrangement then blend, creating an individual piece that still exists within a larger genre. The Western genre also typically utilizes the romantic narrative method, in which "the hero is superior in degree to other men and his environment, but he is mortal" (Pye 242). This narrative style idolizes a plain rural life and portrays a harmonious relationship with the natural environment in agrarian landscapes (Pye 243). Furthermore, this genre of film often involves ideas of "familiar oppositions," such as "garden/desert" and "civilization/savagery" (Pye 244). These oppositions, including the conflict of good and evil, establish an unequivocal mentality. This mentality emphasizes only two extremes rather than several, complex perspectives of a conflict, which forces viewers to select one option rather than another level on the larger spectrum of perspectives. Lastly, Pye argues that the exhibited setting of the Western film is also important to the overall genre. More specifically, he claims that a strain "between a realism of presentation and a...greater degree of abstraction at other levels" is a hallmark attribute of the Western genre (246). In other words, in Westerns, there exists a tension between depicting the reality of ranch life and portraying the stereotypes or idealized versions of living in the Western United States. In *Yellowstone*, this tension between reality and idealization, especially the Duttons' hunger for a nostalgic way of life, creates the primary and enduring conflict of the show. Ultimately, the styled display of setting and the levels of symbolism and abstract meanings are balanced in this genre, neither one dominating the other. In *Yellowstone*, aesthetic landscapes and the symbolic use of characters and music mesh equally, providing viewers with foundational impressions of the setting and simultaneously explaining or challenging those superficial appearances.

While *Yellowstone* fits in the Western category due to its adherence to certain elements (conflicts, landscape, etc.), it also challenges the Western genre and its conventions. Rather than primarily committing cruelties among Native Americans like in traditional Westerns, the show's bestial qualities emanate from the violent acts white Americans, especially the Dutton family and several competing land developers, commit against one another. In season five of the show, John Dutton and Chief Thomas Rainwater, chief and chairman of the neighboring Broken Rock Indian Reservation, share a common enemy: Market Equities. Additionally, Rainwater aided the Duttons with a criminal investigation following an assassination attempt on several Dutton family members. Thus, the two competing sides "have seemingly formed a tentative truce" (Louis). Rather than perpetuating this single story of Native Americans pitted

against white American landowners, *Yellowstone* persuades viewers to consider the realistic complexities of navigating political and racial situations.

In conclusion, the metaphor of the Dutton family as a wolfpack in *Yellowstone* sheds light on the implications of individuals utilizing this metaphor to represent humans. When filmmakers employ this wolfpack metaphor, they show that humans, or a group/family of humans, are loyal to one another and are fierce competitors. Moreover, cinematographers and screenwriters use this association to represent humans as a cohesive unit that acts together. This application of the metaphor encourages other people to view this group of humans in both a positive and negative manner. First, most viewers highly value loyalty and teamwork, which are favorable values employed in the wolfpack comparison. This connection to audiences' values influences viewers to regard the group of humans as a positive force. However, more negatively, *Yellowstone* depicts the Dutton family as a power-hungry, territorial wolfpack. When outside enemies threaten the wolfpack and their territory, the Dutton family resorts to physical attacks and violence to protect their possessions. In contrast to the kinder American cowboy depicted in many twentieth-century Western films and television shows, the Yellowstone ranch hands, consisting of the Dutton family or individuals they choose to let in, are more violent and act as executioners carrying out the dirty work of the pack leader, John Dutton. Modern predators, including outsider developers like Market Equities, hunt the Dutton wolfpack. The Dutton family pack is hungry for political, economic, and physical power to preserve their ranch and their familial legacy. Moreover, they are hungry for a nostalgic, untamed way of life that becomes increasingly difficult to maintain as Montana and Paradise Valley steadily modernize. Additionally, this wolfpack metaphor anthropomorphizes humans while concurrently making the human characters less mortal. Consequently, this comparison excuses the characters' negative behaviors as simply natural instincts rather than intentional, manipulative, and ominous actions. Lastly, this assessment can lead to scholars' future endeavors to further research whether the Western genre has shifted its cultural work to reflect man's inhumanity.

Works Cited

"The Audiences Behind 'Yellowstone's Success." *Paramount*, 23 Aug. 2019, <https://www.paramount.com/news/content-and-experiences/the-audiences-behind-yellowstone-success>. Accessed 29 Apr. 2022.

Bawarshi, Anis, and Mary Jo Reiff. "Rhetorical Genre Studies." *Genre: An Introduction to History, Theory, Research, and Pedagogy*, edited by Charles Bazerman, Parlor Press, 2010, pp. 78-104.

Foss, Sonja K. "Generic Criticism." *Rhetorical Criticism: Exploration and Practice*. ed. 5, Waveland Press, 2018.

Fox, Courtney. "Who Plays Travis on 'Yellowstone'? Taylor Sheridan is a Real Cowboy." *Wide Open Country*, 1 Nov. 2021, <https://www.wideopencountry.com/taylor-sheridan/>. Accessed 23 Mar. 2022.

"Freight Trains and Monsters." *Yellowstone*, directed by Stephen Kay, written by Taylor Sheridan, Bosque Ranch Productions and MTV Entertainment Studios, 2020.

"Freight Trains and Monsters." *Yellowstone*, season 3, episode 2, Paramount, 28 June 2020. Peacock, https://www.peacocktv.com/watch/playback/vod/GMO_00000000353265_01/cb8afa26-7b4a-3fac-ad9d-3ae2c437f2bd?paused=true. Accessed 29 Apr. 2022.

"Freight Trains and Monsters' Behind the Story | Yellowstone | Paramount Network." *YouTube*, uploaded by Yellowstone, 29 June 2020, <https://www.youtube.com/watch?v=xPRd1zAibGo>. Accessed 29 Apr. 2022.

Levin, Samuel. "Aristotle's Theory of Metaphor." *Philosophy & Rhetoric*, vol. 15, no. 1, pp. 24-46. <https://www.jstor.org/stable/40237305?seq=1>. Accessed 29 Apr. 2022.

Louis, Brandon. "How *Yellowstone* Season 5 Having John Dutton as Governor Hurts Rainwater." *Screen Rant*, 15 Nov. 2022. <https://screenrant.com/yellowstone-season-5-john-dutton-governor-rainwater-relationship/>. Accessed 1 Apr. 2023.

Maio, Alyssa. "The Rules of Shot Composition in Film: A Definitive Guide." *Studio Binder*, 13 Dec. 2020, <https://www.studiobinder.com/blog/rules-of-shot-composition-in-film/#2-rule-of-thirds>. Accessed 22 Mar. 2022.

Miller, Carolyn. "Genre as Social Action." *Quarterly Journal of Speech*, vol. 70, 1984, pp. 151-167.

Miller, Carolyn. "Genre as Social Action (1984), Revisited 30 Years Later." *Letras & Letras*, vol. 31, no. 3, 2015, pp. 56-72.

Muller, Valerie. "Film as Film: Using Movies to Help Students Visualize Literary Theory." *The English Journal*, vol. 95, no. 3, pp. 32-38. <https://www.jstor.org/stable/30047041>. Accessed 29 Apr. 2022.

O'Rourke, Ryan. "'Yellowstone' Season 4 Finale Sets Record with over 10 Million Viewers." *Collider*, 5 Jan. 2022, <https://collider.com/yellowstone-season-4-finale-record-viewers/>. Accessed 23 Mar. 2022.

Pye, Douglas. "The Western (Genre and Film)." *Film Genre Reader IV*, edited by Barry Keith Grant, University of Texas Press, 2012, pp. 239-254.

Renée, V. "Left or Right? Why a Character's Lateral Movement On-Screen Matters in Film." *No Film School*, 15 Feb. 2016, <https://nofilmschool.com/2016/02/left-or-right-why-characters-lateral-movement-screen-matters-film>. Accessed 23 Mar. 2022.

Salvi, Pooja. "'Yellowstone' Season 3 Episode 2 Review: Dutton family escapes to the camp but troubles keep coming their way." *Meaww*, 28 June 2020, <https://meaww.com/yellowstone-season-3-episode-2-freight-trains-and-monsters-review-jamie-agent-hendon-tate-john-kevin>. Accessed 25 Mar. 2022.

"Yellowstone Season 3 Recap in 17 Minutes." *YouTube*, uploaded by Yellowstone, 22 Nov. 2020, <https://www.youtube.com/watch?v=fMsEfKgGH-k>. Accessed 29 Apr. 2022.

“Floating Cities”:

Illustrating the Commercial and Conservation Conflict of Alaskan Cruise Ship Tourism

Dalton C. Whitby

Faculty Advisor: Dr. JoEllen Pederson

Department of Sociology

Awarded first place Social Sciences paper

Abstract

Alaska. From the moment of arrival, the raw, unspoiled beauty of the 49th state is almost overwhelming, for it is this unmanaged wildness and the perceivable veil of the unknown inhabiting these lands that mark Alaska as the premier tourist destination in the country, receiving roughly 2.26 million travelers year after year. Furthermore, the primary form of transportation for these travelers is through cruise lines, with about 1,169,000 passengers arriving in 2018 alone. Tourism, specifically that created by cruise ship travelers, has become an economic staple for Alaska, considered by some to trump revenue produced by oil. Businesses depend on the passengers coming to Alaska to survive, and the income produced by Alaska's tourism industry supports the state. But what happens when the means of Alaska's survival may also signal the ultimate destruction of the very characteristic that attracts visitors in the first place? Indeed, the potential environmental hazard cruise ship pollution threatens to Alaska's natural allure is of great concern for the residents of “the last frontier.” My research, in the form of a story, attempts to reconcile the state's dependency on tourism while preserving its most valuable feature.

Floating Cities

As the midnight sun sank lower in the candy-corn sky, the Norwegian Bliss withdrew from the port of Juneau, its ozymandian steel body sliding slowly across the azure surface of the bay and away from the now familiar cement dock that only days ago seemed unknown—what she once coined the entrance into a grand adventure now recognized as the exit from a fond memory. Piper¹ leaned on the cool metal railing of the ship, the breeze from the approaching Pacific twirling her auburn curls and filling the wings of the seagulls that called to each other above her head, while the events of the days before flashed across her eyes as she watched the “last frontier” fade from view.

It was inconceivable for Piper that just a week had eclipsed since she and her family arrived in Alaska to celebrate her 17th birthday, for the time seemed to have both quickened and slowed while she was in the striking land of glaciers and alpine ridges shrouded in mystery and intrigue. It was Piper’s first time on a cruise ship, and the two-day passage from her home of Seattle to Alaska was a journey of awe at engineering miracles, joy for cruise amenities and events, and excitement for the coming adventure.

Piper was struck speechless by Alaska’s culture, history, and raw majesty, and it was her earnest wish to bottle up all its exquisiteness so she could experience the wonderment and breathless feeling the land stirred even at home. The natural, almost untouched beauty held in the bosom of Alaska was something that Piper had never witnessed before, and it was her earnest desire that the land be preserved for future generations. Piper reflected on this as the Norwegian Bliss pulled out of Juneau and began the long journey back to Seattle.

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The sun rested heavily on the horizon, dousing the sea and sky in ruddy and tangerine hues; the immense Pacific was calm, the wind still and dozing on the downy white clouds meandering above; the squawking and calling of seabirds was nonexistent as they perched on the water’s surface in needed respite—this is a summer night in the North. The Norwegian Bliss drifted slowly across the sun-flecked expanse, only a few miles from the port of Juneau, the spruce-lined shores of Alaska still visible in the distance.

Piper pushed through a set of double doors onto the main deck of the ship, her emerald evening gown flowing behind her as she walked out of the auditorium. The Yacht Rock Concert was tonight, but Piper could not sit through another Christopher Cross, Kenny Loggins, Michael McDonald, or Rupert Holmes impersonator’s melody (what her father called “real music”). While her parents were boogieing with the other couples on the dance floor, she snuck out of the concert.

The deck was mostly empty, occupied by two older women gossiping and drinking pink fruity cocktails under wide floppy hats, three children screaming and laughing while playing tag, and a well-groomed man in a polo shirt and pressed khakis talking on his cell phone near the railing. Piper hurried toward the rear of the ship, her black heels clicking and gold bracelets clinking, hoping to distance herself from the still audible *"When you get caught between the moon and New York City..."*

Piper reached the aft of the Norwegian Bliss, shielding her eyes from the low-hanging sun, and pressed her body against the metal railing, enjoying the cool air from the ship's slow procession caressing her face and tangling its tendrils in her hair. She looked out over the water, smiling at the fiery streaks painted across its cerulean depths, until her gaze fell on the ship's wake, her eyes drawn to a rainbow-glinted stream following the vessel from Alaska. Piper stood perplexed at this discovery but was pulled from her thoughts by a metallic scraping noise on her right. Moving toward the port side of the ship, Piper let out a sharp, shocked gasp at what she saw: a brown, murky cloud spreading from the hull of the Norwegian Bliss into the waters below.

Piper was horrified. Her mind was racing, wondering what this substance leaking into the sea was, fearing its effect on the now-beloved Alaskan environment if it should spread that far, and curious whether the cloud was related to that iridescent trail she noticed earlier. As the cloud grew larger and darker, Piper grew frantic and scrambled to inform a crew member of the catastrophe she had witnessed.

Julie, the director of the Norwegian Bliss, was completing her rounds and making notes to the itinerary for tomorrow on her clipboard when she reached the stern of the ship and met Piper. Piper rushed over to the director and tried to explain what she had seen. Julie could feel the distress emanating from Piper, and the tears collecting in the young girl's eyes instilled panic in Julie's heart. Piper led Julie to the railing and pointed toward the murky substance spreading away from the vessel, still overwhelmed with fear. Julie, realizing what had troubled Piper, kneeled, placed her hands on Piper's shoulders, and explained what the teen had glimpsed.

"Sweetheart, calm down," Julie said in a soothing voice. "That cloudy water is simply the waste from the ship being discharged into the ocean. It is a common procedure on cruise ships. Don't let it worry you." She handed Piper her handkerchief.

Piper's face flashed from worry to outrage in an instant. "Forgive me, but I seem to have misheard you," she said, snatching the cloth from Julie's hand and dabbing her eyes. "Are you saying I should not be upset that this ship is dumping waste into the waters surrounding a place that holds so much natural beauty and precious wildlife, a land that has filled my heart

with unmeasurable joy? What do you mean this is a 'common procedure'? Why should I be content that you are knowingly polluting the environment? How could this be legal?"

Piper continued to rattle off indignant rhetorical questions in a fury for several minutes, her disposition growing more inexorable. Julie stood before Piper, absorbing the thorny comments the young woman vomited at her and trying to insert responses that could diffuse the situation. When Piper stopped to take a breath, Julie interjected quickly in an attempt to quell her anger.

"Miss, I understand your distress," Julie cooed in her most considerate voice. "I truly do. If you would be so kind as to follow me, I will take you to someone who will be able to answer all the questions you have about this issue, that I promise. Captain Cooke is just the man you should see." Piper nodded her head in agreement with the director's proposition.

Julie led Piper to the captain's office. They walked toward the bow of the Norwegian Bliss, up two flights of stairs, down a tight hallway, and through a set of glossy double-wooden doors. Julie sat Piper in a green leather chair inside the room and told her the captain would be in shortly. Julie painted on a smile and hurried out to fetch Captain Cooke.<sup>2</sup>

The office was wood-paneled and nautically decorated, with an antique globe table in the corner, a blue rug decorated with anchors and rope knots, a coat rack resembling a palm tree by the door, and a painting displaying two frigates locked in battle above the large mahogany desk littered with folders, pens, a laptop, and a lamp. There was a knock at the door, and a man in a white uniform and captain's hat strode in.

"Good evening," said the figure, hanging his hat on the coat rack. "My name is Gabriel Cooke. I am the captain of the Norwegian Bliss. It has come to my attention that you have some concerns about the activities of this ship, specifically waste management." He unbuttoned his suit jacket and sat down behind the desk. "How can I dissipate your qualms, young lady?" he asked, a warm smile falling over his face.

Piper studied him for a few moments before responding, taking in his calm demeanor. "Well, Captain Cooke, it is quite simple. I was enjoying the fruits of nature when I noticed your ship release waste into the waterways surrounding Alaska, a land I have become quite fond of and feel a responsibility to preserve. My question is this: How can you knowingly pollute this beautiful environment? And what about that rainbow-colored stream following the boat: is that waste too? Just because cruise ships have become an increasingly affordable and fashionable way to travel, how does that justify dumping? What else are you releasing into the ocean?" She concluded with an irate exhale.

Captain Cooke retained his disposition throughout Piper's tirade, shaking his head in understanding as she finished speaking. "Well," he started, "I cannot say your worries are mis-

placed. I, too, treasure the lands and waters of Alaska, and I do not want to see them polluted either. You see, cruise ships are like floating cities, and much like a city, they generate substantial amounts of waste, including sewage, graywater, hazardous wastes, oily bilge water, which is what you saw trailing the ship, ballast water, and solid waste. They also emit air pollutants into the air and water.<sup>3</sup>

"Fortunately, cruise ship discharge is treated to some of the world's most stringent standards. These waste streams are governed by several international protocols and U.S. domestic laws, regulations, and standards, but there is no single law or regulation.<sup>4</sup> We abide by Alaska Water Quality Standards, which require that surface waters and adjoining shorelines be free from floating oil, film, sheen, or discoloration.<sup>5</sup> Therefore, we thoroughly treat or 'clean' all waste before it is released from the ship and use scrubbers to remove harmful chemicals from the exhaust before it exits our funnels. Furthermore, Alaska's Department of Environmental Conservation (DEC) permits cruise ships to dump treated wastewater at least three miles offshore, a distance we are well over, or while moving at six knots or faster, anywhere, anytime in Alaska, a speed we are indeed making."<sup>6</sup>

"But why must you dump at all," interjected Piper. "I do not understand the reason behind it. Why couldn't you hold the waste below decks and dispose of it properly when the ship reached port instead of potentially destroying marine ecosystems or possibly irreparably damaging Alaska's coasts by releasing it into the ocean," Piper asked, still confused.

"That's a good question," answered Captain Cooke, "and one I have heard often. I wish it were as straightforward as all that. Cruise ships do carry some waste until they dock, but here is the problem with holding all of it: Holding the waste of thousands of people means making more room to contain the refuse; expanding waste containment spaces decreases the number of passengers a ship can ferry and increases the ship's weight; more weight means more fuel (because the vessel is moving slower), and fewer passengers and more oil consumption mean higher prices for travelers; higher prices further decreases the number of passengers we carry, which ultimately would decommission the cruise ship and destroy the Alaskan economy. It is a vicious cycle."

Piper nodded in understanding but stopped at the captain's last sentence. "What do you mean, 'destroy the Alaskan economy'?"

"As I'm sure you will agree," started Captain Cooke, taking Piper's question in stride, "Alaska is profoundly different and unique, having more mountains, glaciers, and wildlife than just about anywhere else in the U.S. That would explain why the state is considered the premier cruise destination in the country. I believe a recent article I was reading stated that, according to visitation records, Alaska receives 2.26 million travelers between May and September, year-

after-year. Furthermore, more than half of all visitors coming to Alaska arrive by cruise ship, with about 1,169,000 passengers in 2018 alone.”<sup>7</sup>

Captain Cooke stood up and started fumbling through some papers on his desk. Releasing an audible “a-ha,” he exhumed a document from a thick manila folder and, reaching across the desk, handed it to Piper. “Take a look at this,” he said. “It is from an economic report completed in 2019 that discusses the benefits cruise ship tourism brings to Alaska.” The paper contained the following graph:

| Cruise Ship Influences                            | Alaska      | Share of the U.S. |
|---------------------------------------------------|-------------|-------------------|
| <b>Passenger Embarkations</b>                     | 221,000     | 1.6%              |
| <b>Resident Cruise Passengers</b>                 | 16,000      | 0.1%              |
| <b>Total Passenger Visits &amp; Crew Arrivals</b> | 6, 115, 000 | 21.0%             |
| <b>Total Passenger &amp; Crew Onshore Visits</b>  | 4, 928, 000 | 21.0%             |
| <b>Direct Expenditures (\$ in millions)</b>       | 1,276       | 5.1%              |
| <b>Total Employment Impact</b>                    | 23,008      | 5.3%              |
| <b>Total Wage Impact (\$ in millions)</b>         | 1,226       | 5.0%              |

*For Original Table See: Cruise Lines International Association. (2020). Economic Contribution of the International Cruise Ship Industry in the United States in 2019. Business Research & Economic Advisors, pg. 51.*

“As you can see,” continued Captain Cooke, seating himself once more behind his large mahogany desk, “cruise ships are essential to Alaska, economically that is. Tourism-related businesses, such as tour operators, airlines, and hotels, received roughly \$807 million from cruise ship passengers. Onshore visits produced an estimated \$652 million in passenger and crew spending. These direct expenditures yielded a total economic impact of 23,000 jobs and \$1.2 billion in income throughout the Alaskan economy during 2019.<sup>8</sup> In comparison, the cruise ship industry produced \$55.5 billion in revenue for the entire United States and supported 436,600 American jobs, paying \$24.4 billion in wages in the same year.<sup>9</sup>

“In other words, tourism, specifically that created by cruise ship travelers, has quickly become an economic staple for Alaska, even considered by some to trump revenue produced by oil drilling.<sup>10</sup> Thousands of businesses depend on the passengers coming to Alaska to spend money on tours, public land permits, campgrounds, hotel stays, rental cars, restaurants, laundry services, gifts, equipment, and more, to simply live.<sup>11</sup> Even more, the income



produced by Alaska's tourism industry supports the state by funding capital expenditures, construction, operating equipment, marketing, and non-profit organizations.<sup>12</sup> Alaska needs tourist dollars to survive, and cruise ships are the means of bringing them."

Captain Cooke concluded his speech by taking a long sip from a white and blue *I learned everything I know from the Love Boat* mug on his desk and leaning back in his chair. Piper was still, her green eyes lost in thought, considering all the information the captain relayed to her. Suddenly, her red-painted lips plunged into a frown.

"So," Piper began, "let me see if I understand you correctly, Captain Cooke. Is what I am supposed to take away from your argument that waste dumping and marine pollution is permissible because cruise ships help pay the bills in Alaska and the U.S.? Is making money more consequential than protecting the environment? I'm sorry, sir, I don't think I can agree with that conclusion. When did protecting the earth that supports and inspires us become second in line to increasing capital gain?"

Captain Cooke smiled at the presentation of Piper's fervor. He set down his coffee mug and placed his elbows on the desk, interlocking his fingers in concentration while making eye contact with his enthusiastic guest.

"No," he started, "that is not what I am trying to say, although I applaud you for staying true to your ideals and listening to an opposing viewpoint. I am not declaring that the Alaskan environment should be sacrificed for the state's fiscal advancement, nor vice versa, for Alaska's beauty is what attracts tourists in the first place; I am saying this issue is not as black and white as you may see it. It is important to keep this vessel's discharges in some perspective because cruise ships represent a small—although significantly visible—portion of the entire international shipping industry, and the waste streams I described earlier are by no means unique to cruise ships.<sup>13</sup>

"Furthermore, Alaska has some of the most rigorous environmental standards in the world, and cruise lines entering the state's waters have voluntarily adopted higher standards than those required by state and federal law, spending hundreds of millions of dollars in recent years on upgrades intended to diminish their effect on the environment. Cruise Lines International Association (CLIA), the organization that almost all top cruise lines report to, including Norwegian Cruise Lines, has worked closely with federal and state regulators, the U.S. Coast Guard, and other agencies to ensure Alaska's waters and air stay safe and clean. Cruise ships visiting Alaska must carry permits from the Department of Environmental Conservation (DEC) and the Environmental Protection Agency, as well as approval from the U.S. Coast Guard, to discharge wastewater into the ocean. Under these permits, if a ship plans to discharge wastewater into Alaska's waters, they must abide by the most rigid requirements to prevent the

spread of bacteria, using advanced wastewater treatment systems that represent the best available technology.<sup>14</sup>

"I think you'll be most pleased to hear that not all cruise lines are out to make a 'quick buck,' although there are definitely a few companies who believe in nothing else. However, most are looking into emerging and existing technologies that can help reduce waste and fuel options that emit less carbon dioxide.<sup>15</sup> Most recently, the cruise industry has invested more than half-a-billion dollars in the development of new exhaust gas-cleaning technology to exceed federal air emissions regulations.<sup>16</sup> Many cruise lines are now trying to promote a more environmentally focused lifestyle among their crew and passengers while onboard by encouraging the recycling of glass, cans, and paper and reusing bed linens and towels.<sup>17</sup> CLIA members have even stopped using single-use plastics on their vessels.

"Listen, I know that was a lot of information to absorb at once, and it was not my intention to bombard you, but I want you to understand the complex dichotomy between the economic benefit and environmental consequences of cruise ship tourism. Currently, no perfect solution to this issue exists, probably because it is not a pressing topic in the news or within the walls of Congress. All we can do now is try to be proactive stewards of the earth, working to make any improvement that is possible, no matter how small. And who knows, with a spirit and resolve like yours, maybe you can be the change we need to make travel accessible and environmentally friendly in the future."

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Passengers were filing out of the Yacht Rock Concert as Piper walked along the main deck, running her fingers along the railing while her mind swirled with conflicting thoughts. Piper's parents, who had been looking for their daughter for the last ten minutes, rushed over to her.

"Piper!" her mother and father exclaimed together. "Thank goodness we found you! Where have you been?"

Piper considered her answer for a moment before responding. "I ... I was gaining a new perspective" She looked over the railing into the calm marigold sea below and smiled. "... and, while I may not agree with what was said, I am all the better for hearing it."

End Notes

¹ Piper is the "common man," the everyday observer who is curious about the world around her. She is also the environmentalist, concerned with preserving the earth's natural beauty and character. In comparison, Cooke is the economist and scholar, capable of understanding opposing arguments and providing information supporting his own.

² Captain Cooke is a combination of three individuals that I had the pleasure of conversating with in Alaska: Carol of the Morris Thompson Cultural and Visitor Center in Fairbanks, Lynda of Visit Anchorage Information Center, and the park ranger of Morris Thompson Cultural Center. He is also the culmination of all the research completed prior to writing this piece, as well as a reference to British explorer James Cook, the first person to map Alaska's coastline in 1788.

³ Copeland, C. (2010, December 15). *Cruise Ship Pollution: Background, Laws and Regulations, and Key Issues*. Congressional Research Service, pg. 3.

⁴ Copeland, C. (2010, December 15). *Cruise Ship Pollution: Background, Laws and Regulations, and Key Issues*. Congressional Research Service, pg. 6.

⁵ Southeast Alaska Conservation Council. (n.d.). *Cruise Ship Dumping Resources*.

⁶ Southeast Alaska Conservation Council. (n.d.). *Cruise Ship Dumping Resources*.

⁷ Resource Development Council for Alaska. (2020). *Alaska's Tourism Industry*.

⁸ Cruise Lines International Association. (2020). *Economic Contribution of the International Cruise Ship Industry in the United States in 2019*. Business Research & Economic Advisors, pp. 51-52.

⁹ Cruise Lines International Association. (2019, November 17). *Cruise industry contribution to U.S. economy grew to \$55.5 billion in 2019, generating more than 436,000 American Jobs*.

¹⁰ Comment made by the supervisor of Visit Anchorage Information Center, Lynda; Whitby, D. C. (2022). *LU@Alaska Field Notebook*. Longwood University.

¹¹ Resource Development Council for Alaska. (2020). *Alaska's Tourism Industry*.

¹² Resource Development Council for Alaska. (2020). *Alaska's Tourism Industry*.

¹³ Copeland, C. (2010, December 15). *Cruise Ship Pollution: Background, Laws and Regulations, and Key Issues*. Congressional Research Service, pg. 3

¹⁴ Cruise Lines International Association Alaska. (2019). *Safety and Environment: Exceeding Environmental Standards*.

¹⁵ Friends of the Earth. (2021, December 21). *Solutions to Cruise Ship Pollution*.

¹⁶ Cruise Lines International Association Alaska. (2019). *Safety and Environment: Exceeding Environmental Standards*.

¹⁷ Cruise Lines International Association Alaska. (2019). *Safety and Environment: Exceeding Environmental Standards*.

Sources

Copeland, C. (2010, December 15). *Cruise Ship Pollution: Background, Laws and Regulations, and Key Issues*. Congressional Research Service. Retrieved June 17, 2022, from <https://crsreports.congress.gov/product/details?prodcode=RL32450>.

Cruise Lines International Association. (2019, November 17). *Cruise industry contribution to U.S. economy grew to \$55.5 billion in 2019, generating more than 436,000 American Jobs*. Retrieved May 9, 2022, from <https://cruising.org/en/news-and-research/press-room/2020/november/cruise-industry-contribution-to-us-economy-grew-to-55-billion-in-2019#:~:text=Cruise%20Industry%20Contribution%20to%20U.S.,Than%20436%2C000%20American%20Jobs%20%7C%20CLIA>.

———. (2020). *Economic Contribution of the International Cruise Ship Industry in the United States in 2019*. Business Research & Economic Advisors. Retrieved June 30, 2022, from <https://cruising.org/-/media/research-updates/research/2019-usa-cruise-eis.ashx>.

Cruise Lines International Association Alaska. (2019). *Safety and Environment: Exceeding Environmental Standards*. Retrieved June 30, 2022, from <https://akcruise.org/safetyenvironment/meeting-environmental-standards/>.

Friends of the Earth. (2021, December 21). *Solutions to Cruise Ship Pollution*. Retrieved June 30, 2022, from <https://foe.org/blog/solutions-to-cruise-ship-pollution/>.

Resource Development Council for Alaska. (2020). *Alaska's Tourism Industry*. Retrieved May 9, 2022, from <https://www.akrdc.org/tourism>.

Southeast Alaska Conservation Council. (n.d.). *Cruise Ship Dumping Resources*. Retrieved June 30, 2022, from <https://www.seacc.org/water-quality/cruise-ship-dumping/>.

Whitby, D. C. (2022). *LU@Alaska Field Notebook*. Longwood University.

What Can You Do When Your Genes are the Enemy?

Current Applications of Gene Manipulation and the Associated Ethical Considerations

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Abstract

Over the past decade, there have been rapid advances in the field of genetic editing and gene therapy as techniques are becoming more precise and more reliable. Currently, there are gene therapies in use or development to treat a wide variety of human diseases, including cancer, hemophilia, retinal dystrophy, severe combined immunodeficiency, and spinal muscular atrophy. The use of gene therapy and gene editing can be a controversial topic. There are a variety of potential side effects, which raise questions of safety. Informed consent is another consideration, as is the potential stigmatization of those with disabilities linked to genetic causes. While most gene therapy applies to somatic cells, germline gene manipulation can involve editing the genetic material in reproductive cells, zygotes, and embryos, causing effects which are inheritable by future generations. Therefore, germline gene manipulation raises its own set of ethical questions. Germline gene manipulation could have unpredictable effects on the human gene pool. Additionally, some detractors are concerned that informed consent cannot be obtained from future offspring, who would also be affected by any change in germline cells. Given the rapid pace of scientific development, regulations must be put into place as soon as possible to ensure the ethical use of gene therapy and gene editing technologies.

Introduction

For most of human history, individuals with deleterious genes which result in debilitating or fatal diseases have had little recourse available to them other than symptom management. The last 50 years, however, have seen a rapid increase in the understanding of human genetics and inheritable diseases, and a subsequent advancement in medical science. The Genetic and Rare Diseases Information Center reports that as of 2019, 80% of the over 7000 human diseases reported have a basis in defective genes, but only around 500 of those diseases are treatable with drugs currently available to the public (Goswami et al. 2019). Therefore, the development of gene therapy and gene editing techniques represents an important step forward in the treatment and curing of human diseases.

The basic tenet of gene therapy as it stands today is that by introducing a corrected gene—a transgene—into the cells of an individual, it is possible to alleviate or entirely correct a disease which was caused by the faulty gene (Ingusci et al. 2019). Gene editing, on the other hand, involves changing the actual genome, to correct or alter a genetic sequence (Delhove et al. 2021). Gene editing is often considered a distinct subset of gene therapy. Typical gene therapy introduces a corrected gene into the cell, often using a viral vector, which provides the instructions the cell needs to produce the gene therapy product. Gene editing directly edits the genome itself to change how the cell produces the required gene product (Gene Editing, 2021).

Gene therapy was first tested on human subjects in 1990, when a clinical study was put into place by the U.S. National Institutes of Health (Anguela and High, 2018). This study involved pediatric patients with severe combined immunodeficiency (SCID) due to adenosine deaminase deficiency (ADA). Four-year old Ashanti de Silva was successfully administered gene therapy to introduce a corrected *ADA* gene, and she is considered to be the first gene therapy success story (Collins and Gottlieb, 2018; Sutton, 2018; Wirth et al. 2013). Subsequent gene therapy trials commenced, with varying levels of success and a few unexpected side-effects. Questions were floated among the scientific community about the safety of these rapidly developing gene therapy trials.

In 1999, the potential danger of gene therapy became undeniable with the accidental death of Jesse Gelsinger, a teenage patient in a clinical trial for the treatment of ornithine transcarbamylase deficiency syndrome, a hereditary disorder that affects the body's ability to filter ammonia out of the blood. Jesse was administered a treatment to fix the *OTC* gene, which encodes an enzyme important in preventing ammonia buildup. He suffered a massive immune response to the treatment, and died four days later (Collins and Gottlieb, 2018; Sutton, 2018; Wirth et al. 2013). In the aftermath of this tragedy, gene therapy trials ground to a halt as researchers took a step back to reassess. In the following decade, an extensive amount

of work was put into researching safer and more effective vectors for introducing gene therapy products and determining potential side-effects and how to mitigate them (Dunbar et al. 2018). With increasing advances in the science underlying gene therapy, the last 10 years have seen a rapid expansion in the applications of gene therapy techniques.

One major advancement in the field was the development of proteins capable of directly editing the genome. Some of the early mechanisms involved zinc finger nucleases (ZFNs), discovered in 2005, and transcription activator-like effector nucleases (TALENs), discovered in 2010 (Cavaliere, 2017). A more well-known system was first introduced to the public in 2015. Clustered regularly interspaced short palindromic repeat and CRISPR-associated protein 9, commonly referred to as CRISPR-Cas9, is an RNA-protein complex that can be used to precisely target and cut the genome. The development of CRISPR-Cas9 has led to several breakthroughs in the field of gene therapy and gene editing, which will be discussed later.

This paper will highlight some of the applications of gene therapy and gene editing which are currently approved for medical use or are in development in clinical trials worldwide. Additionally, ethical issues related to the use of gene therapy and gene editing will be discussed, with special consideration given to the controversial ethics of germline gene manipulation. Finally, this paper will conclude with a discussion of the policies and regulations in place or being considered related to gene therapy.

Classifications of Gene Therapy and Gene Editing

Gene therapy and gene editing techniques can be classified as either somatic gene manipulation or germline gene manipulation. Somatic gene manipulation involves manipulating the somatic cells in the body, which includes all the cells except germ cells. Germline gene manipulation targets reproductive cells—sperm and eggs—and zygotes or early-stage embryos (NASEM, 2017). Because germline manipulation targets the reproductive cells, whatever changes are made are inheritable by an individual's offspring. Somatic manipulation is non-heritable. Whatever changes are made to the cell remain with the patient and cannot be passed down to offspring (Delhove et al. 2021; Goswami et al. 2019; Wirth et al. 2013) The distinction between these two forms of genetic manipulation is highly relevant in issues of public acceptability and policy making (Delhove et al. 2021), as will be discussed later in this paper.

Somatic Gene Therapy

There are currently 13 approved gene therapy products on the market in either the United States or European Union (**Table 1**). Gene therapy clinical trials in progress worldwide are too numerous to list.

Tradename (proper name)	Year of approval	Approving Agency	Indication	Viral Vector	Manufacturer
IMLYGIC™ (talimogene Laherparepvec)	2015 2015	FDA EMA	Melanoma	Herpes simplex vector	Amgen Inc. (Thousand Oak, California, USA)
Strimvelis™	2016	EMA	Adenosine deaminase deficiency (ADA-SCID)	Gamma-retroviral vector	GlaxoSmithKline (Middlesex, United Kingdom)
Kymriah™ (tisagenlecleucel)	2017 2018	FDA EMA	Acute lymphoblastic leukemia	Lentiviral vector	Novartis Pharmaceuticals (Basel, Switzerland)
Yescarta™ (axicabtagene ciloleucel)	2017 2018	FDA EMA	B-cell lymphoma	Gamma-retroviral vector	Kite Pharma, Incorporated (Santa Monica, California, USA)
Luxturna™ (voretigene neparvovec-rzyl)	2017 2018	FDA EMA	Retinal dystrophy (biallelic RPE65 mutation)	Adeno-associated vector	Spark Therapeutics, Inc. (Philadelphia, Pennsylvania, USA)
ZOLGENSMA® (onasemnogene Apeparvovec-Xioi)	2019 2020	FDA EMA	Spinal Muscular Atrophy	Adeno-associated vector	Novartis Gene Therapies, Inc. (Chicago, Illinois, USA)
ZYNTEGLO™ (betibeglogene autotemcel)	2019	EMA	Beta-Thalassemia	Lentiviral vector	Bluebird bio, Inc. (Cambridge, Massachusetts, USA)
TECARTUS™ (brexucabtagene autoleucel)	2020 2021	EMA FDA	Mantle cell lymphoma	Gamma-retroviral vector	Kite Pharma, Inc. (Los Angeles, California, USA)
Breyanzi® (lisocabtagene maraleucel)	2021	FDA	B-cell lymphoma	Lentiviral vector	Juno Therapeutics, Inc. (Seattle, Washington, USA)
ABECMA™ (idecabtagene vicleucel)	2021 2021	FDA EMA	Multiple myeloma	Lentiviral vector	Celgene Corporation (Summit, New Jersey, USA)
Skysona™ (elivaldogene autotemcel)	2021	EMA	Cerebral adrenoleukodystrophy	Lentiviral vector	Bluebird bio, Inc. (Cambridge, Massachusetts, USA)
CARVYKTI™ (ciltacabtagene autoleucel)	2022	FDA	Multiple myeloma	Lentiviral vector	Janssen Biotech, Inc. (Horsham, Pennsylvania, USA)

Table 1. Approved gene therapy products in the United States and European Union. Abbreviations: FDA - United States Food and Drug Administration, EMA - European Medicines Agency. Adapted from: Ginn et al. 2018 and OTAT, 2022.

Cancer Therapies

To date, the bulk of gene therapy research and development has centered on the field of cancer treatments. One approach to treating cancer with gene therapy involves using oncolytic viruses. Oncolytic viruses can target cancer cells without harming other tissues. One of the earliest approved cancer gene therapies was IMLYGIC™, developed for the treatment of melanoma patients. IMLYGIC™ works using a modified herpes simplex, which can selectively replicate in tumor cells and synthesize a colony stimulating factor that results in lysis of the tumor cells. This releases tumor antigens, which then stimulates an immune response against the tumor cells (Anguela et al. 2018; Goswami et al. 2019; Imlygic, 2021). Remission rates for patients using IMLYGIC™ are about 50% (Goswami et al. 2019).

Another approach to cancer gene therapy involves the use of chimeric antigen receptor (CAR) T cells. CAR T cells are genetically engineered *ex vivo* (outside the body) to target tumor-specific cell surface antigens, helping the immune system to recognize and destroy cancer cells (Anguela et al. 2018; Ginn et al. 2018; Kaufmann et al. 2013). The most common target of CAR therapies is CD19, an antigen which is found in many B cell malignancies. Since their first usage in the late 2000s, CAR therapies targeting CD19 have been used in clinical trials for the treatment of B cell lymphoma, chronic lymphocytic leukemia, B cell acute lymphoblastic leukemia, and multiple myeloma (Anguela et al. 2018, Dunbar et al. 2018).

There are several CAR-related gene therapy products currently on the market in the United States and/or European Union. Kymriah™ was developed for the treatment of B-cell acute lymphoblastic leukemia and diffuse large B-cell lymphoma, both of which are cancers of the blood (Goswami et al. 2019; Kymriah, 2022). Kymriah™ is CAR T cell therapy created using a lentiviral vector, which targets and kills malignant CD19-expressing cancer cells. Overall, the remission rate in patients treated with Kymriah™ is 83% (Goswami et al. 2019). There are several similar CAR T cell treatments on the market. Yescarta™ is used to treat diffuse large B-cell lymphoma and primary mediastinal large B-cell lymphoma patients (Yescarta, 2021), while TECARTUS™ is used to treat mantle cell lymphoma patients (Tecartus, 2021). While the previously mentioned CAR T cell treatments are approved and available in both the United States and European Union, Breyanzi® is another treatment for B cell lymphoma which is only available in the United States (Breyanzi, 2021).

While CD19-expressing cells initiated CAR T cell therapy research, there are other antigens which can be targeted by these therapies. ABECMA™ is a treatment for multiple myeloma, a cancer that forms in white blood cells called plasma cells. ABECMA™ targets B-cell maturation antigens and is available in both the US and EU (Abecma, 2021). A second gene therapy treatment for multiple myeloma is currently only available in the US. CARVYKTI™ also targets B-cell maturation antigens (Carvykti, 2022).

Hematopoietic stem cell therapies

Hematopoietic stem cells (HSCs) are the self-renewing precursors to all types of blood cells. Many *ex vivo* gene therapies have been developed using HSCs to target a variety of genetic diseases (Anguela and High, 2018; Dunbar et al. 2018). One of the earliest gene therapy trials, conducted in the late 1990s, was developed for the treatment of hereditary X-linked severe combined immunodeficiency (SCID-X1). SCID-X1 is caused by a mutation in a gene encoding part of the cytokine receptor, resulting in a deficient immune system lacking T cells and natural killer cells, and possessing defective B cells. The disease is often fatal early in life (Anguela and High, 2018). The early SCID-X1 trials used gammaretroviral vectors, while more recent trials have shifted to the use of the relatively safer lentiviral vectors (Ginn et al. 2018). SCID-X1 gene therapies have shown significant clinical benefits, demonstrating a partial restoration of natural killer cell and B cells, and in some cases, complete correction of the T cell deficit (Anguela and High, 2018).

ADA-SCID is another rare genetic immunodeficiency which has been successfully treated with gene therapies. Adenosine deaminase deficiency related SCID is caused by a mutation in the gene that codes for adenosine deaminase production and results in the absence of T cell and B cell lymphocytes (Anguela and High, 2018; Kaufmann et al. 2013). Strimvelis™ is a retroviral gene therapy for the treatment of ADA-SCID, which was authorized for use in human patients in the European Union in 2016. Strimvelis™ contains CD34+ cells (lymphocyte-creating cells) extracted from the patient's own bone marrow, which are genetically modified to contain a functioning *ADA* gene. The modified cells are then reinfused into the patient, where they travel to the bone marrow and begin creating healthy lymphocytes (Strimvelis, 2021).

Hematopoietic stem cell therapies are also being used to treat the hemoglobinopathies β -thalassemia and sickle cell disease (SCD). Both diseases affect a person's red blood cells, and many patients with β -thalassemia or sickle cell disease require frequent blood transfusions. Patients with β -thalassemia do not produce enough beta-globin, a required component of hemoglobin found in red blood cells. Approved by the European Medicines Agency in 2019, ZYNTGLO™ is a gene therapy product developed for the treatment of transfusion-dependent β -thalassemia (TDT) patients. Stem cells are collected from the patient's blood and genetically modified using a lentiviral vector carrying a working copy of the beta-globin gene. Chemotherapy is used to clear the patient's bone marrow of cells, and then the modified stem cells are reinfused into the body, where they travel to the bone marrow and begin making healthy red blood cells (Zynteglo, 2021). Gene therapies are also in development to treat sickle cell disease (Anguela and High, 2018).

Retinal therapies

In 2008, three independent clinical trials reported the first use of a gene therapy product to treat a genetic eye disorder, Leber's congenital amaurosis (LCA), a family of retinal dystrophies that can be caused by mutations in many different genes. The patients in these clinical trials had LCA-2, a form of LCA caused by mutations in the *RPE65* gene that codes for a protein called retinal pigment epithelium-specific 65 kDa. Mutations in this gene cause deficiency in photoreceptors and loss of vision. In these trials, AAV2 vectors were used with subretinal injection to transfer a functional copy of the *RPE65* gene, resulting in some improvement in vision (Dunbar et al. 2018; Kaufmann et al. 2013). These trials resulted in the first gene therapy product targeted at a genetic vision disorder, Luxturna™, which was approved for the treatment of LCA-2 patients by the FDA in 2017 and the EMA in 2018 (Goswami et al. 2019; Luxturna, 2021).

Since the approval of Luxturna™ demonstrated the safety and potential benefits to be gained, gene therapy treatments have been investigated for use in several blindness disorders, many of which have a primarily genetic basis. In 2018, results were published on a gene therapy clinical trial for the treatment of choroideremia. Choroideremia is an X-linked genetic retinal degenerative disorder caused by mutations in the gene encoding for Rab-escort protein 1 (Rep1). A deficiency in Rep1 results in the breakdown of the retinal pigment epithelium and photoreceptors of the eye, leading to night blindness and progressive loss of vision. Phase 1/2 clinical trials testing an adeno-associated virus (AAV)-mediated gene therapy product containing a functional copy of the Rep1-encoding gene resulted in an improvement in visual acuity across all treated patients (Xue et al. 2018). In contrast, a recent phase 1 clinical trial testing an AAV-mediated gene therapy for the treatment of retinitis pigmentosa caused by mutations in the *MERTK* gene reported limited success. This disappointing outcome may be a result of the fact that retinitis pigmentosa is a more quickly degenerating disease than choroideremia, with a smaller window of time in which treatment can be effectively administered (Askou et al. 2020).

Hemophilia therapies

Hemophilia is an X-linked genetic bleeding disorder. Hemophilia comes in two forms: hemophilia A, caused by mutations in the genes encoding clotting factor VIII, and hemophilia B, caused by mutations in the genes encoding clotting factor IX. The traditional treatment for hemophilia is regular intravenous infusions of clotting factors (Anguela and High, 2018.) Recently, a phase 2 clinical trial was conducted for the treatment of hemophilia B, using AAV-mediated gene therapy to introduce the human factor IX (hFIX) gene to the liver, where hepatocytes

generate the clotting factor. Patients showed an increase in clotting factor IX to around 30% of the normal level, which was sufficient to reduce bleeding and mitigate the need for frequent transfusions. Numerous phase 1/2 clinical trials are underway for the treatment of hemophilia A and B (Dunbar et al. 2018; Ginn et al. 2018; Goswami et al. 2019)

CNS and neuromuscular therapies

Diseases of the central nervous system are often extremely degenerative, and many of them do not currently have cures or even very effective treatments. Research has shown that certain serotypes of AAVs are quite effective at transducing neurons and other CNS cells, and so AAV-mediated gene therapies are in development to treat a variety of CNS and neuromuscular diseases, including but not limited to Parkinson's disease, Canavan disease, Batten disease, ALS, and Alzheimer's (Anguela and High, 2018; Naso et al. 2017). Early results from clinical trials have demonstrated that AAV-mediated gene therapy introducing the aromatic L-amino acid decarboxylase (AADC) gene to be an effective treatment for both Parkinson's disease and for AADC deficiency (Dunbar et al. 2018).

X-linked adrenoleukodystrophy (ALD) is a fatal neurodegenerative disease affecting the neurons of the central nervous system. Patients with ALD experience a progressive destruction of the myelin sheaths which protect the neurons of the brain and spinal cord. (Anguela and High, 2018; Kaufmann et al. 2013). ALD results from a mutation in a gene which encodes the adrenoleukodystrophy protein (ALDP). Gene therapies using lentiviruses targeting hematopoietic stem cells have been effective in stabilizing, if not curing, the disease (Anguela and High, 2018; Ginn et al. 2018). Approved in the EU in 2021, Skysona™ is used in children under 18 to treat X-linked cerebral adrenoleukodystrophy (CALD), the most severe form of adrenoleukodystrophy. Skysona™ is created by exacting CD34+ cells from the patient's blood and genetically modifying them to express a functioning ALDP gene. Reinfusion into the patient allows their bone marrow to begin producing healthy CD34+ cells which are capable of making functioning adrenoleukodystrophy protein. The results from one clinical trial showed that 90% of pediatric patients treated showed no signs of neurodegeneration after 1 year, compared to 29% of untreated patients in a similar study. The results are expected to be long-lasting (Skysona, 2021).

Spinal muscular atrophy (SMA) has recently emerged as a promising target for treatment with gene therapy. Childhood onset SMA type 1 is a fatal neurodegenerative disorder, and the most common genetic cause of death in infancy. Less than 20% of patients survive unsupported by ventilators past 20 months of age (Anguela et al. 2018). SMA type 1 is caused by a mutation in the survival motor neuron (SMN) 1 gene, which decreases the number of functional motor neurons in the spinal cord, leading to muscle loss. In phase 1 clinical trials, a

serotype of AAV was engineered to be able to effectively cross the blood-brain barrier, carrying a functional *SMN1* gene, and administered intravenously to a group of infants and young children. Results of the study showed that, in comparison to untreated subjects, patients who received the treatment had increased survival rates and improved motor function (Dunbar et al. 2018). As a result of these trials, the gene therapy product ZOLGENSMA® was approved in the US in 2019 and the EU in 2020 for the treatment of SMA type 1 in children 2 years of age or younger (Zolgensma, 2021)

Somatic Gene Editing

Mechanisms of Gene Editing

Gene editing techniques center around the concept of introducing a double-strand break (DSB) using DNA-cleaving enzymes called nucleases. Once a DSB has been created, it can be repaired using the cell's DNA repair mechanisms. Cells have evolved these DNA repair mechanisms because double-stranded breaks occur naturally in the cell during DNA replication, or because of chemical damage or radiation (NASEM, 2017). One such mechanism is called non-homologous end joining (NHEJ). NHEJ-mediated repair is imprecise, frequently causing insertion or deletion mutations, which result in deactivation of the gene, called gene knockout (Dunbar et al. 2018). To perform gene insertion or gene repair, however, homology-directed repair (HDR) of the double-stranded break is used (Ingusci et al. 2019). HDR relies on the use of a DNA template that has sequences of nucleotides that are homologous to the region where the gene manipulation is intended to occur. This allows scientists to make more precise changes to the genome than is possible with NHEJ-mediated repair and can be used to correct a mutation in the gene or to insert an entire gene into the genome (Maeder and Gersbach, 2016). A summary of these two mechanisms can be found in **Figure 1**.

There are two major nucleases which have been well established for use in genome editing. Zinc finger nucleases (ZFNs) were first developed in 2005, while transcription activator-like effector nucleases (TALENs) were developed in 2010 (Dunbar et al. 2018). ZFNs and TALENs are composed of a DNA-binding protein domain joined to a DNA-cleaving protein domain. Both ZFNs and TALENs can be specifically engineered to recognize short segments of DNA, which allows scientists to make targeted changes to the genome through either NHEJ or HDR mechanisms. However, it is often costly and time consuming to engineer novel DNA binding protein domains for each specific genome change that is performed (Maeder and Gersbach, 2016; NASEM, 2017). The discovery in 2012 of the CRISPR/Cas9 system represented a huge step forward for the field of genome editing. Clustered regularly interspaced

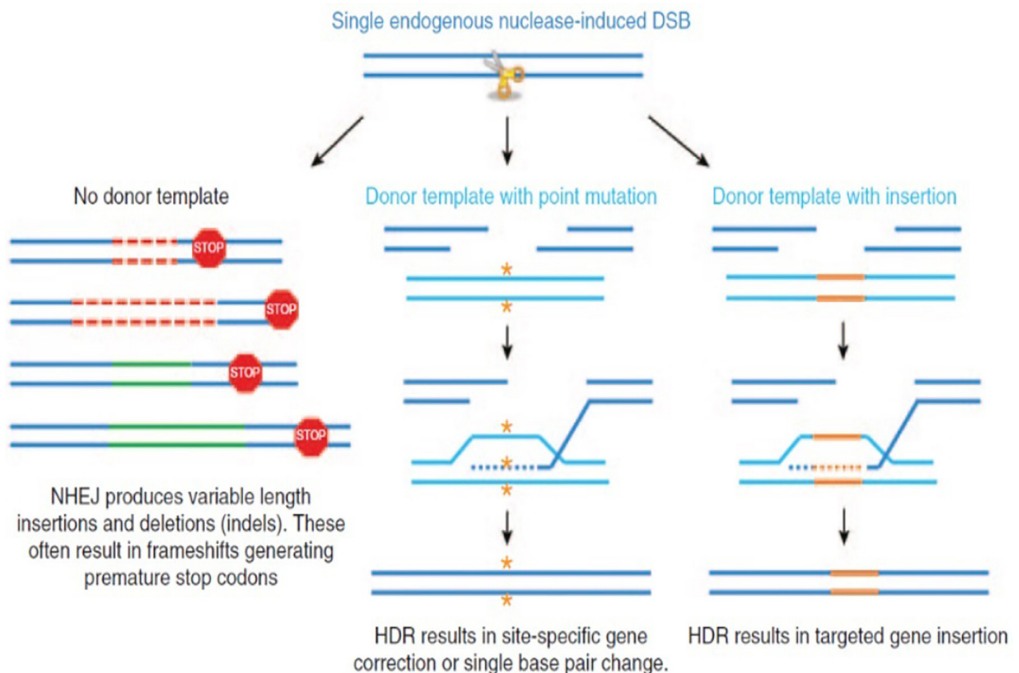


Figure 1. Result of genome editing techniques. Non-homologous end joining results in insertion and deletion mutations, which can cause gene knockout. Homology-directed repair can be used to precisely correct a gene or insert a gene. Sourced from Uddin et al. 2020.

short palindromic repeat (CRISPR)-CRISPR-associated 9 (Cas9) were discovered as part of a defense system used by some bacteria to avoid pathogenic infections (Cavaliere, 2018; Dunbar et al. 2018). CRISPER-Cas9 does not require the engineering of novel proteins to function. Rather, a short and easily altered section of guide RNA is used to direct the nuclease to the exact site of DNA cleavage. (Maeder and Gersbach, 2016)

Gene Editing Clinical Trials

Therapeutic gene editing is in its infancy. To date, there are no approved gene editing products on the market, but there are many clinical trials involving gene editing techniques. Results from one of the first clinical trials using gene editing technologies were published in 2014. In this trial, ZFNs were used *ex vivo* to modify the human CC chemokine receptor 5 (CCR5) gene in CD4 T-cells to induce a 32-bp deletion mutation previously associated with individuals known to be resistant to HIV infection. Patients with HIV were infused with au-

tologous modified CD4 T-cells, and it was found that generally the modified T-cells had a higher survival rate than unmodified T-cells, and that the number of CD4 T-cells in the system increased because of treatment (Tebas 2014).

In 2018, researchers developing *ex vivo* gene-editing based cell therapies for beta-thalassemia and sickle cell disease engineered ZFNs to target the *BCL11A* gene in hematopoietic stem cells, resulting in an increase in the production of fetal hemoglobin (Holmes et al. 2018). Fetal hemoglobin is usually not expressed beyond a few months after birth, but it has been shown in previous studies that elevated fetal hemoglobin levels are therapeutic for beta-thalassemia and sickle cell patients, and inactivation of the *BCL11A* gene has been shown to correct sickle cell disease in mice (Mullard, 2020). Phase 1/2 clinical trials testing Sangamo Therapeutics' cell therapies ST-400 and BIVV003, for beta-thalassemia and sickle cell disease respectively, are currently underway, according to ClinicalTrials.gov. Another gene-edited therapy for the treatment of sickle cell disease also entered clinical trials in 2019. CTX001 is a CRISPR/Cas9-edited hematopoietic stem cell therapy produced by Vertex Pharmaceuticals Incorporated and CRISPR Therapeutics, and is currently in Phase 3 clinical trials, according to ClinicalTrials.gov. CTX001 also aims to increase expression of fetal hemoglobin to therapeutic levels (Mullard, 2020).

Researchers are also beginning to test gene-edited treatments for cancer. In 2019, scientists at the University of Pennsylvania entered phase 1 clinical trials to test the CRISPR-engineered NYCE T-cell treatment for cancer patients. To develop these therapeutic T-cells, CRISPR-Cas9 was used *ex vivo* to knock out genes encoding T-cell receptors (TCRs) and the regulatory checkpoint PD1. Lentiviral vectors were then used to insert a transgene for TCRs recognizing the cancer antigen NY-ESO-1. Preliminary results of the trial demonstrated the safety of using CRISPR-Cas9 engineered products in human patients. Additionally, engineered T-cells were found to persist longer in the patients' systems than non-engineered T-cells, demonstrating the therapeutic effects of the treatment (Mullard, 2020; Stadtmauer et al. 2020). There are numerous other gene-edited immuno-oncology products either currently in clinical trials or approaching clinical trials, using not only CRISPR but also TALENs as the editing machinery (Mullard, 2020).

In vivo gene-editing is also being tested. EDIT-101 is an *in vivo* CRISPR-based gene editing treatment for patients with Leber congenital amaurosis-10 (LCA10), a serious disorder of the retina that is caused by loss-of-function mutations in the *CEP290* gene. LCA10 patients generally present during infancy with severely limited vision or complete blindness. Currently in phase 1/2 clinical trials, EDIT-101 is designed to target the most common mutation known to cause LCA10, a point mutation in intron 26 of the *CEP290* gene which results in the aberrant

splicing that gives rise to the vision loss associated with LCA10. Using CRISPR machinery, researchers removed the part of the gene that causes aberrant splicing, with the hopes of restoring normal CEP290 expression. Preliminary results demonstrated the safety of the technique in animal trials, with human trials representing the next step in the research (Maeder et al. 2019; Mullard, 2020).

Intellia Therapeutics is developing a CRISPR-based gene-editing product for the treatment of the rare genetic disease ATTR amyloidosis. ATTR amyloidosis is caused by mutations in the gene that codes for the protein the transthyretin (TTR). These mutations result in the buildup of misshapen TTR protein in the body, which can be life-threatening if untreated. Scientists at Intellia developed an *in vivo* CRISPR-based gene editing treatment, NTLA-2001, administered intravenously, which knocks down the *TTR* gene in hepatocytes and leads to overall reduction in TTR protein synthesis. Initial results from human trials indicate that NTLA-2001 is associated with only mild adverse side-effects and does demonstrate the ability to decrease TTR protein synthesis (Gillmore et al. 2021; Mullard, 2020).

Aside from the previously mentioned examples, gene editing has broad potential applications, including using gene disruption to treat dominant mutations in neurodegenerative diseases like Huntington's and treating Duchenne's muscular dystrophy by deleting the disease-causing exon in the DMD gene (NASEM, 2017).

Germline Gene Manipulation

Germline gene manipulation is an incredibly controversial topic, as will be discussed later in this review. As such, there are few clinical trials currently working on manipulation of germline cells, and certainly no approved products on the market. In the United States, current regulations stipulate that no government funding can be used to support any research into germline gene manipulation in humans (Dunbar et al. 2018). Similar regulations are in place in other countries as well. This is not to say, however, that germline gene manipulation has *never* been performed on a human subject, as the scientific community found out quite explosively back in 2018, courtesy of Dr. He Jiankui of China. He announced in November of 2018 that he had used CRISPR to genetically edit human embryos, which were then implanted, leading to the birth of two twin girls. The modification that He made to these embryos targeted the *CCR5* gene, in order to induce a mutation that occurs naturally in part of the population, and which has been shown to confer HIV resistance. Of the two girls, only one had successful edits in both copies of the gene, although the ultimate ramifications for the two girls are currently unknown. He Jiankui, however, was sentenced to three years in jail and a 3 million yuan fine for illegal human experimentation (Cwik et al. 2019; Uddin et al. 2020).

While He's questionable experiments are the only known example of germline gene manipulation in an actual human subject thus far, there have been clinical trials performed in human cells purely for research, with no actual intention of implantation. In 2017, results were published from a trial in which CRISPR was used to target the *MYBPC3* gene, mutations in which have been demonstrated to be a cause of hypertrophic cardiomyopathy (HCM). HCM is an autosomal dominant disorder, in which inheriting only a single copy of the mutated gene is sufficient to cause the disease. (Cwik et al. 2019; Ma et al. 2017). By introducing the CRISPR machinery to an oocyte simultaneous with *in vitro* fertilization, researchers were able to induce the zygote to replace the mutated copy of the *MYBPC3* gene via homology-directed repair, resulting in an embryo homozygous for the healthy allele of the gene. While these embryos were not implanted, the research represents a step forward in the development of genome editing as a tool to prevent inherited diseases (Cwik et al. 2019).

Germline gene manipulation is currently barely existent, and there are many scientific hurdles that will need to be addressed before any large-scale clinical trials are possible. But one can envision a potential future for germline gene manipulation. One day, it may be possible to prevent passing on a hereditary disease to one's offspring by editing the genome to remove the cause of the disease. For example, two individuals at risk of passing on the genes for an autosomal dominant disease like Huntington's, in which preimplantation embryo screening is not always useful for preventing disease transmission, (NASEM, 2017) could have a child with no risk of developing the disease. In fact, they could ensure that none of their descendants would carry the gene. Germline manipulation could also be used to lessen the possibility of developing serious illnesses in the future. Couples having children might choose to edit out *BRCA1* genes associated with breast cancer, for instance (Coller, 2019). And as one might imagine, such future possibilities raise several ethical questions and concerns which will need to be addressed by medical ethicists and policy makers.

Ethical Considerations

Safety

Safety is a key ethical consideration for any medical procedure and product used on human patients. Gene therapy becomes safer every year, as research continues and techniques are advanced. Still, there are some safety hurdles that must be addressed, and undoubtedly new obstacles will present themselves in the future. It is therefore worth taking a look at some of the safety concerns that have been previously raised and how they relate to the future of gene therapy.

In the early days of gene therapy during the 1990s, two major safety concerns were first identified. Firstly, for the integrating retroviral vectors used in *ex vivo* treatments, there is the risk of insertional mutagenesis, often called genotoxicity. Insertional mutagenesis occurs when a viral vector inserts its genome into the host chromosomal genome. When uncontrolled, this can cause unexpected and potentially dangerous effects, as was seen in early gene therapy trials using gammaretroviral vectors. In the 1996 X-linked SCID trials using gammaretroviral vectors conducted in the 1990s, 25% of patients later developed T cell leukemia, eventually identified as caused by an insertional mutagenesis event, where the vector inserted itself upstream of a proto-oncogene (Anguela and High, 2018; Delhove et al. 2021). One of the five patients eventually died after unsuccessful chemotherapy. As a result of this trial and others like it, new vectors were derived that are less likely to lead to insertional mutagenesis events. Lentiviral vectors, for instance, are more likely to integrate into the genome in the coding region of the gene, which does not cause the same type of dangerous, cancer prone mutagenesis events that are seen in the early gammaretroviral vectors, which tend to integrate near regulatory regions of genes (Dunbar et al. 2018; Goswami et al. 2019; Kaufmann et al. 2013). The development of precise gene editing techniques offers a potentially powerful solution to the worry of insertional mutagenesis events, by allowing sequence-specific integration (Anguela and High, 2018).

The second major safety concern that was first noted in the early years of gene therapy is the risk of immune response in patients as a result of a gene therapy product, referred to as immunotoxicity. The choice of viral vector, in particular, affects the type of immune response that might be seen in the patient (Anguela and High, 2018; Goswami et al. 2019). Some of these immune responses can be fatal, as seen in the case of Jesse Gelsinger mentioned in the introduction. However, some immune responses only affect the efficacy of the treatment. For example, in the early AAV-mediated gene therapy trials for the treatment of hemophilia B, patients experienced an unexpected drop off in the activity of the transgene. It was eventually determined that the patients' immune system T cells were reacting to the AAV2 vector capsid and destroying the modified hepatocytes, causing a drop in therapeutic clotting factor gene expression. This immune response was not seen in a later trial that used a different AAV serotype. Of note, the presence of AAV-neutralizing antibodies in patients continues to be an obstacle to hemophilia A gene therapy trials. AAV vectors in general are known for a high level of immunotoxicity, sometimes necessitating immunosuppressants be used in conjunction with AAV therapies (Anguela and High, 2018; Ingusci et al. 2019).

Immunotoxicity is a well-known problem in gene therapy trials using CAR T cells. One notable side effect of CAR T cell therapies is cytokine release syndrome (CRS). In some patients,

the replication of CAR T cells can lead to the release of large amounts of cytokines into the blood. Cytokines are proteins involved in cell signaling, and accumulation in the blood can put the immune system on high alert, leading to a number of unpleasant symptoms including fever, elevated heartbeat, breathing trouble, nausea, vomiting, and muscle and joint pain. Very severe cases of CRS can be fatal. Preventing and managing cytokine release syndrome in CAR gene therapy patients is an area of active research in the gene therapy developmental community (Brudno and Kochenderfer, 2016).

Gene editing also has its own set of associate safety concerns. Off-target mutations can happen because the editing machinery tolerates some base pair mismatching with the DNA sequences which guide the nucleases to their target (Dunbar et al. 2018; Maeder and Gersbach, 2016; NASEM, 2017). Off-target effects of gene editing can lead to mutations in important genes like tumor suppressors. Additionally, genomic instability is a risk (Cring and Sheffield, 2020). The development of CRISPR-Cas9 helped to mitigate some of these safety concerns, as it allows much more precise targeting of DNA cleavage and gene repair. Even still, off-target DNA cleavage is still possible (Dunbar et al. 2018).

Immunotoxicity concerns also apply to gene editing as they do to gene therapy techniques, as viral vectors which may trigger immune responses in the patient are also used in gene editing techniques (Maeder and Gersbach, 2016; NASEM, 2017). The editing proteins themselves may also invoke an immune response from the patient. Additionally, some patients may have preexisting antibodies that work against components of the editing system, causing inflammation and possibly other currently unknown side-effects. Such antibodies have been detected in humans that were previously exposed to bacteria that have CRISPR systems of their own (Doudna, 2020).

Informed Consent

Informed consent is an important ethical concern in any medical procedure or treatment, born of a history of unethical practices in the early days of medical science (Caplan, 2019). As a result, clinical trials involving human patients are subjected to rigorous informed consent procedures, and any trial involving gene manipulation should be held to the same standards. A major hurdle in informed consent concerns treatment of children. There are many genetic diseases that could be treated with gene therapy or gene editing that would be best addressed in early childhood, well before children are old enough to issue informed consent. There is precedent established in the case of other medical procedures and treatments in which parents can give informed consent in place of their children, and there are policies and regulations in place to support this (Delhove et al. 2021). It is reasonable to assume that such would be the case for gene therapy treatments as well.

Stigmatization of Disabilities Related to Genetics

A less frequently mentioned but equally important ethical concern related to genetic manipulation involves the potential to increase stigmatization of individuals with disabilities. Conditions for many individuals with disabilities have improved greatly in comparison to much of human history. The Americans with Disabilities Act, passed in 1990, was a huge step forward, and today there are many advocacy groups and accommodations in place for individuals with a variety of conditions labeled as disabilities (Coller, 2019). Many members of the disability community view genetic technologies warily. Widespread use of genetic technologies targeting genes which cause conditions viewed as disabilities has the potential to create stigmatization for individuals who choose to forgo these technologies (NASEM, 2017). The deaf community is an excellent example. While deafness is considered a disability by many members of the public, including many medical professionals, most of those in the deaf community do not consider it a disability. To them, deafness is a part of their culture, and those who advocate correcting deafness (using cochlear implants, for example, or genome editing in the future) are attacking their culture (Coller, 2019). This potential of genetic technologies to increase stigmatization of those with disabilities has a more dramatic endpoint in the case of germline gene manipulation, as will be addressed in the next section.

Germline Gene Manipulation

Germline gene manipulation comes with its own set of ethical considerations, some of which are similar to that of somatic gene manipulation, such as a concern for safety and informed consent, while others are unique (**Figure 2**).

As in gene therapy and somatic gene editing, safety is a pressing concern in germline gene manipulation. Gene editing is currently in its infancy and much more research is needed before its safety can be assured. Current germline editing efficiency is low, and embryos with abnormal numbers of chromosomes is a common problem (Cavaliere, 2017; Delhove et al. 2021). Mosaicism is also of particular concern. If genome editing were performed on a zygote, it is possible that the changes may not occur right at the one-cell stage. If the changes occur once the cells have begun to divide, some of the cells in the resulting embryo would develop without the genetic changes, which is referred to as mosaicism, a potentially serious problem. It is also possible the mosaicism would be present in the resultant child's germ cells, passing the problem on to their offspring as well (NASEM, 2017). Because changes made to germline cells are inheritable, the safety bar should reasonably be placed higher than that of somatic gene editing, simply because germline editing has the potential to affect more than just the patient. Years and possibly decades of research are still needed before germline gene editing should be introduced as a publicly available medical tool.

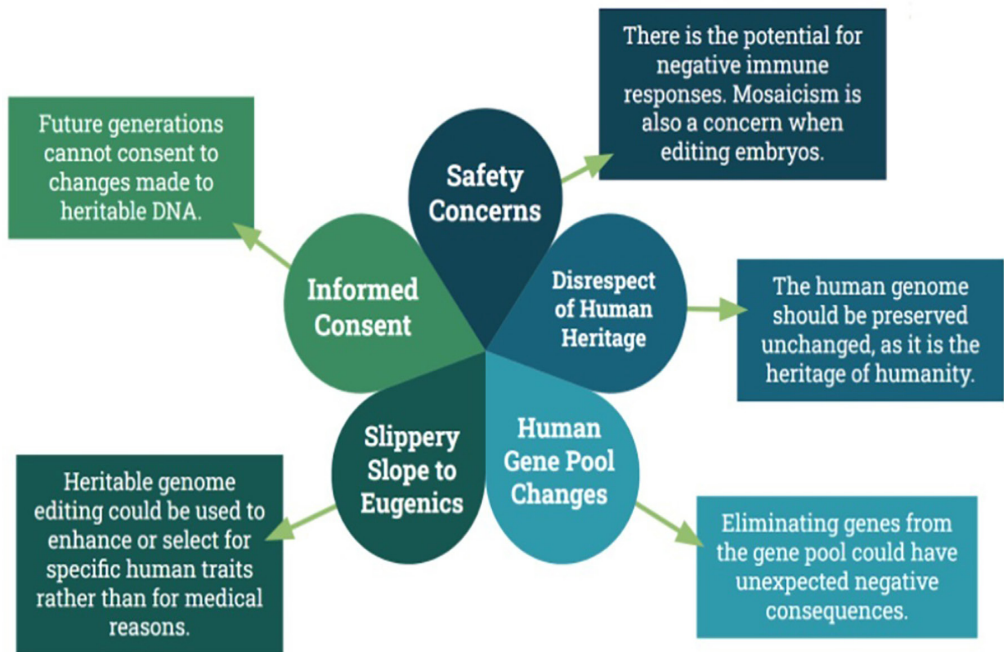


Figure 2. Major ethical concerns that arise when discussing germline gene manipulation.

There are also a number of ethical concerns related specifically to the prospect of genetic manipulation in germline cells, all of which ultimately derive from the fact that germline manipulation is inheritable. Changes in an individual's germline cells can be passed on to their offspring, and their offspring's offspring, so on and so forth (Cavaliere, 2017). One concern that arises from the heritability of germline gene manipulation is related to the previously mentioned issue of informed consent. Critics of germline gene manipulation point out that future generations cannot consent to the changes that were made to their ancestor's genome (Cavaliere, 2017; Delhove et al. 2021). However, many of the choices that are made every day have the potential to affect one's future descendants, and yet consent is not deemed necessary in those cases. A man does not need to ask consent from future generations of his family to make a risky business investment, for instance, even though doing so could land his descendants in poverty if it goes poorly. In the case of germline gene manipulation, as long as the changes created are for necessary medical purposes, expectation of informed consent from future generations can be argued to be unnecessary. Therefore, energy should be redi-

rected toward ensuring that, in future, germline gene manipulation will be used in a way that will be beneficial for future generations.

Another worry frequently floated is that widespread use of germline gene manipulation will introduce changes in the overall human gene pool (Cavaliere, 2017; Wirth et al. 2013). However, this argument seems to misunderstand fundamental truths of genetics and evolution. Changes to the gene pool happen organically; mutations arise on their own as a simple result of errors in DNA replication. Mutations can also arise as a result of the environment. Even medical tools like chemotherapy drugs and radiation can cause changes in an individual's genes (Cavaliere, 2017). Mutations are the key to evolution. Without changes to the human gene pool, humanity does not survive. To argue that germline gene manipulation should not be allowed at all because it introduces genetic changes to the human gene pool entirely ignores these basic facts of life. It is, however, reasonable to say that germline gene manipulation needs to be carefully considered, as we do not currently fully understand the interplay of genes within the human genome and within the overall human gene pool. Even in cases where we do understand the connection between genes and the disease, there are arguments to be made against attempting to eliminate the mutant gene entirely from the gene pool. Take sickle cell disease, for example. Having a single copy of the mutant gene which causes sickle cell disease actually confers a defense against malaria. It is likely there are many other examples of the complex interplay between genes that we have not currently discovered (NASEM, 2017). To this end, several researchers have advocated for the development of a bank that, if germline gene manipulation is ever put into widespread use, would store copies of genes removed from the human gene pool, just in case there are adverse side effects to the population at large (Bosley et al. 2015).

Opponents of germline manipulation also argue that the human genome should be preserved as it is because it is humanity's "heritage." The belief is that germline gene manipulation somehow disrespects our heritage by altering the "natural" state of the human genome (Coller, 2019; NASEM, 2017). However, this is also a fundamental misunderstanding of the human genome. As it stands today, the human genome is far from perfectly "human." It contains DNA from Neanderthal and Denisovian ancestors. A full 8% of the human genome is thought to be the remains of viral DNA acquired by our ancestors surviving viral infections (NASEM, 2017). If there is any disrespect to be had in changing the human genome, it happened long ago and should have no bearing on our decisions today.

In general, public support for somatic gene manipulation is higher than that of germline gene manipulation. When considering only germline gene manipulation, public support is higher in cases where it is used solely for medical treatment, as opposed to enhancement.

The use of germline gene manipulation for human enhancement, rather than medical necessity, is often raised as an objection. What is meant by “enhancement” is usually hazy and ill-defined, but can be assumed to roughly equate to using genome editing to boost certain desired traits, such as athleticism or intelligence (Gyngell et al. 2016). Many people view germline gene manipulation for the purposes of enhancement as akin to “playing God,” which is frowned upon (Delhove et al. 2021). This was well demonstrated by the fiasco of He Jiankui, who manipulated human embryos in order to potentially confer HIV resistance, which were then implanted and led to the birth of twin girls in China. This manipulation was not medically necessary, and many condemned it (Greely, 2019). Delhove et al. (2021) found that, in general, people viewed the He Jiankui incident as a “slippery slope,” which leads neatly into one of the biggest concerns generally raised by critics of germline gene manipulation.

It is impossible to discuss this topic without raising the specter of eugenics, and acknowledging the potential for germline gene manipulation to be put toward non-medical, dangerous, and extremist uses (Cavaliere et al. 2017). If it is possible to edit the human genome to preferentially target certain traits over others, there is always the risk that this will be used to selectively remove traits from the human gene pool (Coller 2019, NASEM, 2017). While heritable genome editing may start with manipulation of genes that cause diseases, who is to say it stops there? Might it eventually spread to removing other traits from the human population, any trait considered “undesirable,” independent of medical need? Some even fear that germline gene manipulation could be used by totalitarian regimes to reproductively control their entire population (Coller, 2019). In counterargument, it bears mentioning that many currently acceptable medical practices, such as preimplantation genetic screening of embryos, were once touted as a “slippery slope” that could lead to the resurgence of widespread eugenics, and those fears have not come to pass (NASEM, 2017). There is little practical reason to believe that the wider scientific community and international policy makers would allow germline gene manipulation to lead to the spread of eugenics unchallenged.

Many of the ethical concerns posed by opponents of germline gene manipulation research can be countered by logical arguments and a variety of actions that can be taken by scientists, researchers, and policy makers (**Figure 3**).

Conclusion

With the advent of gene therapy and genetic editing techniques, the world draws ever closer to a future in which it is possible to alter and correct any disadvantageous genes that might be present in an individual’s genome. Gene therapy products are currently on the market to treat a variety of diseases, including cancers, retinal diseases, neurodegenerative dis-

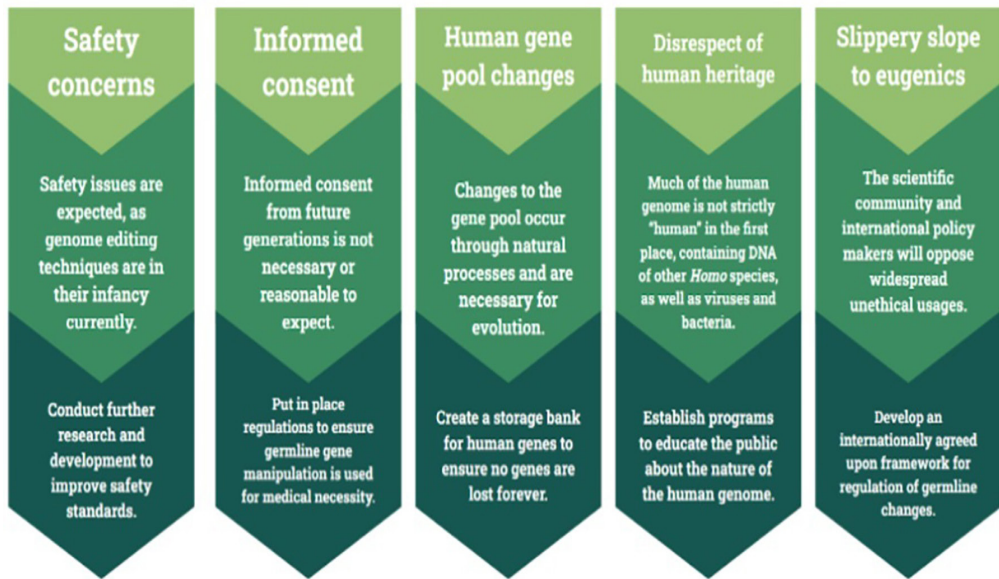


Figure 3. Germline gene manipulation. Arguments challenging acceptability of germline gene manipulation, counterarguments, and proposed actions to mitigate opposing arguments.

eases, and monogenic blood diseases. Numerous clinical trials are underway utilizing both gene therapy and gene editing techniques. Currently, the bulk of gene editing research is in relation to somatic gene editing, rather than germline gene editing. Through germline gene manipulation, it may someday be possible to reduce or eliminate many hereditary diseases. Though germline gene manipulation is not currently being practiced in human trials, incidents such as the He Jiankui affair prove that the technology is developing rapidly, while the regulatory frameworks have not kept pace. It is therefore vitally important that medical ethicists and policy makers address the issue of germline gene manipulation by developing internationally accepted policies and by implementing public education campaigns.

References

Abecma [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 Aug 12; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/abecma>.

Anguela XM, High KA. 2019. Entering the Modern Era of Gene Therapy. *Annual Review of Medicine*. 70(1):273-288.

Askou AL, Jakobsen TS, Corydon TJ. 2020. Retinal Gene Therapy: An Eye-opener of the 21st century. *Gene Therapy*. 28(5):209-216.

Bosley KS, Botchan M, Bredenoord AL, Carroll D, Charo RA, Charpentier E, Cohen R, Corn J, Doudna J, Feng G, et al. 2015. CRISPR Germline Engineering—The Community Speaks. *Nature Biotechnology*. 33(5):478-486.

Breyanzi [Internet]. 2021. Silver Spring, MD (USA): Food and Drug Administration. [updated 2021 March 4; accessed 2022 Mar 11]. Available from: <https://www.fda.gov/vaccines-blood-biologics/cellular-gene-therapy-products/breyanzi-lisocabtagene-maraleucel>.

Brudno JN, Kochenderfer JN. 2016. Toxicities of Chimeric Antigen Receptor T Cells: Recognition and Management. *Blood*. 127(26):3321-3330.

Caplan A. 2019. Getting Serious About the Challenge of Regulating Germline Gene Therapy. *PLOS Biology*. 17(4):e3000223. Available from: <https://doi.org/10.1371/journal.pbio.3000223>.

Carvykti [Internet]. 2022. Silver Spring, MD (USA): Food and Drug Administration. [updated 2022 March 8; accessed 2022 Mar 11]. Available from: <https://www.fda.gov/vaccines-blood-biologics/carvykti>

Cavaliere G. 2017. Genome Editing and Assisted Reproduction: Curing Embryos, Society or Prospective Parents? *Medicine, Health Care and Philosophy*. 21(2):215-225.

Coller BS. 2019. Ethics of Human Genome Editing. *Annual Review of Medicine*. 70(1):289-305.

Collins FS, Gottlieb S. 2018. The Next Phase of Human Gene-Therapy Oversight. *The New England Journal of Medicine*. 379(15):1393-1395.

Cring MR, Sheffield VC. 2022. Gene Therapy and Gene Correction: Targets, Progress, and Challenges for Treating Human Diseases. *Gene Therapy*. 29(1-2):3-12.

Cwik B. 2019. Moving Beyond “Therapy” and “Enhancement” in the Ethics of Gene Editing. *Cambridge Quarterly of Healthcare Ethics*. 28(04):695-707.

Delhove J, Osenk I, Prichard I, Donnelley M. 2019. Public Acceptability of Gene Therapy and Gene Editing for Human Use: A Systematic Review. *Human Gene Therapy*. 31(1-2).

Doudna JA. 2020. The Promise and Challenge of Therapeutic Genome Editing. *Nature*. 578(7794):229-236.

Dunbar CE, High KA, Joung JK, Kohn DB, Ozawa K, Sadelain M. 2018. Gene Therapy Comes of Age. *Science*. 359(6372).

Gene Editing [Internet]. 2021. Waukesha, WI (USA): American Society of Gene & Cell Therapy. [updated 2021 Nov 2; accessed 2022 Mar 6]. Available from: <https://patienteducation.asgct.org/gene-therapy-101/gene-editing>.

Gillmore JD, Gane E, Taubel J, Kao J, Fontana M, Maitland ML, Seitzer J, O'Connell D, Walsh KR, Wood K, et al. 2021. CRISPR-Cas9 In Vivo Gene Editing for Transthyretin Amyloidosis. *New England Journal of Medicine*. 385:493-502.

Ginn SL, Amaya AK, Alexander IE, Edelstein M, Abedi MR. 2018. Gene Therapy Clinical Trials Worldwide to 2017: An Update. *The Journal of Gene Medicine*. 20(5):e3015.

Goswami R, Subramanian G, Silayeva L, Newkirk I, Doctor D, Chawla K, Chattopadhyay S, Chandra D, Chilukuri N, Betapudi V. 2019. Gene Therapy Leaves a Vicious Cycle. *Frontiers in Oncology*. 9.

Greely HT. 2019. CRISPR'd Babies: Human Germline Genome Editing in the "He Jiankui affair". *Journal of Law and the Biosciences*. 6(1).

Gyngell C, Douglas T, Savulescu J. 2016. The Ethics of Germline Gene Editing. *Journal of Applied Philosophy*. 34(4):498-513.

Holmes MC, Reik A, Rebar EJ, Miller JC, Zhou Y, Zhang L, Li P, Vaidya S. 2018. A Potential Therapy for Beta-Thalassemia (ST-400) and Sickle Cell Disease (BIVV003). *Biology of Blood and Marrow Transplantation*. 24(3):S172.

Imlygic [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 Nov 23; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/imlygic>.

Ingusci S, Verlengia G, Soukupova M, Zucchini S, Simonato M. 2019. Gene Therapy Tools for Brain Diseases. *Frontiers in Pharmacology*. 10.

Kymriah [Internet]. 2022. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2022 Feb 17; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/kymriah>.

Lundstrom K. 2018. Viral Vectors in Gene Therapy. *Diseases*. 6(2):42.

Luxturna [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 Nov 11; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/luxturna>.

Kaufmann KB, Büning H, Galy A, Schambach A, Grez M. 2013. Gene Therapy on the Move. *EMBO Molecular Medicine*. 5(11):1642-1661.

Ma H, Marti-Gutierrez N, Park S-W, Wu J, Lee Y, Suzuki K, Koski A, Ji D, Hayama T, Ahmed R, et al. 2017. Correction of a Pathogenic Gene Mutation in Human Embryos. *Nature*. 548(7668):413-419.

Maeder ML, Gersbach CA. 2016. Genome-editing Technologies for Gene and Cell Therapy. *Molecular Therapy*. 24(3):430-446. doi:10.1038/mt.2016.10.

Maeder ML, Stefanidakis M, Wilson CJ, Baral R, Barrera LA, Bounoutas GS, Bumcrot D, Chao H, Ciulla DM, DaSilva JA, et al. 2019. Development of a Gene-editing Approach to Restore Vision Loss in Leber Congenital Amaurosis Type 10. *Nature Medicine*. 25(2):229-233.

Mullard A. 2020. Gene-editing Pipeline Takes Off. *Nature Reviews Drug Discovery*. 19(6):367-372.

Naso MF, Tomkowicz B, Perry WL, Strohl WR. 2017. Adeno-Associated Virus (AAV) as a Vector for Gene Therapy. *BioDrugs*. 31(4):317-334. doi:10.1007/s40259-017-0234-5.

[NASEM] National Academies of Sciences, Engineering, and Medicine (US). 2017. Human Genome Editing: Science, Ethics, and Governance. Washington, DC: The National Academies Press.

[OTAT] Office of Tissues and Advanced Therapies (US). 2022. Approved Cellular and Gene Therapy Products. Silver Spring, MD: US Food and Drug Administration. Available from: <https://www.fda.gov/vaccines-blood-biologics/cellular-gene-therapy-products/approved-cellular-and-gene-therapy-products>.

Skysona [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 July 27; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/skysona>.

Stadtmauer EA, Fraietta JA, Davis MM, Cohen AD, Weber KL, Lancaster E, Mangan PA, Kulikovskaya I, Gupta M, Chen F, et al. 2020. CRISPR-engineered T cells in Patients with Refractory Cancer. *Science*. 367(6481).

Strimvelis [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 Jan 24; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/strimvelis>.

Tebas P, Stein D, Tang WW, Frank I, Wang SQ, Lee G, Spratt SK, Surosky RT, Giedlin MA, Nichol G, et al. 2014. Gene Editing of CCR5 in Autologous CD4 T Cells of Persons Infected with HIV. *New England Journal of Medicine*. 370(10):901-910.

Tecartus [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 Oct 15; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/tecartus>.

Uddin F, Rudin CM, Sen T. 2020. CRISPR Gene Therapy: Applications, Limitations, and Implications for the Future. *Frontiers in Oncology*. 10(1387).

Wirth T, Parker N, Ylä-Herttua S. 2013. History of Gene Therapy. *Gene*. 525(2):162-169.

Xue K, Jolly JK, Barnard AR, Rudenko A, Salvetti AP, Patrício MI, Edwards TL, Groppe M, Orleans HO, Tolmachova T, et al. 2018. Beneficial Effects on Vision in Patients Undergoing Retinal Gene Therapy for Choroideremia. *Nature Medicine*. 24(10):1507-1512.

Yescarta [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 Aug 7; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/yescarta>.

Zolgensma [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 June 12; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/zolgensma>.

Zynteglo [Internet]. 2021. Amsterdam, Netherlands (EU): European Medicines Agency. [updated 2021 Jan 20; accessed 2022 Mar 11]. Available from: <https://www.ema.europa.eu/en/medicines/human/EPAR/zynteglo>.

La doble cara: un tema romántico en las obras de Larra y Hawthorne

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Abstract

“El mundo todo es máscaras” by Mariano José de Larra and The Scarlet Letter by Nathaniel Hawthorne exemplify romantic themes such as hypocrisy and deceit through representations of duplicitous characters and archetypes, especially those in influential positions. The authors voice their criticism by revealing the hidden and subjective associated with romanticism, condemning the fictional communities they portray in their respective stories as manifestations of the superficial modern society they witness beyond the literary. Larra writes from an idealistic perspective, criticizing the use of social “masks” which serve as a sign of a corrupt world—a world calling for restoration. Similarly to Luis Vélez de Guevara in El diablo cojuelo, Larra combines the fantastical effects of a dream with the critical reality of modern society, juxtaposing truth with deception to expose the egregious overlap he disdains in the world around him. Hawthorne, on the other hand, denounces the hypocrisy and hierarchical nature of the Puritan society in his novel through his characterization of powerful figures in the community; he characterizes them in the public and private spheres simultaneously, laying bare the discrepancies.

El Romanticismo del siglo XIX era un movimiento artístico y literario en Europa y las Américas que incluía un gran enfoque en los sentimientos. Un elemento muy destacado del romanticismo es la idea de que nosotros como sociedad no sabemos todo—"El mundo romántico ... está radicalmente abierto a lo supernatural y al misterio" (Aguar e Silva 332). Mientras que otros movimientos artísticos y filosóficos, como la Ilustración y el Neoclasicismo, giran en torno a la razón y la lógica, el romanticismo, en los Estados Unidos y España en particular, se basa en los misterios de la humanidad; es decir, las partes de la sociedad que no tienen explicación científica, en las que "nada de lo que es visible y palpable representa la realidad verdadera; la realidad auténtica no es perceptible a los sentidos" (332). Esta idea está conectada con el énfasis en la subjetividad del romanticismo, en la que hay un gran enfoque en los sentimientos y perspectiva personal. El enfoque en lo subjetivo e inexplicable permite una crítica de la naturaleza humana, y algunos autores adoptan elementos románticos para proponer una vista condenatoria de la sociedad. "El mundo todo es máscaras. Todo el año es carnaval" (1833) por Mariano José de Larra y *The Scarlet Letter* (1850) por Nathaniel Hawthorne ejemplifican el tema romántico de la hipocresía o la doble cara, en particular la de las figuras poderosas, a través de su representación de personajes engañosos, criticando la jerarquía social corrupta y la superficialidad chocante de estas sociedades ficticias.

Larra publicó "El mundo todo es máscaras" en 1833 en Madrid como una respuesta a todo lo malo que vio en la sociedad en su tiempo—"un intercambio de perjuicios cuyo denominador es el egoísmo humano" (Cedeño 17). La obra es un ejemplo de costumbrismo en que Larra critica las tendencias egoístas y mentirosas del hombre, específicamente en el siglo XIX. La historia se centra en un narrador que va a unos bailes de máscara y observa ejemplos de personas que llevan la doble cara en una combinación de la realidad y la fantasía. En "El mundo todo es máscaras," Larra ilustra varios ejemplos de personas que tienen identidades secretas, y los muestra a través de la gran diferencia entre su representación en la esfera pública y sus acciones en privado. En los ejemplos que propone Larra, esta diferencia se debe a la hipocresía de la gente. Un ejemplo es el abogado que "pasa entre vosotros los hombres por sensato" (Larra 20). Este hombre es una figura valorada en la comunidad y es un símbolo de la ley y la justicia. Sin embargo, mientras parece ser sensato y virtuoso, en privado él "cierra los libros" (20). El abogado, que debería proteger a sus clientes y poseer características morales fuertes, solamente quiere el dinero de la gente inocente. Esta es la doble cara en la que Larra centra su crítica, y es un tema romántico que ejemplifica la falta de verdad en la sociedad. Según Cedeño, Larra "trata a la sociedad en conjunto como problema; lo que ve y experimenta está en contradicción como la manera como él cree que la sociedad debe cambiar para llegar a ser una sociedad cuyas reglas maestras provengan de la verdad

y de la Naturaleza" (20). Es decir, la crítica en que centra Larra en esta obra viene de su idealismo romántico. El autor no solo escribe su sátira para expresar descontento con su sociedad, sino también escribe con la aspiración de perfeccionarla. Como nota Harkema, "Larra ve que el orden antiguo ya no es adecuado para la modernidad, e incita una reconstrucción, reordenamiento y resucitación de la política y la cultura" (46). La lucha personal de Larra entre el engaño que observa en la sociedad y lo que podría ser la sociedad tiene gran influencia en sus obras, y es una raíz de los elementos románticos que usa como la hipocresía o doble cara. El abogado es solo un ejemplo de alguien que usa una máscara en el público por su propio beneficio; alguien que se supone que es una figura confiable, pero en realidad no lo es.

Otros ejemplos de la doble cara que provee Larra incluyen el moribundo que se "arrepiente de sus pecados," pero "tornará a las andadas" (Larra 21), y el autor de comedia, quien "está muy persuadido de que ha escrito los sentimientos" (23) de figuras que nunca ha conocido. A través de estos ejemplos, Larra critica la hipocresía de los individuos en una comunidad, ilustrando cómo la sociedad ha fomentado el uso de máscaras. Es decir, la sociedad moderna de la que escribe Larra no castiga a la gente por sus engaños, sino a veces incluso los recompensa; por eso, los continúan. Él demuestra y condena esta tendencia, usando sus personajes como reflejos de la maldad que vio crecer en su comunidad—"Es precisamente porque ama el mundo que Larra critica su sociedad; porque lo valora, no puede olvidarse de los problemas y las tristezas que siguen existiendo en él. La manera adecuada de expresar esta tensión se encuentra en la escritura" (Harkema 54). Además, pone énfasis en la idea de la ficción en la forma de literatura, y en la forma de mentira. El moribundo miente, arrepintiéndose sin sinceridad. El autor de comedia escribe como si fuera la voz de otro, compartiendo una historia ficticia. De esta manera, Larra demuestra el romanticismo de nuevo, explicando que, en la sociedad llena de máscaras, no podemos saber qué es genuino y qué no. Él refuta las ideas principales de la Ilustración y el Neoclasicismo, períodos en los que los académicos se enfocan en lo que saben, como la ciencia o la educación. Estos movimientos dependen fuertemente del racionalismo, mientras que el romanticismo se enfoca más en la introspección, como es evidente en las obras de Larra. En "El mundo todo es máscaras," Larra propone que hay demasiado que no podemos saber o entender debido a la naturaleza humana contradictoria, es decir, la superficialidad del mundo corrupto.

Larra usa el escenario del baile de máscaras debido a su significado metafórico (la falsedad, hipocresía, etc.), pero también porque este evento fue muy popular en España en esta edad. El baile y el teatro español experimentaron muchos cambios durante esta edad, principalmente por el trabajo de Jean-Marie Grimaldi. Desde mediados de la década de 1820, Grimaldi se embarcó en "una campaña para la transformación de los teatros españoles" (Gies, "Jean-Marie Grimaldi"), y "fue el creador de los bailes de máscaras, más concurridos y ele-

gantes de la temporada de 1836" (Gies, "El poder" 49). Sirvió como un mentor para varias figuras famosas del teatro y de la literatura en España, teniendo gran influencia en la vida de Larra en particular: "Grimaldi invitó a Larra a escribir para el teatro y produjo su *Macías* en 1833, le animó a traducir obras del francés, le consiguió su trabajo como crítico en *La Revista Española* e incluso le sugirió su seudónimo más conocido, *Fígaro*" (Gies, "Jean-Marie Grimaldi"). En "El mundo todo es máscaras," Larra sitúa su narrador, y por eso su audiencia, en el baile de máscaras que desarrolló su mentor Grimaldi, criticando a su sociedad por enfocarse en las verdades ocultas dentro de este evento popular del mundo moderno. Larra satiriza la hipocresía de la sociedad moderna a través del contraste entre el ambiente del disfraz y el descubrimiento de la verdad.

La combinación de la realidad y la fantasía de Larra, similar a la de Luis Vélez de Guevara en *El diablo cojuelo* (1641), critica aún más a la sociedad por enfatizar la pérdida de la autenticidad. En el caso de estas historias españolas, la sinceridad y la realidad son iguales, y también lo son la fantasía y la máscara—como la sociedad lleva la máscara para cubrir lo que es genuino, la historia usa la fantasía para escapar de la realidad. Los autores condenan la decepción del mundo, yuxtaponiéndola con lo sobrenatural del otro mundo. En *El diablo cojuelo*, el diablillo ilumina a don Cleofás sobre la falsedad del humano usando sus poderes sobrenaturales:

Pretendiéndose engañar los unos a los otros, levantándose una polvareda de embustes y mentiras, que no se descubriría una brizna de verdad por un ojo de la cara, y don Cleofás iba siguiendo a su camarada, que le había metido por una calle algo angosta, llena de espejos por una parte y por otra, donde estaban muchas damas y lindos mirándose y poniéndose de diferentes posturas de bocas, guedejas y semblantes, ojos, bigotes, brazos y manos, haciéndose cocos a ellos mismos (Vélez de Guevara "Tranco III").

Al igual que "El mundo todo es máscaras," este texto más viejo propone una crítica social por ejemplificar el tema romántico de la doble cara, mostrando al personaje y al lector la máscara en acción en forma de personas deshonestas. Al comienzo de la historia, el protagonista, Don Cleofás, no es consciente de las maneras hipócritas de su mundo; "with the assistance of this supernatural figure, however, he will begin to perceive the genuine significance which lies behind deceptive appearances" (Bjornson 15). Esta historia de fantasía y verdad comparte con las otras la sátira de su sociedad contemporánea. Como dice Bjornson en su artículo sobre la estructura temática en *El diablo cojuelo*, "Vélez de Guevara envisions the material world as illusory, ever-changing, and arbitrary" (15), similar a la perspectiva de Larra. Por eso, estos escritores desarrollan sus mundos escritos, productos de la fantasía y la realidad combinadas, para reflejar las contradicciones que miran en el mundo real.

Hawthorne también critica la superficialidad de la sociedad en su obra *The Scarlet Letter*, retratando personajes que tienen una identidad pública prominente, pero en la vida privada, tienen una identidad muy diferente. Por ejemplo, Arthur Dimmesdale es un clérigo muy apreciado—"They deemed the young clergyman a miracle of holiness. They fancied him the mouthpiece of Heaven's messages of wisdom, and rebuke, and love" (Hawthorne 172-73). Sin embargo, la historia trata de sus pecados y el secreto que guarda. La gente en su iglesia no sabe que Dimmesdale ha tenido relaciones con una mujer casada, y no saben que él es el padre de Pearl. Por eso, el personaje de Dimmesdale sirve como una representación de la doble cara—"subtle, but remorseful hypocrite that he was" (174-75). El clérigo habla de devoción y honestidad en la iglesia, pero en realidad no obedece estos principios. Kenneth Pimple explica la lucha moral de Dimmesdale, notando que "he values both his social face and his immortal soul, but he cannot save one without losing the other," y por eso su vida es una de "ongoing deception" (270). Al retratar a un personaje como Dimmesdale que no tiene que encarar las consecuencias de sus pecados, Hawthorne critica el vicio y la hipocresía de una sociedad que castiga a quienes que usan la letra (Hester), pero no a quienes que usan la máscara (Dimmesdale).

En Hawthorne, Roger Chillingworth refleja las mismas ideas románticas de la doble cara y la jerarquía social porque él también tiene autoridad y una identidad secreta. La introducción de Chillingworth revela que "he chose to withdraw his name from the roll of mankind...to vanish out of life as completely as if he indeed lay at the bottom of the ocean" (Hawthorne 143). Chillingworth no comparte su identidad con la sociedad, y nadie sabe que es el marido de Hester. Además, nadie sabe sus malas intenciones, especialmente Dimmesdale—"He became, thenceforth, not a spectator only, but a chief actor, in the poor minister's interior world. He could play upon him as he chose" (169-70). Hawthorne usa la ironía, similar a la de Larra, en su caracterización de Chillingworth; como el abogado que no protege a sus clientes, Chillingworth es un doctor que quiere enfermar a su paciente (Dimmesdale). Por lo tanto, Hawthorne usa la medicina, algo que representa la ciencia y lógica, para el propósito opuesto. A este médico no le importa la razón ni la mejoría de la sociedad—solo le importa la venganza. Sus acciones, similares a las de Dimmesdale, tienen raíces emocionales. Estos personajes llevan una máscara enfrente de los demás, mientras debajo del disfraz, ambos tienen secretos graves. Esta es la máscara que ilustran Larra y Hawthorne, y es una demostración de sus tendencias literarias románticas. Como afirma Aguiar e Silva en "Teoría de la literatura," "la ironía representa otro elemento importante del romanticismo" porque "nace de la conciencia del carácter antinómico" (335), y, por lo tanto, ejemplifica la futilidad de la lógica en un mundo donde lo que se dice y lo que se quiere decir difieren, o en el caso de estas dos historias, la apariencia y la verdad difieren.

Las dos obras también critican una sociedad deshonesta por abordar el tema de la infidelidad, un elemento parecido al concepto romántico de la libertad. En "El mundo todo es máscaras," Larra describe en gran detalle los eventos del baile a través de la experiencia del narrador, que menciona varias veces la infidelidad y rebeldía de los participantes—"Algunas madres, sí, buscaban a sus hijas, y algunos maridos a sus mujeres; pero ni una sola hija buscaba a su madre, ni una sola mujer a su marido" (Larra 8). Larra critica esta infidelidad como otro ejemplo de la máscara. De esta forma, el autor satírico expresa un deseo romántico clásico de viejos valores, pero también la ambición de cambio—"Su escritura sugiere una visión que, en vez de huir de los problemas del mundo contemporáneo, dedica, se da, a una concepción más grande de él: un mundo compuesto pasado y presente" (Harkema 55). Aquí otra vez es evidente el idealismo romántico de la figura literaria en que denuncia la sociedad moderna superficial y corrupta, proponiendo un gran cambio social. Larra, a través su narrador, retrata la decepción personal de la infidelidad entre amantes—"Yo me había llevado la querida de otro" (Larra 11), para yuxtaponerla con la gran decepción social de la hipocresía—"toda la noche he seguido a otra creyendo que era ella, hasta que se ha quitado la careta" (11), condenando a ambas a favor de la verdad.

Hawthorne usa este tema de la infidelidad como un enfoque central por el cual el conflicto inicial se introduce. Hester, la protagonista de la novela, debe soportar escrutinio severo por su comunidad debido a su acto de adulterio:

But the point which drew all eyes, and, as it were, transfigured the wearer,—so that both men and women, who had been familiarly acquainted with Hester Prynne, were now impressed as if they beheld her for the first time,—was that SCARLET LETTER, so fantastically embroidered and illuminated upon her bosom. It had the effect of a spell, taking her out of the ordinary relations with humanity, and enclosing her in a sphere by herself (Hawthorne 59-60).

El autor pone énfasis en el juicio de la mujer, otra vez criticando la hipocresía de la sociedad en que solo una persona recibe castigo por su pecado. Por su enfoque en la infidelidad, Hawthorne aplica una característica muy destacada del romanticismo: el conflicto entre amor y deber social (Martínez Torrón 34). Hester enfrenta este conflicto, y últimamente elige el amor, o por lo menos el deseo. Aunque Hester lleva la letra de la infidelidad y desgracia, es la sociedad desdeñosa que condena Hawthorne por la imagen de la letra escarlata: "Hawthorne uses Hester's dilemma to attack inadequacies in the organization of both the family and social morality in the Puritan community" (Rowe 1211). Mientras Larra critica directamente la infidelidad como ejemplo de la doble máscara, Hawthorne critica la hipocresía de una comunidad llena de pecadores que juzga a otras en nombre de la infidelidad—una comunidad que per-

mite a los que están en poder que permanezcan ocultos detrás de sus identidades secretas. De esta forma, los dos autores adoptan un idealismo romántico, buscando de lo absoluto en sociedades llenas de máscaras e hipocresía.

Larra y Hawthorne ejemplifican los temas de la hipocresía y la doble cara a través de sus personajes, denunciando la corrupción y superficialidad de sus respectivas sociedades, ambas ficticias y reales. Hay una ausencia de certeza en sus historias debido a las figuras poderosas o apreciadas que engañan a las otras. El abogado, el moribundo, el autor de comedia, Dimmesdale, y Chillingworth, todos tienen algo en común—son mentirosos. Mienten a sus clientes, a Dios, a su audiencia, a su comunidad, a sus “amigos”—a sí mismos. Sus conflictos psicológicos reflejan “el hombre interior,” el cual representa “el imperio de lo subjetivo, de los sentimientos, de la interioridad afectiva del hombre” (Martínez Torrón 35). Sus pensamientos y secretos ilustran el hombre interior, y sus máscaras ilustran la supresión u ocultación de esta identidad. De esta forma, estos dos autores expresan al lector el tema romántico fundamental: la lucha entre los deberes sociales y la pasión, la razón versus la emoción—la verdad versus la máscara. Los autores usan estas figuras para criticar a la sociedad entera. Los personajes no son los únicos que engañan a otros. Aunque no todos llevan una letra escarlata, no son inocentes. Todos usan una máscara—“Todo el año es carnaval.”

Fuentes

Aguilar e Silva, Vitor Manuel de. *Teoría De La Literatura*, Editorial Gredos, 1972, pp. 319-341.

Bjornson, Richard. “Thematic Structure in ‘El diablo cojuelo.’” *Hispanófila*, no. 60, 1977, pp. 13-19.

Cedeño, Aristófanes. “Hombre y Sociedad en el Pensamiento de Larra.” *Hispanófila*, no. 123, University of North Carolina at Chapel Hill for its Department of Romance Studies, 1998, pp. 17-29.

Gies, David T. “El poder de la palabra: Juan de Grimaldi y el periodismo político en el siglo XIX.” *Actas del IX Congreso de la Asociación Internacional de Hispanistas 18-23 agosto 1986*. Vol. II, Berlín, Frankfurt am Main, 1989, pp. 49-55.

———. “Jean-Marie Grimaldi.” *Inicio*, db.e.rah.es/biografias/70603/jean-marie-grimaldi.

Harkema, Leslie J. “‘¿Y memoria?’: Larra y La Resistencia al Olvido.” *Revista Hispánica Moderna*, vol. 62, no. 1, 2009, pp. 41-56.

Hawthorne, Nathaniel. *The Scarlet Letter*. Edited by The Project Gutenberg, *The Project*

Gutenberg EBook of *The Scarlet Letter*, by Nathaniel Hawthorne, 2008, <https://www.gutenberg.org/files/25344/25344-h/25344-h.htm#VI>.

Larra, Mariano José de. "El mundo todo es máscaras. Todo el año es carnaval / Mariano José De Larra." Biblioteca Virtual Miguel De Cervantes, www.cervantesvirtual.com/obra-visor/el-mundo-todo-es-mascaras-todo-el-ano-es-carnaval--0/html/ff791c32-82b1-11df-acc7-002185ce6064_1.html.

Martínez Torrón, Diego. "Fundamentos Teóricos Acerca Del Romanticismo Español / Diego Martínez Torrón." Biblioteca Virtual Miguel De Cervantes, www.cervantesvirtual.com/obra-visor/fundamentos-tericos-acerca-del-romanticismo-espaol-0/html/ff6f40b8-82b1-11df-acc7-002185ce6064_2.html#l_0_.

Pimple, Kenneth D. "'Subtle, but Remorseful Hypocrite': Dimmesdale's Moral Character." *Studies in the Novel*, vol. 25, no. 3, 1993, pp. 257-71.

Rowe, John Carlos. "The Internal Conflict of Romantic Narrative: Hegel's Phenomenology and Hawthorne's *The Scarlet Letter*." *MLN*, vol. 95, no. 5, 1980, pp. 1203-31.

Vélez de Guevara, Luis. *El diablo cojuelo*. Biblioteca Virtual Miguel De Cervantes, https://www.cervantesvirtual.com/obra-visor/el-diablo-cojuelo--0/html/fee8f6b6-82b1-11df-acc7-002185ce6064_2.html.

Resolving a Conflict:

How to Teach Evolution to Students with a Religious Background

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Abstract

Acceptance of the theory of evolution is abnormally low in the United States, with only about 50% of Americans accepting the theory compared to acceptance levels in the 80s for other developed nations. Religion is one of the main reasons that Americans reject the theory. Lack of acceptance by Americans is problematic because evolution is used as a basis of our scientific understanding of the world. Without understanding evolution, researchers would not be able to make advances in a wide range of scientific areas from microbiology to wildlife conservation. Because of the importance of understanding evolution and Americans' relative lack of acceptance, recent literature has focused on how to teach evolution to religious students in a way that leads to high rates of acceptance. This review outlines why it's important to understand and accept evolution, barriers to teaching it in public schools and at the university level, as well as the best methods for teaching evolution to religious students in a way that allows for acceptance.

Introduction

Evolutionary theory is one of the foundational principles of biology, yet only about 50% of Americans accept evolution as a valid theory (**Figure 1**) (Miller et al. 2006, Barnes et al. 2020, Cassella 2021). This surprisingly low level is in stark contrast to other developed countries, where about 80% of the public accepts evolution (Miller et al. 2006). One of the biggest reasons that Americans reportedly deny evolution is pre-existing religious beliefs (Levesque and Guillaume 2010, Ranney 2012, Barnes and Brownell 2018). While a lack of acceptance in evolution is a global issue, because America has one of the lowest public acceptances of evolution worldwide and is a secular

country with a wide spectrum of religions, this review will focus on religion and evolutionary acceptance only in the United States (Miller et al. 2006).

The reason that it is important for evolution to be taught to and accepted by students is because it is the basis of many areas of scientific knowledge (Heddy and Nadelson 2012). To further understanding in any field of science, students and professionals alike must be able to build upon what is already known. Thus, students need to be taught the foundational principles of biological evolution so that they can apply that knowledge in the future. However, in American public K-12 education, and even at the university level, there are significant barriers to teaching evolution, including state laws, educational rules, and the values of some educators themselves (Reid 2018, Tolman et al. 2021)

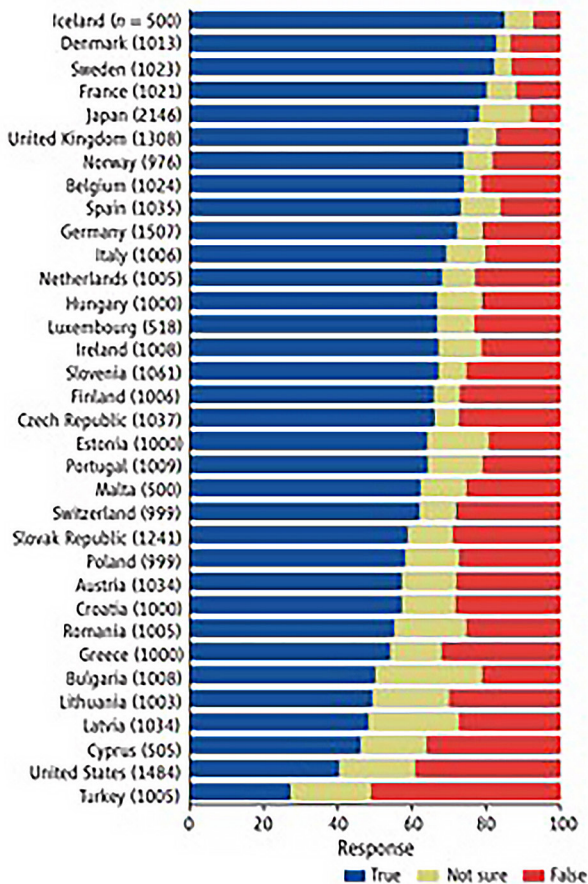
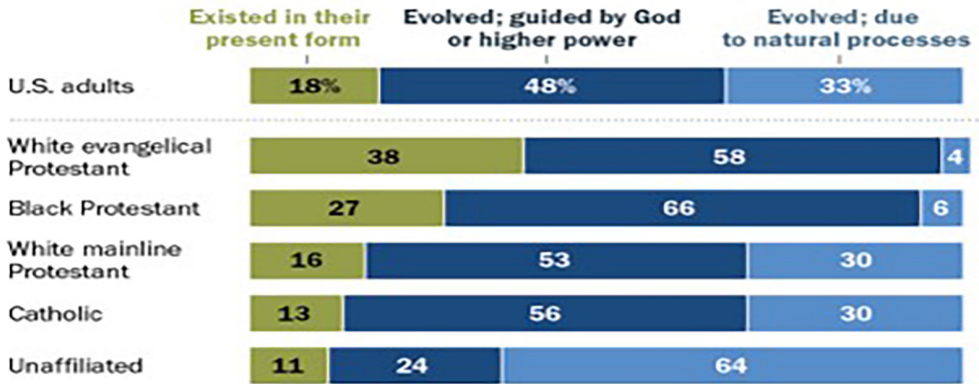


Figure 1. Public evolutionary acceptance rates by country. Figure from Miller et al (2006).

Belief in evolution by religious tradition

% in each religious group who say humans have ...



Note: Respondents who gave other responses or who did not give an answer are not shown.

Source: Survey conducted April 23-May 6, 2018.

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Figure 2. Evolutionary belief by religious traditions. Figure from Masci (2019).

One of the biggest challenges with teaching evolution is overcoming the notion that religious beliefs and the theory of biological evolution are incompatible. Some American Christians, particularly Evangelical Christians, are deeply opposed to the concept of evolution and prefer the creationist interpretation of their religion (**Figure 2**) (Masci 2014, Masci 2019). Others, both religious and areligious, feel that religion and evolution are entirely separate and maintain that the two ideas are compatible (Pew Research Center 2009). After a careful review of the literature, it seems clear that while religious students are less likely to accept the theory of evolution, teaching evolutionary concepts properly and allowing students to evaluate their own religious beliefs with the scientific data can lead to higher levels of acceptance.

Why Evolution Needs to be Taught

Scientists use the theory of evolution to both explain natural observations and to make predictions or hypotheses to be tested. Evolutionary theory, like all other scientific theories, is supported by an accumulation of facts, data, and testing over long periods of time, making

it a powerful tool for understanding the world around us. Additionally, evolutionary theory is unique scientifically in that it answers many questions about why things are the way they are. For example, we know that bacteria are able to evolve resistance to antibiotics through mutation. Scientists have discovered that mutations occur at random and only bacteria with beneficial mutations can survive when treated with an antibiotic. This finding has led scientists to make predictions about how long antibiotics will be effective and have allowed teams to work diligently to find new methods to combat bacterial infections that are not as susceptible to bacterial evolution (Aslam et al 2018).

To learn more about ourselves, there is an emerging field in science called “evolutionary medicine” that biological anthropologists have been developing for over 60 years (Trevathan 2007). Physicians and medical researchers alike tend to explore and treat proximate bases for disease while evolutionary medicine seeks to understand the underlying historical causes for illness (Gluckman et al. 2011). Through a deeper understanding of the conditions under which humans evolved—such as living and sleeping outdoors, days spent running and walking to hunt prey, and learning to communicate with one another around a fire—scientists can determine how contemporary lifestyles—including working indoors with artificial light, high-calorie diets, and lack of face-to-face interactions—affect people’s health. Conditions like knee pain, back pain, heart disease, obesity, anxiety, and depression can all be addressed through the application of evolutionary medicine (Trevathan 2007, Gluckman et al. 2011).

Using evolutionary medicine concepts, researchers are also able to identify potential issues related to illness, genetics, and heredity (Gluckman et al. 2011). This has been essential during the COVID-19 pandemic. Epidemiologists—those who study the spread of diseases or epidemics—have been able to use genetics and evolutionary concepts to identify how diseases such as COVID-19 change over time and how those changes happen in response to a co-evolutionary arms race with the human immune system. Through understanding of this competition, scientists were able to devise a vaccine that would allow the immune system to fight COVID-19. Additionally, scientists have been able to make predictions about the types of mutations that could appear, which would be most harmful, and how mutations would spread globally. This understanding has been invaluable to the health and safety of communities around the world (Reid 2020, Tolman et al. 2021).

Bacterial evolution and evolutionary medicine are just two of many examples of what we can learn from understanding evolutionary biology. Because of the incredibly valuable knowledge from diverse fields that can be gained, it is critical for young scientists to both understand evolutionary principles and accept evolution as a valid theory so that they can build upon that understanding in future studies.

Barriers to Teaching Evolution

Given the clear value of understanding the theory of evolution, it is unclear why there is such low acceptance of the theory in the United States. Many studies have focused on determining the cause of evolutionary rejection among Americans. One of the primary causes of lack of acceptance is religion. However, persistence of misconceptions or lack of education on evolutionary principles is also a factor. The lack of education is due in part to rules or laws in place to prevent discussing evolution in a certain way and in part due to educators deciding they do not want to teach evolution fully or at all in their classrooms (Meadows et al. 2000, Manwaring et al. 2015).

Rules and Laws

Broadly speaking, American public schools teach a curriculum that is decided at the state level. This means that educational content can vary from state to state and is swayed considerably by the community (World Population Review 2022). Unfortunately, some groups have fought and are still fighting to remove discussion of evolutionary biology from public school curriculum (Johnstone 2007, Berkman and Plutzer 2011, Reid 2018). The advocacy of these groups, such as evangelical Christians, have pressured school boards to set strict regulations on when or how science teachers are allowed to discuss evolution. Even when evolutionary theory can be taught in public K-12 schools, the national separation of church and state prevents educators from explicitly addressing students' religious questions or concerns. And though universities are not bound by secularism in the same ways public K-12 schools are, some universities still have their own rules in place to make teaching evolution effectively to students more difficult (Tolman et al. 2021). The consequence of these limitations is that many American students leave high school without ever having been effectively taught evolutionary principles.

Educators

In public K-12 schools, curriculum is determined by the state. However, daily instruction depends heavily on individual classroom teachers. Thus, even when teachers are asked to teach evolutionary biology, some admit that they teach the topic improperly, incompletely, or not at all because of their own personal feelings towards evolution (Berkman and Plutzer 2011, Reid 2018). Moreover, even if an educator does accept the theory of evolution, faculty at many public schools and universities admit that they are afraid to teach the subject due to the student conflict that may ensue (Tolman et al. 2021). Since many students rely heavily—or solely—on their public school teachers for their education, having faculty that do not want to

teach evolution—or teach it improperly—leads to a lack of understanding and a lack of acceptance of the theory.

How to Reconcile Religion and Evolutionary Education

Given the challenges to teaching evolutionary biology in the United States, researchers have sought to understand effective and ineffective methods of teaching evolution. Intuitively, one might believe that just teaching students the facts of evolution is enough to lead to acceptance. However, that is not the case with highly religious students. Teaching religious students evolutionary facts while ignoring opposing religious beliefs can allow students to understand evolutionary theory, but does not necessarily lead to an acceptance of evolution as a valid scientific theory (Lindsay et al. 2019). Through religious teachings, devout students may have been led to believe that evolution is atheistic and incompatible with religion. Therefore, accepting evolution would mean rejecting their long-standing religious beliefs, community, and family, something that many students are (unsurprisingly!) not willing to do (Lindsay et al. 2019, Barnes et al. 2020). It is clear, then, that in order to get religious students to accept the theory of evolution, their religious beliefs must be acknowledged and addressed.

Effective Methods to Teaching Evolution

A famous study by Barnes and Brownell (2018) outlines six important steps (**Figure 3**) that can be taken to reconcile faith and evolution in students, the first of which is acknowledging the discrepancies and that there can be a conflict between evolutionary theory and personal religious beliefs. The second step is encouraging exploration and possible re-evaluation of students' personal beliefs. For some religious students, this means reinterpreting sections of their religious texts that talk about creation of the world. In a study with Christian students, exploring religious beliefs meant explicitly re-examining the book of Genesis in the Bible as a literary text vs. a literal interpretation creation (Levesque and Guillaume 2010, Winslow et al. 2011).

The third step to effectively teach evolution to religious students is to tell students about the different ways of knowing. The nature of science is to explore the natural world and attempt to explain what is observed. Essentially, scientists are looking for evidence and facts. Conversely, religion is an examination of the world through belief. Religion uses belief in religious powers to help explain the unexplainable, including the purpose of life and existence after death. By distinguishing scientific and religious ways of knowing, students are allowed to feel comfortable learning about evolutionary theory because it is no longer in direct con-

ReCCEE practice	Description
Acknowledge	Acknowledge that some students may see a conflict between evolution and their religious beliefs.
Explore	Discuss and encourage the exploration of students' personal views on evolution and religion.
Teach the nature of science	Explain to students the bounded nature of science and different ways of knowing.
Outline the spectrum of viewpoints	Explain that there are diverse viewpoints on evolution and religion and that viewpoints are not restricted to atheistic evolution and special creationism. Discuss the possibility of theistic evolution.
Provide role models	Highlight religious leaders and biologists who accept evolution.
Highlight potential - compatibility	Explicitly discuss the potential compatibility between evolution and religion.

Figure 3. Six practices that need to be employed to effectively teach evolution to religious students. Figure from Barnes and Brownell (2018).

flict with religious beliefs (Tolman et al. 2020). Related, the fourth step is to teach that there are many different viewpoints on both religion and evolution. Explicitly talking about how religious beliefs can incorporate with the theory of evolution is important for increasing acceptance rates. One study by Manwaring et al. (2015) demonstrated that open discussions in the classroom on the compatibility of religious beliefs and evolution (sixth step) (**Figure 3**), correlates with higher evolutionary acceptance rates.

Finally, studies have shown that role models matter. Having a professor with religious beliefs, or hearing a religious leader talk about their acceptance of evolutionary theory is beneficial to student acceptance. These models of acceptance demonstrate to students firsthand that they do not have to reject their religious beliefs, community, or family in order to accept evolutionary theory (Winslow et al. 2011, Barnes and Brownell 2018, Lindsay et al. 2019).

Discussion

The low acceptance rates of evolutionary theory in the United States are driven by perceived conflicts between religion and science. These perceptions have led some religious groups to vocally advocate for schools to not teach evolution in K-12 classrooms and the pub-

lic conflict has resulted in a variety of laws, regulations, and even individual preferences that have inhibited the effectiveness of teaching on the topic. The too-common lack of acceptance is problematic because understanding and accepting evolutionary principles allows for the furthering of scientific knowledge including issues related to public health.

Recent studies have shown that evolutionary biology can be successfully taught to be accepted by religious university students (Winslow et al. 2011, Barnes and Brownell 2018, Lindsay et al. 2019). Unfortunately, Barnes and Brownell's (2018) six-step plan on effectively reconciling evolution and religion is harder to implement in public K-12 education in America due to laws and regulations restricting what educators can teach and talk about. In some ways, teaching evolution at the K-12 levels needs to be supported at the state level before it can be effectively done in the classroom. One fruitful avenue for future research may be a focus on how to help teach evolution to children in religious communities without impeding on the constitutional separation of church and state or upsetting religious parents.

Based on evidence and practice, openly discussing how science and religion are different ways of understanding the world could be critical. Once students and parents understand that there does not need to be a conflict between science and religion—and more importantly how the two ways of knowing can even work together—that will allow more people to understand and accept the theory of evolution and help make biology more accessible to students of all backgrounds. In turn, greater understanding of evolutionary principles will allow religious students (and all students) to make significant contributions to the scientific fields of their choosing in the future.

Works Cited

Aslam B, Wang W, Arshad MI, Khursid M, Muzammil S, Rasool MH, Nisar MA, Alvi RF, Aslam MA, Qamae MU, et al. 2018. Antibiotic resistance: A Rundown of a Global Crisis. *Infection and Drug Resistance*. 11: 1645-1658.

Barnes ME and Brownell SE. 2018. A Call to Use Cultural Competence when Teaching Evolution to Religious College Students: Introducing Religious Cultural Competence in Evolution Education (ReCCEE). *CBE—Life Sciences Education*. 16(4).

Barnes ME, Dunlop HM, Sinatra GM, Hendrix TM, Zheng Y, Brownell SE. 2020. "Accepting evolution means you can't believe in God": Atheistic Perceptions of Evolution among College Biology Students. *CBE—Life Sciences Education*. 19(2).

Berkman MB and Plutzer E. 2011. Defeating Creationism in the Courtroom, but Not in the classroom. *Science*. 331(6016): 404-405.

Cassella C. 2021. More Americans are Finally Coming Around to Accepting the Science of Evolution. *Science Alert*. [updated 2021 Aug 29; cited 2022 Oct 1]. Available from: <https://www.sciencealert.com/more-americans-are-finally-coming-around-to-the-idea-that-life-really-does-evolve>.

Gluckman PD, Low FM, Buklijas T, Hanson MA, Beedle AS. 2011. *Evolutionary Applications*. 4(2): 249-263.

Heddy BC and Nadelson LS. 2012. A Global Perspective of the Variables Associated with the Acceptance of Evolution. *Evolution: Education and Outreach*. 5: 412-418.

Johnstone G. 2007. Judgement Day: Intelligent Design on Trial. PBS Distribution.

Levesque PJ and Guillaume AM. 2010. Teachers, Evolution, and Religion: No Resolution in Sight. *Review of Religious Research*. 51(4): 349-365.

Lindsay J, Arok A, Bybee SM, Cho W, Cordero AM, Ferguson DG, Galante LL, Gill R, Mann M, Peck SL and others. 2019. Using a Reconciliation Module Leads to Large Gains in Evolution Acceptance. *CBE-Life Sciences Education*. 18(4).

Manwaring KF, Jensen JL, Gill RA, Bybee SM. 2015. Influencing Highly Religious Undergraduate Perceptions of Evolution: Mormons as a Case Study. *Evolution: Education and Outreach*. 8(23).

Masci D. 2014. 5 facts about evolution and religion. Pew Research Center [Internet]. [cited 2022 Dec 10]. Available from: <https://www.pewresearch.org/fact-tank/2014/10/30/5-facts-about-evolution-and-religion/#:~:text=Of%20all%20the%20major%20religious,most%20likely%20to%20reject%20evolution>.

Masci D. 2019. For Darwin Day, 6 facts about the evolution debate. Pew Research Center [Internet]. [cited 2022 Dec 15]. Available from: <https://www.pewresearch.org/fact-tank/2019/02/11/darwin-day/>.

Meadows L, Doster E, Jackson DF. 2000. Managing the Conflict Between Evolution & Religion. *The American Biology Teacher*. 62(2): 102-107.

Miller JD, Scott EC, Okamoto S. 2006. Public Acceptance of Evolution. *Science*. 313(5788): 765-766.

National Academy of Sciences. 1998. *Teaching about Evolution and the Nature of Science*. Washington DC: National Academy Press.

Pew Research Center [Internet]. 2009. Religious Groups' Views on Evolution. [updated 2014

Feb 3; cited 2022 Dec 10]. Available from: <https://www.pewresearch.org/religion/2009/02/04/religious-groups-views-on-evolution/>.

Ranney M. 2012. Why Don't Americans Accept Evolution as Much as People in Peer Nations Do? A Theory (Reinforced Theistic Manifest Destiny) and Some Pertinent Evidence. In: *Evolution Challenges: Integrating Research and Practice in Teaching and Learning about Evolution*. Oxford University Press. 233-269.

Reid A. 2018. It's Still Hard to Teach Evolution in too Many Public School Classrooms. *Los Angeles Times*. [updated 2018 Nov 18; cited 2022 Sept 10]. Available from: <https://www.latimes.com/opinion/op-ed/la-oe-reid-teaching-evolution-20181118-story.html>.

Reid A. 2020. Evolution and Epidemics. National Center for Science Education.

Tolman ER, Ferguson DG, Mann M, Cordero AM, Jensen, JL. 2020. Reconciling Evolution: Evidence from a Biology and Theology Course. *Evolution: Education and Outreach*. 13(19).

Tolman ER, Ferguson DG, Hubble G, Kaloi M, Niu M, Jensen JL. 2021. Barriers to teaching evolution in higher education. *Evolution: Education and Outreach*. 14(1): 12.

Trevathan WR. 2007. Evolutionary Medicine. *Annual Review of Anthropology*. 36:139-154.

Whittaker RH. 1972. Evolution and Measurement of Species Diversity. *Taxon*. 21(2-3): 213-251.

Winslow MW, Staver JR and Scharmann LC. 2011. Evolution and Personal Religious Belief: Christian University Biology-related Majors' Search for Reconciliation. *Journal of Research in Science Teaching*. 48(9): 1026-1049.

World Population Review [Internet]. 2022. States that Don't Teach Evolution 2022. [cited 2022 Dec 15]. Available from: <https://worldpopulationreview.com/state-rankings/states-that-dont-teach-evolution>.

A History of Secret Societies at Longwood University and their Relationship to Student Power and Agency

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Honors College

Abstract

The foundation of secret societies at Longwood University reflects the desire of college students to create organizations through which they can assert power and influence. Since the eighteenth century, college students have taken it upon themselves to take control from oppressive and authoritative institutions and claim it as their own. The most visible manifestation of students claiming authority and exercising collective agency are student government associations, which are present at almost every college in the United States. Groups and organizations such as fraternities, sororities, and clubs were also created by students and made into outlets through which they could claim authority and influence. Historically, Longwood University was founded as a female-only institution. The school's administrators instituted strict standards and rules for Longwood's female student population, limiting their mobility and social activities. In the late 1890s, due to the university's administration lessening its strict policies, the students of Longwood began to socialize more freely and more frequently. The result of this was a rapid expansion of new organizations on Longwood's campus, all with their own aims and goals. Secret societies were created in the late 1890s and early 1900s by the student population of Longwood University with the intent of overcoming the oppressive and authoritative barriers created by the society they lived in.

Early Secret Societies at Longwood University

Collegiate secret societies are present on many campuses across the United States.¹ Longwood University has a rich history of secret societies that has worked itself into the social fabric of the university's culture for over one hundred years. These societies formed for a variety of reasons and have served many different roles on Longwood's campus, some as honor societies and social clubs, while others took on more formal and significant roles. These secret societies were sources of empowerment for the female students, who could socialize with freedom and have an effect the campus where they lived. There are currently three active secret societies on Longwood's campus: CHI, Princeps, and Cahoots that carry on one hundred years of tradition and continue to serve as outlets through which students influence the culture of Longwood.

According to the 1897 edition of the *Virginian*, the Mystic Three was the first secret society and sorority created on Longwood's campus, founded on 13 February 1897. Three students founded the Mystic Three, who also called themselves the "Great High Jingeree of the Needle," the "Appointed Prophetess to Mystic Three," and the "Most Exalted Keeper of the Records." This secret society met on the third, thirteenth, and twenty-third of each month. While their purpose is unknown, this was the first of many secret societies. Over the next thirty years, students founded a wide range of new secret societies at Longwood between 1900 and 1930: CHI (1900), LK Society (1901), GCGC, RPCPP, S.T.A.R (1903), I.M.P.S (1909), Black Cats, W.A.N.K., FANGS, Mu Omega (1912), S.S. (1914), BOMO (1916), OWLS, Zeta Tau (1920), Quo Vadis Ignoramus (1921), and C.A.L.S. (1925).² The exact purposes of these organizations are unknown and their only public records are photos, mottos, and colors recorded in the *Virginian*, Longwood's yearbook. Their short lifespans suggest that most of these organizations were social groups and likely close friend groups; the *Virginian* also reveals a great deal of overlap in membership between these organizations. By the 1930s, the culture of the university slowly shifted to acknowledge the need for women to have a public voice and freely socialize, and the desire of students to gather in secret slowly faded away.³

Secret societies came into existence at the start of the twentieth century when Longwood was undergoing a great deal of social change. Joseph Jarman became the President of Longwood at the start of the 1900s and began extensive building projects aimed at expanding

¹ J. Blanchard, "Secret Societies in Colleges," *The College Courant* 10.15 (April 13, 1872): 169.

² "Chi Celebrates its 100 Years of Service during Oktoberfest," *The Rotunda* 80.5 (Oct. 12, 2000).

³ Barbara Shepard, *Longwood University, the First 175 Years*, (Farmville, VA: Longwood University Foundation, 2014), 12.

Longwood's student recreational facilities. Jarman also permitted far more socialization and free time for the all-female student population; this was far from the social norms of the early-twentieth century and was a change far ahead of its time.⁴ This brought about a rapid expansion of chaperoned extracurricular activities at Longwood. At the time, students could not leave campus without permission, speak to men through their dorm windows, smoke tobacco, drink alcohol, miss meals without permission, they were made to adhere to a strict dress code, and were expected to be quiet in all public spaces, among many other rules.⁵ These rules were intended to mold the female student population into "proper" women. Secret societies were a way for the female student population to socialize and form their own identity away from the conformist and patriarchal American society. Most of these secret societies faded from existence, and by the 1930s, CHI stood alone. As these secret societies produced very few public records, it is impossible to tell why these societies declined, but they likely faded along with the need for private socialization. The widespread expansion of Greek Life at Longwood, which also took root in 1897, contributed to the decline of early secret societies.⁶ Despite this, CHI persisted and has left a long and rich history.

The History of CHI

CHI is the second oldest secret society founded at Longwood University, with a history spanning over one hundred years. CHI's stated purpose is to "promote and maintain a spirit of cooperation among students in every phase of college life," fostering loyalty and respect for Longwood.⁷ The organization states that to fulfill its aims, they hope to represent the entire student body and recognize the efforts of students, faculty, and campus organizations.⁸ The symbol of CHI is the Longwood Rotunda; the four pillars represent loyalty, character, respect, and challenge, the horizontal bar represents responsibility, the triangle represents their purpose, and the dome represents the student body.⁹ The current colors of CHI are blue and white.¹⁰ CHI intends to bind Longwood's campus together by promoting the abstract idea of the "spirit of Longwood." CHI has not always existed in its current state, however, and has undergone tremendous change throughout its history. CHI evolved and adapted with Long-

⁴ Ibid., 11–12.

⁵ Ibid., 54.

⁶ "Chi Celebrates," *The Rotunda*.

⁷ "X CHI 2006 X," *The Rotunda* 85.13 (Jan 26, 2006).

⁸ Ibid.

⁹ "CHI: Founded October 15, 1900," LU-073, CHI Collection, Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

¹⁰ Ibid.

wood's campus, and its purpose, iconography, and membership have changed over its one hundred and twenty-year history.

Founded on 15 October 1900, CHI was originally an honor society for the three sorority alpha chapters founded at Longwood University; CHI admitted the fourth alpha chapter founded at Longwood into its ranks following its foundation.¹¹ These sororities are as follows: ΚΔ (1897), ΣΣΣ (1898), ΖΤΑ (1898), and ΑΣΑ (1901); CHI invited fourteen sisters of these sororities each year for membership.¹² CHI became known as "The Sorority of Sororities," setting the precedent that entry to CHI was only possible through invitation.¹³ CHI occupying a prominent position on Longwood's campus, and acting as a sort of early precursor to the National Panhellenic Conference. Because of its prominent position and its ability to adapt, CHI survived the decline of secret societies on Longwood's campus. CHI first appears in the 1901 edition of the *Virginian*, and the first photo appears in the 1903 edition. There are very few public records of CHI's presence and activities on campus at this time beyond photos in the *Virginian*.

CHI changed dramatically during its first thirty years and moved away from simply being an honor society for Longwood's sororities. According to the 1939 edition of the *Virginian*, CHI adopted a new aim and coordinated with Longwood's Honor System to prevent rule-breaking and help maintain high standards on Longwood's campus. This period of CHI can be categorized as "old" CHI, as this organization is hardly recognizable compared to modern CHI. The colors of old CHI were red and white, their symbol was the *Memento Mori*, a red skull and bones that was a common icon of many secret societies and sororities dating from the latter half of the nineteenth century, and their lyrics were far more cryptic.¹⁴ In 1939 they adopted red and white robes featuring a red X.¹⁵ Instead of commending the students and faculty of Longwood's campus, as modern CHI does, old CHI condemned students that they deemed to have broken the morals and values of Longwood by having poor grades or acting outside of the "morals" of Longwood.¹⁶ CHI acted as an outward extension of the Honor and Conduct system until the 1970s.¹⁷ As recounted by their former faculty advisor Dr. Raymond French,

¹¹ Shepard, *Longwood University*, 50.

¹² *Ibid.*

¹³ *Ibid.*

¹⁴ "All the way from FANGS to CHI, Longwood's had its 'secret societies'," *The Rotunda* 53.23 (Dec. 5, 1973).

¹⁵ "Secret Groups History Interestingly Unusual," *The Rotunda* 44.14 (March 10, 1965).

¹⁶ *Ibid.*

¹⁷ "The Student Government Association," *The Focus* (Oct. 1911).

their methods of condemnation included painting red X's on students' foreheads, writing notes to students and burning the edges of the papers, and announcing condemned students' names at an old version of a CHI burning, one of the three public rituals CHI has used as a means of expressing itself on campus since its earliest iteration.¹⁸

The first of the public rituals is the CHI walk, which became a commonplace on Longwood's campus in the 1930s. During a CHI walk, hooded members of CHI walk across Longwood's campus and sing CHI's song. CHI's original song contained rather cryptic lyrics warning the campus to beware of CHI, provided by a former member of CHI:

Through the dark of night, we're going to go where you are. If it's wrong or right, we're going to go where you are. All through the halls of darkness, searching for you. And if your doors are locked tight, CHI will be there, too! CHI is watching you. We're going to go where you are. And no place can be too far, where you are. There are no chains can bind you. If you're there, we'll find you. We're going to go where you are.

CHI walks initially sparked the student population's interest, but the cryptic lyrics later contributed to the student population's negative attitudes towards CHI. In the 1970s the lyrics were changed to promote school spirit.

The burnings are the second important public ritual performed by CHI. Historically, during a Burning, hooded members of CHI circled a bonfire, read out the names of condemned students, and burnt their names in the fire before revealing their identities. During modern iterations of the Burning, members of CHI celebrate students, faculty members, and organizations by announcing them before burning their names in the fire and revealing their identities. Droppings are CHI's third public ritual. Droppings likely evolved from letters of condemnation and red X's painted on the foreheads of condemned students. They are now small trinkets left around campus for students to find as good luck charms. These public rituals are important to CHI's identity as they are the main way CHI interacts with Longwood's student population.¹⁹

Following the World Wars, many students became more apprehensive of authority. While CHI was founded with the intention of empowering students, to many it came to be seen as an authoritative group. Students and faculty alike began speaking out against the actions of CHI during this period; the *Rotunda* published several articles on the topic. In 1948, students and faculty felt that CHI overstepped its bounds by replacing the original Joan of Arc statue that was donated to the school in 1914 and was housed in the Rotunda throughout both World Wars.²⁰ Following a CHI burning in 1950 where seventeen CHI members were revealed and

¹⁸ "All the way from FANGS," *The Rotunda*.

¹⁹ Shepard, *Longwood University*.

²⁰ "Was Chi Wrong Again?," *The Rotunda* 27.28 (May 12, 1948).

four students were publicly condemned, a *Rotunda* article questioning CHI's existence stated that "secret societies with no acknowledged purpose have little place on a modern campus," that CHI's only "outstanding accomplishments" were twice throwing the campus into an uproar by replacing the Joan of Arc statue and announcing a CHI walk, and that CHI only existed to serve as a "Boogie Man" to scare students into obeying the rules of the college.²¹

At this time, CHI insisted that its goals and motives remain a secret, challenged the *Rotunda's* right to question their right to exist, stated that secret societies were still a part of many college campuses, and that the *Rotunda* was responsible for fostering negative attitudes towards them.²² The *Rotunda* responded that they felt a majority of the campus stood behind their negative analysis of CHI. At the same time as CHI's existence was being challenged on campus in the early 1950s, a spin-off group known as Cahoots formed.²³ By the 1960s, Cahoots was a prominent secret society on campus but its membership was not a secret.²⁴ Cahoots presented itself as the opposite of CHI, hosted "Freezings" rather than "Burnings," and attempted to make campus laugh instead of enforcing standards and rules.²⁵ At a time when CHI condemned members of the student body at their Burnings, Cahoots commended students at their Freezings.²⁶ Like CHI, Cahoots also held walks, but dressed as clowns singing songs through the Rotunda, instead of walking in the dark of night through the colonnades draped in robes. The first iteration of Cahoots faded in the late 1980s but stood as an example of the student body's negative attitudes towards CHI.

By 1970, CHI changed its course and acknowledged its need to adapt. CHI began to do away with its old methodologies and iconography, opening up and justifying its existence on Longwood's campus. In 1970, CHI wrote a letter to a Mr. Butler stating that "CHI of 1971 had just begun its long walk," and listed their positive influences and gifts to campus, citing a new scholarship fund and various plaques and cornerstones as their recent achievements.²⁷ In 1971, CHI published a welcome letter to all faculty and staff stating that it changed its colors to the school's colors, blue and white, discarded the *Memento Mori* iconography in favor of the blue word CHI and the Rotunda symbol, changed their lyrics warning students to beware of CHI to lyrics intended to promote the "spirit of Longwood," and committed itself to recog-

²¹ "Why CHI . . .," *The Rotunda* 29.26 (May 10, 1950).

²² "The Situation Stands . . .," *The Rotunda* 29.27 (May 27, 1950).

²³ "Extra . . .," *The Rotunda* 29. 26 (May 3, 1950).

²⁴ Ibid.

²⁵ "Learning is Burning but Freezing is Pleasing," *The Rotunda* 47.6 (Nov. 8, 1967).

²⁶ Ibid.

²⁷ CHI letter to Butler 1970, LU-073, CHI Collection, Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

nizing the efforts of students and faculty instead of condemning them.²⁸ At this time CHI also wrote and published the *Longwood College Songbook*.²⁹ This songbook was meant to help create a positive image of CHI and encourage school spirit. These were massive changes to the organization as CHI adapted to ensure its self-preservation.

In the 1970s, CHI continued improving its image across campus, work that was positively received by the student body. In 1972, an article in the *Rotunda* stated that CHI was “aware of its traditions and place in the college, but at the same time seeking new ways to implement itself into the college community.”³⁰ CHI’s changes represent a larger shift at Longwood towards modernization and changing attitudes about what it meant to be a woman. Many of the former oppressive and authoritative rules that were in place at Longwood had faded by this point, and student attitudes on campus reflected the idea that Longwood must “project itself into the future and march with the times or it will cripple itself into non-existence,” and the *Rotunda* stated that CHI must do the same.³¹ By the 1980s, old CHI began to closely resemble modern CHI. They commended students, faculty, and organizations by handing out wax-sealed jars of ash from the burnings, continued their tradition of doing hooded CHI walks, encouraged students to uphold the four aspects of student life: social, recreational, intellectual, and spiritual, fostered participation in student organizations, and committed itself to upholding the Honor and Judicial codes.³² By the 1990s, the campus at large no longer resented CHI and the *Rotunda* published many positive articles about CHI throughout the 1980s and 1990s.

Despite all the changes to CHI throughout the 1900s, many of its public traditions and contributions have remained. Visible evidence of CHI on campus includes CHI walks and CHI burnings—survivors from its earliest traditions—as well as the blue Rotunda symbols found in front of Eason Hall and on Stubbs lawn, which are seen as symbols of the “spirit of Longwood” by members of the university community. CHI Burning and walks remain the most public events CHI hosts. At Burnings, CHI emphasizes that it is not an organization intended for the individual but, according to a member of CHI, that “CHI is a spirit.”³³ CHI also places various banners around campus demonstrating support for organizations and events, leaves CHI

²⁸ CHI letter to Faculty and Staff, LU-073, CHI Collection, Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

²⁹ “Longwood College Songbook,” LU-336, Vertical Files, Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

³⁰ “The New Spirit,” *The Rotunda* 51.22 (April 26, 1972).

³¹ *Ibid.*

³² “CHI Speaks,” *The Rotunda* 65.5 (Oct. 15, 1985).

³³ “The Spirit of CHI Supports Longwood,” *The Rotunda* 71.1 (Oct. 8, 1990).

droppings, and maintains their scholarship fund. CHI has remained a secret organization all this time, stating that secrecy is vital to its mission; its goal is not to emphasize the individual but to promote the "spirit of Longwood."³⁴

Contemporary Secret Societies

The 1990s saw a resurgence of students founding secret societies at Longwood—at least three were founded during this period, all seemingly with good intentions. The Society of the Fraternity and the Nineteen Hidden Polyester Lords were two minor and short-lived secret societies from this period. The Society of the Fraternity, founded in 1991, recognized faculty members they deemed worthy on behalf of the student population by leaving pumpkins at their houses.³⁵ The Nineteen Hidden Polyester Lords, founded in 1992, claimed to hold a great secret they intended to later reveal to campus in order to bring down "priests or kings who happened to be in authority at the time."³⁶ *Princeps*, founded in 1992, is the third and only surviving secret society from this period.³⁷ The Longwood community scrutinized all three new secret societies; articles from the *Rotunda* state that people were "concerned with the recent trend toward the increasing number of secret societies on Longwood's campus."³⁸ These articles also point out that the campus as a whole was not consulted regarding their formation and activities and questioned who gave them such authority to carry out their actions.³⁹ While students founded these secret societies with good intentions and *The Rotunda* implied that students founded secret societies with the intent of empowerment so they were not initially received well. The Nineteen Hidden Polyester Lords and the Society of the Fraternity faded with time, but *Princeps* remains.

At this time, *Princeps* is one of three active secret societies on Longwood's campus and is the second oldest still active. The "Seven Pillars of PRINCEPS" announced the creation of *Princeps* in the *Rotunda* on February 5, 1992; *Princeps* stated that the founding members were influential leaders from across Longwood's campus.⁴⁰ According to the article, *Princeps* was founded with the intention of promoting leadership on Longwood's campus.⁴¹ Physical

³⁴ "Chi Through the Years," LU-073, CHI Collection, Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

³⁵ "Letter to the Editor," *The Rotunda* 71.14 (March 4, 1992).

³⁶ *Ibid.*

³⁷ *Ibid.*

³⁸ *Ibid.*

³⁹ *Ibid.*

⁴⁰ "Letters to the Editor," *The Rotunda* 71.10 (Feb 5, 1992).

⁴¹ "Letters to the Editor," *The Rotunda*.

evidence of Princeps includes “droppings,” which are good luck charms left around campus for students, the seven black crowns painted on Longwood’s sidewalks at various points, and small paper sevens left on doors of campus residences: red ones signify the president’s list and black ones signify the dean’s list. The symbol of Princeps is a seven, and their motto is “to lead is to serve.”⁴² According to interviews conducted with alumni from this time period, students founded Princeps out of dissatisfaction with the way CHI operated. There is no written evidence to corroborate these statements, but this was the conclusion drawn from various interviews. Princeps did not intend to compete with CHI, denoting in its founding document that it was to focus on leadership. In 1994, the *Rotunda* reported that CHI advocated for school spirit and Princeps advocated for the advancement of leadership on campus. CHI and Princeps now exist as well-respected and prestigious honor societies on Longwood’s campus.

On February 12, 2018, students announced the return of Cahoots in the *Rotunda*. This new Cahoots was modeled after its predecessor, retaining the traditions and iconography of Cahoots from the mid-twentieth century. Cahoots reemerged at a politically fraught period in the history of the United States and stated that they exist to “support the bond between students, faculty, and staff.” According to Cahoots, its membership is diverse and representative of Longwood’s campus as a whole, and they made it known that they are not competing with CHI or Princeps, but rather wish to fill a gap on campus. As with their forebears, Cahoots hosts walks and Freezings and leaves droppings around Longwood’s campus. As with CHI and Princeps, they stress that secrecy is necessary to lessen any emphasis that may be put on an individual and to strengthen the community. Like its many predecessors, Cahoots is an example of students seeing a need and filling it. Cahoots may not attempt to overcome oppressive barriers, as many early secret societies founded on Longwood’s campus did, but the premise for its founding is similar. As this new incarnation is such a recent development, there is little published information regarding the current activities of Cahoots.

Conclusion

The secret societies formed on Longwood’s campus, primarily CHI and later Princeps, are prime examples of students coming together to create powerful student organizations. Since 1897, secret societies have been a part of the cultural fabric of Longwood University, influencing both students and faculty alike. Students founded many of these secret societies to fill a need, primarily overcoming social barriers created by authoritative and patriarchal institutions. In doing so, they empowered themselves and the female population of Longwood by going against the status quo of their day. While, for many years, Longwood’s campus

⁴² “All the way from FANGS,” *The Rotunda*.

was indifferent or hostile to secret societies, they have become a part of the many beloved traditions present on campus while still empowering students to some extent. The current active secret societies on Longwood's campus are CHI, which promotes spirit, Princeps, which promotes leadership, and Cahoots, which promotes community. These secret societies fill a particular need on campus and serve as powerful and prestigious student organizations.

Bibliography

"All the way from FANGS to CHI, Longwood's had its 'secret societies,'" *The Rotunda* 53.23 (Dec. 5, 1973).

Blanchard, J. "Secret Societies in Colleges." *The College Courant* 10.15 (April 13, 1872): 169.

CHI Brochure. LU-073. CHI Collection. Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

"Chi Celebrates its 100 Years of Service during Oktoberfest," *The Rotunda* 80.5 (Oct. 12, 2000).

"CHI: Founded October 15, 1900." LU-073. CHI Collection. Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

CHI letter to Butler 1970, LU-073. CHI Collection. Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

CHI letter to Faculty and Staff. LU-073. CHI Collection. Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

"CHI Speaks," *The Rotunda* 65.5 (Oct. 15, 1985).

"CHI Through the Years." LU-073. CHI Collection. Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

"Extra . . .," *The Rotunda* 29. 26 (May 3, 1950).

"Learning is Burning but Freezing is Pleasing," *The Rotunda* 47.6 (Nov. 8, 1967).

"Letter to the Editor," *The Rotunda* 71.14 (March 4, 1992).

"Letters to the Editor," *The Rotunda* 71.10 (Feb 5, 1992).

"Longwood College Songbook." LU-336. Vertical Files, Greenwood Library Archives and Special Collections, Longwood University, Farmville, VA.

"The New Spirit," *The Rotunda* 51.22 (April 26, 1972).

"Secret Groups History Interestingly Unusual," *The Rotunda* 44.14 (March 10, 1965).

Shepard, Barbara. *Longwood University, the First 175 Years*. Farmville, VA: Longwood University Foundation, 2014.

"The Situation Stands . . .," *The Rotunda* 29.27 (May 27, 1950).

"The Spirit of CHI Supports Longwood," *The Rotunda* 71.1 (Oct. 8, 1990).

"The Student Government Association," *The Focus* (Oct. 1911).

"Was Chi Wrong Again?," *The Rotunda* 27.28 (May 12, 1948).

"Why CHI . . .," *The Rotunda* 29.26 (May 10, 1950).

"X CHI 2006 X," *The Rotunda* 85.13 (Jan 26, 2006).

Policy Brief:

Addressing Petroleum Pollution in the Chesapeake Bay around Naval Station Norfolk

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Abstract

This year our research team was chosen to be a part of the Scholars Transforming Through Research Advocacy Program (STR) administered by the National Council for Undergraduate Research (NCUR). This program provides the opportunity for undergraduate students and faculty mentors to communicate their research to stakeholder groups such as elected officials and funding agencies. Our research is centered around the pollution of the Chesapeake Bay, specifically as it relates to the Naval station in Norfolk, Virginia. Naval Station Norfolk is the largest Navy base in the world, where 75 ships are regularly docked and circle the Bay. The first part of the CUR-STR program was a workshop in Washington D.C., where we learned how to write a policy brief. We took this opportunity to address the petroleum pollution caused by the Naval Station's docked ships. In the following policy brief, we reach out to the Department of Defense to urge decision makers to replace some of their existing diesel fueled fleet with ships that use ammonia fuel.

Pollution of the Chesapeake Bay

As the largest estuary in the United States, the Chesapeake Bay, located in the Mid-Atlantic region, is surrounded by the states of Virginia, Delaware, and Maryland. The Bay is extensive, and although it is only bordered by three different states, its watershed runs through six states and Washington D.C. It is connected to at least 150 major rivers, streams, and approximately 100,000 smaller creeks, brooks, and streams (The Chesapeake Watershed (nasa.gov)). Surrounding states rely heavily on this estuary and are directly impacted by its conditions.

Marine ecosystems like the Chesapeake Bay are prone to petroleum pollution as the demand for marine vessels and oil industries grows. Since the emergence of technological advances during the Industrial Revolution in the nineteenth century, water pollution has been an underlying concern. Oil pollution, in particular, is responsible for many of the environmental issues we have today, including the decline of marine life populations and the creation of unsafe drinking conditions for animals and people globally.

Major oil spills like the Deepwater Horizon (DH) spill in 2010 had detrimental effects on millions of people surrounding the Gulf of Mexico. In 2019, a study of the Deepwater Horizon spill proved that petroleum pollution remained in the Gulf of Mexico eight years after the event occurred. Billions of dollars were put into the restoration efforts to clean up the Gulf (<https://doi.org/10.1016/j.envpol.2019.05.134>). While the Bay has not experienced major oil spills like DH, the gradual accumulation of petroleum in the Bay may accompany environmental concerns. Naval Station Norfolk, the largest Naval base in the world, provides security along the Tidewater coast. Although the safety of the Tidewater region is of utmost importance, optimal environmental conditions are not met. The Naval station mentions in their environmental policy that they are committed to preventing pollution whenever possible, however the Naval base docks their ships in the Bay during times of peace. These stationary ships rely on diesel fuel that have the potential to cause petroleum pollution. The docked ships make the Naval station a contributor to petroleum pollution in the Bay.

The Effect of Pollution on the Chesapeake Bay

The Chesapeake Bay serves as a center for trade and commerce; seafood is a major economic contributor that many states rely on as a source of food and income. In 2019, Virginia's commercial harvest of blue crabs alone was over 28 million pounds and had a dockside value of \$34 million (Blue crab stock remains within healthy range | Virginia Institute of Marine Science (vims.edu)). Petroleum pollution along the Bay can lead to the contamination of private drinking wells along the coast, as well as the declining health of the marine life that sustains the Bay and those who rely on it. The DH oil spill caused the accumulation of hydrocarbons

within the bodies of marine animals, rendering seafood from the Gulf of Mexico unsafe for consumption. Large fishing areas along the Gulf were closed off to ensure the safety of seafood (<https://sgp.fas.org/crs/misc/R41640.pdf>). Since the Chesapeake Bay produces approximately 500 million pounds of seafood annually, the pollution of this estuary could similarly result in the decline of the economy of surrounding states.

As an essential factor to Bay's economy, blue crabs are a symbol of Chesapeake Bay culture. These crabs are very sensitive to the condition of the Chesapeake Bay. With petroleum pollution being a major concern to marine life, the Chesapeake Bay Foundation has opposed the expansion of the oil and gas industry in the Bay (<https://www.cbf.org/issues/offshore-drilling/>). If petroleum pollution continues to accumulate in the Bay, the decline of the blue crab species would have severe economic consequences for surrounding states.

Potential Solution: Ammonia Fueled Ships in the Fleet

Diesel fueled ships, although efficient, are not environmentally friendly as these products are responsible for air and water pollution. Recently there has been research involving the use of nitrogen-based fuels to power ships and other marine vessels. When produced with clean, renewable power, nitrogen-based fuels have the potential to lower greenhouse gas emissions and, if appropriately converted, can lead to lower nitrogen-based byproduct emissions (Progress and Prospective of Nitrogen-Based Alternative Fuels (acs.org)). Shipping industries are exploring the nitrogen-based fuels such as ammonia as a clean source of energy. Utilizing ammonia as a fuel source provides safer transportation while being just as effective as petroleum products. The Viking Energy supply vessel, with a five-year contract period with Eidesvik Offshore, will be part of a research project developing, installing, and testing long-distance sailing fueled by carbon-free ammonia fuel cells. The technology will be tested on the vessel starting in 2024 (The world's first carbon-free ammonia-fuelled supply vessel on the drawing board - equinor.com). Now that the United States is in a time of peace, the Navy should invest in research to investigate the effect of nitrogen fuels on ships currently stationed along the Chesapeake Bay and contribute to the decrease of petroleum pollution in the Bay.

Bibliography

"The Chesapeake Watershed." NASA, NASA, <https://earthobservatory.nasa.gov/images/86815/the-chesapeake-watershed>.

Elishav, Oren, et al. "Progress and Prospective of Nitrogen-Based Alternative Fuels." *Chemical Reviews*, vol. 120, no. 12, 2020, pp. 5352-5436., <https://doi.org/10.1021/acs.chemrev.9b00538>.

"Offshore Drilling." Chesapeake Bay Foundation, <https://www.cbf.org/issues/offshore-drilling/>.

Turner, R. Eugene, et al. "Oiling of the Continental Shelf and Coastal Marshes over Eight Years after the 2010 Deepwater Horizon Oil Spill." *Environmental Pollution*, vol. 252, 2019, pp. 1367-1376., <https://doi.org/10.1016/j.envpol.2019.05.134>.

Upton, Harlod F. 2011, pp. 1-17, *The Deepwater Horizon Oil Spill and the Gulf of Mexico Fishing Industry*, <https://sgp.fas.org/crs/misc/R41640.pdf>.

VMRC, –adapted from "Blue Crab Stock Remains within Healthy Range." Virginia Institute of Marine Science, 20 May 2020, https://www.vims.edu/newsandevents/topstories/2020/wbcds_2020.php#:~:text=Even%20with%20lower%20exploitation%2C%20the%202019%20bay-wide%20commercial,and%20had%20a%20dockside%20value%20of%20%2434%20million.

"The World's First Carbon-Free Ammonia-Fuelled Supply Vessel on the Drawing Board." Equinor, <https://www.equinor.com/news/archive/2020-01-23-viking-energy>.

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