2024

A More Modern Prometheus: What Frankenstein Tells Us About Genetic Modification

Allison M. Ambrose
Georgia Southern University

A More Modern Prometheus: What Frankenstein *Tells Us About Genetic Modification*

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in *Philosophy and Religious Studies.*

By
Allison Ambrose

Under the mentorship of *Dr. Paul Tubig*

ABSTRACT

Mary Shelley's famous novel, *Frankenstein,* is often hailed as the first true science fiction novel. In my thesis, I use the premonitive lens towards creation of life provided in *Frankenstein* to evaluate the morality of genetic modification of children. CRISPR-Cas9 is quickly emerging as the most important development in reprogenetic technology of our time, and many argue for its merits as a method of designing our children. I argue against this trend of "designer babies," specifically raising questions about the soundness of modifying non-disease traits in future children and encouraging a more cautious attitude in both the scientific and philosophical communities.

Thesis Mentor: *Dr. Paul Tubig*

Honors Dean: Dr. Steven Engel

April 2024
Philosophy and Religious Studies
Honors College
Georgia Southern University

Acknowledgments

I would like to acknowledge and thank the professors whose classes or words inspired this thesis: Dr. Bill Eaton, Dr. Dan Larkin, and Dr. Joseph Pellegrino. Special thanks to Dr. Paul Tubig as my mentor and avid supporter in all things academic. I would also like to thank the Honors College and Department of Philosophy & Religious Studies for the opportunity to attempt a project like this, and for the support and resources to see it through.

1. Introduction: Science Fiction Novels as Premonitions

It's incredible how often literature can predict the future. Science fiction in particular seems akin to an ancient oracle, with outlandish stories written and then brought to actuality decades or even centuries later. An explanation for why this is likely lies somewhere with creativity, progress, and how both reveal our species basest desires. Some of these predictions are presented as world-ending examples of hubris. Some of them are imagined as life-saving or life-enhancing. Looking at the predictions and comparing them with the ways, both positive and negative, that emerging or existing technologies have been or are being used can reveal important fears and desires. The unique perspective of writers creating stories about exotic technologies before they come into existence or become easily accessible often identifies the potential problems they may create more sharply than those who are living with the advancements. While these cautionary or exciting tales should not be taken as gospel truth, they should not be dismissed because they were written in the past. Authors with no personal or economic

investment in technology are able to confront issues that more modern writers might sweep under the rug in favor of benefitting from them.

For example, *Fahrenheit 451* is frequently taught in high school literature classes and features kinds of technology that were advanced and futuristic at the time but are now commonplace: "earbuds," advanced flatscreen televisions, and ATMs.[1] The *Back to the Future* movie duology previews voice user interface, tablet computers, videotelephony (now called Facetime or Zoom), augmented and virtual reality, and fingerprint scanners.[2] Both pieces' approach to the technology differs from current opinions. *Fahrenheit 451* in particular serves as a cautionary tale and associates these advancements with oppressive government surveillance and censorship. While some of these fears were exaggerated, one could point out numerous instances that make them seem well-founded. The "Great Firewall of China" and recent protests of video surveillance in public spaces certainly make Ray Bradbury's writing seem like an accurate prediction of the future. The present-day coordination to limit ideas and organizational activity with supercomputers is not casually ignored in *Fahrenheit 451*.

The question that philosophers, literary scholars, and connoisseurs of science fiction ought to be asking themselves is this: Why is something that was historically shunned as preposterous or dreaded because of its potential now something we embrace or are aiming to achieve? There are many cases where reasonable explanations may be given: videotelephony allows us to 'visit' each other despite being thousands of miles apart, fingerprint scanners keep our cell

[1] Bradbury, *Fahrenheit 451*
[2] Spielberg, *Back to the Future, Back to the Future II*

phones more secure, etc. Yet there are also many cases where adjustments have not been made—to security, intention, or function, to name a few areas–and concerns have been pushed aside.

One salient case is the novel, *Frankenstein*. In the novel, the mother of science fiction, Mary Shelley, presents the ability to construct a living being and animate it in a clearly critical light. Although it's important to dispel incorrect assumptions about reproductive and creative technology, it seems more pressing to focus on the criticisms of human confidence and rapid scientific advancement that have not been adequately responded to.

The story of *Frankenstein* can be understood as a premonition of the recent groundbreaking advancement in genetic and reproductive technology, CRISPR-Cas9. CRISPR-Cas9 is a technique of altering genes, which has allowed scientists to understand the genomes of virtually any species and enabled them to pursue more advanced forms of genetic engineering. With CRISPR, individual gene sequences can be isolated and examined to determine what phenotypic trait they coordinate with. A gene sequence may then be "selected" and removed, replaced, or modified. When combined with modern reproductive technologies of pre-genetic diagnostics and in vitro fertilization, scientists can edit the genes of human embryos and implant them in womens' uteruses in hopes of producing genetically modified children with socially desirable traits. The concept of "designer babies" is easily within reach with the introduction of CRISPR-Cas9. Although Dr. Frankenstein's creation was certainly not a newborn baby, he was designed and brought to life in an unconventional method of creation and as I will demonstrate, the two scenarios parallel in multiple morally important ways.

Reflecting on the glaring moral issues in *Frankenstein*, it raises a puzzling but urgent question: why are many members of the scientific and philosophical communities so unbothered by the possibility and practice of modifying and designing children? How does the story of *Frankenstein* inform the ethical discourse of creating designer children? Does the novel object to or condone this pursuit?

In my thesis, I will use the novel to frame the ethical issues of embryo modification when used for non-disease traits. A discussion of the moral tragedies of *Frankenstein* will reveal concerns that ought to be raised about a prospective widespread use of CRISPR-Cas9 and what kind of reevaluation is needed before technological progress in this technique is resumed. I will ultimately argue against the genetic modification of embryos for non-disease traits and explain why a more cautionary attitude is needed within the philosophical and scientific traditions towards the rapid progression of genetic engineering. Despite strong support, genetic modification for non-disease traits treats people as the problem, as opposed to the society we live in, complicates modern family dynamics, and is an imposition of values. It redefines parenthood, childhood, and society in negative and harmful ways.

2. The Moral Tragedy of *Frankenstein*

Before considering *Frankenstein* in the context of genetic modification and the ways in which the novel illuminates the complicated ethical dimensions of this technological innovation, I want to briefly analyze Mary Shelley's novel

more generally. As mentioned in the introduction, science fiction often serves as a herald or oracle, predicting scientific advancements that may come about in the future–sometimes specifically, sometimes in a more abstract manner. The particularly fascinating aspect of turning to *Frankenstein* is that it allows us to take on a perspective of the past. We can revisit what it might be like to speculate about technologies we now consider commonplace through novels. This removes the potential bias of the present towards technology and how it has been normalized in our everyday lives. For example, it is hard for me to consider the morality of fingerprint sensors because I interact with the technology everyday, unlocking my phone multiple times a day by having my phone read my unique fingerprint. My attunement to the moral concerns, like privacy, that might be important to consider when discussing fingerprint sensors is tainted by the pervasive role they play in my life. A writer from two hundred years ago will not have this crutch. They may consider fingerprint technology in a more unbiased perspective. That is not to say that we do not now have information regarding technology that is not essential that historical writers would have lacked. Overwhelming fear towards various prospective devices has often been misplaced, and their actualization has been much simpler and less troubling than we speculated. Yet there is still important value in engaging science fiction as premonitive and being able to see without blinders that may be limiting our perspectives. Combined with current and retrospective data, science fiction can help us gain a more "true" understanding of the morality of technology.

So, looking at *Frankenstein* as a premonitive novel grappling with moral questions of science and technology, what issues does it discuss and what ideals

does it criticize? Ultimately, what is the moral tragedy and moral cautionary tale presented by Shelley? Multiple points immediately come to mind, and I will briefly elaborate each before relating the novel to modern genetic modification.

2.1 The Doctor's Motivation

First, there is the issue of Frankenstein's motivation.[3] Shelley cited one of her first ideas about her story being the "terror" she felt "for the artist who endeavored to 'mock the stupendous mechanism of the Creator of the world,'" and that much inspiration for the novel came from a discussion of Erasmus Darwin's success at animating a piece of flesh.[4] Doctor Frankenstein is presented consistently throughout the novel as out of touch with the world around him, heedless of caution, and ultimately self-serving. He admits that his pursuit of the science was "at first… a matter of duty and resolution," but as time went on, "the more exclusively [he] pursued it for its own sake… now so ardent and eager."[5] The consuming and overwhelming nature of his discoveries and what he was attempting overrode "the magnitude and complexity of [his] plan as any argument of its impracticality," and he "beheld only the result," of his studies, forgetting all steps that led up to it.[6]

For most of us, the issues with the original creation in the novel are glaring, but Shelley includes a second creature, although never completed, whose

[3] Commonly confused, "Frankenstein" actually refers to the student and doctor, Victor Frankenstein. Throughout the paper, I will refer to him as either "Frankenstein" or "Doctor Frankenstein" or "Doctor" and his creation as "the creature" or "creation." A further discussion of the decision to call the creation by those terms takes place in Section 4.3.
[4] Ty, *Mary Shelley Biography*
[5] Shelley, *Frankenstein* p.38
[6] Ibid. p.40-42

construction scenes juxtapose the original ones. Frankenstein becomes aware of moral problems that he overlooked in the first experiment and refuses to finish a companion for his original creature. Even though when someone fails or overlooks a major problem the first time they attempt something we are usually quick to forgive, an endeavor such as this cannot be given such excuses. The long list of wrongs committed by Dr. Frankenstein can be easily attributed to the wrong motivation. Discovery and progress for their own sakes left other, more important considerations like understanding, safety, and the wellbeing of future people behind.

At a point, Frankenstein's motivation shifts from scientific obsession and blind ardor to take on a self-glorifying and self-serving aspect. He begins to understand that he is creating something truly new and contemplates the ways it will owe him for his life. He thinks to himself that "a new species would bless me as its creator and source; many happy and excellent natures would owe their being to me. No father could claim the gratitude of his child so completely as I should deserve theirs."[7] His excitement at being hailed as a benevolent creator became unjustified when he failed to think about the duties it entailed, especially towards his creation who is full of sentience and agency. He does not at all consider that he will have any responsibilities or owe anything to his creation after its animation, and when he momentarily realizes the responsibilities he assumed as the creator of life, he does not maintain this attitude for long. Rather than supreme pride and affection, he ends up horrified at the creature and unable

[7] Ibid.

or unwilling to analyze his role as the single contributor and therefore the only one to blame for this mistake.

Doctor Frankenstein's self-centeredness and moral myopia of overlooking the welfare of his future, sentient creation is also exemplified in how he constructed the creature. Some of the smaller decisions made in the creation process were not given proper consideration and led to complications later on. The creature's large and foreboding stature that serves to make him an outcast later in the story was a deliberate choice by the doctor to simply speed up the experiment. As he began and the "minuteness of the parts formed a great hindrance to [his] speed, [he] resolved, contrary to [his] first intention, to make a being of gigantic statue."[8] Later he understands the ramifications of this change. The creature is terrible to behold from the Doctor's perspective and possesses superhuman strength and speed because of his strange proportions. In fact, this becomes a danger to Frankenstein as the creature goes on to threaten him and his family.

2.2 Alienation and the Problematic Relationships in *Frankenstein*

Second, the relationships between Doctor Frankenstein and the creature and each with themselves are complicated throughout the story by relative alienation, neglect, and a denial of or change in the true nature of each. Alienation is a prominent theme in *Frankenstein* that begins with the Doctor's isolation during his scientific pursuits and the consequential ways that success

[8] Ibid.

isolates him from the world afterwards. His outlook and his ability to enjoy his life are severely tainted and his actions cast a shadow of anxiety and fear over his character for the rest of the novel.

Frankenstein also alienates the creature from the rest of society even as he is making him. His decisions about the creature's stature and appearance leave it unable to find community later and his reaction to the creature following its successful reanimation alienates the creature from him, the only person it would likely ever be able to bond with and the person who owes it a great deal. Upon first waking, the creature witnesses his creator express great fear, regret, and horror, and those attitudes color the rest of their interactions. It is left to find its own place in the world and suffers greatly because of its lack of guidance and strange, atypical nature. Its creator refuses to provide a companion later in the novel and its suffering is only increased as it is denied a meaningful existence and the possibility for life-affirming relationships. This denial is not only in the sense that it has none of the important relationships necessary to nurture one's being, but that it is not even able to name itself or be recognized as a new species or form a robust, meaningful identity because it is alone.

When Frankenstein first lays eyes on the creature, he is not just struck by the ugliness of it and his fear of it, but also the knowledge of how the act of creation has changed himself. Much of the rest of the novel rides on his denial of this irrevocable change and refusal to confront his responsibilities. When discussing the role of human rights in the novel, scholar Diana Reese writes that the Doctor is left unable to participate in society normally and unable to understand the creature's request for a companion because "the work of [his]

hands (the creation of this ranging, destructive other) has alienated him from himself and his authorship from the site of this alienation, he lacks the "power"---of either sensibility or reason—to judge the monster's request."[9] Unable to provide for his creation, Frankenstein flees it and attempts to take solace in his future wife and friends. Although he is able to resume his previous joys and interests for a short time, he relapses frequently to terror and brooding on his creature.

The relationship that follows the creation event is one of further rejection, denials, and frustration. Both parties despair because of the actions of the other. The Doctor lives in constant fear because of the threats of the creature and wages an inner war of whether to acquiesce to his request for a companion. The creature hates his creator for being unwilling to fulfill his responsibilities and alleviate his pain. Interestingly enough, this "rejected-child syndrome" is often the foremost concern of students and scholars alike. One high school English teacher writes that each time they assign the novel *Frankenstein*, they are always surprised that "most of the students have chosen to write about the rejected-child syndrome and the responsibility of the creator toward the created," closely tying that in with the more general "responsibility of scientists to consider the societal and moral implications of their work."[10] The teacher ponders the various reasons for this, considering the impact it has on the students' understanding of parenting and the father's role especially. I am particularly interested in the way that even young students understand the special case a creator-creation dynamic presents and

[9] Reese, *A Troubled Legacy* pg. 52
[10] Simmons, *"Frankenstein" for the 21st Century* p.32

how important it is that the creator steps up to be a guardian supportive of the needs of a being dependent on them.

Harking back to the earlier reference to Shelley's own report of her inspiration for the novel, the central discussion can accurately be described as one of the unique responsibilities that a scientist will have when they begin truly creating life, and the remainder of the novel as a demonstration of what those responsibilities are and what kinds of mistakes someone can make when pursuing scientific knowledge and technological innovation in ways that are not attentive to the important ethical implications of their pursuit.

In the next section, I will elaborate on the innovative technique of CRISPR-Cas9 as a form of technology being rapidly developed to enable us to design human life. It is this ability that I will raise ethical concerns and draw moral analogies to the story of *Frankenstein*.

3. The Miracle of CRISPR-Cas9

Recent developments in genetic and reproductive technologies—or reprogenetic technologies—have proven to be some of the most controversial scientific advancements of our time. From embryonic selection to fertility treatments, a variety of moral considerations on reprogenetic technology are now before us. My thesis will focus on the new possibilities presented by a genetic engineering technique known as CRISPR-Cas9. This technology enables us to modify the genetic traits of embryos with the aim of designing future children. CRISPR-Cas9 is deeply controversial, especially its relation to modification of

non-disease traits. I believe this parallels with the story of *Frankenstein* more closely than the use of genetic technology to modify disease traits, and will focus exclusively on non-disease trait modification.

The origins of CRISPR-Cas9 (hereafter referred to as "CRISPR") are important for understanding its function and the kinds of possibilities that it presents for reproductive technology and our understanding of the human genome. Biochemist Jennifer Doudna and her lab are credited with the discovery of CRISPR, and she speaks on her experience at length in a TED interview I will reference throughout this section. The name: CRISPR-Cas9 refers to two different parts that function together to allow scientists to edit genetic sequences with an unprecedented ease and in more ways than one. "CRISPR" is an abbreviation for "clustered regularly interspaced short palindromic repeats," which refers to a specific DNA sequence found in bacteria that enables their immune system to identify repeat viral infections. After identifying the virus, the enzyme Cas9 is employed along with an RNA guide to remove and disable the viral DNA.[11]

Once scientists understood how CRISPR and Cas9 worked together, they realized they could employ the combination themselves, allowing them to add, delete, and replace genetic material in cells. Additionally, there is another step where edited genes can be "deactivated" or "turned off."[12] This has served as a safety feature to control unintentional mutations while scientists work with

[11] Rulli, *Reproductive CRISPR Does Not Cure Disease,* p. 1073; Raposo, *CRISPR-Cas9 and the Promise of a Better Future,* p.308
[12] Raposo, *CRISPR-Cas9 and the Promise of a Better Future,* p.308

CRISPR. CRISPR allows scientists to do three genetic engineering-based activities with a much higher confidence rate and much better results than previous genetic engineering techniques and reproductive technologies. First, it allows them to do research and further their understanding of genomes and cellular function in virtually any organism. Doudna explained that her lab was particularly interested in utilizing it to isolate the genetic sequence responsible for wing patterns in butterflies, but it can help isolate and identify any genetic sequence in living organisms. This, Doudna stated, was the intent of her lab. They wanted to begin diving into genomes and creating a database for other types of research to reference.[13]

Second, CRISPR has a "somatic" function, where scientists are able to edit the genetic sequence in individual cells and re-insert them into an already existing individual.[14] This is the therapeutic function of CRISPR, and can be used to treat things like aggressive lung cancer.[15] One might accurately say that a somatic use of CRISPR is a curative technology or a medical treatment. This is in contrast to the third function of CRISPR, which does not cure already existing or inevitable diseases, but allows scientists to edit embryos before their implantation. This function might allow a scientist to remove a genetic sequence that is known to cause a disease before the embryo is implanted. It is not curative

[13] Doudna, *The Science and Ethics of Rewriting our DNA*
[14] Rulli, *Reproductive CRISPR Does Not Cure Disease,* p. 1073
[15] Cyranoski, *CRISPR gene-editing tested in a person for the first time* p.279

or a treatment because it affects non-existing persons whose existence is not inevitable.[16]

This third function will be my focus. To break it down further, we might compare it to the already widespread practice of embryonic selection using in vitro fertilization and pre-genetic diagnostics, IVF and PGD for short. At present, it is fairly common for parents who desire to have a genetically related child but are at a high risk for communicating genetic diseases or have trouble conceiving naturally to use one or both of these technologies. Combined, they allow prospective parents to choose from multiple embryos based on the genetic composition of each one. If an embryo has serious genetic mutations and would result in a fetus that is not viable or has significant defects, the parents are able to choose another one and have that embryo be implanted to a parent's uterus artificially. It is worth noting that these procedures are expensive and often traumatic for the mother. IVF is known to be less than successful and often must be done multiple times.[17]

CRISPR would take these technologies one step further. It would be used in combination with IVF and PGD but beyond mere selection. Instead, CRISPR would allow parents to edit the genetic profile of the selected embryo. If a satisfactorily "safe" or "desirable" embryo is not possible, scientists would be able to edit one to accommodate for the dangerous or undesirable gene sequences.

[16] This will be discussed in further detail later and is a point of great dispute among ethicists. The differentiation between curative and non curative technology often defines a procedure's morality.
[17] De-Melo Martin, *On Our Obligation to Select the Best Children* p.74

Champions of CRISPR have developed extremely convincing arguments for why we should welcome its use in whatever capacities. Some have taken that support one step further to argue that we have an *obligation* to use CRISPR as it presents the possibility of a better life for the prospective children it might be used on. No one has been more outspoken about this than ethicist Julian Savulescu. According to Savulescu, non-disease genes have a strong effect on the quality of a person's life—their well-being—and therefore are worthy of our concern for genetic modification. He calls this principle "Procreative Beneficence." In his article, *Procreative Beneficence: Why We Should Select the Best Child,* Savulescu demonstrates how he thinks the traditional bioethical principle of beneficence creates an obligation for us to genetically modify our children.[18] He describes procreative beneficence as different from eugenics in that it has a different motivation. Eugenics, Savulescu explains, is enacted on a population and has a societal justification whereas procreative beneficence is enacted by individuals on their prospective children and functions as a more private enterprise. [19]

This declaration understandably generated numerous response papers, many of which I will reference later on, but it points to a very troubling reality that is not just confined to the theoretical world of philosophy.[20] While many

[18] Savulescu, *Procreative Beneficence*
[19] Ibid. p.425
[20] While there are many other arguments in support of non-disease trait modification, I will be focusing more on the literary analysis of *Frankenstein* as it relates to CRISPR in my thesis, rather than replying directly to supporters. I did want to bring up Savulescu because of how influential his work has been on this discussion and how the principle of procreative beneficence relates to Doctor Frankenstein's motivation. I will also frame some of my later arguments against genetic modification as a response to his reasoning.

scientists who are working with CRISPR are passionate about its potential benefits in many respects, Savulescu's popularity and many supporters reveal that people are not just optimistic about gene editing for the purpose of enhancing human lives—they are utterly convinced of its merits. One scientist has already gone so far as to edit human embryos and implant those embryos.[21] The importance of this discussion cannot be overstated, and the consensus reached will affect the way we create life for generations to come.

In the next section, I will argue that the pursuit of developing CRISPR to allow prospective parents to design their children beyond the promotion of health is deeply morally troubling. Contrary to the philosophers and scientists who praise CRISPR as an exciting enhancement technology that will dramatically improve the human condition at the genetic level, I raise a range of concerns for why the use of CRISPR for editing non-disease traits of future children is morally impermissible and argue that we are on a morally treacherous path if we continue to develop and promote CRISPR with this objective in mind. In making this argument, I will draw from the earlier discussion of *Frankenstein* and connect its insights to the issue of CRISPR.

4. The Impermissibility of CRISPR

So how does the story of *Frankenstein* and the new technology of CRISPR-Cas9 relate to each other, and what moral questions might we draw on from

[21] Relegado, *Chinese Scientists are Creating CRISPR Babies*

Frankenstein when assessing CRISPR? The perspective of Doctor Frankenstein helps us understand how having such power over the creation of life is morally significant and points us in the direction of important considerations when editing human embryos. Although this relates more to the technological side of CRISPR, *Frankenstein* issues a caution against hasty decision making and a reminder to fully consider the consequences of each individual change. The physical appearance of the creature being a result of the Doctor's desire to finish his experiment faster and resulting in complete alienation of the creature is a lesson we cannot ignore. Although a generally cautious attitude has been adopted across the board in regards to CRISPR, specifically in the labs where scientists are working with it, I think *Frankenstein* points us to a deeper kind of caution. We don't need to just be sure that every step we take is *safe* but also that it is morally sound.

What arguments can be made against CRISPR based on *Frankenstein* beyond simple "caution"? I will propose two types of arguments. First, CRISPR introduces the "true creator" role to reproduction, where we become more than parents and the relationships we have with our children change. While this could be a positive change in theory, close examination will reveal that we are already well on the way to making the same kinds of mistakes made by Doctor Frankenstein. In particular, designed children may be viewed as mere commodities who add value to a person's life based on how heavily modified they are, which will likely lead parents to set much higher expectations for them. This speaks to the Doctor's unreasonable and burdensome expectations for the creature and how he never stood a chance of living up to them.

Second, CRISPR could change the way children will fit into society, as well as the influence society could have over what type of person they will become. This can include social trends for children that lead to socially enforced eugenics, exacerbation of already existing inequalities as we become culpable for our physical features, and an erasure of "advantages." In the novel, the influence society had on the creature was much greater than it would have had on a "normal" child, and we see him at odds with the rest of society due to his atypical traits, including how he came into existence. I will outline these key connections, dividing them into four sections, and explain the various aspects of each while defending my position against non-disease modifications.

4.1 True Creator Role

My first argument focuses on the kinds of relationships and roles formed through the use of life-creating and life-designing technologies, like CRISPR. *Frankenstein* encourages us to reconsider the relationship that might form between the prospective child, the scientists helping to modify them, and the parents. Most of the conflict in the novel begins with the Doctor's refusal to consider himself accountable or responsible for the creature and the moral relationship he unintentionally entangled himself in, and this choice to spurn and ignore his creation leads to deaths of loved ones. Although this may be an extreme example to relate back to CRISPR, the moral lesson is easily transferable.

The knowledge that the parents of a CRISPR-engineered child made choices about their genetic makeup and even determined their physical

appearance can put serious strain on their relationships, and a parent's decisions on how to guide their child through life will reasonably have a different ethical significance when the parent deliberately determined what kind of child they would be having. First, the parent's relationships with themselves come into question. Parents take on more direct responsibility for their child's life when they make the decision to "design" their babies through the use of CRISPR. Second, the child's relationship with itself, much like the creature of the novel, becomes all the more complicated when they consider how different they are from their peers and even their parents.

My first objection against CRISPR is based on the ways in which our identity is not only shaped by the bodies we assume, but also how certain human beings come into this world. Let us first focus on the child whose genetic traits are intentionally tailored by their parents through CRISPR. They will form their identities based on their abilities, experiences, and how they interact with the world as well as how the world interacts with them based on their embodiments. But also how they come into the world will shape their identities in profound ways. All of these factors are affected when CRISPR is used to alter a child's genetic makeup. And given the complexity of the human genome, one of the already difficult parts of any type of genetic engineering is the tendency for a change in one gene to affect countless others.[22] How would a child conceive of themselves if they knew any of these factors that shape their identity could have been determined not by chance or their own exercise of autonomy, but by their

[22] Raposo, *CRISPR-Cas9 and the Promise of a Better Future*

parents? The ability to shape a person's identity before they are even born is not new. Many parents develop narratives about how their family will grow and exist long before they have a child to care for, and societal pressures and expectations affect us all in numerous unavoidable ways. Yet the far-reaching potential of CRISPR to alter a person's abilities, appearance, and interactions with the world has troubling implications.

When considering CRISPR as a technology capable of altering the identities of future generations one might come to the troubling conclusion that it leads to the commodification of children. This conclusion in particular relates to *Frankenstein* in a number of ways. Both scenarios can be considered to undervalue humanness and treat life as a commodity. Many scholars have deemed *Frankenstein* to be a discussion of humanness and consider the journey of Doctor Frankenstein not as man becoming god, but as man becoming man in his attempts to create.[23] The creature serves as a foil; he is separated from true humanity by numerous factors: a lack of history, no possibility of community and companionship, and a developmental journey of a very different nature. Even his lack of the ability to be human can be attributed to the Doctor's failure to consider the materials he was dealing with—presumably body parts from the corpses he robbed—and the potential of the end product:a humanoid creature that would have a much more complex existence than his simple hope of a "new species [that] would bless [him] as its creator and source."[24] The potential life was seen as an advantageous commodity for the Doctor to have.

[23] Reese, *A Troubled Legacy* p. 52
[24] Shelley, *Frankenstein* p. 42

These considerations are easily transferable to the question of genetic modification of embryos, if not even more appropriate. Oftentimes, philosophers, novelists, and poets alike are in agreement that the rarity of human life and the odds of any person having a particular character trait or phenotypic trait are unique and contribute the ultimate question: what does it mean to be human? Changing the very manner in which we come into existence may very well change what it means to be human and should prompt us to reevaluate our conceptions of morality and ethics as important features like temperament and health become malleable.

Additionally, there is the risk of further commodifying the ability to reproduce and the risk of social trends for modifications that many call "new eugenics," which will be discussed further in the next section.

4.2 "Socially Sanctioned" Child

Eugenics is generally considered to be a state-sanctioned implementation of methods of reproduction such as selective breeding or sterilization in an effort to improve the genetic composition of a population.[25] The moral issue is usually something to do with the wrongness of a government imposing standards of existence on a population, determining what is desirable and what is not, and the negative effects it has on the parts of the population that do not have the desired traits. Many scholars have argued for the merits of eugenics in the past, with little success. With an increased level of understanding and control over

[25] *Merriam-Webester.com Dictionary* s.v. "Eugenics"

reproduction and the human genome, eugenics has become a popular discussion topic as ethicists try to determine how to avoid eugenical practices. CRISPR is considered by some to be a *new* form of eugenics. It has made our ability to manipulate the gene pool more accurate and could potentially make reprogenetic technology far more accessible. Proponents of new eugenics consider it pluralistic and not guilty of imposing standards as it allows for individual parents to make their own decisions.

At the very least, I might be persuaded to agree that new eugenics has merit in that it is not imposed by the state. But it seems that every other negative consequence still holds true, and some of the conclusions reached by adopting new eugenics are even more radical than its traditional counterpart. Prominent philosopher Robert Sparrow considers new eugenics to instead be a new refrain of an old song, arguing against it in his article *A Not-So-New Eugenics: Harris and Savulescu on Human Enhancement*. He is responding to the way that Savulescu–often in conjunction with John Harris–develops the principle of procreative beneficence to justify new eugenics. Sparrow discusses social prejudices extensively as a contributing factor to the way this proposed new form of eugenics would play out.[26] Even without rejecting individualism outright, one can reasonably argue that individual preferences are heavily influenced by social preferences. Consider how *truly individual* our decisions about clothing or hairstyles are. They are heavily impacted by location, culture, and historical factors to that point that they are difficult to consider as independent choices.

[26] Sparrow, *A Not-So-New Eugenics*

And what are the consequences of not conforming to social standards of appearance? Often non-conforming individuals face stigma, discrimination, and even ostracization. A prospective parent would be hard pressed to develop a justification for their decisions to edit their child's genes, especially genetic sequences that alter something like their hair type or color, that does not involve a desire to conform to social norms. The individualistic and pluralistic aspect of new eugenics is built on a shaky foundation of varying social norms. An ability to make choices that increase our conformity and therefore ease of life and even level of success would only expand the power of society to determine what a good life is and who is worthy of moral concern. Our children's traits and features would be dictated by trends. The parental responsibility of "designing" one's children that those who support the use of CRISPR or new eugenics in pursuit of procreative beneficence desire would backfire. There would be socially binding limits to their freedom of choice and individual expression. And "socially-sanctioned" eugenics is no better than eugenics enforced by the state.

4.3 Exacerbation of Social Inequalities

The potential for a *more difficult* life as a result of genetic modification or 'designing' is also a necessary consideration. Beyond that of basic relational and societal pressures, the creation and exacerbation of inequalities is inevitable.[27] The relationship between a modified child and their parents and even the child

[27] Savulescu himself acknowledges the great potential for this in his article on Procreative Beneficence, and responding philosophers De Melo-Martin and Bennett expand on the reasons why it is not just highly likely, but inevitable.

with itself would be transformed and undoubtedly would introduce new stressors, but the child may also face stigma among larger society, being "othered" and treated as different from its peers.

There is no greater example of this than *Frankenstein*. The sentient being created by the Doctor in the novel is 'othered' throughout the story, being different from the people it comes into contact with and actively alienated in numerous ways. Furthermore, the very terminology of the novel reveals its complicated identity; Mary Shelley refers to it with various labels and scholars writing about the creature are divided on the proper way to address it. Any term, no matter how neutral or what good intentions the user has, isolates the creature from the rest of society. Creature, creation, monster, daemon, etc. all serve as a reminder to the reader of how different it is. This problem of how to refer to people who are products of genetic designing and the use of CRISPR might be less tricky to navigate, but the moral concern about a difference in nature persists. Are we responsible enough as a society to accept these children without qualms?

Even if we are successful and the discrimination towards designer children is not an issue, many would argue that they represent the ultimate form of discrimination. Introducing children whose selected features and manufactured identities may be based on the most socially and economically advantageous traits will widen the gap between marginalized and privileged groups immensely. A disruption of the social order would take place at best, a subjugation of non-conforming individuals at worst. It may be less likely that designer babies will

face discrimination and more likely that they will increase discrimination towards already existing 'othered' groups.

Julian Savulescu infamously insists that the principle of procreative beneficence must be upheld, even if "beneficent" choices for our children exacerbate existing inequalities.[28] Accepting a beneficent principle seems harmless, but furthering the social stigma and physical, mental, and emotional harm inflicted on historically marginalized groups certainly is not. Savulescu argues that this harm would be outweighed by the good. I think Inmaculada De Melo-Martin's article responding to Savulescu does an excellent job of explaining the skewed thinking here. Besides bringing the *extremely relevant* female perspective to the table, she points out that this defense of the possible exacerbation of social inequalities is insufficient because it implies that we are morally obligated to make a decision that results in social injustice.[29] She explains that Savulescu's claim that "it is unlikely that selection on a scale that contributes to inequality would promote well-being" is most likely incorrect, and though he is right to consider institutional reform, he fails to consider how institutional reform might reframe what non-disease traits are even desirable or disadvantageous.[30] Jumping to genetic modification as the solution and eliminating currently problematic or undesirable traits skips the vitally important steps of reforming the institutions that actively criminalize, disadvantage, and oppress various identities and groups. Instead of leveling the playing field to

[28] Savulescu, *Procreative Beneficence* p. 422-424
[29] De Melo-Martin, *On Our Obligation to Select the Best Children* p. 80-82
[30] Savulescu, *Procreative Beneficence;* Ibid.

allow all to participate, we would erase those who have difficulty participating. Such adoption of CRISPR implies that the moral issue is with people themselves rather than our environment.

Parents who utilize CRISPR in an attempt to set their children up for success, would inadvertently disadvantage other children. Although desiring a good life for our family is a positive thing, worsening inequality and overall quality of life for others doesn't seem like a worthy exchange. De Melo-Martin and many other philosophers who write on the ethics of selecting for and modifying non-disease traits also raise the concern that choosing advantageous traits for our children would be a self-defeating sort of effort.[31] By selecting and modifying embryos to ensure our children have a competitive advantage, we would render many advantageous traits null and void because of how common they would become. More generally, the pursuit of perfection in children may also be self-defeating. Philosopher Michael Parker describes it as "inevitably… both exhausting and unlikely to lead to stable, satisfying or deep interpersonal relationships."[32] By elevating genetic perfection exemplified by phenotypical and identity-based excellence, we impose conceptions of the good life, limit freedom of expression, and burden future generations.

If we are able to decide the very *type* of people we bring into the world, our ability to manipulate ethical and moral standards will be enhanced. Many philosophers consider their life's purpose to be to learn the secrets of the universe, uncovering what is truly good and moral by observing the world around

[31] De Melo-Martin, *On Our Obligation to Select the Best Children*
[32] Parker, *The Best Possible Child*

us. Designing our children and effectively designing the future of our race would allow us to impose moral philosophies and conceptions of the "good life" in unprecedented ways. This might lead us to ask certain troubling questions as: once everyone is able to determine the skin color of their child, will it still be immoral to have a preference for lighter or darker skin in the workforce? If traits like obsessive behavior and tendency to become an addict are manipulatable, the excuse that someone "can't help it" and "doesn't have a choice" disappears and society is able to use parents as a scapegoat.

An entirely new set of ethical standards would be necessary if we plan to implement CRISPR as a socially acceptable and even expected way of reproduction as parents and larger groups will be able to enforce personal convictions. We will be able to decide the quality threshold for worthy life and we will be able to decide what traits are morally or ethically superior by promoting them in future generations. The claim that societal norms do not reflect a deeper ethical commitment does not stand up to close inspection, and with the ability to create quality standards and influence population attributes so much that we can change their ethical understandings, we will be making enforceable proclamations about what a "good life" is.

4.3.1 Economic Factors

It is worth briefly mentioning that one of the most glaring issues when it comes to inequality and CRISPR would be unequal access, even if this thesis is not of a large enough scope to thoroughly address it. I am of the firm belief that a technology like this would be deemed medically unnecessary and optional by

both government sponsored and private healthcare institutions and denied insurance coverage or governmental subsidy. In most countries, genetic modification would only be available to those who could afford to pay extra. And by extra, tens of thousands of dollars seems a reasonable estimation.[33] It could become a tool of the rich to further promote and enforce their own phenotypic and cosmetic standards on society. CRISPR most certainly could not be considered morally obligatory, even by the principle of procreative beneficence, if it would require a person's life savings to pay for it. Things that are morally right and only attainable by the rich reveal a set of priorities that does not centralize the wellbeing of all people.

4.4 Responsibility

Making decisions about the non-disease traits of children will drastically change the definition of what it means to be a parent. Michael Sandel explains this in his popular article, "The Case Against Perfection," and argues in favor of treating children as gifts and being able to adapt to the unexpected attributes that come along with life as a central pillar of what it means to be human.[34] Although he is misguided in declaring that *everything* should be treated as a gift, the risk of believing we are entitled to a certain type of child and the positive aspects that come along with them is indeed grave.

Doctor Frankenstein was hoping for the sort of creature that would "bless [him] as its creator" and thought that "many happy and excellent natures would

[33] Crawford et al., *Costs of Achieving Live Birth from ART*
[34] Sandel, *The Case Against Perfection*

owe their being to [him]."[35] The creature itself was set up for failure, as it had no control over its physical appearance and stature, which frightened the Doctor so much that he fled after giving it life. It laments the lost relationship and its own inability to fix it while pleading with the parent who rejected it for a companion. Already we see modern day parents who have children desiring not just to be a parent or to nurture new life, but to reap the benefits that come along with it. They often become frustrated when their child does not allow them to live out their dreams (such as coaching a championship little league team or taking their child to music recitals) and this damages the child's perception of love and their own purpose. How much easier would it be to create unfair expectations and project your own desires onto a child who the parents feel uniquely responsible for? If you made decisions to edit the embryo that would become your child to increase their potential athletic abilities, you might feel more justified in holding them to higher standards of performance throughout their life.

This potential for CRISPR to allow parents to feel justified in their increased expectations for their children also works in reverse. The way in which you come into the world shapes your identity, but so does the way in which you bring another person into the world. The same way the child produced by genetic modification would feel pressured to live up to preset standards, the parent would feel increased pressure to create a certain sort of environment and to push their child to perform to higher standards. The weight of knowing you made choices before they were born that either set them up for success or burdened

[35] Shelley, *Frankenstein* p. 42

them would surely be overwhelming. Children may even feel more justified in blaming their parents for any complications health-wise or aspects of their identity they are not pleased with or that have caused them grief. While many people consider genetically designing children to be an exercise of parents' autonomy, it may also limit their future autonomy as it puts strain on their relationships and psyche.[36]

A question we need to ask ourselves before we begin designing our future generations is whether we are ready to be our children's parent *and* creator? Extensive thought has been given to the subject of the divine's role in creation. Now we must begin to turn that pattern of thinking on ourselves and consider what this new, human role in creation will look like. This concern should increase our overall caution towards the development of CRISPR. Hopefully, unlike Dr. Frankenstein, we will assume responsibility for the decisions we make.

4.4.1 Burden on Women

We must consider how the burden of this responsibility will be divided between parents as well. In order to take advantage of CRISPR, both PGD and IVF are necessary. The embryo must be tested, modified, and then manually implanted into the uterus of a parent. If we indeed have an obligation to create the best children possible, then we would also have an obligation to utilize the combination of CRISPR, PGD, and IVF every time a couple decides to conceive in order to assure the child has the best genetic makeup possible. After considering

[36] Davis, *Genetic Dilemmas and the Child's Right to an Open Future*

whom these procedures will be done to, we might rephrase the statement of obligation to say that *women* would have an obligation to subject themselves to in vitro fertilization everytime they and their partner decided to have a child. As de Melo-Martin points out, this is an unfair and unequal burden on women.[37] The process of IVF is costly, risky, and can be traumatizing for the woman involved.[38] Men are not asked to take on an equal or even similarly difficult role in the idealistic "procreative beneficence," and as always, the woman is forced to carry more responsibility and risk. As IVF is necessary to utilize CRISPR on human embryos, we need to ask ourselves if it is reasonable to consider CRISPR a beneficent reprogenetic technology if it would increase the burden on women, who have been historically repressed and subjugated?

Even if the principle of procreative beneficence is not adopted and the combination of IVF, PGD, and CRISPR is not considered obligatory, the trend of designer babies or any form of widespread use of CRISPR would still overburden women. The proportionality of parental responsibility would become even more skewed than it currently is. Rather than liberating future generations of women by creating more perfect human beings, designer babies would ensure the continuation of women's oppression in the family structure. Thus far, very few voices in the philosophical and scientific communities have acknowledged this. In order to mitigate possible harms or strengthen arguments against genetic modification through CRISPR, we will have to be proactive in bringing women's voices to the forefront of the discussion and prioritizing their wellbeing.

[37] De Melo-Martin, *On Our Obligation to Select the Best Children*
[38] Ibid. p. 75-78

5. Conclusion

In summary, *Frankenstein* provides a unique perspective on the morality of reprogenetic technology. Shelley writes as someone who can only imagine the kinds of power and control we now have over our own genome, and sheds light on many of the concerns we need to address as we begin venturing into the role of "creator" of future generations. The Doctor is an excellent example of the kinds of mistakes one might make if diving head first into development of technology like CRISPR that allows us to modify the genetic makeup of future children, and the creature is an excellent example of the consequences of alienation, 'othering,' and the unique ways societal pressures might impact genetically modified children. CRISPR is opening the gateway to designing our babies, and this is extremely morally problematic.

Genetically modifying children for non-disease traits in an effort to improve their lives will negatively transform parental responsibility by increasing the burden, complicating parent-child relationships, and casting a shadow over the resulting children's lives. It is an expression of the ethical framework of new eugenics that fails to rectify old problems, and would lead to a "socially-sanctioned" child rather than a state-sanctioned one. The use of CRISPR in pursuit of procreative beneficence will inevitably exacerbate the existing social and economic inequalities, and an obligation to use it is concerning given the limited accessibility. Finally, it overburdens women in a manner that cannot be ignored. Women's voices must be prioritized in this conversation as they stand to

shoulder the burden of obligatory in vitro fertilization. The problems CRISPR presents demand caution and careful evaluation of what our priorities are. We must take great care not to begin treating individuals as the problem when institutional reform is a far more appropriate solution.

Works Cited

Bradbury, Ray. *Fahrenheit 451*. Transworld, 1963.

Crawford S, et al. Costs of achieving live birth from assisted reproductive technology: a comparison of sequential single and double embryo transfer approaches. Fertil Steril. 2016 Feb; 105 (2): 444-50. doi: 10.1016/j.fertnstert.2015.10.032.

Cyranoski, D. "CRISPR gene-editing tested in a person for the first time." *Nature*, 539 (2016) 479. doi:10.1038/nature.2016.20988.

Davis, Dena S. “Genetic Dilemmas and the Child’s Right to an Open Future.” *Hastings Center Report,* 27, no. 2 (1997) 7-15.

Doudna, Jennifer. “The science and ethics of rewriting our DNA.” Interviewed by Chris Anderson, *The TED Interview,* June 17, 2021.

Knight, Amber. “Mary Shelley’s *Frankenstein*, Disability, and the Injustice of Misrecognition.” *Disability Studies Quarterly*, Vol. 40, No. 4, Fall 2020. URL: “https://dsq-sds.org/index.php/dsq/article/view/7109/5809”.

Melo-Martín, Inmaculada de. “On Our Obligation to Select the Best Children: A Reply to Savulescu.” *Bioethics*, vol. 18, no.1, 2004.

Merriam-Webster.com Dictionary, s.v. “eugenics,” https://www.merriam-webster.com/dictionary/eugenics.

Parker, Michael. “The Best Possible Child.” *J Med Ethics:* Reproductive Ethics, vol. 33, 2007.

Raposo, Vera Lucia. “CRISPR-Cas9 and the Promise of a Better Future.” *European Journal of Health Law,* vol. 26, no. 4, Oct. 2019, pp. 308-329.

Reese, Diana. “A Troubled Legacy: Mary Shelley’s *Frankenstein* and the Inheritance of Human Rights.” *Representations* 96, no. 1 (2006): 48–72. https://doi.org/10.1525/rep.2006.96.1.48.

Regalado, Antonio. “Chinese scientists are creating CRISPR babies.” *MIT Technology Review,* Nov. 25, 2018.

https://www.technologyreview.com/2018/11/25/138962/exclusive-chinese-scientists-are-creating-crispr-babies/.

Rulli, Tina. "Reproductive CRISPR Does Not Cure Disease." *Bioethics,* vol. 33, no. 9, Nov. 2019, pp. 1072-1082.

Sandel, Michael J. "The Case Against Perfection: What's wrong with designer children, bionic athletes, and genetic engineering." *The Atlantic Monthly*, April 2004.

Savulescu, Julian. "Procreative Beneficence: Why We Should Select The Best Children." *Bioethics,* vol. 15, no. 5-6, 2001.

Shelley, Mary Wollstonecraft. *Frankenstein*. Barnes & Noble, 2005.

Simmons, Eileen A. "'Frankenstein' for the Twenty-First Century: An Exploration of Contemporary Issues." *The English Journal* 83, no. 4 (1994): 30–32. https://doi.org/10.2307/821080.

Spielburg, Steven. *Back to the Future,* Universal Pictures, 1985.

Spielburg, Steven. *Back to the Future II,* Universal Pictures, 1989.

Ty, Eleanor. "Mary Wollstonecraft Shelley." https://people.brandeis.edu/~teuber/shelleybio.html#_frankenstein.