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Symposium Article: Transhuman Babies and Human Pariahs: Genetic Engineering, Transhumanism, Society and the Law¹

By Alexandra M. Franco, J.D.²

I. INTRODUCTION

About three million children are born in the United States every year.³ The birth of a child invokes myriad thoughts in the minds of the child's parents. It is unlikely, however, that any such thought involves the question: "is my child considered a person under the law?" Indeed, the most unlikely thought in any new parent's mind is the bizarre concept that who or what constitutes a human person under American law has never been conclusively defined. And due to technological developments in reproductive and other biomedical technologies, the need for such a definition is urgent.

Novel technologies enable biomedical pioneers to achieve remarkable feats. In 2014, a woman gave birth through a transplanted womb.⁴ In 2016, a woman gave birth to her child using ovarian tissue which had been removed from her body and frozen since she was nine years old.⁵ In the realm of non-reproductive medical technologies, physicians can stop a man's uncontrollable tremors through brain surgery—without ever opening the man's skull.⁶ In 2012, Oscar Pistorius made history when he became the first double amputee to compete in the Olympic Games⁷ with his "blade" prosthesis.⁸ These biotechnological achievements would have fallen into the category of science-fiction a few years ago; today, they are a reality.

Technological developments such as the above reflect the remarkable progress of the biomedical field. Even more astounding, however, is the progress in the realm of genetic

¹ This Article was originally presented in its current version at the Loyola University School of Law Children's Legal Rights Journal Symposium on October 14, 2016.

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³ *Births and Natality*, CENTERS FOR DISEASE, CONTROL AND PREVENTION, <https://www.cdc.gov/nchs/fastats/births.htm> (last visited May 12, 2017).

⁴ Simon Johnson & Catherine Evans, *Swedish Woman World's First to Give Birth After Womb Transplant*, REUTERS (Oct. 4, 2014), <http://uk.reuters.com/article/2014/10/04/us-sweden-transplant-idUKKCN0HT0GC20141004>.

⁵ Kimiko De Freytas-Tamura, "It's Like a Miracle": Woman Gives Birth Using Ovary Frozen Since Childhood, N. Y. TIMES (Dec. 15, 2016), <http://www.nytimes.com/2016/12/15/world/europe/its-like-a-miracle-woman-gives-birth-using-ovary-frozen-since-childhood.html>.

⁶ Fergus Walsh, *Doctors Use Deep-Brain Ultrasound Therapy to Treat Tremors*, BBC (Dec. 9, 2016), <http://www.bbc.com/news/health-38157770>.

⁷ Laura Donnelly, *Oscar Pistorius Makes Olympic History*, TELEGRAPH (Aug. 4, 2012), <http://www.telegraph.co.uk/sport/olympics/london-2012/9450469/Oscar-Pistorius-makes-Olympic-history.html>.

⁸ Larry Greenmeier, *Blade Runners: Do High-Tech Prostheses Give Runners and Unfair Advantage?*, SCI. AM. (Aug. 5, 2016), <https://www.scientificamerican.com/article/blade-runners-do-high-tech-prostheses-give-runners-an-unfair-advantage/>.

engineering technologies. For example, a new technology called CRISPR⁹ has revolutionized the field of genetic engineering.¹⁰ CRISPR could potentially lead to the eventual cure of conditions ranging from cancer¹¹ to sickle-cell disease¹² and is therefore promising in its potential biomedical applications. Nevertheless, despite the fact that novel genetic engineering technologies such as CRISPR may bring significant benefits to society, they also present serious concerns. Legal scholars¹³ and scientists¹⁴ fear that such technologies will be used for non-medical purposes, including the creation of “designer babies”—genetically enhanced children with specific traits selected by their parents.¹⁵

Designer children would give rise to a great number of legal and ethical issues. Amongst these issues is the uncertainty as to whether, for legal purposes, these children would be considered “persons.” Bioethicist Francis Fukuyama expressed this concern best when he stated: “what rights will [the] *enhanced creatures* claim, and what rights will they possess when compared to those left behind?”¹⁶ “Personhood” in American jurisprudence is a largely undefined notion,¹⁷ and as such, there is no guarantee that genetically enhanced children would be automatically entitled to legal personhood status. Moreover, in light of the rapid development of novel genetic technologies, Fukuyama’s question is more relevant and more pressing now than ever before in history.

Human enhancement through genetic engineering has been thoroughly debated, and the literature on the topic is extensive.¹⁸ Some proponents, known as Transhumanists,¹⁹ argue that it is human nature to strive for enhancement by any means, including genetic modification.²⁰ On the other hand, some opponents argue that genetic engineering technologies carry physical, ethical and legal concerns,²¹ and that they are particularly problematic if their effect is to change the human

⁹ CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats. Ekaterina Pak, *CRISPR: A Game-Changing Genetic Engineering Technique*, HARVARD UNIVERSITY, GRADUATE SCHOOL OF ARTS AND SCIENCES: SCIENCE IN THE NEWS (July 31, 2014), <http://sitn.hms.harvard.edu/flash/2014/crispr-a-game-changing-genetic-engineering-technique/>. See also *What is CRISPR-Cas9?*, YOURGENOME, <http://www.yourgenome.org/facts/what-is-crispr-cas9>.

¹⁰ Heidi Ledford, *CRISPR, the Disruptor*, 522 NATURE 20, 20 (2005), <http://www.nature.com/news/crispr-the-disruptor-1.17673>.

¹¹ Sara Reardon, *First CRISPR Trial Gets Green Light from U.S. Panel*, NATURE (June 22, 2016), <http://www.nature.com/news/first-crispr-clinical-trial-gets-green-light-from-us-panel-1.20137>.

¹² Sharon Begley, *A CRISPR-Based Fix for Human Sickle Cells Shows Promise in Mice*, STAT (Oct. 12, 2016), <https://www.statnews.com/2016/10/12/crispr-sickle-cell-mouse/>.

¹³ See, e.g., Lori B. Andrews, George Annas & Rosario M. Isasi, *Protecting the Endangered Human: Toward an International Treaty Prohibiting Cloning and Inheritable Alterations*, 28 AMER. J. L. & MED. 153 (2002).

¹⁴ Rob Stein, *Scientists Urge Temporary Moratorium on Human Genome Edits*, NPR (Mar. 20, 2015), <http://www.npr.org/sections/health-shots/2015/03/20/394311141/scientists-urge-temporary-moratorium-on-human-genome-edits>.

¹⁵ *Id.*

¹⁶ Francis Fukuyama, *Transhumanism*, 144 FOREIGN POL’Y 42, 42 (2004) (emphasis added).

¹⁷ See e.g., Michael D. Rivard, *Contemporary Issues in Administrative Adjudication: Comment: Toward a General Theory of Constitutional Personhood: A Theory of Constitutional Personhood for Transgenic Humanoid Species*, 39 UCLA L. REV. 1425, 1431-33 (1992).

¹⁸ See, e.g., Andrews, Annas & Isasi, *supra* note 13; Rivard, *supra* note 17; Fukuyama, *supra* note 16.

¹⁹ A broad definition of “Transhumanism” is that it is a movement generally seeking to expand natural human capabilities and eliminate natural human limitations through technology. See *Transhumanist Declaration*, HUMANITY+, <http://humanityplus.org/philosophy/transhumanist-declaration/> (last visited May 12, 2017).

²⁰ *What We Do*, HUMANITY+, <http://humanityplus.org/> (last visited May 12, 2017).

²¹ See generally Andrews, Annas & Isasi, *supra* note 13.

genome permanently.²² The fundamental problem with this debate is that it has not led to the implementation of regulations or laws addressing the genetic engineering of humans. As of 2017 there are no comprehensive laws in the United States addressing the genetic engineering of human embryos.²³

The background of this issue is, therefore, (1) a heated ideological debate, (2) fast-developing technology, and (3) regulatory and legal uncertainty. Additionally, societal values are increasingly accepting of enhancement technologies. In the meantime, the first children who will be born as a result of the application of genetic engineering techniques remain legally vulnerable. Therefore, the underlying arguments presented in this Article aim to highlight that the first “Transhuman,”²⁴ designer children, would be unprotected by the American legal system and that the best approach to solving this issue is to implement a legal definition of “human person.” However, to understand the complexity of the issues that arise from the designer baby movement, it is necessary to engage in an interdisciplinary discussion providing an overview of issues presented by Transhumanism, the designer baby movement and genetic engineering technologies, specifically, those involving germline genetic modifications—a type of genetic engineering which is not limited to the target subject and which can be passed down to future generations.²⁵

To address this complex, multidimensional topic in this Article, I will (1) present an overview of recent scientific developments in genetic engineering technologies enabling the designer baby movement, (2) provide a brief overview of Transhumanist ideology, its relationship to genetic engineering technologies, as well as the possible effects of the ideology and the technology on children and future generations, (3) provide a critical analysis of existing proposals addressing the issues presented by genetic engineering technologies, (4) discuss the existing legal precedent in the realm of legal personhood which can facilitate the development of a regulatory scheme, and finally (5) propose a regulatory scheme based on a bio-psychological theory of legal personhood.

II. OVERVIEW OF GENETIC ENGINEERING – RECENT DEVELOPMENTS AND IMPLICATIONS

²² Edward Lanphier, Fyodor Urnov, Sarah Ehlen Haeckler, Michael Werner & Joanna Smolenski, *Don't Edit the Human Germline*, 519 NATURE 410, 410 (2015), <http://www.nature.com/news/don-t-edit-the-human-germ-line-1.17111>.

²³ Anna Zaret, *Editing Embryos: Considering Restrictions on Genetically Engineering Humans*, 67 HASTINGS L. J. 1805, 1839, 1832 (2016). However, a notable recent development to this general lack of regulation is a 2016 House Appropriations bill, which has the effect of restricting FDA funds from being used to perform germline genetic modifications to a human embryo. See generally Glenn Cohen & Eli Y. Adashi, *The FDA is Prohibited from Going Germline*, 353 SCI. 545, (Aug. 5, 2016). See also H.R. Res. 2029.

²⁴ The Merriam-Webster Dictionary defines Transhuman as: “transcending human limits: superhuman.” *Transhuman*, MERRIAM-WEBSTER DICTIONARY. For purposes of this article, a Transhuman is a genetically engineered human enhanced beyond baseline human capabilities. See also HUMANITY+, *supra* note 19.

²⁵ Germline genetic engineering affects the genetic makeup of “reproductive cells where the genes can be transmitted to succeeding generations.” Maxwell J. Mehlman, *Will Directed Evolution Destroy Humanity, and if So, What Can We Do About It*, 93 ST. LOUIS U. J. HEALTH L. & POL’Y 93, 94 (2009). For purposes of this article, unless otherwise noted, the only type of genetic editing discussed will be germline genetic modifications. See also Patrick Skerret, *Experts Debate: Are We Playing With Fire When We Edit Human Genes?*, STAT (Nov. 17, 2015), <https://www.statnews.com/2015/11/17/gene-editing-embryo-crispr/>.

It is hard to imagine a future in which “designer babies” are possible. However, it only takes an analysis of the recent timeline of developments in the realm of genetic engineering to see the writing on the wall.

In February 2015, lawmakers in the United Kingdom voted to allow in-vitro fertilization²⁶ using a technique called mitochondrial replacement therapy (MRT), which replaces the mitochondrial DNA of the mother with that of a donor to prevent the resulting child from being born with an inherited mitochondrial disease.²⁷ In addition to producing a child free of mitochondrial disease, this technique has the side effect of producing a child from three genetic parents.²⁸ Because the technique affects all the cells of the resulting child—including reproductive cells—MRT is a form of germline genetic modification which can be passed down to a subject child's descendants.²⁹

Around March of 2015, scientists around the world broke into a collective alarm about a genetic engineering technique called CRISPR,³⁰ which revolutionized the field of genetic engineering.³¹ Prior to its inception, performing genetic edits was a long, difficult, and expensive task.³² CRISPR enabled scientists to perform genetic modifications cheaply and accurately.³³ The technology is so vastly superior to what was previously available, that the scientific community called for a moratorium on the use of CRISPR in human embryos.³⁴ The call for the moratorium was the result of the concern that the rise of the technology made the genetic engineering of humans an imminent possibility.³⁵

²⁶ See *In Vitro Fertilization (IVF)*, MAYO CLINIC, <http://www.mayoclinic.org/tests-procedures/in-vitro-fertilization/home/ovc-20206838>.

²⁷ Laura Smith-Spark, *UK Lawmakers Approve ‘3-Parent Babies’ Law*, CNN (Mar. 3, 2015), <http://www.cnn.com/2015/02/03/health/uk-ivf-3-person-babies/>. See also James Masters, *‘Three-Parent’ Babies Approved in The UK*, CNN (Dec. 15, 2016), <http://www.cnn.com/2016/12/15/health/babies-three-people-embryos/index.html>. On December 2016, the fertility regulator of the U.K. gave its approval to the treatment, meaning that the first U.K. children born from MRT could arrive in 2017. *Id.*

²⁸ Smith-Spark, *supra* note 27. To understand the reason for the term “three-parent baby,” it is necessary to review the biology of the cell. The mitochondria are the only other part of the cell besides the nucleus which contain genetic material, 37 genes to be precise. See *Genetics Home Reference*, NIH: U.S. NATIONAL LIBRARY OF MEDICINE, <https://ghr.nlm.nih.gov/primer/basics/mtdna>. (visited May 12, 2017). Mitochondrial replacement therapy produces a so-called “three parent baby” because it utilizes the healthy mitochondria from a donor, which contains DNA from that donor; therefore, in addition of the nuclear DNA from the intended parents, the resulting child will have the DNA from a third person. Shoukhrat Mitalipov & Don P. Wolf, *Clinical and Ethical Implications of Mitochondrial Gene Transfer*, 25 TRENDS IN ENDOCRINOLOGY & METABOLISM 5 (2014).

²⁹ Marcy Darnovsky, *A Slippery Slope to Human Germline Modification*, 499 NATURE 127, 127 (July 9, 2013), <http://www.nature.com/news/a-slippery-slope-to-human-germline-modification-1.13358>. See also Masahito Tachibana et al., *Towards Germline Gene Therapy of Inherited Mitochondrial Diseases*, 493 NATURE 627, 627 (Jan. 2013) (explaining that mitochondrial DNA is passed down from the woman's egg to the offspring).

³⁰ CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats. Ekaterina Pak, *CRISPR: A Game-Changing Genetic Engineering Technique*, HARVARD UNIVERSITY, GRADUATE SCHOOL OF ARTS AND SCIENCES: SCIENCE IN THE NEWS; (July 31, 2014), <http://sitn.hms.harvard.edu/flash/2014/crispr-a-game-changing-genetic-engineering-technique/>. See also *What is CRISPR-Cas9?*, YOURGENOME, <http://www.yourgenome.org/facts/what-is-crispr-cas9>. See also, Stein, *supra* note 14.

³¹ See Ledford, *supra* note 10.

³² See Stein, *supra* note 14

³³ Heidi Ledford, *Riding the CRISPR Wave*, 531 NATURE 157, 159 (2016), <http://www.nature.com/news/crispr-gene-editing-is-just-the-beginning-1.19510>.

³⁴ See Stein, *supra* note 14. See also Lanphier et al., *supra* note 22.

³⁵ See Stein, *supra* note 14.

In the following month, the aforementioned concern materialized when, through the use of CRISPR, Chinese scientists reported having successfully edited the genes of human embryos for the first time in history.³⁶ Although the Chinese scientists used non-viable embryos that could not result in a live birth³⁷ this experiment evidences that it is now possible to genetically edit human embryos. Moreover, commentators note that in addition to the now infamous Chinese experiment,³⁸ more experiments involving the genetic editing of human embryos will continue to take place.³⁹ If germline genetic modifications to human embryos occur in instances in which the embryos are carried to term, such modifications would pass down to future generations and would thus have the potential to alter the genetic makeup of the human species.⁴⁰

The scholarly and regulatory communities have responded to these recent developments. On April 28, 2015, Francis Collins, Director of the National Institutes of Health, issued a statement regarding CRISPR and explaining the NIH's stance against germline modification.⁴¹ He stated that the "NIH [would] not fund any use of gene-editing technologies in human embryos" and that the NIH's Recombinant DNA Advisory Committee⁴² "[would] not at present entertain proposals for germline alteration."⁴³

In December 2015, about 500 ethicists, legal scholars, advocates, and scientists converged at a summit in Washington D.C. to craft guidelines addressing the genetic engineering of humans through technologies such as CRISPR.⁴⁴ The group, however, did not condemn the Chinese experiments, and instead chose to discuss the broader ethical and clinical issues involved.⁴⁵

In February 2016, the National Academy of Sciences, Engineering, and Medicine issued a statement encouraging the Food and Drug Administration's consideration of allowing clinical investigations of MRT with certain limitations.⁴⁶ However, although the therapy has not been

³⁶ David Cyranoski & Sara Reardon, *Chinese Scientists Genetically Modify Human Embryos*, NATURE (Apr. 22, 2015), <http://www.nature.com/news/chinese-scientists-genetically-modify-human-embryos-1.17378>.

³⁷ *Id.*

³⁸ The scientific community was so shocked by this experiment that reputable scientific journals Science and Nature refused to publish the study due to ethical considerations. Sarah Knapton, *China Shocks World by Genetically Engineering Human Embryos*, TELEGRAPH (Apr. 23, 2015), <http://www.telegraph.co.uk/news/science/11558305/China-shocks-world-by-genetically-engineering-human-embryos.html>.

³⁹ Lanphier et al., *supra* note 22.

⁴⁰ See Andrews, Annas & Isasi, *supra* note 13, at 160-61.

⁴¹ *Statement on NIH Funding of Research Using Gene-Editing Technologies in Human Embryos*, NAT'L INST. OF HEALTH (Apr. 28, 2015), <https://www.nih.gov/about-nih/who-we-are/nih-director/statements/statement-nih-funding-research-using-gene-editing-technologies-human-embryos>.

⁴² "The Recombinant DNA Advisory Committee is a federal advisory committee that provides recommendations to the NIH Director related to basic and clinical research involving recombinant or synthetic nucleic acid molecules." *Biomedical Technology Assessment; Recombinant DNA Advisory Committee*, NIH: OFF. OF SCI. POL'Y, <http://www.osp.od.nih.gov/office-biotechnology-activities/biomedical-technology-assessment/hgt/rac> (last visited Apr. 10, 2017).

⁴³ *Statement on NIH Funding of Research Using Gene-Editing Technologies in Human Embryos*, *supra* note 41. Despite the NIH's position and the stance of the scientific community, the first U.S. experiment on the genetic editing of embryos took place on July of 2017. See Steve Connor, *First Human Embryos Edited in U.S.*, MIT TECH. REV. (July 26, 2017), <https://www.technologyreview.com/s/608350/first-human-embryos-edited-in-us/>.

⁴⁴ Sara Reardon, *Global Summit Reveals Divergent Views on Human Gene Editing*, 528 NATURE 173, 173 (Dec. 8, 2015).

⁴⁵ *Id.*

⁴⁶ *Clinical Investigations of Mitochondrial Replacement Techniques are "Ethically Permissible" If Significant Conditions are Met, Says New Report*, NAT'L ACAD. OF SCI., ENGINEERING, AND MED. (Feb. 3, 2016),

approved in the United States,⁴⁷ and despite recent legislative efforts to tighten regulations of gene editing technologies,⁴⁸ the first baby resulting from MRT was born in September of 2016.⁴⁹ A Jordanian couple was able to conceive the child through MRT with the help of an American team, which traveled to Mexico to avoid regulatory obstacles in the United States.⁵⁰

The latter example illustrates the slow pace of discussion and the inadequacy of laws and regulations when compared to the pace at which the technology advances. As mentioned above, there are no comprehensive laws in the United States addressing the genetic engineering of human embryos.⁵¹ This regulatory void is especially alarming in the realm of germline genetic engineering technologies because, in addition to leaving genetically modified children legally unprotected, they have the potential to alter the genetic makeup of future generations permanently⁵² and in unpredictable ways.⁵³

When legislators in the U.K. approved MRT, then Prime Minister David Cameron justified the approval stating: “We’re not playing God here, we’re just making sure that two parents who

<http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=21871>. Such limitations include clinical investigations being limited to women who are at serious risk of passing mitochondrial disease to their children and that the technique be restricted to male embryos only (since mitochondria only pass down from the maternal line, men being born as a result of the therapy do would not pass their donated mitochondria to future generations). *Id.* Although such approval is for non-reproductive purposes, the author notes that: “researchers say that the decision to allow embryo-editing research could inform the debate over deploying gene-editing in embryos for therapeutic uses...” *Id.*

⁴⁷ *Mitochondrial Replacement Therapy*, UMDF Position Statement on Mitochondrial Replacement Therapy, UNITED MITOCHONDRIAL DISEASE FOUND, http://www.umdff.org/site/c.8qKJOmVf7LUG/b.9166823/k.2E25/Mitochondrial_Replacement_Therapy.htm (last visited Apr. 11, 2017).

⁴⁸ See Sara Reardon, *U.S. Congress Moves to Block Human-Embryo Editing*, NATURE (June 25, 2015), <http://www.nature.com/news/us-congress-moves-to-block-human-embryo-editing-1.17858>; see also Cohen & Adashi, *supra* note 23; H.R. Res. 2029. The relevant language in the Consolidated Appropriations Act of 2016 states: “none of the funds made available by this Act may be used to notify a sponsor or otherwise acknowledge receipt of a submission for an exemption for investigational use of a drug or biological product under section 505(i) of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 355(i)) or section 351(a)(3) of the Public Health Service Act (42 U.S.C. 262(a)(3)) in research in which a human embryo is intentionally created or modified to include a heritable genetic modification. Any such submission shall be deemed to have not been received by the Secretary, and the exemption may not go into effect.” *Id.* at § 749. However as Mehlman notes, it is uncertain whether regulation of genetic engineering technologies through the FDA would be effective—as the FDA does not regulate the practice of medicine—thus potentially placing a large part of the technology outside the FDA’s jurisdiction. MAXWELL J. MEHLMAN, *THE PRICE OF PERFECTION* 193 (The Johns Hopkins University Press 2009).

⁴⁹ Michelle Roberts, *First “Three Person Baby” Born Using New Method*, BBC (Sept. 27, 2016), <http://www.bbc.com/news/health-37485263>.

⁵⁰ *Id.* In August of 2017, the FDA warned the physician who performed the procedure to stop marketing the treatment after having told the FDA that he would not use the MRT technology until a trial is formally approved. See Susan Scutti, James Masters and Susannah Cullinane, *FDA Warns ‘3-Parent’ Baby Fertility Doctor Over Marketing*, CNN (Aug. 7, 2017), <http://www.cnn.com/2017/08/07/health/fda-3-parent-fertility-zhang/index.html>. See also, Mary A. Malarkey, *August 4, 2017 Letter to Dr. John Zhang*, <https://www.fda.gov/downloads/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/ComplianceActivities/Enforcement/UntitledLetters/UCM570225.pdf>.

⁵¹ See Zaret, *supra* note 23.

⁵² See Lanphier et al., *supra* note 22.

⁵³ Skerret, *supra* note 25.

want a healthy baby can have one.”⁵⁴ This explanatory statement is unsurprising, since the rapid advance of genetic engineering technologies has been met with resistance. Regarding the three-parent baby born in Mexico, commentators from the scientific and scholarly community condemned the work of the U.S. team that performed the procedure, calling it “irresponsible.”⁵⁵ Attendees at the D.C. summit specifically raised the concern that contemporary gene-editing technologies are a gateway to designer children, which in turn can exacerbate existing issues of discrimination and social inequality by enabling parents to select their children’s features—such as their skin tone.⁵⁶ Human Genetics Alert⁵⁷ Director, David King, expressed this concern when he noted the need to prevent “[an] eugenic future in which the rich can buy themselves a baby with built-in genetic advantages.”⁵⁸

Will the rapid development of genetic engineering technologies truly lead to a “designer baby” future as commentators fear? The answer to this question is not necessarily evident solely from examining the recent developments in genetic engineering—as impressive as they may be. It is further necessary to examine history and the recent changes in societal values favoring enhancement technologies and behaviors. When examining the two in conjunction, it becomes evident that a future of enhanced, designer children is no longer in question.

III. THE BIRTH OF THE TRANSHUMAN BRAIN-CHILD - TRANSHUMANISM, SOCIETY AND THE CONSEQUENCES TO FUTURE GENERATIONS

a. A Brief Overview of Transhumanism

The obsession with enhancement of the human condition—such as the one evidenced by the designer baby movement—stretches back to the earliest days of human society and has been pervasive throughout history. The ancient Spartans, for example, inspected every newborn for defects and discarded those who did not meet their standard of perfection.⁵⁹ The Nazis ran state-sanctioned clinics known as *Lebensborn* in which they would care for single, pregnant women—so long as they possessed the desired physical characteristics—in order to promote the “Aryan race.”⁶⁰ Due to their innate vulnerability—as evidenced by the aforementioned examples—this obsession with “perfection” has naturally affected children, but its intellectual roots are broader and have evolved into complex ideological movements with definite values affecting society in general. Therefore, in order to understand the true implication of the eternal human quest for perfection, and the ideological roots of the designer baby movement, it is necessary to understand the modern incarnations of this ideal.

⁵⁴ James Gallagher, *MPs Say Yes to Three-Person Babies*, BBC (Feb. 3, 2015), <http://www.bbc.com/news/health-31069173>.

⁵⁵ Roberts, *supra* note 49.

⁵⁶ Reardon, *supra* note 44.

⁵⁷ “Human Genetics Alert (HGA) is a secular, independent public interest watchdog group, based in London, UK.” *About Us*, HUMAN GENETICS ALERT, <http://www.hgalert.org/aboutUs/> (Last visited May 12, 2017).

⁵⁸ Knapton, *supra* note 38.

⁵⁹ Evan Andrews, *8 Reasons It Wasn’t Easy Being Spartan*, HISTORY (Mar. 5, 2013), <http://www.history.com/news/history-lists/8-reasons-it-wasnt-easy-being-spartan>.

⁶⁰ Mark Landler, *Results of Secret Nazi Breeding Program: Ordinary Folks*, N. Y. TIMES (Nov. 7, 2006), <http://www.nytimes.com/2006/11/07/world/europe/07nazi.html>.

Transhumanism is an intellectual movement that actively promotes human enhancement.⁶¹ According to Transhumanist proponent and scholar Nick Bostrom,⁶² the roots of Transhumanist thought can be traced to the ancient Sumerians, to Taoism in China, to alchemists seeking to produce the “Elixir of Life” and to early adventurers looking to find the “Fountain of Youth.”⁶³ However, as Bostrom notes, it was not until the period of time known as the Enlightenment—in which human society experienced an exponential increase in discoveries and scientific developments⁶⁴—that Transhumanism became a quest for improvement through scientific means.⁶⁵

Philosophy has also left a mark in the movement, with Friedrich Nietzsche being one of the most influential philosophers in Transhumanist thought.⁶⁶ In his book *Thus Spake Zarathustra*, Nietzsche famously set forth the concept of humanity as a transient state, members of which should strive to transcend and evolve into something superior.⁶⁷ Nietzsche immortalized this ideal in the following passage:

And Zarathustra spake thus unto the people: I teach you the Superhuman. Man is something that is to be surpassed. What have ye done to surpass man? All beings hitherto have created something beyond themselves: and ye, want to be the ebb of that great tide, and would rather go back to the beast than surpass man? What is the ape to man? A laughing-stock, a thing of shame. And just the same shall man be to the Superhuman: a laughing-stock, a thing of shame.⁶⁸

The modern Transhumanist movement saw its birth in the early 1990s,⁶⁹ and its formal philosophy is that of “[seeking] the continuation and acceleration of the evolution of intelligent life beyond its current human form and human limitations by means of science and technology, guided by life-promoting principles and values.”⁷⁰ Authors and scholars such as Max Moore,⁷¹

⁶¹ See *Transhumanist Declaration*, HUMANITY+, *supra* note 19.

⁶² See Nick Bostrom, *Home Page*, <http://www.nickbostrom.com/> (last visited May 12, 2017).

⁶³ Nick Bostrom, *A History of Transhumanist Thought*, 14 J. EVOL. & TECH. 1, 1 (2005), <http://www.nickbostrom.com/papers/history.pdf>.

⁶⁴ *Id.* See also *Enlightenment*, HISTORY, <http://www.history.com/topics/enlightenment> (last visited May 12, 2017). The Enlightenment is the period of time between 1685 and 1815 also known as the “Age of Reason.” *Id.* During this time, “Enlightenment thinkers in Britain, in France and throughout Europe questioned traditional authority and embraced the notion that humanity could be improved through rational change.” *Id.*

⁶⁵ Bostrom, *supra* note 63, at 2.

⁶⁶ Bostrom disagrees with this notion noting that: “What Nietzsche had in mind, however, was not technological transformation but a kind of soaring personal growth and cultural refinement in exceptional individuals . . .” *Id.* at 4. Nevertheless, Bostrom’s interpretation of Nietzsche’s ideal in itself is consistent with Transhumanism as a philosophy of life, instead of solely as a movement in support of purely physical transformation. See *id.* In contrast with Bostrom’s view, Transhumanist scholar Stefan Lorenz Sorgner believes that Nietzsche’s “will-to-power” philosophy is consistent with Transhumanism because “if you will to power, then it is in your interest to enhance yourself.” Stefan Lorenz Sorgner, *Nietzsche, the Overhuman and Transhumanism*, 20 J. EVOL. TECHNOL. 29 (2009), <http://jetpress.org/v20/sorgner.htm>.

⁶⁷ FRIEDRICH NIETZSCHE, *THUS SPAKE ZARATHUSTRA*, <http://www.gutenberg.org/files/1998/1998-h/1998-h.htm>.

⁶⁸ *Id.*

⁶⁹ *Philosophy*, HUMANITY+, <http://humanityplus.org/philosophy/philosophy-2/> (last visited May 12, 2017).

⁷⁰ *Id.* (quoting Max Moore).

⁷¹ See *Strategic Philosopher Max More, What Does He Do?*, <http://www.maxmore.com/bio.htm>.

Nick Bostrom⁷² and James Hughes⁷³ have shaped the movements' modern intellectual foundations and promoted the benefits that Transhumanism may bring to humanity at large.⁷⁴ Bostrom, for example, asserts that the use of technologies such as genetic engineering would allow humanity to eliminate disease and needless suffering⁷⁵—a core Transhumanist tenet.⁷⁶

Indeed, new genetic engineering techniques such as CRISPR can open the door to the achievement of some Transhumanist goals, such as the elimination of disease.⁷⁷ For example, CRISPR has shown promise in editing HIV out of human cells⁷⁸ and in curing sickle-cell disease.⁷⁹ The technology is so promising in the treatment of disease that on June 21, 2016, the National Institutes of Health approved a proposal for a human clinical trial employing CRISPR to treat three types of cancer.⁸⁰

However, despite the significant medical benefits the technology could bring, it could also be used to further controversial Transhumanist ideals. Transhumanist beliefs range from that of general improvement of the human condition⁸¹ to that of achievement of a state of “post-humanity,” which is the existence of “future human beings whose basic capacities so radically exceed those of present humans as to be no longer unambiguously human by our current standards.”⁸² Genetic engineering technologies can advance to the point that they could enable the achievement of Transhumanist goals such as human immortality,⁸³ great increase in human intelligence⁸⁴ and other more “cosmetic” improvements, such as the ability to see infrared radiation.⁸⁵

Not surprisingly, the “enhancement” goals of Transhumanism have been rejected by bioethicists, as well as law and policy scholars. Some opponents argue that Transhumanism is a “hubristic form of humanism, replacing the worship of God with the worship of man.”⁸⁶ Other

⁷² See Bostrom, *supra* note 63.

⁷³ See James Hughes, INSTITUTE FOR ETHICS AND EMERGING TECHNOLOGIES, <http://ieet.org/index.php/IEET/bio/hughes> (last visited May 12, 2017).

⁷⁴ Nick Bostrom, *Human Genetic Enhancements: A Transhumanist Perspective*, 37 J. OF VALUE INQUIRY 493 (2003), <http://www.nickbostrom.com/ethics/genetic.html>.

⁷⁵ Nick Bostrom, *Ethical Issues for the Twenty-First Century; Transhumanist Values*, 4 REV. CONTEMP. PHIL. 3 (May 2005), <http://www.nickbostrom.com/ethics/values.pdf>. See also Humanity+, *Transhumanist FAQ*, <http://humanityplus.org/philosophy/transhumanist-faq/> (last visited Apr. 29, 2017).

⁷⁶ *Id.*

⁷⁷ See Bostrom, *supra* note 75.

⁷⁸ See generally Gang Want, Na Zhao, Ben Berkout & Atze T Das, *CRISPR-Cas9 Can Inhibit HIV-1 Replication but NHEJ Repair Facilitates Virus Escape*, 24 MOLECULAR THERAPY 522 (2016).

⁷⁹ Begley, *supra* note 12.

⁸⁰ Shelly Fan, *CRISPR Targets Cancer in First Human Trial – What You Need to Know*, SINGULARITY HUB (June 26, 2016), <http://singularityhub.com/2016/06/26/75-crispr-targets-cancer-in-first-human-trial-what-you-need-to-know/>. See also, Preetika Rana, *China Pushes Ahead With Human Gene-Editing Trials*, WALL ST. J. (Apr. 28, 2017), <https://www.wsj.com/articles/china-pushes-ahead-with-human-gene-trials-1493380057?mg=id-wsj>.

⁸¹ See generally Bostrom, *supra* note 75.

⁸² See *Transhumanist FAQ*, *supra* note 75.

⁸³ Olivia Solon, *All Aboard the Immortality Bus: The Man Who Says Tech Will Help Us Live Forever*, GUARDIAN (June 16, 2016), <https://www.theguardian.com/technology/2016/jun/16/transhumanist-party-immortality-zoltan-istvan-presidential-campaign>.

⁸⁴ See *Mission: What is the Mission of Humanity+?*, HUMANITY+, <http://humanityplus.org/about/mission/> (last visited May 12, 2017). See also Bostrom, *supra* note 75, at 3, 8.

⁸⁵ Bostrom, *supra* note 75, at 7.

⁸⁶ James Hughes, *The Politics of Transhumanism and the Techno-Millennial Imagination*, 47 ZYGON 757, 770 (2012).

opponents have attempted to “secularize” this criticism by rephrasing it as a need to respect human “dignity.”⁸⁷ Francis Fukuyama, denounces Transhumanism as a threat to human essence itself, and as such, to the legal rights to which humans are entitled.⁸⁸ Fukuyama notes that the essence of human equality is at the core of a liberal society, and that tampering with this “essence” would jeopardize the legal status quo.⁸⁹ Legal scholars Lori Andrews, George Annas, and Rosario Isasi also espouse the idea that human rights attach to some essential aspect of biological “humanity” as a justification to oppose Transhumanism and germline genetic engineering technologies.⁹⁰ Other, more extreme arguments against the implementation of enhancement through genetic engineering are that it will lead to the creation of a subspecies of human,⁹¹ the discrimination of unmodified-humans by modified “humans,”⁹² eugenics,⁹³ and even the end of the human species as we know it.⁹⁴

However, the aforementioned bioethical-legal criticism of Transhumanism is outdated in light of the recent permutation of Transhumanism from a “fringe movement”⁹⁵ to a core set of values embraced by mainstream society. Examples of this phenomenon are wide-ranging. A Facebook page advertises⁹⁶ a new “high-end” supplement offering the potential for longer life without the need for a physician’s prescription.⁹⁷ And this is just one product in the increasingly expanding market for longevity products.⁹⁸ Nootropics⁹⁹—substances which purportedly have cognitive-enhancing properties¹⁰⁰—are becoming increasingly popular for uses ranging from the

⁸⁷ See Andrews, Annas & Isasi, *supra* note 13, at 152. One of the most persuasive criticisms against some opponents of Transhumanism is their attempt to “devise rational arguments in defense of irrational taboos.” James Hughes, *Contradictions from the Enlightenment Roots of Transhumanism*, 35 J. MED. PHILOS. 623, 625 (2010).

⁸⁸ See Fukuyama, *supra* note 16.

⁸⁹ *Id.*

⁹⁰ Annas, Andrews & Isasi, *supra* note 13, at 153.

⁹¹ *Id.* at 161-62.

⁹² *Id.* at 162.

⁹³ Lisa C. Ikemoto, *Disentangling Fact from Fiction: The Realities of Unequal Health Care Treatment: Article: Race to Health: Racialized Discourses in a Transhuman World*, 9 DEPAUL J. HEALTH CARE L. 1101, 1117 (2005).

⁹⁴ Annas, Andrews & Isasi, *supra* note 13, at 153. The authors comment on the dangers of emerging biotechnologies such as cloning and germline genetic modifications, and make reference to Nazi experiments which involved unethical and atrocious experimentation to human subjects, to make an argument about the potential problems of such technologies, and how they are a threat to human existence. *Id.*

⁹⁵ Fukuyama, *supra* note 16, at 42.

⁹⁶ Elysium Health; *About*, FACEBOOK https://www.facebook.com/pg/elysiumhealth/about/?ref=page_internal (last visited May 12, 2017) (on file with author).

⁹⁷ Karen Weinraub, *The Anti-Aging Pill*, MIT TECH. REV. (Feb. 3, 2015), <https://www.technologyreview.com/s/534636/the-anti-aging-pill/>.

⁹⁸ MEHLMAN, *supra* note 48, at 23. The author notes that as of 2009, People in the United States spent over \$45 billion per year on the anti-aging market *Id.* See also *The Business of Longevity*, ECONOMIST, <http://www.economist.com/events-conferences/americas/longevity> (last visited Apr. 10, 2017).

⁹⁹ See generally Wolfgang Forestl, Andreas Muhs, & Andrea Pfeifer, *Cognitive Enhancers (Nootropics). Part 2: Drugs Interacting With Enzymes*, 33 J. OF ALZHEIMER’S DISEASE, 547 (2013).

¹⁰⁰ What constitutes a “nootropic” substance can range from simple coffee to obscure compounds such as “noopept.” Olga Khazan, *The Brain Bro*, ATLANTIC (Oct. 2016), <http://www.theatlantic.com/magazine/archive/2016/10/the-brain-bro/497546/>; Mike Montgomery, *Better, Stronger, Faster: Why Nootropics Will be Big Business In 2016*, FORBES (Jan. 19, 2016), <http://www.forbes.com/sites/mikemontgomery/2016/01/19/better-strongerfaster-why-nootropics-will-be-big-business-in-2016/#7c0271a076cd>. Nevertheless, some of these substances have been rejected by the mainstream scientific community as not being proven to have cognitive-enhancing properties. Khazan, *supra* note 100.

treatment of depression to improving work performance.¹⁰¹ It is estimated that in 2016, the nutritional supplement industry which encompasses nootropics was worth between \$12 and \$37 billion.¹⁰² Students routinely turn to the more traditional “smart drugs” to gain an edge in an increasingly competitive higher education landscape.¹⁰³ For example, in the year 2000, there were about five million prescriptions written for Adderall—a popular, widely-abused¹⁰⁴ “smart drug”—in the United States; in 2005 the number of scripts for the drug multiplied to about nine million.¹⁰⁵ Everyday people purchase electronic devices to improve physical performance,¹⁰⁶ sleep,¹⁰⁷ and even correct “bad habits” by giving themselves electric shocks.¹⁰⁸ Despite strict anti-doping policies,¹⁰⁹ professional athletes routinely use performance-enhancing drugs.¹¹⁰ The 2016 Rio Olympics were ridden with doping scandals.¹¹¹ Yet, despite these scandals and their implications

¹⁰¹ Khazan, *supra* note 100.

¹⁰² Montgomery, *supra* note 100.

¹⁰³ Leigh Jones, *Adderall in Law Schools: A Dirty Little Secret*, NAT'L L. J. (Nov. 3, 2016), <http://www.nationallawjournal.com/id=1202771536711/Adderall-in-Law-Schools-A-Dirty-Little-Secret?slreturn=20161020185340>.

¹⁰⁴ Many students take Adderall for performance-enhancing purposes and obtain the drug without a prescription. Hub Staff Report, *Adderall Abuse on the Rise Among Young Adults, Johns Hopkins Study Suggests*, JOHNS HOPKINS U. (Feb. 2016), <http://hub.jhu.edu/2016/02/16/adderall-abuse-rising-young-adults/>. See generally Lian-Yu Chen, Rosa M. Crum, Eric C. Strain, G. Caleb Alexander, Christopher Kaufmann, & Ramin Mojtabai, *Prescriptions, Nonmedical Use, and Emergency Department Visits Involving Prescription Stimulants*, 77 J. CLIN. PSYCHIATRY 297 (Mar. 2016). See also Casey Schwartz, *Generation Adderall*, N. Y. TIMES MAGAZINE (Oct. 12, 2016), <http://www.nytimes.com/2016/10/16/magazine/generation-adderall-addiction.html>.

¹⁰⁵ Schwarz, *supra* note 104. Moreover, students are easily able to obtain Adderall without a prescription to use as a study aid. See also ALAN SCHWARZ, *ADHD NATION: CHILDREN, DOCTORS, BIG PHARMA, AND THE MAKING OF AN AMERICAN EPIDEMIC* 226 (Scribner 2016). Schwarz notes: “Dozens of studies since the 1990s have estimated that about 8 to 35 percent of undergraduates take stimulant pills illicitly to try to improve their grades; a reasonable estimate among high-pressure colleges is probably 15 to 20 percent.” *Id.*

¹⁰⁶ See FITBIT, www.fitbit.com (last visited May 12, 2017).

¹⁰⁷ See HELLO, <https://hello.is/> (last visited May 12, 2017).

¹⁰⁸ See PAVLOK, <https://pavlok.com/> (last visited May 12, 2017). Pavlok’s website states how the device works: “each time you do that bad habit send yourself a zap by pressing down on the device...” Pavlok, *How Does Pavlok Work?* https://pavlok.groovehq.com/knowledge_base/topics/how-does-pavlok-work (last visited Apr. 4, 2017)

¹⁰⁹ See *World Anti-Doping Code*, WORLD ANTI-DOPING AGENCY, <https://www.wada-ama.org/en/what-we-do/the-code> (last visited May 12, 2017).

¹¹⁰ See Motez Bishara, *Russian Doping: ‘an Unprecedented Attack on the Integrity of Sport & the Olympic Games,’* CNN (July 21, 2016), <http://edition.cnn.com/2016/07/18/sport/russia-doping-sochi-2014-olympic-games-rio-2016/>. See also Ben Rumsby, *Rio 2016 Olympics: Anti-Doping Branded ‘Worst’ in Games History*, TELEGRAPH (Aug. 17, 2016), <http://www.telegraph.co.uk/olympics/2016/08/17/rio-2016-olympics-anti-doping-branded-worst-in-games-history/>. The Article noted the difficulties the organizers of the Rio Olympics encountered in conducting the doping tests. *Id.* A commentator noted that the issue with testing was so bad that “we almost [got] to the situation where we’re lucky to catch anybody.” *Id.* This comment implies that it is not a question of whether doping takes place at the most famous international sports event, which is governed by the World Anti-Doping Agency and the World Anti-Doping Code, [See *Who We Are*, WORLD ANTI-DOPING AGENCY, <https://www.wada-ama.org> (last visited May 12, 2017)] but instead, the extent to which it happens. Despite this unspoken truth, the Olympic Games still enjoy popularity among the watching public. See Daniel Holloway, *How Rio Ratings Surprised NBC and Will Impact Future Olympics*, VARIETY (Aug. 23, 2016), <http://variety.com/2016/tv/news/2016-olympics-ratings-rio-nbc-1201843200/>. 27.5 million people watched the Rio Olympic Games. *Id.* See also Maxwell J. Mehlman, Elizabeth Banger, & Matthew M. Wright, *Doping in Sports and the Use of State Power*, 50 ST. LOUIS L. J. 15 (2005) (providing general overview of the extensive history of doping in sports).

¹¹¹ See Bishara, *supra* note 110.

for the integrity of the competition, people continue to watch and support the Olympics.¹¹² Notwithstanding the pervasive negative connotations of doping in sports, on October 28, 2016, the New York Times published an article featuring the usually obscure sport of bodybuilding,¹¹³ a sport notorious for the rumored rampant use of performance-enhancing drugs by its athletes.¹¹⁴

In sum, a glance through different aspects of contemporary society reveals that now more than ever before, society values those who are faster, stronger and more capable in an ever-increasing race to the top,¹¹⁵ in a world in which opportunities to succeed are narrowing at an alarming rate.¹¹⁶ A conclusion that derives from this observation is that in today's society it might be necessary, rather than just desirable to be "enhanced."¹¹⁷ It is at this juncture that society's absorption of Transhumanist "enhancement" values has led to the rise of the "designer baby" movement.

While critics of possible human applications of genetic engineering technologies decry their use because it can lead to "designer babies,"¹¹⁸ the reality is that current societal trends enable prospective parents to make conscious decisions to have children with specific traits, even without the use of genetic engineering. Online dating sites allow customers to select potential partners based on specific physical traits.¹¹⁹ Companies sell tests to parents designed to measure the child's

¹¹² See Halloway, *supra* note 110.

¹¹³ John Branch, *No One Is Looking at This Headline*, N. Y. TIMES (Oct. 28, 2016), <http://www.nytimes.com/2016/10/29/sports/phil-heath-mr-olympia-bodybuilder.html>. The author commented on the use of performance-enhancing drugs in bodybuilding: "Their murky role in bodybuilding has long shrouded the sport. A 2013 documentary . . . called "Generation Iron," . . . called the topic 'taboo.' It then insinuated that, of course, bodybuilders competing in top-level contests . . . use steroids." *Id.* To this, the 2016 bodybuilding champion of the Mr. Olympia bodybuilding competition, Phil Heath, stated: "Everybody is going to do what they do[.]" *Id.*

¹¹⁴ There is a notable lack of mainstream media coverage of bodybuilding. For example, the biggest competition in the sport, the Mr. Olympia competition, has not had television coverage for many years. See *The Rock Announces Next Year's Olympia Will be on CBS Sports*, GI TEAM, <http://generationiron.com/rock-announces-next-years-olympia-will-cbs-sports> (last visited May 12, 2017). It is the Author's opinion that coverage from the New York Times signals an increased acceptance of the sport and what it implies, the acceptance of visible physiological enhancement, in bodybuilding's case, through anabolic steroids. See also Chris Street, *The Steroids Interviews – Professional Bodybuilding*, T NATION, <https://www.t-nation.com/steroids/steroid-interviews-professional-bodybuilding> (last visited Mar. 24, 2017); See *Arnold Schwarzenegger Admits Steroids Use (1977) Full Interview*, ESPN Classic, YOUTUBE, https://www.youtube.com/watch?v=Fp9Z_KGkxFo. See also *London Reel, Dorian Yates, Steroid Use*, YOUTUBE, <https://www.youtube.com/watch?v=m2PzkGKvdcE>. (last visited May 12, 2017).

¹¹⁵ See Sarah Green Carmichael, *The Research Is Clear: Long Hours Backfire for People and for Companies*, HARV. BUS. REV. (Aug. 19, 2015), <https://hbr.org/2015/08/the-research-is-clear-long-hours-backfire-for-people-and-for-companies>.

¹¹⁶ Indeed, it is evident that the competitiveness of the job market will only increase over time. See *Special Report: Automation and Anxiety; Will Smarter Machines Cause Mass Unemployment?*, ECONOMIST (Jun. 25, 2016), <http://www.economist.com/news/special-report/21700758-will-smarter-machines-cause-mass-unemployment-automation-and-anxiety>; see also *Recovery; Job Growth and Education Requirements Through 2020*, GEORGETOWN U. PUB. POL'Y INSTIT. & CTR. ON EDUC. AND THE WORKFORCE, (June 2013), https://cew.georgetown.edu/wp-content/uploads/2014/11/Recovery2020.FR_Web_.pdf; see also Tim Worstall, *Manufacturing Jobs Just Aren't Good Middle Class Jobs Anymore*, FORBES, (Nov. 21, 2014), <https://www.forbes.com/sites/timworstall/2014/11/21/manufacturing-jobs-just-arent-good-middle-class-jobs-any-more/#5670b1817007>; See *America's Shrinking Middle Class: A Close Look at Changes Within Metropolitan Areas*, PEW RES. CTR., (May 11, 2016), <http://www.pewsocialtrends.org/2016/05/11/americas-shrinking-middle-class-a-close-look-at-changes-within-metropolitan-areas/>.

¹¹⁷ MEHLMAN, *supra* note 48, at 50.

¹¹⁸ Annas, Andrews & Isasi, *supra* note 13, at 161-62.

¹¹⁹ MEHLMAN, *supra* note 48, at 25.

aptitude for a specific type of sport.¹²⁰ Parents make their children engage in demanding activities to develop superior abilities in, for example, music and sports, regardless of the negative effect those activities may have to the children's well-being.¹²¹ While some may draw a distinction between behaviors which may be considered akin to selective breeding¹²² and nurturing,¹²³ and genetic engineering, the underlying value is the same: people want to have active control over their offspring's traits to "enhance" their abilities and traits through whatever means are available to them.

The transition of Transhumanism's values into mainstream society is also reflected in current reproductive technologies and their applications. Women have the option to abort due to genetic abnormalities discovered during pregnancy.¹²⁴ For women undergoing in-vitro fertilization, preimplantation genetic screening and diagnosis are also available to detect an underlying genetic condition¹²⁵ which can lead them to decide to terminate a pregnancy.¹²⁶ Women can also decide the sex of their future child if they chose this option during in-vitro fertilization.¹²⁷ Children are therefore, being born as a result of the conscious choice of an embryo over another due to a particular trait. As legal scholar Maxwell Mehlman notes, "these reproductive behaviors are forms of germline genetic engineering, because they influence the genes that will be passed on to future generations and they collectively have a gradual impact on the evolutionary make-up of the human species."¹²⁸

In light of this societal shift towards perfection through various means, opponents are therefore rightly concerned about the consequences of the designer baby movement on the collective human biological future.¹²⁹ However, the ongoing discussion must take into account the potential impact of the technology's implementation on a crucial subset of the population—the "designer children" themselves. As those who will be directly affected, is fair and necessary to address the consequences specifically as to them.

b. The Consequences of Genetic Engineering to Children and Future Generations

¹²⁰ *Id.* at 103.

¹²¹ *Id.* at 105. Mehlman notes that for example, elite girl gymnasts evidence psychological problems when they grow up: "[they] had problems expressing emotion and some had real problems with men. They'd go with... abusive men, because that's what they'd become used to. And they were very immature socially. . . ." *Id.*

¹²² Selective breeding, such as in the context of domesticated animals, involves the purposeful breeding of specimens of the species containing desirable characteristics. See *Natural Selection and Selective Breeding*, BBC, <http://www.bbc.co.uk/education/guides/z6trd2p/revision/3> (last visited Apr. 4, 2017).

¹²³ Nurturing is defined in part as "the sum of environmental factors influencing the behavior and traits expressed by an organism." *Nurture*, MERRIAM-WEBSTER DICTIONARY, <https://www.merriam-webster.com/dictionary/nurture> (last visited May 12, 2017).

¹²⁴ Mark Lawrence Schrad, *Does Down Syndrome Justify Abortion?* N. Y. TIMES (Sept. 4, 2015), <http://www.nytimes.com/2015/09/04/opinion/does-down-syndrome-justify-abortion.html>. For example, it estimated that two thirds of pregnant women chose to abort if Down Syndrome is detected during the pregnancy. *Id.*

¹²⁵ MEHLMAN, *supra* note 48, at 26. See also Richard Sherbahn, *Preimplantation Genetic Screening – PGS for Aneuploidy With IVF; Does PGS with Chromosomal Tests of Embryos Improve IVF Success?*, <http://www.advancedfertility.com/pgs-ivf-genetic-testing.htm> (last visited May 12, 2017).

¹²⁶ Schrad, *supra* note 124.

¹²⁷ Nara Schoenberg, *For Some IVF Patients, a Choice: Do You Want a Boy or a Girl?*, CHI. TRIB. (Oct. 14, 2015), <http://www.chicagotribune.com/lifestyles/health/sc-gender-selection-health-1021-20151014-story.html>.

¹²⁸ Mehlman, *supra* note 25, at 94.

¹²⁹ Annas, Andrews & Isasi, *supra* note 13, at 161.

Legal commentators acknowledge that it is only a matter of time before parents employ genetic engineering techniques to manipulate the genome of their future offspring¹³⁰—some even argue that genetic engineering of children will be mandatory.¹³¹ Author Henry Greely, for example, asserts in his book, *The End of Sex*, that in the near future all children will be designer children: “Prospective parents will be told as much as they want to know about the DNA of, say, 100 embryos and the implications of that DNA for the diseases, looks, behaviors and other traits of the child each of those embryos may become. Then they will be asked to pick one or two to be transferred into a womb for possible gestation and birth.”¹³²

Greely’s vision of a total “designer child” world may seem implausible. However, in consideration of the aforementioned social values and technological advances, the possibility that designer children will occur to some extent is real. As Mehlman notes, “the constitutional right of parents to rear their children extends even to exposing the children to known health risks.”¹³³ Therefore, in light of the great discretion that parents enjoy in “the care, custody and control of their children”¹³⁴ in the American legal system,¹³⁵ there needs to be a discussion of the possible negative effects of unregulated “designer children” on those children who will be subjects of genetic engineering.

Legal scholars and bioethicists warn that the negative consequences for the genetically modified children include knowing that their future has already largely been decided by their parent’s choices.¹³⁶ Another consequence to those children is knowing that they are the recipients of an advantage available only to the lucky few whose wealthy parents could afford it.¹³⁷ Other negative consequences are the uncertainty of their genetic future, and that of their descendants.¹³⁸ Commentators also note the psychological risk that these children will not feel the unconditional love of their parents, but instead, feel that the love of their parents is contingent on how successful

¹³⁰ See *id.* at 160. The authors note that one of the arguments for the use of genetic engineering is that “these technologies, while not necessarily desirable, are unstoppable because the market combined with parental desire will drive scientists and physicians to offer these services to demanding couples.” See also Zaret, *supra* note 23, at 1808.

¹³¹ Conor Friedersdorf, *Will Editing Your Baby’s Genes Be Mandatory?* ATLANTIC (Apr. 14, 2017), <https://www.theatlantic.com/politics/archive/2017/04/will-editing-your-babys-genes-be-mandatory/522747/>.

¹³² HENRY GREELY, *THE END OF SEX AND THE FUTURE OF HUMAN REPRODUCTION* 1-2 (Harvard University Press, 2016).

¹³³ *Id.*

¹³⁴ *Troxel v. Granville*, 530 U.S. 57, 65 (2000). See also MEHLMAN, *supra* note 48, at 105-06.

¹³⁵ MEHLMAN, *supra* note 48, at 105-06.

¹³⁶ Annas, Andrews & Isasi, *supra* note 13, at 161. The authors note that technologies such as the genetic engineering of embryos and cloning inherently inhibit the resulting child’s right “to an ‘open future.’” *Id.* (citing HANS JONAS, *PHILOSOPHICAL ESSAYS: FROM ANCIENT CREED TO TECHNOLOGICAL MAN* 160 (1974)). See also Nancy Pham, *Choice v. Chance: The Constitutional Case for Regulating Human Germline Genetic Modification*, 34 HASTINGS CONST. L. Q. 133-59, 150 (2006). It is worth noting that, some commentators are unpersuaded by this argument. For example, Michio Kaku expresses skepticism that the availability of technologies capable of increasing intelligence could lead to inequality, according to him, because not many people would be attracted to the idea of becoming mathematicians or physicists—as such careers are not very lucrative—and that such technologies may even lead to a leveling of the playing field caused by economic inequality. MICHIO KAKU, *THE FUTURE OF THE MIND* 162-64 (Anchor Books, 2015).

¹³⁷ See Annas, Andrews & Isasi, *supra* note 13, at 160-61. See also Reardon, *supra* note 42, at 173.

¹³⁸ Pham, *supra* note 136, at 150.

of an experiment they result to be.¹³⁹ Other critics go as far as stating that biomedical enhancement objectifies children, making them nothing more than products of their parents' whims.¹⁴⁰

Regarding physical harms, commentators note the many unknown risks of genetic engineering.¹⁴¹ Although genetic engineering is more sophisticated than ever before, the technology is inherently risky in part because it cannot be tested safely.¹⁴² Also, knowledge of human genetics, as advanced as it may be, is still in its infancy; it is still largely unknown how the approximately 20,000 genes in the human genome work.¹⁴³ To this point, one commentator noted: "Evolution has been working toward optimizing the human genome for 3.85 billion years. Do we really think that some small group of human genome thinkers could do better without all sorts of unintended consequences?"¹⁴⁴ Since the consequences of gene editing are largely unpredictable, they are therefore potentially harmful.¹⁴⁵

In addition to the absence of comprehensive federal laws regulating genetic engineering of children and human embryos,¹⁴⁶ the federal research regulations,¹⁴⁷ which govern human experimentation and have specific provisions meant to protect children¹⁴⁸ and embryos,¹⁴⁹ are insufficient to address the concerns that arise as a result of genetic engineering technologies.¹⁵⁰ General bioethical values will also not suffice. One of the fundamental concepts of bioethics and medical research is to inform a research subject of the potential benefits and risks of the research experiment,¹⁵¹ and to obtain the individual's full informed consent.¹⁵² But in the designer baby

¹³⁹ *Id.* at 147-48.

¹⁴⁰ MEHLMAN, *supra* note 48, at 101. (The author refers to relevant comments made by philosopher Jürgen Habermas and former Supreme Court Justice John Paul Stevens).

¹⁴¹ Lori Andrews, *Genetics: Coitus Defunctus*, 522 NATURE 36 (April 2016), <http://www.nature.com/nature/journal/v532/n7597/full/532035a.html> (responding to Henry Greely's claims that what he calls "easy PGD" will replace sex as the usual manner of having children) *See generally* Greely, *supra* note 132. *See also* Skerret, *supra* note 25.

¹⁴² *See* Annas, Andrews & Isasi, *supra* note 13, at 158.

¹⁴³ *See* Kelly Rae Chi, *The Dark Side of The Human Genome*, 538 NATURE 275 (Oct. 13, 2016), <http://www.nature.com/nature/journal/v538/n7624/full/538275a.html>.

¹⁴⁴ Skerret, *supra* note 25.

¹⁴⁵ *Id.* For example, geneticist and NIH Director, Francis Collins notes that, most of the changes imagined by proponents of genetic enhancement are "complex multigene situations in which the environment plays critical roles." *Id.* Professor Gang Bao further notes that even sophisticated gene-editing techniques such as CRISPR can edit genes in an unexpected, harmful manner. *Id.*

¹⁴⁶ *See supra* note 48 and accompanying text.

¹⁴⁷ 45 C.F.R. §46.401, et seq. The federal research regulations govern human subjects research as undertaken by (1) institutions which receive monetary support from the federal government or (2) those seeking to obtain FDA approval. § 45 CFR 46.101-103, 111; 25 CFR § 50.1, et seq.

¹⁴⁸ 45 C.F.R. §46.401, et seq.

¹⁴⁹ 45 C.F.R. §46.116 (b) (1).

¹⁵⁰ *See* 45 C.F.R. §46.401. *See also* *Federal Policy for the Protection of Human Subjects*, U.S. DEP'T OF HEALTH AND HUM. SERV., <https://www.hhs.gov/ohrp/regulations-and-policy/regulations/common-rule/> (last visited May 12, 2017). The federal research regulations are general rules governing human subjects research in general. *Id.* *See also* Skerret, *supra* note 25 and accompanying text.

¹⁵¹ 45 C.F.R. §46.116 (a)(2).

¹⁵² Informed consent from a research subject requires that researchers provide the following information: (1) information about the research, (2) description of possible risks, (3) disclosure of alternative treatments, (4) how confidentiality will be maintained, (5) contact information for questions that may arise and (6) "a statement that participation is voluntary." 45 C.F.R. §116 (a). The principle of requiring informed consent derives from the Nuremberg Code, which was conceived after the Nuremberg Trials to prevent the atrocious acts committed by Nazi scientists from happening again. *The Nuremberg Code*, U.S. DEP'T OF HEALTH & HUM. SERV.,

scenario, an unborn, genetically altered child, would be unable to consent to something that will affect her or him directly, as well as her or his descendants.¹⁵³ Also, as Mehlman notes, although the fundamental principles of bioethics which apply to human experimentation—beneficence, autonomy and justice¹⁵⁴—would provide some guidance regarding the protection of children from injuries resulting from genetic engineering techniques, such principles, in the abstract, are insufficient to ensure the children's protection.¹⁵⁵ This, coupled with the aforementioned vast discretion which parents have under American law,¹⁵⁶ leaves genetically modified children largely unprotected from many harms.¹⁵⁷

In light of the aforementioned physical risks and general lack of protections, should the application of genetic engineering technologies—which are understood to be inherently unpredictable and potentially dangerous¹⁵⁸—to create genetically modified children, prompt an expansion of the legal doctrines of wrongful birth or wrongful life?¹⁵⁹ As the technologies develop and are implemented, it is of the utmost importance that attorneys working on child law issues prepare and consider the possible strategies and legal arguments to seek redress for children who may be harmed by their parents' choice to employ genetic engineering.

Additionally, germline genetic modification will carry other consequences for genetically modified children not stemming from physical harm. For example, how would issues of parentage be resolved in the context of a three-parent baby?¹⁶⁰ Although legal scholar John Harris dismisses the idea that a child born as a result of MRT is a “three-parent baby,” declaring the notion unfounded due to the minute amount of DNA contained in mitochondria,¹⁶¹ the presence of a third

<http://www.hhs.gov/ohrp/archive/nurcode.html> (last visited May 12, 2017); Peter Tyson, *The Experiments*, PBS, <http://www.pbs.org/wgbh/nova/holocaust/experiside.html>. (last visited May 12, 2017).

¹⁵³ Skerret, *supra* note 25.

¹⁵⁴ The fundamental principles of bioethics are beneficence, autonomy and justice. See *The Nuremberg Code*, *supra* note 145142145. See also, *The Belmont Report*, THE NAT'L COMMISSION FOR THE PROTECTION OF HUM. SUBJECTS OF BIOMEDICAL AND BEHAV. RES. (April 18, 1979),

<http://www.hhs.gov/ohrp/humansubjects/guidance/belmont.html#xselect>.

¹⁵⁵ Mehlman, *supra* note 28, at 120-22.

¹⁵⁶ MEHLMAN, *supra* note 48, at 106.

¹⁵⁷ *Id.*

¹⁵⁸ See Andrews, Annas & Isasi, *supra* note 12, at 158.

¹⁵⁹ See Kathleen A. Mahoney, *Malpractice Claims Resulting From Negligent Preconception Genetic Testing: Do These Claims Present a Strain of Wrongful Birth or Wrongful Conception, and does the Categorization Even Matter?* 39 SUFFOLK U. L. REV. 733, 779-80 (2006) (explaining the application of wrongful birth and wrongful life actions in the context of preconception genetic testing).

¹⁶⁰ See generally Amy B. Leiser, *Parentage Disputes in the Age of Mitochondrial Replacement Therapy*, 104 GEO. L. J. 413 (2016).

¹⁶¹ John Harris, *Germline Modification and the Burden of Human Existence*, 25 CAMBRIDGE Q. HEALTHCARE ETHICS 6 (Jan. 2016). The author notes: “The third-party DNA contained in the donated mitochondrial makes up less than 1 percent of the total genetic contribution and does not transmit any of the traits that confer the usual family resemblances and distinctive personal features in which both parents and children are interested.” *Id.*

person's genetic material raises legal concerns which cannot be overlooked in light of the complex law of parentage,¹⁶² surrogacy¹⁶³ and estates and trusts¹⁶⁴ in the United States.

Although existing proposals and scholarly discussions of genetic engineering have addressed issues that arise from the technology, including the significance of the legal notion of "personhood" in this context, a review of a cross-section of the existing literature reveals the problems inherent with some proposals, namely, that they either take a very broad, philosophical approach embracing an extreme side of the Transhumanist debate, or a very narrow legal approach, both of which fail to take important factors into consideration. A review of such proposals reinforces the argument that the best regulatory approach is a middle-ground solution in the form of a legal definition of human person.

IV. CRITICISM OF EXISTING PROPOSALS - ADDRESSING GENETIC ENGINEERING TECHNOLOGIES AND TRANSHUMANISM

As mentioned above, the Transhumanism debate is lengthy, complex, and heated. Some proposals focus on broad, philosophical concepts to propose a solution to the problems posed by the implementation of genetic engineering technologies and the Transhumanist movement. However, as set forth in the following discussion, such proposals are inadequate to resolve the problems presented by genetic engineering technologies and the evolution of Transhumanism into a societal value.

For example, opponents of Transhumanism and germline genetic modification technologies such as Andrews, Annas, and Isasi, argue that germline genetic modification threatens the foundation of human rights.¹⁶⁵ Their justification for this proposition is their belief that "membership in the human species is central to the meaning and enforcement of human rights."¹⁶⁶ This means that the authors espouse a biological theory of personhood, to which the *Homo sapiens* genome—the 99.9% of DNA all humans share across the earth¹⁶⁷—is the

¹⁶² See Nancy D. Polikoff, *A Mother Should Not Have to Adopt Her Own Child: Parentage Laws for Children of Lesbian Couples in the Twenty-first Century*, 5 STAN. J. CIV. RTS. & CIV. LIBERTIES 201 (2009). See also Linda Wray Black, *The Birth of a Parent: Defining Parentage for Lenders of Genetic Material*, 92 NEB. L. REV. 799 (2014). The author notes, for example, that "maternity has been understood as a question of fact, the fact of childbirth. Maternity is still a question of fact, but the scientific facts have changed to permit two biologically related females for one child. It has become prescriptive rather than descriptive to limit the label of biological mother to either (i) the genetic mother or (ii) the gestational mother. If a biological connection to the baby is the starting point for legal parentage, the law must embrace the science supporting the biological connection of not only the genetic mother but also the gestational mother." *Id.* at 807. Applying the authors' reasoning in the context of MRT for example, there would be a biological connection—albeit tenuous—between the child and the mitochondrial donor, which can lead to genuine parentage disputes absent a clear regulatory system.

¹⁶³ See Joseph F. Morrissey, *Surrogacy: The Process, The Law and the Contracts*, 51 WILLAMETTE L. REV. 459 (Summer 2015).

¹⁶⁴ See generally Lee-Ford Tritt, *Sperms and Estates: An Unadulterated Functionally Based Approach to Parent-Child Property Succession*, 62 SMU L. REV. 367 (2009) (discussing the issues of inheritance and intestacy in relation to changing societal structures and technologies).

¹⁶⁵ Annas, Andrews & Isasi, *supra* note 13, at 151-52.

¹⁶⁶ *Id.* at 153.

¹⁶⁷ *What Does It Mean to Be Human? Genetics*, SMITHSONIAN NAT'L MUSEUM OF NAT. HIST., <http://humanorigins.si.edu/evidence/genetics> (last visited May 12, 2017).

“membership” entitling someone to legal rights and protections.¹⁶⁸ This view implicitly assumes that the totality of human DNA is the source of human essence. Therefore, under this theory, the genetically modified children’s biological legacy, as well as their entitlement to human rights and legal protections would be jeopardized by germline genetic modifications.¹⁶⁹ The solution, according to these authors, is to ban the technology.¹⁷⁰

This absolute ban approach ignores the aforementioned reality of a society increasingly accepting of “enhancement.”¹⁷¹ Also, this position undermines the non-enhancement benefits that genetic engineering technologies could bring.¹⁷² As mentioned above, CRISPR for example, has shown promise in the treatment of diseases.¹⁷³ There is no justification to completely ban the application of genetic engineering technologies to the extent that they can be used to edit serious diseases out of the genomes of future generations of affected families. For example, genetic engineering could be used in families carrying the genes responsible for Huntington’s disease,¹⁷⁴ or a type of cancer which is of genetic origin and can be inherited,¹⁷⁵ who want to have a child free of the disease. This application would prevent the suffering of children who would otherwise be born with these genes, as well as that of their families.

This application of the technology would also be beneficial to society at large. If genetic engineering technologies are used, for example, to prevent children from inheriting genes responsible for certain cancers, the economic impact would be considerable; the current cost of cancer in the United States’ economy is over \$88 billion dollars.¹⁷⁶ Therefore, the eradication of inheritable diseases from the human germline through genetic engineering would have significant positive personal, social and economic consequences. The potential benefits are too great to close the door to the technology.

On the other side of the ideological spectrum, Transhumanist James Hughes, replies that a homo-centric theory of law dependent exclusively on *Homo sapiens*’ DNA, misses the purpose of modern democratic systems, which are founded on notions of “personhood” instead of “humanness” in the pure genetic sense.¹⁷⁷ In his book, *Citizen Cyborg*, Hughes explains the need to develop what he calls a “cyborg citizenship” which would be based on “personhood” to

¹⁶⁸ Annas, Andrews & Isasi, *supra* note 13, at 152-53. In support of this argument, the authors quote a statement by Daniel Lev of Human Rights Watch: “Whatever else may separate them, human beings belong to a single biological species, the simplest and most fundamental commonality before which the significance of human differences quickly fades. We are all capable, in exactly the same ways, of feeling pain, hunger, and a hundred kinds of deprivation. The idea of universal human rights shares the recognition of one common humanity...” *Id.*

¹⁶⁹ *Id.*

¹⁷⁰ *Id.* at 154.

¹⁷¹ See *supra* notes 96-117 and accompanying text.

¹⁷² See Begley, *supra* note 12; Fan, *supra* note 76.

¹⁷³ See Begley, *supra* note 12; Reardon *supra* note 11.

¹⁷⁴ “Huntington’s disease is an inherited disease that causes the progressive breakdown (degeneration) of nerve cells in the brain.” *Diseases and Conditions: Huntington’s Disease*, MAYO CLINIC, <http://www.mayoclinic.org/diseases-conditions/huntingtons-disease/basics/definition/con-20030685>. Huntington’s disease is fatal, and due to its nature, researchers have reservations about revealing positive test results, due to the possibility that the person may commit suicide. See LORI B. ANDREWS, MAXWELL J. MEHLMAN & MARK A. ROTHSTEIN, *GENETICS: ETHICS, LAW AND POLICY* 22, 106 (West 2010).

¹⁷⁵ *Family Cancer Syndromes*, AM. CANCER SOC’Y, <http://www.cancer.org/cancer/cancercauses/geneticsandcancer/heredity-and-cancer> (last visited May 12, 2017).

¹⁷⁶ Economic Impact of Cancer, AM. CANCER SOC’Y, <http://www.cancer.org/cancer/cancerbasics/economic-impact-of-cancer> (last visited May 12, 2017).

¹⁷⁷ JAMES HUGHES, *CITIZEN CYBORG* 78-79 (Westview Press 2004).

accommodate creatures other than humans in a “Transhuman” society grounded on democratic principles.¹⁷⁸ Therefore, Hughes’ theory favors a general notion of personhood as a basis to award legal rights and protections to genetically modified humans.¹⁷⁹ Moreover, Hughes’ perspective on “personhood” is in line with the Transhumanist belief that human nature in itself, is to seek evolution of the present human form through technological means.¹⁸⁰

The problem with this view is that “personhood” is an inherently vague, largely undefined legal notion, and therefore, a legal system based on generic “personhood” could potentially extend personhood rights to any genetically modified human—no matter how “non-human” he or she is—or deny personhood rights to those who should be entitled to them.¹⁸¹ Hughes’ approach also leaves other concerns expressed by opponents unaddressed; for example, how would humans and modified humans have a functional coexistence in society?¹⁸² This concern goes at the heart of the proposition that germline genetic engineering can be detrimental to the current socio-legal status quo.¹⁸³ Nevertheless, although Hughes promotes the idea of general personhood, he also makes an important acknowledgement, which is that “human specific DNA is only relevant to citizenship to the extent that it codes for the mental and emotional abilities that we identify as *essentially human*.”¹⁸⁴

The aforementioned proposals are at opposite ends in the ideological spectrum. They also, constitute an impressive intellectual exercise, which is unhelpful for practical purposes; their broadness and reliance on the unsupported notion that personhood depends upon an arbitrary element of human essence—whether ethereal or tangible—renders them unusable in a practical, legal sense. Philosopher Hannah Arendt explained the inherent problem of such proposition in her book, *The Human Condition*:

The problem of human nature, the Augustinian question *mihi factus sum* (“a question I have become for myself”), seems unanswerable in both its individual psychological sense and its general philosophical sense. It is highly unlikely that we, who can know, determine, and define the natural essences of all things surrounding us, which we are not, should ever be able to do the same for ourselves—this would be like jumping over our own shadows. *Moreover, nothing entitles us to assume that man has a nature or essence in the same sense as other things.* In other words, if we have a nature or essence, then surely only a god could know and define it, and the first prerequisite would be that he be able to speak about a “who” as though it were a “what.” The perplexity is that the modes of human cognition applicable to things with natural qualities, including ourselves to the limited extent

¹⁷⁸ *Id.*

¹⁷⁹ *Id.*

¹⁸⁰ Michael Hauskeller, *Prometheus Unbound: Transhumanist Arguments From (Human) Nature*, 16 ETHICAL PERSP. 3, 9-10 (2009), <http://www.ethical-perspectives.be/viewpic.php?LAN=E&TABLE=EP&ID=1165>.

¹⁸¹ HUGHES, *supra* note 177, at 79, 93.

¹⁸² See Andrews, Annas & Isasi, *supra* note 12, at 153. The authors believe that the widespread implementation of the technology would result in the emergence of the “posthuman” and as such, “the new species or subspecies, or ‘posthuman,’ will likely view the old “normal” humans as inferior, even savages, and fit for slavery or slaughter. *Id.* at 162 “The normal, on the other hand, may see the posthumans as a threat and if they can, may engage in a preemptive strike by killing the posthumans before they themselves are killed or enslaved by them.” *Id.*

¹⁸³ See generally *id.*

¹⁸⁴ HUGHES, *supra* note 177, at 93 (emphasis added).

that we are specimens of the most highly developed species of organic life, fail us when we raise the question “and who are we?”¹⁸⁵ (emphasis added).

As noted above, while some Transhumanist proponents of genetic engineering adopt the notion that human essence is to strive for evolution of the current human form,¹⁸⁶ some opponents believe that the totality of human DNA in its present form is the essence of humanity.¹⁸⁷ Arendt rightly rejects arbitrary views of human nature such as these, noting that even “the sum total of human activities and capabilities that correspond to the human condition do not constitute anything like human nature.”¹⁸⁸ Arendt’s philosophy, explaining the impossibility of defining what “human nature” is in an ontological sense, evidences that reliance on unsupported, philosophical notions of human essence or nature are inherently arbitrary and therefore, cannot serve as the underlying support for a regulatory or legal scheme.

Instead of arguing broadly about what constitutes “human essence” both sides of the debate should work towards a functional solution based on the single proposition on which they agree: that, according to them, there is such thing as a “human essence.”¹⁸⁹ However, the ideological debate for regulatory purposes as to what constitutes “human essence” must be based on understanding what such essence is from a legal perspective—in other words, as a legal fiction and not an ontological truth.

It worth noting that opponents of germline genetic modifications such as Andrews, Annas, and Isasi are correct to exhibit concern about the application of human rights—and, by implication, regional rights such as those provided by the United States Constitution—in the context of an evolved human condition enabled by genetic engineering technologies, as it is unknown to what extent a genetically modified human would still be considered a person under the law.¹⁹⁰ Legal commentator Michael Rivard notes this gaping hole in American jurisprudence, and explains that the ethereal legal definition of human person that we take for granted will become increasingly ambiguous over time: “The historical distinctions between species will not remain intact. Scientists using genetic engineering technology will blur distinctions between species as they transfer characteristic traits – such as intelligence – between species... the line dividing human and nonhuman will disappear’ it will be replaced by a genetic continuum.”¹⁹¹

In addition to the aforementioned proposals, which focus broadly on the justifications for or against the implementation of genetic engineering based on philosophical arguments, legal scholars have made numerous¹⁹² proposals to address specific, narrow issues arising from the technology. While it is beyond the scope of this article to provide a comprehensive review of the existing literature,¹⁹³ it is worthwhile to address examples of existing proposals and to highlight why narrow solutions—which fail to take into consideration various important factors—are also insufficient to address the issues arising from genetic engineering technologies.

¹⁸⁵ HANNAH ARENDT, *THE HUMAN CONDITION* 10 (University of Chicago Press, 2d ed. 1958).

¹⁸⁶ Hauskeller, *supra* note 180. (Hauskeller adopts the definition crafted by Max Moore, one of the founders of the modern Transhumanist movement.).

¹⁸⁷ See Annas, Andrews & Isasi, *supra* note 13, at 170.

¹⁸⁸ ARENDT, *supra* note 185, at 10.

¹⁸⁹ See Annas, Andrews & Isasi, *supra* note 13, at 170; Hughes, *supra* note 177, at 93.

¹⁹⁰ *Id.*

¹⁹¹ Rivard, *supra* note 17 at 1442-43.

¹⁹² See, e.g., *infra* p. 27, notes 194-97 and accompanying text.

¹⁹³ A comprehensive literature review of the topic would be proper for a lengthy treatise.

A recent proposal suggested that Congress create a committee in charge of reporting recommendations, presenting current research, and asking for the public's input.¹⁹⁴ The author further suggested the creation of a federal body to oversee entities engaging in genetic engineering research.¹⁹⁵ Another proposal—which observed the problem of a lack of a legal definition of personhood—argued for the creation of a “moral” theory of constitutional personhood, wherein the only creatures entitled to constitutional rights would be those that can understand the rights and liberties granted by the Constitution.¹⁹⁶ Another proposal argued for a revamp of the criminal justice system specifically; under the author's proposed system, a genetically enhanced perpetrator could be held to a higher standard of criminal responsibility when committing a crime against a non-enhanced victim.¹⁹⁷

Proposals such as these constitute important thought experiments in the legal issues arising from genetic engineering technologies, but fail to take into consideration several critical factors. They assume that the federal government is in a state of functionality capable of undertaking major, non-pressing reforms—it is not.¹⁹⁸ Also, inequality, injustice and institutionalized racism are rampant¹⁹⁹ in the existing criminal justice system, and yet the legislature is unable to pass criminal justice reform,²⁰⁰ which evidences that extensive reforms of any kind in the legal system are not likely to occur. Additionally, the aforementioned proposal suggesting a “moral” theory of legal personhood, although recognizing the need for a definition of “person,” would only further issues of discrimination and inequality.²⁰¹

¹⁹⁴ Zaret, *supra* note 23, at 1805-39, 1811.

¹⁹⁵ *Id.*

¹⁹⁶ Rivard, *supra* note 17, at 1425, 1472.

¹⁹⁷ Susan Brenner, *Humans and Humans+: Technological Enhancement and Criminal Responsibility*, 9 B.U. J. SCI & TECH. L. 215 (2013).

¹⁹⁸ See Sara Binder, *Polarized We Govern?*, CTR. FOR EFFECTIVE PUB. MGMT. AT BOOKINGS 2, 5 (May 2014) (the author discusses the deeply dysfunctional state of the legislative branch, which is largely unable to resolve issues of legislative importance due in part to a deep partisan divide). See also Alexandra M. Franco, *The House Strikes Back: The Obamacare Saga and American Democracy in the Era of House v. Burwell*, 26 S. CAL. INTERDIS. L. J. 25, 28-29 (2016). It is further important to note that the dysfunctionality of the federal government is getting exponentially worse; the current administration is even seeking to cut funding for biomedical research. See Robert Pear, *Plan to Cut Funding for Biomedical Research Hits Opposition in Congress*, THE N. Y. TIMES (Apr. 3, 2017), <https://www.nytimes.com/2017/04/03/us/politics/trump-medical-research-funding-nih.html>.

¹⁹⁹ See generally MICHELLE, ALEXANDER, *THE NEW JIM CROW: MASS INCARCERATION IN THE AGE OF COLORBLINDNESS* (The New Press 2012).

²⁰⁰ The situation is so dire that while “only 5 percent of the world's population lives in the United States, it is home to 25 percent of the world's prison population....” Michelle Ye Hee Lee, *Yes, U.S. Locks People Up at a Higher Rate Than any Other Country*, WASH. POST (July 7, 2015), <https://www.washingtonpost.com/news/fact-checker/wp/2015/07/07/yes-u-s-locks-people-up-at-a-higher-rate-than-any-other-country/> (quoting Hillary Rodham Clinton, Speech on Criminal Justice at Columbia University, April 29, 2015). See also Penny Star, *Dem: Lack of Action on Criminal Justice Reform Makes Incarcerated Political Prisoners* CBS NEWS (Dec. 1, 2016), <http://www.cnsnews.com/news/article/penny-start/dem-lack-action-criminal-justice-reform-makes-incarcerated-political>.

²⁰¹ Rivard, *supra* note 17, at 1479. Rivard asserts that he seeks to find a “morally meaningful distinction” between persons and non-persons. *Id.* Under his theory, he would grant personhood to a species which could perceive and appreciate Constitutional protections such as liberty. *Id.* Such definition would not be meaningful; however, as it would discriminate against those creatures who can feel the psychological pain of captivity—and who should be entitled to at least a certain level of “personhood” for purposes of protection from harm—merely because they cannot understand abstract concepts such as constitutionally-granted liberty. For example, as evidenced by the example of Tommy, chimpanzees—although not able to understand the abstract concept of constitutionally-granted

The problem with relying on institutional oversight as a solution to issues arising from experimentation with genetic engineering technologies is worth explaining in greater detail. Research as an institution is currently plagued with issues relating to institutional oversight.²⁰² Researchers²⁰³ and Institutional Review Boards (IRBs)—the bodies in charge of overseeing the ethics of human experimentation and the safety of human subjects²⁰⁴—are subject to conflicts of interest as it relates to their research, thus placing research subjects in danger.²⁰⁵ Moreover, oversight institutions have shown disregard for the well-being of vulnerable populations such as children, and have even allowed researchers to perform harmful experiments on children without the children's or the parent's full informed consent.²⁰⁶

For example, in the infamous case of *Grimes v. Kennedy Krieger Institute*, a research institution associated with Johns Hopkins University exposed families with children to various levels of lead in homes to test the effectiveness of lead abatement procedures.²⁰⁷ The researchers knew that the children subjects would accumulate lead in their blood.²⁰⁸ The researchers, however, did not disclose this to the parents.²⁰⁹ As the court noted, “it can be argued that the researchers intended that the children be the canaries in the mines, but never clearly told the parents.”²¹⁰ Also, the IRB in charge of reviewing the study protocol, “apparently saw nothing wrong with the search protocols that anticipated the possible accumulation of lead in the blood of otherwise healthy children.”²¹¹ *Grimes*, as well as the infamous case of the gene therapy-caused death of Jesse Gelsinger²¹² evidence that reliance on oversight alone to protect research subjects is an insufficient solution.

To conclude, to be effective, proposals in must aim to achieve first-step solutions to regulating genetic engineering technologies, which are neither too broad in the philosophical sense, nor too narrow in the legal and practical sense. Crucially, proposals must take into consideration existing laws and precedent which can serve as a scaffold to regulatory or jurisprudential development and facilitate a solution which would not require a significant revamp

liberty, share traits with humans—such as experiencing trauma and mental suffering—which would arguably entitle them to limited “personhood” protections. See Lee Hall & Anthony Jon Waters, *From Property to Person: The Case of Evelyn Hart*, 11 SETON HALL CONST. L.J. 1, 19-28 (2000).

²⁰² Ezekiel J. Emanuel, Trudo Lemmens, & Carl Elliot, *Should Society Allow Research Ethics Boards to Be Run As For-Profit Enterprises?*, 3 PLOS MEDICINE 941, 941 (2006); Heidi Ledford, *Death in Gene Therapy Trial Raises Questions About Private IRBs*, 25 NAT. BIOTECHNOLOGY 1067, 1067 (2007).

²⁰³ Emanuel et al., *supra* note 202. See also Wilson, *infra* note 212, at 295-96, 307-10.

²⁰⁴ IRBs are in charge of: (1) reviewing and approving research subject to the federal research regulations, and (2) requiring investigators to obtain informed consent from subjects. 45 C.F.R § 46.109 (2005).

²⁰⁵ See *supra* note 202 and accompanying sources.

²⁰⁶ *Grimes v. Kennedy Krieger Inst., Inc.*, 782 A.2d 807 (Md. 2001).

²⁰⁷ *Id.*

²⁰⁸ *Id.* at 38.

²⁰⁹ *Id.*

²¹⁰ *Id.*

²¹¹ *Id.*

²¹² Robin Fretwell Willson, *The Death of Jesse Gelsinger: New Evidence of the Influence of Money and Prestige in Human Research*, 36 AM. J. L. & MED. 295 (2010). Gelsinger suffered from a liver deficiency of genetic origin, and enrolled in a gene therapy trial. *Id.* at 298. There were many irregularities in the research protocol which researchers ignored, and it was later discovered that one of the researchers, Dr. James Wilson, had a financial stake in a company which would profit from the research. *Id.* at 295. Furthermore, the informed consent form that Gelsinger signed did not contain information about the death of monkeys during experiments as a result of the therapy. *Id.* at 316.

of the legal system. The next section addresses such scaffold as it relates to the notion of “personhood,” further evidencing that a legal definition of “human person” would fit the criteria of a common-sense, practical regulatory approach.

V. TRANSHUMAN CHILDREN AS LEGAL PARIAS - OVERVIEW OF PERSONHOOD IN AMERICAN LAW

As noted above, while some commentators argue that human rights attach to creatures with *Homo sapiens* DNA,²¹³ other commentators have instead assumed that genetically modified humans are automatically entitled to legal rights.²¹⁴ One such commentator asserts that “since the purpose of [human genetic modification] is to create a living child, that child has constitutional rights under the Fourteenth Amendment.”²¹⁵ However, there is no reason to believe that under the current legal system a genetically modified child would be automatically entitled to the protections afforded by the Fourteenth Amendment, or any other constitutional or statutory rights or protections. In fact, legal scholars have argued that even a human clone—who, by definition, would have a 100 percent unaltered *Homo sapiens* genome—would not be entirely human and thus would not be entitled to legal protections.²¹⁶

In light of the concern that genetically modified humans may not be automatically entitled to legal rights, the adoption of a strict biological definition of personhood,²¹⁷ is tempting. However, such a definition would run contrary to American jurisprudence. Legal personhood in the United States—such as in ancient Rome²¹⁸ and other contemporary legal systems around the world²¹⁹ — has never depended on biology, and is instead a malleable legal construct.²²⁰

The earliest indication of what entitles persons in the United States to legal rights comes from the Declaration of Independence: “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.”²²¹ However, throughout most of American history, these “self-evident” truths have not been so self-evident. As Fukuyama notes, “women

²¹³ See Annas, Andrews & Isasi, *supra* note 13.

²¹⁴ See Pham, *supra* note 136, at 150-53. The author argues that genetically modified humans would be protected, *inter alia*, under the American jurisprudential system of tort law, property law and children’s rights. *Id.*

²¹⁵ *Id.* at 153 133-159.

²¹⁶ Michael H. Shapiro, *I Want A Girl (Boy) Just Like the Girl (Boy) That Married Dear Old Dad (Mom): Cloning Lives*, 9 S. CAL. INTERDISC. L. J. 1, 36 (1999). Shapiro discusses the arguments made by Jean Bethke Elshtain and George Annas regarding the fact that human clones would not be entirely human. *Id.* at 6, 36. In fact, Andrews, Annas and Isasi make the same argument, which directly contradicts their main proposition that human DNA is the essence of humanity and therefore, what entitles people to human rights. See Annas, Andrews & Isasi, *supra* note 13, at 152, 153.

²¹⁷ See Annas Andrews & Isasi, *supra* note 13, at 152.

²¹⁸ See ANDREW BORKOWSKI & PAUL DU PLESSIS, TEXTBOOK ON ROMAN LAW 87-89 (Oxford University Press 2005). The authors note that, in addition to fulfilling other criteria, the eldest living male of a household was the one who enjoyed the greatest rights and liberties in ancient Roman society. *Id.*

²¹⁹ See SUSAN TIEFENBRUN, WOMEN’S INTERNATIONAL & COMPARATIVE HUMAN RIGHTS 102 (Carolina Academic Press 2012). For example, only Muslim males in countries under Shari’a law enjoy full legal rights. *Id.*

²²⁰ See *infra* notes 221–35 and accompanying text.

²²¹ The Declaration of Independence, <https://www.archives.gov/founding-docs/declaration-transcript> (last visited May 12, 2017) (emphasis added).

and blacks did not make the cut in 1776 when Thomas Jefferson penned the declaration.”²²² The Constitution’s “Three-Fifths Clause” counted African Americans as three-fifths of a person for purposes of states’ representation,²²³ and referred to them as “*other persons*.”²²⁴ The legal rights and protections that African Americans, women and other traditionally marginalized groups enjoy today did not come from the legal adoption of a biological notion of personhood, but instead through a patchwork of constitutional amendments,²²⁵ and development of precedent in fact-specific cases.²²⁶ Nevertheless, as the infamous *Dred Scott*²²⁷ case demonstrates, the judiciary has always exercised its power to expand or contract the definition of *person* as it saw fit, even for regrettable purposes.²²⁸

The focus on “personhood” as a pure legal fiction, however, is best observed in the context of corporations,²²⁹ which have limited legal personhood extending from case law²³⁰ and legislation.²³¹ As a judicial construct, the Supreme Court has actively breathed life into the corporate, non-living, non-sentient juridical person.²³² The *Citizens United* and *Hobby Lobby* cases illustrate that the Supreme Court has extended rights to corporations which were popularly thought to be reserved for human persons, such as the protection of political speech²³³ and religious

²²² Fukuyama, *supra* note 16, at 42. Fukuyama makes this observation, noting Transhumanism’s threat to equality under the law. *Id.*

²²³ Paul Finkelman, *Affirmative Action for the Master Class: The Creation of the Proslavery Constitution*, 32 AKRON L. REV. 423, 428-29 (1999).

²²⁴ U.S. Const. Art. I, § 2. *See also* Finkelman, *supra* note 223, at 428-29.

²²⁵ For example, the Thirteenth, Fourteenth and Ninetieth Amendments. *See* U.S. Const. Amend. XIII, XIX, XIV.

²²⁶ The incorporation of minorities into the fabric of social equality is evidenced by the long history of Supreme Court precedent. *See, e.g.,* *Frontiero v. Richardson*, 411 U.S. 677 (1973); *Loving v. Virginia*, 388 U.S. 1 (1967); *Brown v. Bd. of Educ.*, 347 U.S. 483 (1954); *Laurence v. Texas*, 539 U.S. 558 (2003); *Obergefell v. Hodges*, 135 S. Ct. 2584 (2015). All of these cases exemplify the idea that there has been no need thus far to craft a definition of legal personhood for the law to expand rights and protections to traditionally marginalized groups.

²²⁷ *Scott v. Sandford*, 60 U.S. 393 (1856). In *Dred Scott* the question was “whether the descendants of [slaves]... are citizens of a State, in the sense in which the word citizen is used in the Constitution of the United States.” *Id.* at 403. In arriving at a conclusion, the Court noted: “But there are two clauses in the Constitution which point directly and specifically to the negro race as a separate class of persons, and show clearly that they were not regarded as a portion of the people or citizens of the government then formed. *Id.* at 411. In making a distinction between different types of “persons” the Court concluded that Scott “was not a citizen... within the meaning of the Constitution of the United States. *Id.* at 427.

²²⁸ Legal scholar Michael Rivard notes the Court’s approach, stating: “Rather than developing an underlying theory of personhood, the Supreme Court follows a pragmatic, result-oriented approach. The Justices seem to grant or deny constitutional rights on the basis of political expedience or similar considerations, and only then answer the question whether to extend constitutional personhood.” *See* Rivard, *supra* note 17, at 1425, 1465, 1431.

²²⁹ *See generally* Susanna K. Ripken, *Corporations are People Too: A Multi-Dimensional Approach to the Corporate Personhood Puzzle*, 15 FORDHAM J. CORP. & FIN. L. 97 (2009-2010).

²³⁰ *See* *Trustees of Dartmouth College v. Woodward*, 1 N.H. 111, 115 (1817) (“A corporation considered as a faculty, in an artificial, invisible body, existing only in contemplation of law...”).

²³¹ *See generally* Limited Liability Company Act, 805 ILL. COMP. STAT. ANN. 180/1-5 (2012). Other state statutes provide similar definitions of “person.” *See, e.g.,* Del. Code Ann. tit. VI, § 18-101 (12) (1992).

²³² *See* *Santa Clara County v. Southern Pac. R.R. Co.*, 118 U.S. 394 (1886) (the Court expressed the opinion that corporations are persons for purposes of the Fourteenth Amendment).

²³³ *See* *Citizens United v. FEC*, 558 U.S. 310, 342-43 (2009) (“The Court has recognized that First Amendment protection extends to corporations. This protection has been extended by explicit holdings to the context of political speech. Under the rationale of these precedents, political speech does not lose First Amendment protection simply because its source is a corporation. The Court has thus rejected the argument that political speech of corporations or

freedom.²³⁴ Legislatures have also created rights for corporate persons; for example the Illinois Limited Liability Company Act defines person as “an individual, partnership, domestic or foreign limited partnership, limited liability company or foreign liability company, trust, estate, association, corporation, governmental body, or other juridical being.”²³⁵

Although the courts have granted personhood rights to non-biological, entities such as corporations,²³⁶ when it comes to living creatures, relatively recent notions of personhood track closely with the genetic makeup of *Homo sapiens*. In *Roe v. Wade*, the Court explicitly stated that “the word ‘person,’ as used in the Fourteenth Amendment, does not include the unborn.”²³⁷ However, in *Gonzales v. Carhart*, the Court’s reasoning evolved into an extension of a quasi-personhood status to a human fetus based on some abstract, non-scientific,²³⁸ element of human life, as a justification for banning a late-term abortion procedure.²³⁹ Although this is as far as the judiciary has gone in extending elements associated with “personhood” to a human fetus²⁴⁰ there is a widespread movement seeking to extend full personhood to a human embryo from the moment of conception.²⁴¹ Human personhood, therefore, remains a murky area in American jurisprudence, which is seemingly dependent on some genetic components and other, ethereal, non-defined criteria.²⁴²

other associations should be treated differently under the First Amendment simply because such associations are not ‘natural persons.’”) (citations omitted).

²³⁴ *Burwell v. Hobby Lobby*, 134 S. Ct. 2751, 2767-69 (2014) (“The first question that we must address is whether this provision [the Religious Freedom Restoration Act] applies to regulations that govern the activities of for-profit corporations like Hobby Lobby... Under the Dictionary Act, the wor[d] ‘person’... include[s] corporations, companies, associations, firms, partnerships, societies, and joint stock companies, as well as individuals.” Thus, unless there is something about the [Religious Freedom Restoration Act (“RFRA”)] context that indicates otherwise, the Dictionary Act provides a quick, clear, and affirmative answer to the question whether the companies involved in these cases may be heard... No known understanding of the term “person” includes *some* but not all corporations. The term person sometimes encompasses artificial persons (as the Dictionary Act instructs), and it sometimes is limited to natural persons.”) (citations omitted).

²³⁵ 805 Ill. Comp. Stat. Ann. 180/1-1.5 (2012).

²³⁶ See *supra* notes 231- 35.

²³⁷ *Roe v. Wade*, 410 U.S. 113, 158 (1973).

²³⁸ *Gonzales v. Carhart*, 550 U.S. 124, 158 (2007) (“The Act’s ban on abortions that involve partial delivery of a living fetus furthers the Government’s objectives. No one would dispute that, for many, D & E is a procedure itself laden with the *power to devalue human life*. Congress could nonetheless conclude that the type of abortion proscribed by the Act requires specific regulation because it implicates additional ethical and moral concerns that justify a special prohibition.”) (emphasis added). See also Pham, *supra* note 136, at 150.

²³⁹ *Carhart*, 550 U.S. at 158.

²⁴⁰ See Pham, *supra* note 136, at 150.

²⁴¹ Jonathan F. Will, *Beyond Abortion: Why the Personhood Movement Implicates Reproductive Choice*, 39 AM. J. L. & MED. 573, 598 (2013).

²⁴² Personhood as it relates to human embryos is a legal area which is far from settled. There has been a recent revival of the movement seeking to overturn *Roe v. Wade*. In 2016, the Ohio legislature passed a bill that would outlaw abortion as soon as a fetal heartbeat is detected. See Kim Palmer, *Ohio Lawmakers Pass ‘Heartbeat’ Abortion Legislation*, REUTERS (Dec. 7, 2016), <http://www.reuters.com/article/us-ohio-abortion-idUSKBN13W177>. Another example of the fight for the recognition of personhood at the moment of conception is evidenced by the bizarre case against actress Sofia Vergara, who has been sued by her own frozen embryos. See Ruth Graham, *Sofia Vergara’s Frozen Embryos, “Emma” and “Isabella,” Are Suing Her*, SLATE (Dec. 8, 2016), http://www.slate.com/blogs/xx_factor/2016/12/08/sofia_vergara_s_frozen_embryos_emma_and_isabella_are_suing_her.html.

The courts have been reluctant however, to extend personhood rights to other living beings. The Nonhuman Rights Project,²⁴³ a legal advocacy group, has tried to secure legal rights and protections for animals such as chimpanzees.²⁴⁴ One of their clients is a chimpanzee known as Tommy.²⁴⁵ The group brought a writ of habeas corpus petition at a New York State Supreme Court, presenting the argument that the writ of habeas corpus is “aimed at the denial of a legal person, not necessarily a human-being, but a legal person’s right to bodily liberty.”²⁴⁶ Counsel acknowledged that although being a *Homo sapiens* is a sufficient condition for personhood, there are other conditions which are sufficient for personhood²⁴⁷ such as exerting choice, and evidencing self-awareness, autonomy, and self-determination.²⁴⁸ Despite recognizing the argument’s strength, the court did not find it persuasive, holding that Tommy was not a human or a person who could seek a habeas corpus petition.²⁴⁹

The Nonhuman Rights Project filed an appeal at the New York Supreme Court Appellate Division, and presented the following question:

Is a chimpanzee, who is a member of a species that possesses the capacities for autonomy and self-determination, and possesses an autobiographical self, episodic memory, self-consciousness, self-knowingness, self-agency, referential and intentional communication, empathy, a working memory, language, metacognition, numerosity, and material, social and symbolic culture, the abilities to plan, engage in mental time-travel, intentional action, sequential learning, meditational learning, mental state modeling, visual perspective-taking, cross-modal perception, the abilities to understand cause-and-effect and the experiences of others, to imagine, imitate, engage in deferred imitation, emulate, to innovate and to use and make tools and who suffers from imprisonment the way a human suffers from imprisonment, a ‘person’ under the New York common law of habeas corpus?²⁵⁰

²⁴³ NON-HUMAN RIGHTS PROJECT, <http://www.nonhumanrights.org/> (last visited Feb. 16, 2017) (The Non-Human Rights Project is a legal organization working toward achieving legal rights for members of species other than our own. “Our mission is to change the common law legal status of at least some appropriate nonhuman animals from mere “things” which lack the capacity to possess any legal right, to ‘persons,’ who possess such fundamental rights as bodily integrity and bodily liberty.”).

²⁴⁴ NON-HUMAN RIGHTS PROJECT, <http://www.nonhumanrightsproject.org/qa-about-the-nonhuman-rights-project/> (last visited May 12, 2017) (“Specifically what rights are you seeking? The right to bodily liberty – i.e. not to be imprisoned.”).

²⁴⁵ David Grimm, *Chimpanzee ‘Personhood’ Effort Begins New Court Battle*, SCI. (Oct. 8, 2014), <http://news.sciencemag.org/plants-animals/2014/10/chimpanzee-personhood-effort-begins-new-court-battle>.

²⁴⁶ Transc. of *Proceeding under Article 70 of the CPLR for a Writ of Habeas Corpus* at 10 ¶¶ 5-9; NONHUMAN RIGHTS PROJECT, Inc., *av. Lavery*, Index No. 0251 at 10, ¶¶ 5-9, <http://www.nonhumanrightsproject.org/wp-content/uploads/2013/12/Fulton-Cty-hearing-re.-Tommy-12-2-13.pdf> (N.Y. Sup. Dec. 3, 2013).

²⁴⁷ *Id.* at 20, ¶¶ 19-22.

²⁴⁸ *Id.* at 21, ¶¶ 10-23.

²⁴⁹ *Id.* at 26, ¶¶ 11-25.

²⁵⁰ Appellate Br. of Petitioners-Appellant at 2, *People ex rel. Nonhuman Rights Project, Inc., v. Lavery* (N.Y. App. Div. 2013) (No. 2013-02051) available at <http://www.nonhumanrightsproject.org/wp-content/uploads/2014/06/8.-Appellate-Brief-Filed-with-Court-Tommys-Appeal1.pdf>.

Chimpanzees and humans share approximately 98.8 percent of their DNA.²⁵¹ Yet, despite this genetic similarity, and the cognitive similarities between the two species, chimpanzees are *non-persons* according to the New York court's ruling.²⁵² One conclusion deriving from this reasoning is that there is something essential for legal purposes about *Homo sapiens* DNA which entitles the human species to rights and protections associated with personhood which others cannot have.²⁵³

A hint as to what that essential legal element of *Homo sapiens* DNA is may be discerned from the evolving policy on the creation of chimaeras. On August of 2016, the National Institutes of Health lifted a ban on the creation of chimaeras—part-human part-animal creatures—for research purposes.²⁵⁴ One of the concerns in creating chimaeras with human DNA is that scientists might create a creature with a certain level of human consciousness.²⁵⁵ Therefore, the ban remains for creating chimaeras with part human DNA and part non-human primate DNA—such as chimpanzee DNA.²⁵⁶ The ban on creating part human part non-human primate DNA illustrates the concept that there is a biological line between the human person and the non-human person which is relevant for legal purposes, and that such line is not the clear-cut 99.9 percent collective *Homo sapiens* DNA.

By way of illustration, if a Neanderthal were cloned and raised in American culture, and had the full capability of assimilation into society,²⁵⁷ would it be just to deny the Neanderthal legal rights because he or she is merely 99.7% genetically similar to humans?²⁵⁸ As noted in the previous discussion, even as science crystalized the notion that humans are nearly genetically identical by

²⁵¹DNA: *Comparing Humans and Chimps*, AM. MUSEUM OF NAT. HIST.

<http://www.amnh.org/exhibitions/permanent-exhibitions/human-origins-and-cultural-halls/anne-and-bernard-spitzer-hall-of-human-origins/understanding-our-past/dna-comparing-humans-and-chimps/>. (last visited May 12, 2017).

²⁵² *But see, e.g.*, Valeria Roman, *Argentina Grants an Orangutan Human-Like Rights*, SCI. AM. (Jan. 9, 2015), <https://www.scientificamerican.com/article/argentina-grants-an-orangutan-human-like-rights/> (The Argentinean judiciary, however, has found the opposite. A similar case was brought in an Argentinian court, in which counsel brought a habeas corpus petition arguing that a captive orangutan, Sandra, had been deprived of her freedom unjustifiably. *Id.* (Andres Domingues, a member of the Association of Professional Lawyers for Animal Rights in Argentina stated that “[t]he ruling was historic because before a nonhuman primate like Sandra was considered an object and therefore there was no dispute about its captivity.”) *Id.*

²⁵³ The New York Supreme Court Appellate Court rejected the appeal, stating, as reasoning for its decision, that “only people can be held legally accountable for their actions.” David Grimm, *Chimpanzee ‘Personhood’ Fails on Appeal*, SCI. (Dec. 4, 2014), <http://www.sciencemag.org/news/2014/12/chimpanzee-personhood-fails-appeal>.

²⁵⁴ Rob Stein, *NIH Plans to Lift Ban on Research Funds for Part-Human, Part-Animal Embryos*, NPR (Aug. 4, 2016), <http://www.npr.org/sections/health-shots/2016/08/04/488387729/nih-plans-to-lift-ban-on-research-funds-for-part-human-part-animal-embryos>.

²⁵⁵ *Id.*

²⁵⁶ *Id.*

²⁵⁷ Although it is disputed in the scientific community whether Neanderthals were a type of Human or a different species altogether. *See* Tabitha M. Powledge, *Were Neanderthals a Different Species?*, GENETIC LITERACY PROJECT (Feb. 4, 2014), <https://www.geneticliteracyproject.org/2014/02/04/were-neanderthals-a-different-species/>.] For example, scientists believe that Neanderthals were capable of talking at a level similar to that of humans. *See also* Kaku, *supra* note 1336, at 153-54.

²⁵⁸ Larry Thompson, *Complete Neanderthal Genome Sequenced*, NAT'L INST. OF HEALTH (May 5, 2010), <https://www.genome.gov/27539119/>. It is also believed that there was extensive interbreeding between Neanderthals and *Homo sapiens*, and that approximately two percent of DNA of people from Asian and European descent comes from Neanderthals. *See* Ewan Callaway, *Modern Human Genomes Reveal Our Inner Neanderthal*, NAT. (Jan. 29, 2014), <http://www.nature.com/news/modern-human-genomes-reveal-our-inner-neanderthal-1.14615>. *See also*, ANDREWS ET AL., *supra* note 174 at 370.

virtue of the shared 99.9% of *Homo sapiens* DNA,²⁵⁹ the law was never forced to define what it means to be a human person. Nevertheless, it is clear that legislatures and the judiciary have the ability and the precedent to extend legal notions of personhood to other living creatures, even to a cloned Neanderthal.

Therefore, following existing precedent, or enacting legislation to adopt a legal definition of ‘human person,’ would not require an unreasonable revamp of the current legal system to address the concerns arising from genetic engineering. The final question then becomes, what is the best approach to craft a definition of human person which: (1) takes into account the arguments raised by proponents and opponents of the technology, and (2) is sufficiently meaningful and practical to be an effective means of protection for the first generation genetically modified children and their descendants?

VI. THE HUMAN BRAIN AND THE TRANSHUMAN FUTURE: RATIONALE FOR A BIO-PSYCHOLOGICAL APPROACH TO REGULATION OF THE GENETIC ENGINEERING OF HUMANS

a. The Foundation of a Regulatory Scheme – A Definition

As noted in a previous section, just as the definition of personhood based on the totality of *Homo sapiens* DNA is too narrow for practical and sensible regulatory purposes,²⁶⁰ a legal system based on undefined “personhood” is too broad.²⁶¹ For example, although it would make sense to extend some notions of personhood to creatures such as chimpanzees,²⁶² it would be illogical to extend every right currently associated with human personhood to a chimpanzee—such as the right to vote and own property. Nevertheless, the most efficient starting point for the creation of a definition is the intersection between the opposing ideologies; those who argue that human DNA is the essence of personhood rights,²⁶³ and those who espouse a general notion of “personhood” and a liberal view of human essence.²⁶⁴ The intersection, as noted previously in this Article, is that both sides agree that *at least a portion of Homo sapiens’* DNA is necessary in a legal sense, and as such, there is such thing as “human essence.”²⁶⁵

Thus, it is that necessary part of *Homo sapiens’* DNA that entitles a living being to the status of human person. The preliminary issue with the aforementioned proposition is that such “essential” part of the *Homo sapiens* DNA could derive from a multitude of genetically-generated traits, such as certain physiological features²⁶⁶ or the manner of conception of the genetically modified human.²⁶⁷ Also, as illustrated by Tommy’s case, that *something* which is critical for legal purposes is not necessarily dependent on even those features commonly associated as intrinsically human, such as cognition or consciousness.²⁶⁸ Therefore, the definition cannot be anchored to an arbitrary element of human genetics; the definition must strive to pinpoint what is *essentially human* about human DNA for legal purposes.

²⁵⁹ See SMITHSONIAN NATIONAL MUSEUM OF NATURAL HISTORY, *supra* note 167.

²⁶⁰ See *supra* notes 165-170 and accompanying text.

²⁶¹ See *supra* notes 177-180 and accompanying text.

²⁶² See *supra* notes 201, and 246-250.

²⁶³ See Annas, Andrews & Isasi, *supra* note 13, at 170.

²⁶⁴ See Fukuyama, *supra* note 16.

²⁶⁵ See *supra* note 189.

²⁶⁶ See Shapiro, *supra* note 216, at 37.

²⁶⁷ Annas, Andrews & Isasi, *supra* note 13, at 159.

²⁶⁸ See generally Kaku, *supra* note 136.

Law and legal systems flow from human society and culture in its most primitive form.²⁶⁹ Although law and culture are not commonly associated with genetics, in fact, law as derived from culture stems directly from human genetics. To this point, ethnologist and author Joseph Campbell, states:

[T]he historically conditioned forms of thought and language by which our lives are shaped are indeed historically conditioned, whereas the psychosomatic entity that is everywhere being shaped—namely the bioenergetic system of one species *Homo sapiens sapiens* (emphasis in original)—is and has been for some forty millennia a constant. Hence the “*elementary ideas*”... of this single species—which are biologically grounded...²⁷⁰ (emphasis added).

Campbell asserts that human psychology is unique to humans and thus dependent on human DNA.²⁷¹ Individual human psychology, in turn, gives rise to collective myth and culture, which are independent of the external environment or the distinct evolution of disperse, unaffiliated human societies.²⁷² The consequence of this genetically-encoded human psychology is the rise of repeated motifs and myths common throughout humanity, all of which resonate internally with the human mind regardless of location, ethnicity or language.²⁷³ This unique human psychology, which derives from specific parts of *Homo sapiens* DNA responsible for brain development, is therefore, essential to the functioning of human society and must be preserved to ensure the stability the socio-legal systems.²⁷⁴ Unique human psychology, therefore, makes a human, a *person* for legal purposes.

This psychological theory of legal personhood has the advantage of avoiding reliance on unsupported premises or arbitrary notions of “personhood” which have no scientific or evidentiary support.²⁷⁵ Also, as Hughes—a proponent of Transhumanism—acknowledges, philosophers such

²⁶⁹ This seemingly straight-forward proposition is exceedingly complex at its core and outside of the scope of this Article. A basic explanation is that it derives from the legal philosophy of positivism, which in the Author’s opinion provides the best explanation for the birth of legal systems from the basic origins of human society. This specific theory comes from legal philosopher H.L.A. Hart. H. L. A. Hart, *Law as the Union of Primary and Secondary Rules*, in PHILOSOPHY OF LAW 93-96 (Joel Feinberg, Jules Coleman & Christopher Kutz, Wadsworth Cengage Learning, 2014). Hart posits that at its most essential level, primitive human societies must act according to an internally-generated “primary rule of obligation,” which enables the society to function by restricting unwanted behavior detrimental to group function: “in some form restrictions on the free use of violence, theft, and deception to which human beings are tempted but which they must, in general, repress if they are to coexist in close proximity to each other.” *Id.* at 93. According to Hart, this emergent legal system is a “necessary and sufficient condition of the existence of law.” H. L. A. Hart, *The Foundations of a Legal System*, in PHILOSOPHY OF LAW 93-96 (Joel Feinberg, Jules Coleman and Christopher Kutz, Wadsworth Cengage Learning, 2014). As such, human societies evolve from the “pre-legal to the legal” by implementation of these “primary rules” in addition to “rules of recognition,” which arise when “a suggested rule...[is] taken as a conclusive affirmative indication that it is a rule of the group to be supported by the social pressure it exerts.” *Hart, Law as the Union of Primary and Secondary Rules*, at 95.

²⁷⁰ JOSEPH CAMPBELL, *THE INNER REACHES OF OUTER SPACE* xx (New World Library 1986).

²⁷¹ *Id.*

²⁷² *Id.* at 6, 27-30.

²⁷³ BURTON GUTTMAN, ANTHONY GRIFFITHS, DAVID SUZUKI & TARA CULLIS, *GENETICS: THE CODE OF LIFE* 4 (The Rosen Publishing Group, Inc., 2011).

²⁷⁴ See discussion accompanying *supra* note 269.

²⁷⁵ See Hughes, *supra* note 87.

as Immanuel Kant and John Locke—who were greatly influential in the development of American legal bioethics²⁷⁶—believed that a psychological basis for personhood was appropriate,²⁷⁷ thus making a psychological theory of personhood consistent with existing law and policy. In addition, as noted in greater detail below, a definition derived from this theory would level the legal field for genetically modified and standard humans²⁷⁸ and would not exacerbate issues of inequality and discrimination.²⁷⁹

Unregulated genetic engineering which allows scientists to tinker with the human brain could open the door to the creation of a genetically modified “human” who may not identify her or himself internally as human due to an altered psychology which does not correspond to that of *Homo sapiens*. For example, there is a theory in psychology that a need to maintain an essential network of relationships with others is innate to the human psyche and is therefore, common to all human beings.²⁸⁰ This same theory holds that deprivation from social interaction leads to mental illness and “maladjustment.”²⁸¹ Genetically modifying a child for example, to have a reduced need to spend time with friends—with the goal that the child will be more inclined to spend his or her time dedicated to his or her studies—would recklessly eliminate something which is an essential foundation of a functional human society.

Therefore, a legal definition of *human person* must encompass at its core the following primary proposition: a *human person* is a biological creature containing the genetic material of *Homo sapiens* which codes for the complete psychological makeup unique to *Homo sapiens*. The definition should be accompanied by secondary propositions, such as a statement that all human persons are entitled to the totality of rights and liberties provided by law. This definition should also be accompanied by a prohibition of germline genetic engineering which would produce a creature that would run afoul of the definition. The definition would, therefore, (1) automatically provide all legal rights and protections to genetically modified children born of genetic engineering procedures, (2) make researchers legally-required to abide by the definition, (3) restrict some risky applications of the technology and (4) preserve the current socio-legal status quo by preventing creatures so psychologically dissimilar to humans that they would be unable to coexist with humans.²⁸²

An argument against this definition is that it is unhelpful on its own, as it requires a companion precise, scientific definition of the unique psychology of *Homo sapiens*. The response to this concern is that the definition could not be enacted until there is scientific certainty about the way in which the human genome controls highly specialized aspects of brain development, and

²⁷⁶ See generally W. Noel Keyes, *Our Continued Need for Coordination of the United States Constitution of the Eighteenth Century's 'Age of Enlightenment' With the Twenty-First Century's Ages of 'Modern Science and Bioethics'*, 27 WHITTIER L. REV. 951 (2006); John B. Mitchell, *My Father, John Locke, and Assisted Suicide: The Real Constitutional Right*, 3 IND. HEALTH L. REV. 45 (2006).

²⁷⁷ Hughes, *supra* note 87, at 634.

²⁷⁸ *Id.* Hughes believes that a general psychological theory of personhood would likely lead to Transhumans having a higher “moral status” and therefore more extensive rights. Nevertheless, Hughes refers to an imprecise definition of psychology which is apparently, not tied to biology and somehow related to consciousness. *Id.* This imprecise definition runs afoul of the underlying bio-psychological theory upon which this Article’s proposed definition is grounded.

²⁷⁹ See *supra* notes 199, 200, 201.

²⁸⁰ Roy F. Baumeister & Mark R. Leary, *The Need to Belong: Desire for Interpersonal Attachments as Fundamental Human Motivation*, 117 PSYCHOL. BULL. 497, 499 (1995).

²⁸¹ *Id.* at 500.

²⁸² See Andrews, Annas & Isasi, *supra* note 13, at 162.

the specific role of genetics in the development of human psychology. Once scientists ascertain such knowledge, an explanation defining the characteristics essential to human psychology for purposes of human personhood would accompany the definition.

In the meantime, since scientific knowledge of the human brain is still in its infancy,²⁸³ a temporary ban to all germline genetic modifications affecting the human brain has to be enacted. Such a ban should last until scientists have deciphered to a degree of scientific certainty the role of genetics on human psychology, what constitutes human psychology, and by implication, the functioning of the brain—which is possibly the most complex item in the known universe.²⁸⁴ As daunting as the aforementioned task sounds, it is a necessary step in protecting society, the human species, and the rights of any genetically modified children who will ultimately bear the brunt of what was done to them before they even existed. This definition would also still allow research and development in other areas of genetic engineering which could lead to great societal benefit.

A more elaborate definition of *human person* is not necessary at this moment. For example, one of the greatest concerns of those who oppose human germline modifications is that those who have the means would be able to buy enhancements—such as the capability for greater intelligence—for their future child.²⁸⁵ The proposed definition, however, indirectly restricts the implementation of germline genetic modifications meant to increase human intelligence. The reason for this indirect restriction is that human intelligence and human psychology are inexorably interconnected,²⁸⁶ and therefore, any changes to the threshold level of human intelligence in a hypothetical, genetically enhanced human would affect his or her psychology.

Consequently, the proposed definition would also have the effect of restricting dramatic changes to human intelligence, which would result in the gross social inequalities that some opponents of the technology fear.²⁸⁷ Transhumanist proponents and enthusiasts of the designer baby movement may protest that one of the most promising aspects of genetic enhancement is the increase in human intelligence, and that the proposed definition implicitly impedes the achievement of this goal. However, this definition merely prohibits the enhancement of human intelligence through germline genetic modification. Outside the definition remain other possible

²⁸³ Thomas Insel, the Director of the National Institute of Mental Health, has spoken about how little is known about the human brain: “I can’t tell you – nor can anyone else how the brain functions as an information processing organ. How does it do it?... We really don’t have a sense how the brain works.” Kevin Loria, *Most People Don’t Understand Just How Little We Know About the Human Brain*, BUS. INSIDER (May 22, 2015), <http://www.businessinsider.com/what-we-know-about-the-brain-2015-5>.

²⁸⁴ KAKU, *supra* note 136, at 1-2. To illustrate this point, Kaku states: “There are 100 billion stars in the Milky Way galaxy, roughly the same as the number of neurons in our brain. You may have to travel twenty-four trillion miles to the first star outside our solar system to find an object as complex as what is sitting on your shoulders.” *Id.*

²⁸⁵ See generally Annas, Andrews & Isasi, *supra* note 13. See also Pham, *supra* note 136, at 150.

²⁸⁶ See Robert J. Sternberg, *Human Intelligence; Psychology*, BRITANNICA ONLINE ENCYCLOPEDIA (May 7, 2015), <https://www.britannica.com/topic/human-intelligence-psychology> (noting that the most salient theories of human intelligence are based on “psychometrics; cognitive psychology, which concerns itself with the processes by which the mind functions; cognitivism and contextualism.”). See also ROBERT J. STERNBERG, *BEYOND IQ: A TRIARCHIC THEORY OF HUMAN INTELLIGENCE* (Cambridge University Press 1984). At its most essential level, Human psychology is the behaviors reflecting the inner workings of the human mind. See also Christian Nordqvist, *What is Psychology? What are the Branches of Psychology?*, MEDICAL NEWS TODAY (Aug. 14, 2015), <http://www.medicalnewstoday.com/articles/154874.php>.

²⁸⁷ Annas, Andrews & Isasi, *supra* note 13, at 161.

means of intellectual enhancement, for example, by increasing the brain's efficiency through the use of drugs and other means.²⁸⁸

Moreover, as physicist Michio Kaku notes, there are known limits to biological enhancement of the human brain. He explains that although there is a general knowledge about the specific human genes that code for intelligence,²⁸⁹ there are several genetic changes not directly affecting the brain, which are necessary to sustain greater intelligence and would thus make the process of biological enhancement more difficult.²⁹⁰ In addition, Kaku explains that there are limits as to how much human intelligence can be enhanced through physical changes to the structure and functioning of the brain itself before the laws of physics intervene.²⁹¹ Kaku's explanation shows that enhancing intelligence through genetic modification would be a particularly risky type of genetic engineering—even within the inherently risky realm of genetic engineering in general—thus warranting more stringent restrictions.²⁹²

Another argument against the proposed definition is that it is too imprecise, as there are other essential aspects of the human brain that can be used to define what constitutes a human person, such as human consciousness. Kaku defines human consciousness as “a specific form of consciousness that creates a model of the world and then simulates it in time, by evaluating the past to simulate the future. This requires mediating and evaluating many feedback loops in order to make a decision and achieve a goal.”²⁹³ However, as precise as a definition—such as the one adopted by Kaku—may be, it results non-functional as applied to law and policy. Consciousness, although undoubtedly essential to human identity, is not the engine upon which human society—as a collective of individuals sharing something inherently essential across cultures and across time—is founded.²⁹⁴ Rather, consciousness is an internal process which allows a human to interact in a highly-advanced manner with the world which surrounds her or him.²⁹⁵ In other words, consciousness looks inwards, while psychology looks outwards.

In conclusion, implementation of the proposed definition would provide a starting point for the regulation of genetic engineering. It would allow the development of genetic engineering applications which do not immediately threaten the survivability of the human species through the

²⁸⁸ KAKU, *supra* note 136, at 162.

²⁸⁹ *Id.* at 150-51.

²⁹⁰ *Id.* at 155-56 Kaku notes that, for example, in order to increase the intelligence of a chimpanzee to approximate that of a human, numerous other physical changes would be required, for example, he notes: “a larger brain would be useless unless it could control fingers capable of exploiting tools... But since chimps walk on their hands, another gene would have to be altered so that the backbone would straighten out and an upright posture would free up the hands...” *Id.* at 156.

²⁹¹ *Id.* at 161. Kaku explains for example, that one approach to increasing intelligence could be to attempt increasing the size of the brain. *Id.* However, a larger brain size means a greater consumption of energy, which generates heat and can cause tissue damage. *Id.*

²⁹² Mehlman explains that despite the great discretion that parents enjoy in raising their children, the state is not without power to place proper restrictions, suggesting that at levels of great risk, the parents' desire for a genetically-enhanced, super-intelligent child might not be sufficient to justify parental discretion. MEHLMAN, *supra* note 48, at 107-108.

²⁹³ KAKU, *supra* note 136, at 46.

²⁹⁴ See CAMPBELL, *supra* note 270.

²⁹⁵ Kaku, *supra* note 136, at 34. Kaku defines consciousness generally as “the process of creating a model of the world using multiple feedback loops in various parameters (e.g., in temperature, space, time, and in relation to others), in order to accomplish a goal (e.g., find mates, food, shelter).” *Id.*

destruction of socio-legal systems, and which would provide immediate and total legal protection to genetically engineered children.

b. Possible Avenues of Implementation

The final issue in the present discussion is the most realistic avenue for implementation; how could such definition become functional? The specific manner of implementation warrants a lengthy discussion which falls outside of the scope of this Article. However, the conclusion of this Article will briefly discuss the pros and cons of the possible manners of implementation.

The optimum approach would be a federal law implementing the definition and any necessary secondary propositions and relevant moratoria, thus completely settling the issue across the country and providing total regulation of germline genetic engineering. One problem with this approach is that in order for the legislation to be precise and effective in a scientific sense, the scientific community would have to be heavily involved in drafting the law's language;²⁹⁶ otherwise, there is a risk that politicians pursuing their own agendas would render the definition dangerous²⁹⁷ or counterproductive.²⁹⁸ Also, as mentioned above, the American government is in grave a state of dysfunction, making it exceedingly unlikely that a federal law would be enacted.²⁹⁹ A constitutional amendment would be even more unlikely, if not impossible.³⁰⁰

The current issues facing the United States Legislature would leave three other potential sources of implementation, (1) the judiciary, (2) the individual state legislatures, and (3) federal or state regulations. Although inherently unpredictable, the judiciary has the power to adopt the definition, as noted earlier in this Article. A problem with this approach is that it would be a reactive, not a proactive approach and it would therefore be unlikely to take place in a timely fashion.³⁰¹ The state legislature approach may be the most realistic and timely, especially in states which are receptive to the technology.³⁰² This approach however, would leave the door open for serious issues of inequality such as those observed in the fight for marriage equality prior to the Supreme Court's ruling in *Obergefell v. Hodges*,³⁰³ and the current fight for fair access to bathroom facilities for transgender people;³⁰⁴ in other words, it would be particularly dangerous for a

²⁹⁶ For example, as it relates to the scientific consensus at the time about what *Homo sapiens*-specific psychology is.

²⁹⁷ For example, the bill and definition could be corrupted to include language which would extend human personhood status to a human embryo, thus endangering abortion rights.

²⁹⁸ See Mike Orcutt, *The Unintended Consequences of Congress's Ban on Designer Babies*, MIT TECH. REV. (Aug. 26, 2016), <https://www.technologyreview.com/s/602219/the-unintended-consequence-of-congresss-ban-on-designer-babies/>. See also Reardon, *supra* note 44.

²⁹⁹ See Binder, *supra* note 198.

³⁰⁰ See Will Short Gorham, *Of 11,000 Attempts to Amend the U.S. Constitution, Only 27 Amendments Have Passed*, POLITIFACT (Aug. 30, 2011), <http://www.politifact.com/truth-o-meter/statements/2011/aug/30/xavier-becerra/11000-attempts-amend-us-constitution-only-27-amend/> (noting the extreme difficulty in passing an amendment to the Constitution, referring to a statement by Representative Xavier Becerra: "We've had 11,000 attempts to amend the Constitution since 1789. Twenty-seven amendments have been passed, 10 of them in one shot with the Bill of Rights.").

³⁰¹ See Rivard, *supra* note 17.

³⁰² California is one example of a state receptive to the technology. See Charles Piller, *California Considers Funding Controversial Research: Editing Genes in Human Embryos*, STAT (Feb. 8, 2016), <https://www.statnews.com/2016/02/08/california-weighs-gene-editing-embryos/>.

³⁰³ *Obergefell v. Hodges*, 135 S. Ct. 2584 (2015).

³⁰⁴ Eric Ekholm & Alan Blinder, *Federal Transgender Bathroom Access Guidelines Blocked by Judge*, N.Y. TIMES (Aug. 22, 2016), <http://www.nytimes.com/2016/08/23/us/transgender-bathroom-access-guidelines-blocked-by->

genetically modified child to be considered a human person in one state and not in another state. The regulatory approach would be easier to undertake, for example, through changes to the federal research regulations,³⁰⁵ but this approach would be insufficient to extend all legal protections for all genetically enhanced humans, as it would merely apply to some types of research.³⁰⁶

VII. CONCLUSION

Whichever of the aforementioned approaches becomes feasible in the next decade, it is important that child law attorneys, science and technology law attorneys, civil rights attorneys, judges, scientists, scholars, law students, and everyday citizens become educated and aware of the issues discussed in this Article. Moreover, it is the responsibility of the community of law and policy professionals to pursue all means available to ensure the protection of those who will inevitably be born as the first generation of genetically modified humans. This Article is a call of urgency to those who take their responsibility to society seriously to become engaged, to learn about the difficult issues, and to actively pursue a solution. As humanist and astronomer Carl Sagan stated:

More often, science is taken to task because it and its products are said to be morally neutral, ethically ambiguous and readily employed in the service of evil as of good... Since technology has been with our ancestral line from before the first human, since we are a technological species, this problem is not so much one of science as of human nature. By this I don't mean that science has no responsibility for the misuse of its findings. It has profound responsibility, and the more powerful its products the greater its responsibility.³⁰⁷

My purpose with this Article—other than to highlight the dangers facing the first genetically modified children and present a theory of legal personhood—is to provide a starting point to those who are unfamiliar with the issues, and to inspire those interested in ensuring the continued survival of the human species, and the protection of all human persons involved to take action.³⁰⁸ The technological landscape is changing rapidly and is enabling society to achieve things which were unimaginable just a few years ago. All of this awesome technological power is accompanied by significant responsibility, which we must accept with enthusiasm and bravery.

judge.html. Also, such as in the examples mentioned above, this divergence between the states would likely require a unifying resolution through the Supreme Court.

³⁰⁵ 45 C.F.R. § 46, et seq.

³⁰⁶ See *supra* notes 147, 150.

³⁰⁷ CARL SAGAN, *THE DEMON-HAUNTED WORLD, SCIENCE AS A CANDLE IN THE DARK* 283 (Ballantine Books 1996).

³⁰⁸ Regarding the importance for legal professionals to become more engaged in issues of scientific and ethical importance, Maxwell Mehlman mentions the thoughts of Richard Posner: “the regulation of science must be delegated to lawyers. ‘Policing the intersection between law and science,’ he says ‘is a more natural role for lawyers than for scientists to play ...’ But Posner readily acknowledges that most lawyers are scientifically illiterate, and in the end, this forces them to rely on the very scientists they are attempting to regulate to supply the necessary expertise. Posner’s solution is for law schools to require that “a substantial fraction for law students be able to demonstrate by the time they graduated... a basic competence in college-level math and statistics plus one science such as physics, chemistry, biology, computer science, medicine, public health or geophysics.” Mehlman, *supra* note 25, at 104 (citing RICHARD A. POSNER, *CATASTROPHE: RISK AND RESPONSE* 202-208 (2004)). This Author does not think that such an extreme measure is necessary. All it takes is personal responsibility and drive.