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The Moral & Ethical Concerns of Synthetic Biology: The Reasons Why We Should Stop

By: Dennise E. Mejia¹

Introduction

“In the beginning God created the heavens and the earth... Then God saw everything that He had made, and indeed *it was* very good.”² From the beginning of time, mankind has struggled with attempting to recreate what God originally gave us before our fall through scientific and technological advancements. History has shown us that despite mankind’s best efforts, not all scientific advancements should be pursued because man is not in a position to create life, only God. Through mankind’s own arrogance, we are also in peril of creating unforeseen consequences that we may not have originally intended. However, technological advancements in the life sciences continue to grow despite public concerns and vocal resistant. Some examples include nanotechnology, genetic engineering, synthetic biology, stem cell research, and reproductive technologies.

There will come a time where a mother and father will be able to select the features of their yet unborn child in order to make the child a future superstar. With genetic engineering and synthetic biology this may soon be possible. Parents will ultimately have the ability to automatically screen their embryos for a wide variety of disorders, and those with the right genes will be implanted in the mother’s womb.³ Some fear that parents, by merely knowing they have the option to design the child they want, will soon forget how to love the child they are given by God.⁴ On the other hand, others see genetic modification and synthetic biology as a logical

¹ Seton Hall University School of Law J.D. Candidate, 2016. I want to thank God for inspiring to write on this controversial topic and helping me analyze the issues and ethical concerns of synthetic biology under His laws and guidance. I also want to thank Gustavo Perez for leading me towards the relevant Biblical scriptures.

² GENESIS 1:1-31.

³ RONALD COLE-TURNER, DESIGN & DESTINY – JEWISH AND CHRISTIAN PERSPECTIVES ON HUMAN GERM-LINE MODIFICATION: RELIGION AND THE QUESTION OF HUMAN GERM-LINE MODIFICATION (2008).

⁴ *Id.*

extension of medicine, consistent with basic human values and parental love that will only help further biotechnology.⁵

Biotechnology has been at a rapid rate of advancement since the commencement of the Human Genome Project. The Human Genome Project, funded by the J. Craig Venter Institute, was an effort to decode the entire DNA sequences and ultimately help form the identification of genes that may have possible diseases.⁶ The identification of the sequence of three billion paired genetic letters, that form the command of every feature in our biology, was successfully completed in April 2003.⁷ In May 2010, the J. Craig Venter Institute created the first single synthetic cell with the ability to self-replicate.⁸ Although some may argue that this is a monumental step forward in the area of biotechnology, in particular synthetic biology, we need to halt any further advancement and caution on the side of reason and ethics, because mankind is not in a position to create life, only God. To point a few concerns in the synthetic biology realm, we will look at issues concerning the extent of scientific freedom in the context of playing God, the protection of public good, bioterrorism, bioerrorism, the destruction of animal habitats and remaining reservoirs, and the use of remaining resources in third world countries for the production of synthesized organisms.

Part I of this article examines an overview of biotechnology, touching on the eugenics movement and DNA, with emphasis on genetic engineering and synthetic biology concerns. Part II of this article presents the differing views in the context of playing God regarding synthetic biology. Part III offers the different religious perspectives regarding synthetic biology touching upon the Catholic Church's position and the Jewish attitude regarding synthetic biology. Part IV

⁵ *Id.*

⁶ Jordan Paradise, J.D. & Ethan Fitzpatrick, Ph.D., *Synthetic Biology: Does Re-Writing Nature Require Re-Writing Regulation?*, 117 Penn St. L. Rev. 53 (2012).

⁷ RONALD M. GREEN, *BABIES BY DESIGN*, 2 (2007).

⁸ Jordan Paradise, J.D. & Ethan Fitzpatrick, Ph.D., *supra* note 6.

of this article articulates a suggestion to the scientific community and readers, proposing that we should not continue with the advancement of synthetic biology because of the many inherent and unknown risks, and the suspicion of megalomania with reference to the Biblical scriptures. Lastly, Part V concludes this article with a summary of the proposed suggestions.

I. An Overview of Biotechnology

Biotechnology is a “set of technologies that use biological molecules and cells to make products, solve problems, and do research, based upon an understanding of cellular and molecular structures and processes.”⁹ In other words, biotechnology allows humankind to make or modify products for a specific purpose to help improve our lives through the use of living organisms.¹⁰ The earliest forms of biotechnology were the domestication of animals through selective breeding programs that employed selection and hybridization, and the selective crossing of plants for crops.¹¹

A. The Eugenics Movement

In the early 1900s, the excitement for biotechnology revamped after several Europeans discovered the mathematician-monk, Gregor Mendel’s, pea plant experiment establishing the rules of heredity.¹² However, the enthusiasm for this new biotechnology science led to two movements that ultimately led both to bad results – one for human well-being and the other for scientific progress.¹³ This led the biologist and eugenic crusader, Charles B. Davenport, into a mission to send fieldworkers into prisons, hospitals, and insane asylums to collect data on

⁹ VICTORIA SUTTON, LAW AND BIOTECHNOLOGY, 4 (2007).

¹⁰ Biotechnology Industry Organization, *What is Biotechnology?*, <https://www.bio.org/articles/what-biotechnology> (last visited Dec. 4, 2014).

¹¹ VICTORIA SUTTON, *supra* note 9 at 11. For example, yogurt and cheese were developed through the use of microorganisms for human needs around 3,200 B.C. *Id.*

¹² GEORGE F. CAHILL, A BRIEF HISTORY OF THE HUMAN GENOME PROJECT, 2-3 (1996).

¹³ *Id.*

genetic backgrounds on the “defective” humans.¹⁴ Davenport hoped that such data would prevent the reproduction of the genetically unfit.¹⁵ The “eugenics movement¹⁶ concluded that the human population should be improved through selective breeding and culling” since inheritance was deemed so important by Charles Darwin and Gregor Mendel.¹⁷

In *Buck v. Bell*, the United States Supreme Court upheld a compulsory sterilization law for the unfit, including intellectually disabled people.¹⁸ The case involved Carrie Buck, a seventeen year old feeble-minded white mother of an illegitimate feeble-minded child.¹⁹ Buck’s mother was also a feeble-minded woman committed to the same State Colony as Buck.²⁰ Justice Oliver Wendell Holmes Jr. wrote, “We have seen more than once that the public welfare may call upon the best citizens for their lives...It is better for all the world, if instead of waiting to execute degenerate offspring for crime, or to let them starve for their imbecility, society can prevent those who are manifestly unfit from continuing their kind...Three generations of imbeciles are enough.”²¹

In Germany, Adolf Hitler offered a statement of the eugenic faith: “The demand that defective people be prevented from propagating equally defective offspring is a demand of the clearest reason and, if systematically executed, represents the most humane act of mankind. It will spare millions of undeserved sufferings, and consequently will lead to a rising improvement of health as a whole.”²² Unfortunately, Hitler carried eugenics beyond sterilization and into

¹⁴ MICHAEL J. SANDEL, *THE CASE AGAINST PERFECTION*, 64 (2007).

¹⁵ *Id.*

¹⁶ The eugenics movement was an effort to “improve the genetic makeup of the human race.” *Id.* at 63.

¹⁷ GEORGE F. CAHILL, *supra* note 12.

¹⁸ *Buck v. Bell*, 274 U.S. 200 (1927). This case has not been overruled.

¹⁹ *Id.* at 205.

²⁰ *Id.*

²¹ *Id.* at 207.

²² ADOLF HITLER, *MEIN KAMPF*, 225 (1943), *quoted in* EDWIN BLACK, *WAR AGAINST THE WEAK*, 274 (2003).

genocide and mass murder.²³ The second unfortunate result was an attempt “to calculate both population and individual characteristics, including physical and behavioral traits in a naïve attempt to improve the human gene pool.”²⁴ The Nazis attempted to establish this racial purity with improved physical and emotional characteristics.²⁵ News of the Nazis’ atrocities led America to abandon the eugenics movement.²⁶ This is a perfect example of how easy it is for a worthy goal to become perverted through unacceptable means. In other words, there is always a chance of abuse by those that hold this immense power.

B. The Emergence of DNA

In 1956, two young scientists by the names of Francis Crick and James Watson discovered the secret of life in the form of deoxyribonucleic acid (DNA) – the genetic material stored in the nucleus of living cells.²⁷ Significant advances in DNA technology has made it possible to push the limits of life sciences through the tinkering and manipulation of intra-species or transgenic genetic structures, in particular with genetic engineering and synthetic biology.²⁸ Using DNA technology, scientists are able to identify particular genetic traits responsible for diseases, athletic ability, intelligence, and even leadership potential in humans.²⁹

However, advances in DNA technology suggest that DNA holds the potential for good as well as evil as seen through the similar eugenics movement.³⁰ For instance, DNA can help with the elimination of certain diseases through genetic intervention at the cellular level, or through

²³ MICHAEL J. SANDEL, *supra* note 14 at 67.

²⁴ GEORGE F. CAHILL, *supra* note 12 at 4.

²⁵ *Id.*

²⁶ MICHAEL J. SANDEL, *supra* note 14 at 67-68.

²⁷ Kojo Yelpaala, *Owning The Secret of Life: Biotechnology and Property Rights Revisited*, 32 McGeorge L. Rev. 111, 118 (2000).

²⁸ *Id.*

²⁹ *Id.*

³⁰ *Id.* at 119.

the treatment of defective genes by decoding genetic traits of living organisms.³¹ As a result, DNA could help identify and classify certain “genetic traits most susceptible to serious diseases, such as diabetes or cancer.”³² This could lead to medical treatments that could be designed to target these particular genetic traits.³³ However, this same science could be used to genetically control the “characteristics of people, how long people live, where they live, and even what they eat.”³⁴ It holds the risk where human existence will be based upon pre-selection and genetic engineering, rather than on the probabilities of natural genetic selection.³⁵ This could create a world of serious inequality among the human race through the “predetermined social engineering of genetic manipulation.”³⁶ This goes to show that whoever controls the basis of knowledge in DNA technology can hold a vast amount of power.³⁷

DNA has also held the promise of significant financial rewards if the science could be converted into products or services.³⁸ For example, “universities and research scientists once committed to total openness were no longer merely interested in scientific discoveries in biology, biochemistry, or the life sciences simply for the advancement of knowledge.”³⁹ Instead, they were now interested in discoveries that could be “appropriated, protected within an intellectual property regime, and eventually transformed into products or services.”⁴⁰ Scientists and universities are now interested in acquisitiveness and exclusivity.⁴¹ This brings a host of questions concerning whether the scientific community is doing this for the monetary gain and

³¹ *Id.*

³² *Id.*

³³ *Id.*

³⁴ *Id.*

³⁵ *Id.*

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ *Id.* at 120.

scientific recognition, or for the advancement of the human well-being. Scientists ought to remember that there are limits to our knowledge and that our intent matters when we are dealing with new unknown areas regarding the human existence. Human well-being should remain our number one priority rather than monetary gain.

C. Genetic Engineering

Genetic engineering is the direct manipulation of an organism's genome through the use of biotechnology to "change the genetic makeup of cells to produce improved or novel organisms."⁴² Genetic engineering can be conducted in two ways: the somatic and germ-line modification.⁴³ Both the somatic and germ-line modification have been tested on animals and plants.⁴⁴ Here, each cell of an early embryo becomes either a somatic or germ cell.⁴⁵ The somatic cells are the remaining cells of the embryo.⁴⁶

With somatic engineering, it modifies only somatic cells such as liver, muscle, or blood cells.⁴⁷ Engineering the somatic cells only affect the individual being treated and does not affect future generations.⁴⁸ Currently, there are somatic engineering techniques available for human use to increase muscle strength.⁴⁹ This muscle-strengthening procedure can help the ill through genetic therapy by altering the cells solely to cure the person's sickness.⁵⁰ This same procedure can be applied for genetic enhancement purposes for people seeking greater muscle efficiency by

⁴² Union of Concerned Scientists, Science for a Healthy Planet and Safer World, *What is Genetic Engineering?*, http://www.ucsusa.org/food_and_agriculture/our-failing-food-system/genetic-engineering/what-is-genetic-engineering.html#.VIDRDDHF-So (last visited Dec. 4, 2014).

⁴³ Sarah M. Markwood, *Creating A Perfect Human Is Not So Perfect: The Case for Restricting Genetic Enhancement Research*, 110 Penn St. L. Rev. 473, 475 (2005).

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ *Id.* at 476.

⁵⁰ *Id.* at 477.

altering a “normal” cell to reach a desired outcome.⁵¹ Genetic enhancement goes beyond genetic therapy with its focus on enhancing human traits rather than repairing or curing human diseases and conditions.⁵² This opens the floodgates in making radical changes in humankind by going well beyond God’s intention and desired creation.⁵³ We are no longer focused on curing our diseases, but on making ourselves “better.”

Unlike somatic cells, germ cells are the sperm or egg cells and thus, they convey heritable characteristics.⁵⁴ Germ cells are more attractive because its engineering can extend to future generations.⁵⁵ In other words, germ cells are able to impact future generations in treating inherited diseases like diabetes.⁵⁶ Germ-line engineering “occurs when the alteration of the animal is right before fertilization, or before the embryonic cells are differentiated as somatic or germ cells.”⁵⁷ Unfortunately, the testing of germ-line engineering in animals, through pronuclear microinjection, has resulted in little success by leading to low birth rates and high newborn death rates.⁵⁸ This is because germ-line engineering requires the random integration of the donor’s DNA, and the timing and location of the DNA integration cannot be determined.⁵⁹ This has led to many animal abnormalities in mice, sheep, pigs, and cattle.⁶⁰ All of these testing raise concerns as to animal suffering and cruelty in conducting these experiments, and the lack of knowledge we still have in pursuing these advancements.

⁵¹ *Id.* at 476-77.

⁵² *Id.* at 477-78.

⁵³ *Id.* at 487.

⁵⁴ *Id.* at 475.

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

In addition, one single gene in a human body can perform multiple roles and thus, adjusting one gene may have more consequences than originally intended.⁶¹ For instance, a gene which contributes to sickle-cell anemia may also provide resistance to malaria, and thus, altering that gene to prevent sickle-cell anemia may increase the likelihood for contracting malaria.⁶² Thus, the genetic changes that result may have harmful effects on the altered individual, regardless of the purpose for altering the person's genetic make-up, due to technological errors or the scientist's lack of knowledge on how the implanted gene will react to other genes.⁶³ Here, the floodgates of the unknown will continue to surface with each manipulation mankind does.

D. Synthetic Biology

Synthetic biology is the “design and fabrication of new biological parts and systems that do not already exist in the natural world, and also the re-design and fabrication of existing biological systems to perform specific tasks.”⁶⁴ Here, synthetic biologists go one step further than genetic engineering – they want to design new life and construct it from scratch.⁶⁵ Synthetic biology merges chemistry and biology with engineering by targeting the items that make life itself.⁶⁶ It takes the four core materials of DNA and RNA, adenine (A), thymine (T), guanine (G), and cytosine (C), which constitutes the genetic make-up of all life forms, and rewrites biology.⁶⁷ The “sequences of RNA and DNA are the genetic code for all life,... and through the biological process called transcription, the genetic code of DNA is read by separating chains of DNA into single strands, that are then used as a template to make a chain of complementary RNA. The RNA is then translated into linear polypeptide chains of amino acids, called proteins,

⁶¹ *Id.* at 477.

⁶² *Id.*

⁶³ *Id.* at 478.

⁶⁴ Synthetic Biology Project, Synthetic Biology 101, *What is Synthetic Biology?*, <http://www.synbioproject.org/topics/synbio101/definition/> (last visited Dec. 4, 2014).

⁶⁵ RATHENAU INSTITUUT, *CONSTRUCTING LIFE: THE WORLD OF SYNTHETIC BIOLOGY*, 2 (2007).

⁶⁶ Jordan Paradise, J.D. & Ethan Fitzpatrick, Ph.D., *supra* note 6 at 55.

⁶⁷ *Id.*

which perform the majority of work within the cell... Thereafter, the development of rDNA introduces foreign genetic material into the natural process.”⁶⁸

In May 2010, researchers at the J. Craig Venter Institute successfully managed to synthesize the genome of a “bacterium called *Mycoplasma mycoides*, inserted it into a cell of a closely related species, *Mycoplasma capricolum*, from which the genome had been removed,” and produced a fully functioning *M. mycoides*.⁶⁹ The researchers allowed the new cell to carry on with its new life in order to prove that the experiment had worked.⁷⁰ Although the genome was the only thing that was synthesized, the researchers concluded that the new cell was under the control of the genome and had become a product of this new genome, and thus was a synthetic cell – a newly created species.⁷¹ The only difference between the old cell and the new cell was that the genome held names and e-mail addresses of some of the researchers in the cell’s sequences.⁷² The researchers included some inspirational quotes such as Richard Feynman’s famous line, “What I cannot create, I do not understand.”⁷³ This new cell also had the ability to self-replicate which only proved that the researchers’ experiment worked.⁷⁴

Although some may praise the researchers’ work, this “creation” raises a number of ethical concerns regarding the extent of scientific freedom, the responsibilities of scientists and the government to protect the public good from unknown species, and the desirability of promoting equitable distributions of goods and harms to society.⁷⁵ This new technology also raises concerns about dangers and deliberate misuses that are similar to the concerns held by the

⁶⁸ *Id.* at 57.

⁶⁹ GREGORY E. KAEBNICK & THOMAS H. MURRAY, *SYNTHETIC BIOLOGY AND MORALITY: ARTIFICIAL LIFE AND THE BOUNDS OF NATURE* (2013).

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² *Id.*

⁷³ *Id.*

⁷⁴ *Id.*

⁷⁵ *Id.* at 2.

nuclear physicists in the 1940s, regarding the energy contained in the atom and the possibilities for releasing it.⁷⁶ Synthetic biology also brings issues of bioterrorism where a rogue state or bioterrorist might recreate the smallpox or the 1918-19 influenza strain, or create new pathogens that may be deadly to mankind.⁷⁷ We have already seen examples of bioterrorism such as the anthrax attacks after 9/11.

Another set of concerns centers on mere safety called bioerrorism.⁷⁸ Here, a synthesized organism might escape from the laboratory, turn out to have properties different from what was originally intended, perhaps mutate and become established in the wild, and possibly pose a public health threat to the environment, mankind, and agriculture.⁷⁹ This is similar to the cautionary tale of the super AIDS mouse of 1990.⁸⁰ In the late 1980s, researchers at the National Institute of Allergy and Infectious Disease micro-injected the human AIDS virus into mouse embryos.⁸¹ The mice were born with the AIDS virus and mice in the subsequent generations carried the HIV virus.⁸² Critics warned of the possibility of the mice escaping from the laboratory into the wild and mating with non-infected mice.⁸³ Then in February 1990, Dr. Robert Gallo published the results of a study that reported that the AIDS virus, carried with other mouse viruses, could result in the creation of a super AIDS virus.⁸⁴ This new super AIDS virus acquired biological characteristics that allowed the virus to rapidly reproduce, infect new kinds of cells, and possibly be spread by new routes such as through air.⁸⁵

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ JEREMY RIFKIN, *HARNESSING THE GENE AND REMAKING THE WORLD: THE BIOTECH CENTURY*, 71 (1998).

⁸¹ *Id.*

⁸² *Id.*

⁸³ *Id.*

⁸⁴ *Id.*

⁸⁵ *Id.*

In addition, synthetic biology might also pose economic consequences.⁸⁶ Since the field is at the beginning stages, one concern is that the cellular factories will need to run on complex sugars extracted from sugarcane in the vast tracts of developing countries.⁸⁷ This in turn will affect the “food crops needed by some of the world’s poorest people,” by replacing the crops with different crops used to produce materials consumed in wealthier countries.⁸⁸ It is already bad enough that these developing and underdeveloped countries lack in resources – by using up their remaining resources, we would ultimately create a worst environment for them. Moreover, the synthetic biology market is currently held by some of the largest life science companies such as Novartis, Sandoz, and Ciba-Geigy.⁸⁹ Assuming *arguendo* that certain synthetic biology products are beneficial for mankind, this brings back concerns of whether they will be equally distributed among all class of people due to the fact that this is a very singular highly monopolized market. Because of this monopoly, prices are most likely to sky rocket and lower class people will not be able to afford these products.

As to environmental concerns, these new species are unpredictable as to how they will interact with other living organisms. The use of factories may diminish the remaining reservoirs of biological diversity and the environmental habitats.⁹⁰ Animal suffering will be both at the wildlife and experiments. These experiments require hundreds of repeated experiments on additional animals until the scientists successfully develop the desired outcome.⁹¹ In turn, so many innocent animals will be sacrificed in the name of science. To make matters more risky, the U.S. Department of Agriculture “devotes a mere 1% of its total funds allocated to

⁸⁶ GREGORY E. KAEBNICK & THOMAS H. MURRAY, *supra* note 69 at 2.

⁸⁷ *Id.*

⁸⁸ *Id.*

⁸⁹ JEREMY RIFKIN, *supra* note 80 at 69.

⁹⁰ *Id.* at 74.

⁹¹ *Id.* at 97.

biotechnology research to risk assessment.”⁹² One percent is not enough to figure out all the unknown risks that may potentially arise before, during, or after the experiments are completed. With all this in mind, we should consider that the advancement of synthetic biology is really not worth the risk, because of the possibility of us losing our precious Earth and the harm we will be causing to other mammals of the environment. Synthetic biology will “continue to raise questions about the human relationship to the natural world and about human control over living things.”⁹³

II. Differing Views in the “Playing God” Context Regarding Synthetic Biology

As stated in Second of *Timothy*, “For the time is coming when people will not endure sound teaching, but having itching ears they will accumulate for themselves teachers to suit their own passions, and will turn away from listening to the truth and wander off into myths.”⁹⁴ Over the years, mankind has continued to imitate God like abilities through the advancement of biotechnology and now in particular with synthetic biology. However, not all scientists see this as a problem despite the great moral ramifications. The secular philosopher, Ronald Dworkin, rejects the phrase of “playing God” in its entirety, and accuses those of using the phrase of being intellectually and morally dishonest.⁹⁵ According to Dworkin, the overstepping of boundaries actually belongs to the very nature of man, not God, especially when biotechnology is qualitatively nothing new.⁹⁶ Dworkin believes that the accusation of playing God serves as a repository for those who “reject the non-rejectable cultural duty of man shaping the world.”⁹⁷

⁹² *Id.* at 77.

⁹³ GREGORY E. KAEBNICK & THOMAS H. MURRAY, *supra* note 69 at 3.

⁹⁴ 2 TIMOTHY 4:3-4.

⁹⁵ Peter Dabrock, *Playing God? Synthetic Biology as a Theological and Ethical Challenge*, 3 *Sys. Synth. Biol.* 47 (2009); See RONALD DWORKIN, *SOVEREIGN VIRTUE: THE THEORY AND PRACTICE OF EQUALITY* (2000).

⁹⁶ *Id.*

⁹⁷ *Id.*

In 2007, a number of prominent scientists gathered at an Edge Foundation meeting, entitled *Life: What a Concept!*⁹⁸ John Brockman, the founder and scientist of the Edge Foundation, excitedly wrote how the current research at play “may allow scientists to transform one species into another and create new life forms.”⁹⁹ Brockman briefly touched upon the place of religion in this new research stating, “We are witnessing a point in which the empirical has intersected with the epistemological... don’t even try to talk about religion: the gods are gone.”¹⁰⁰ A contributor to the Synbiosafe conference wrote, “We are defining life from zero. This is a HUMAN CREATIONIST environment. No Gods have any relationship with this crucial moment. No myths – just human desire.”¹⁰¹ In that respect, in a secular society the “person who plays God intrudes not on God’s sovereignty, but on the sovereign autonomy of another person.”¹⁰² In other words, these scientists are more concerned with achieving their human desired outcomes in the scientific realm rather than thinking about the moral limits that one should place and consider. These scientists fail to see that boundaries and limits are necessary in order to comply with God’s laws. We should keep in mind that God gave us the privilege to our own existence, and therefore, we should follow His guidance.

On the other hand, Paul Ramsey, a Protestant theologian, wrote in opposition to the development of in vitro fertilization (IVF), “Men ought not to play God before they learn to be men, and after they have learned to be men they will not play God.”¹⁰³ Religious cultural traditions define this limit as a divine privilege, and even if a person does not believe in God, the

⁹⁸ Patrick Heavey, *The Place of God in Synthetic Biology: How Will the Catholic Church Respond?*, 27 *Bioethics* 36 (2011).

⁹⁹ *Id.* at 37.

¹⁰⁰ *Id.*; See JOHN BROCKMAN, *LIFE: WHAT A CONCEPT! AN EDGE SPECIAL EVENT AT EAST OVER FARM*, 8 (2008), available at <http://www.edge.org/documents/life/Life.pdf>.

¹⁰¹ *Id.*; See Synbiosafe, *Compilation of all SYNBIOSAFE E-Conference Contributions*, 23 (2008), available at http://www.synbiosafe.eu/uploads/pdf/Synbiosafe_e-conference_all_contributions.pdf.

¹⁰² RONALD COLE-TURNER, *supra* note 3 at 9.

¹⁰³ *Id.*; See PAUL RAMSEY, *FABRICATED MAN: THE ETHIC OF GENETIC CONTROL*, 138 (1970).

“guiding function of the religious motive for guarding this fundamental boundary is still widely appreciated.”¹⁰⁴ In Protestant theology, if there are no limits in place, good deeds will be done in the name of evil.¹⁰⁵ This brings the example of Martin Luther’s good tree, which carries good fruits, but even in the justified the power of sin is still at play.¹⁰⁶ For example, the Hiroshima atomic bomb may have been good for the United States’ victory in World War II, but it was not good for the innocent Japanese families that perished during the explosion.

Leon Kass, a conservative in the biotechnology realm, stated, “Man, or *some* men, are becoming creators of life, and indeed, of individual living human beings (in vitro fertilization, cloning); they stand in judgment of each being’s worthiness to live or die (genetic screening and abortion) – not on moral grounds, as is said of God’s judgment, but on somatic and genetic ones; they also hold out the promise of salvation from our genetic sins and defects.”¹⁰⁷ This is equally troubling because scientists are judging each being’s worthiness on genetic traits which is very similar in the judgment of the eugenics movement. The phrases quoted by Ramsey and Kass have taken on lives of their own by many who share the idea that there must be limits in place to the use of biotechnology.¹⁰⁸ These phrases can be said to be rhetorical shorthands “to warn that certain technologies go too far and that God (or those at least who believe in God) is opposed.”¹⁰⁹

III. Different Religious Perspectives Regarding Synthetic Biology

Up until now, there has been little religious debate regarding synthetic biology because it is still a new area to be explored.¹¹⁰ However, as synthetic biology becomes more successful this

¹⁰⁴ Peter Dabrock, *supra* note 95 at 48.

¹⁰⁵ *Id.* at 51.

¹⁰⁶ *Id.*

¹⁰⁷ RONALD COLE-TURNER, *supra* note 3 at 9. See LEON R. KASS, LIFE, LIBERTY, AND THE DEFENSE OF DIGNITY: THE CHALLENGE FOR BIOETHICS, 129 (2002).

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

¹¹⁰ Patrick Heavey, *supra* note 98 at 37.

will soon change.¹¹¹ At one side, is the view that nature is sacred and because of it we are stewards of nature, not masters, and therefore, may not change it.¹¹² If man decides to do otherwise and oppose God's will, he will ultimately be committing sin.¹¹³ In addition, if human beings try to conquer the role of God, who is the One who embodies the most fundamental difference from mankind, they will be suspected of exceeding man's limit and committing irresponsible behavior.¹¹⁴ This arouses the suspicion of megalomania¹¹⁵ when man tries to play God.¹¹⁶

The heart of many religions, including biblical tradition, "is touched when science questions the privilege of God to decide on the transitions between life and the inanimate."¹¹⁷ As a result, it seems plausible to identify synthetic biology as a new form of overstepping man's boundaries by man setting out to create a *creatio a novo*.¹¹⁸ Some scholars have applied the story of the Tower of Babel¹¹⁹ to science.¹²⁰ Here, at a time where all the people spoke the same language, people wished to build a great tower that would reach the heavens in order to show God that they were just as worthy as Him.¹²¹ God did not want this, and to destroy the people's plan, He split them up into different linguistic groups in order to limit their collective efficiency.¹²² This prevented the people from communicating with each other and building the tower.¹²³ From this, one can argue that certain scientific research that impinges on God's role are

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ *Id.*

¹¹⁴ Peter Dabrock, *supra* note 95 at 47.

¹¹⁵ It is the obsession with the exercise of power.

¹¹⁶ Peter Dabrock, *supra* note 95 at 47.

¹¹⁷ *Id.* at 49.

¹¹⁸ *Id.*

¹¹⁹ GENESIS 11:1-9.

¹²⁰ Patrick Heavey, *supra* note 98 at 37.

¹²¹ *Id.*; See GENESIS 11:1-9.

¹²² *Id.*

¹²³ *Id.*

out of bounds and therefore, we should not continue them because we cannot try to better the world God has given us.¹²⁴

On the other hand, other theologians have referenced the fact that we are created in God's image and thus, God continues to create and so should we.¹²⁵ At this end, in order to fulfill our true potential as desired by Him, we should continue to create in the biological areas in order to increase our knowledge in nature.¹²⁶ These biological creations would help further cures for diseases and enhance life for the better.¹²⁷ Although we do not have the power to create *ex nihilo*, we do have the right and duty to create our own civilization and use our creative powers in biotechnology research.¹²⁸ These scholars point to Jesus's parable in *Matthew* 25:14-30, where Jesus commands us to use our talents and to not do so would be displeasing to God.¹²⁹ These scholars believe since now we have the capacity to conduct biotechnology research, it is our duty to advance it for knowledge and for the human well-being.¹³⁰

A. The Catholic Church's Position Regarding Synthetic Biology

The Catholic Church's support for synthetic biology has gone even further than what one might imagine. In Catholic universities, primary and secondary schools students are taught science, including the basics of the evolutionary theory, as well as housing science faculties in their own campuses.¹³¹ The Pontifical Academy of Science, located in Vatican City, aims to advance the life sciences, biotechnology, bioethics, and ethics.¹³² Here, academicians are elected

¹²⁴ *Id.*

¹²⁵ *Id.*

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ *Id.*

¹²⁹ *Id.*; See MATTHEW 25:14-30.

¹³⁰ *Id.*

¹³¹ *Id.* at 40.

¹³² *Id.*

by the Pope and religious affiliation or lack of it is not a factor in which the Pope considers.¹³³ A few non-Catholic members include Stephen Hawking, George Lamitre (father of the big bang theory), and Francis Collins.¹³⁴ Pope Pius XII has further described “science, philosophy, and revelation as instruments of truth, like the rays of the same sun.”¹³⁵

The Pontifical Academy for Life, the Catholic Church’s academy dedicated to promoting the Church’s consistent life ethics, stated the following regarding synthetic biology, “There are no ethical limits to the knowledge of the truth, that this, there are no ‘barriers’ beyond which the human person is forbidden to apply his cognitive energy. The Holy Father has wisely defined the human being as ‘the one who seeks truth’... but on the other hand, precise ethical limits are set out for the manner the human being in search of the truth should act, since ‘what is technically possible is not for that very reason morally.’”¹³⁶ In other words, scientists should continue with their search for the truth in synthetic biology so long as there are certain ethical limits in place.

The Catholic Church has also issued several teachings regarding the research on biotechnology on the *Compendium of the Social Doctrine of the Church*.¹³⁷ This Magisterium documents focuses on economic and social justice issues.¹³⁸ It states:

“The Christian vision of creation makes a positive judgment on the acceptability of human intervention in nature, which also includes other living things, and at the same time makes a strong appeal for responsibility. In effect, *nature is not a sacred or divine reality that man must leave alone. Rather, it is a gift offered by the Creator to the human community, entrusted to the intelligence and moral*

¹³³ *Id.*; See Bishop Chancellor M. Sanchez Sorondo, *The Pontifical Academy of Science: A Historical Profile*, Vatican City: Pontifical Academy of Sciences http://www.vatican.va/roman_curia/pontifical_academies/acdscien/400_ann/storia_en_qxd.pdf (last visited Dec. 4, 2014).

¹³⁴ *Id.*; See SIMON SINGH, *BIG BANG*, 156-161 (2004).

¹³⁵ *Id.* at 39; See Pope Pius XII, *The Proofs for the Existence of God in the Light of Modern Science*, Papal Encyclicals <http://www.papalencyclicals.net/Pius12/P12EXIST.HTM> (last visited Dec. 4, 2014).

¹³⁶ *Id.* at 41; See Pontifical Academy for Life, *Concluding Communiqué on ‘The Ethics of Biomedical Research for a Christian Vision,’* http://www.vatican.va/holy_father/john_paul_ii/speeches/2003/february/documents/hf_jp-ii_spe_20030224_pont-acad-life_en.html (last visited Dec. 4, 2014).

¹³⁷ *Id.*

¹³⁸ *Id.*

responsibility of men and women. For this reason, the human person does not commit an illicit act when, out of respect for the order, beauty and usefulness of individual living beings and their function in the ecosystem, he intervenes by modifying some of their characteristics or properties. Human interventions that damage living beings or the natural environment deserve condemnation, while those that improve them are praiseworthy."¹³⁹

This above referenced quote runs afoul from the basic notions of common sense. Given the multiple experiments that are needed to successfully conduct a biotechnological experiment, scientists will have to damage a number of living beings in order to accomplish their desired results. This will ultimately condemn the scientists involved.

In May 2010, after the release of the Synthia bacterium by the J. Craig Venter Institute, Cardinal Angelo Bagnasco, head of the Italian Bishops' Conference, applauded the discovery as a further sign of intelligence.¹⁴⁰ According to Cardinal Bagnasco, this was a sign of God's gift to understand intelligence and to better govern it.¹⁴¹ He cautioned that this intelligence should be taken with responsibility and measured against the ethical dimensions each person has in their hearts.¹⁴² On the other hand, Bishop Domenico Mogavero, head of the Law Department of the Italian Bishops' Conference, noted "Pretending to be God and parroting his power of creation is an enormous risk that can plunge men into a state of barbarity... Scientists should never forget that there is only one creator, God. In the wrong hands, today's development can lead tomorrow to a devastating leap in the dark."¹⁴³ In other words, except for Bishop Mogavero, the leading opinion in the Catholic Church poses a strong support for synthetic biology conditioned on the

¹³⁹ *Id.*; See Pontifical Council for Justice and Peace, *Compendium of the Social Doctrine of the Church*, para. 473 http://www.vatican.va/roman_curia/pontifical_councils/justpeace/documents/rc_pc_justpeace_doc_20060526_compendio-dott-soc_en.html (last visited Dec. 4, 2014).

¹⁴⁰ *Id.* at 42; See Alessandra Rizzo, *Vatican: Scientist Shouldn't Play God But Church Officials Say Synthetic Cell Could Have Benefits*, Associated Press (May 21, 2010), http://www.nbcnews.com/id/37285047/ns/#.VFO-B_nF-So.

¹⁴¹ *Id.*

¹⁴² *Id.*

¹⁴³ *Id.*

absence of any ethical or theological problems.¹⁴⁴ This presupposes that this immense technology and power will not be in the wrong hands. On the alternative, will the Catholic Church feel the same way if this technology happened to be in the wrong hands?

B. The Jewish Attitude in Synthetic Biology

The Jewish scholars also show a strong support for synthetic biology like the Catholic Church, but they take it one step further. In the most popular interpretations of Judaism, man is mandated to use “his God-given talents to improve upon nature.”¹⁴⁵ They base this attitude on two Biblical passages – “Be fruitful and multiply, fill the earth and subdue it”¹⁴⁶ and “The heavens are the Lord’s heavens, but the earth God has given to humanity.”¹⁴⁷ Rabbi Akiva, a Talmudic scholar, argues that the world was deliberately created in an incomplete form and therefore, man is supposed to be a co-creator.¹⁴⁸ He uses the example of the command for circumcision as proof that “man was supposed to go beyond the original natural model created by the Almighty.”¹⁴⁹ These Jewish thinkers do not believe that the natural law should be limited, as opposed to prominent Jewish thinkers like Leon Kass, who believes that there *should* be limits to our knowledge.¹⁵⁰

Rabbi Soloveichik, one of the leading Jewish thinkers of the twentieth century, argues that creativity is not a heavenly monopoly, but rather a human responsibility.¹⁵¹ According to Soloveichik, mankind has been given a license by God to use his intellect, ingenuity, and physical prowess to develop and improve the world.¹⁵² Talmudic scholars use the earliest

¹⁴⁴ *Id.*

¹⁴⁵ Shimon Glick, *Synthetic Biology: A Jewish View*, 55 *Perspectives in Biology and Medicine* 4, 571-80 (2012).

¹⁴⁶ *Id.*; GENESIS 1:28.

¹⁴⁷ *Id.*; PSALMS 115:16.

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.*

examples of biotechnology, such as the domestication of animals and the selective crossing of plants, as examples of man modifying nature since the beginning of history.¹⁵³ In addition, they believe that synthetic biologists are not playing God, but rather are working to make a better world for all mankind.¹⁵⁴

In the Jewish tradition, the fear of playing God is not regarded with much concern.¹⁵⁵ However, the Jewish scholars caution that while they are commanded to be co-creators as God and take initiatives, they should “caution against hubris and assuming to be all-knowing and all-powerful.”¹⁵⁶ They reference to *Genesis* 2:15 where man is supposed to guard the earth against destruction.¹⁵⁷ Despite this word of caution, Talmudic scholars still believe that any advancement in synthetic biology will not incur any negative consequences. They use the example of the Golem Legend, a Jewish folklore, as a way to show that synthetic biology will not have any harm.¹⁵⁸

Here, holy men created an inanimate being through the “ritualistic use of a combination” of Hebrew letters.¹⁵⁹ The Golem was animated through the inscriptions of the three letter Hebrew word “emet,” meaning truth, on its forehead.¹⁶⁰ When the masters of the Golem wanted it to become deactivated, they would remove the first letter, converting “emet” to “met,” meaning death.¹⁶¹ The Talmudic scholars argued that there were no theological objections raised by the Rabbis to these acts, nor were there reports of any Golem having the ability to speak or think.¹⁶² For this matter, in the Jewish tradition there is not much fear or concern with playing God,

¹⁵³ *Id.*

¹⁵⁴ *Id.*

¹⁵⁵ *Id.*

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² *Id.*

because of no prior incidents.¹⁶³ However, one should take precaution regardless of no prior incidents, because if no harm happened in the past, it does not mean it cannot occur presently or in the future.

IV. Proposed Suggestion as To Why We Should Halt the Advancement of Synthetic Biology

In *Genesis* 1:27-28 it states, “So God created man in His *own* image; in the image of God He created him; male and female He created them. Then God blessed them, and God said to them, ‘Be fruitful and multiply; fill the earth and subdue it; have *dominion* over the fish of the sea, over the birds of the air and over every living thing that moves on the earth.’”¹⁶⁴ From a plain reading of the text, God commands mankind to be stewards of nature, to guard nature, and prevent it from destruction or exploitation. In other words, we are not commanded to change the earth as synthetic biologists, the Catholic Church, and Jewish scholars argue.

To further this, the Hebrew word for dominion is “*memshalah*,” meaning rule, dominion, authority, and govern.¹⁶⁵ Nowhere in the Hebrew definition does dominion mean to change, alter, or modify. If the Talmudic scholars and Catholic Church are quick to support the changing in our ecosystem by the creation of new species, they need to refer back to the original meaning of the Word in order to fully understand God’s message – which is contrary to what they believe. Moreover, God commands man to be fruitful and multiply, but with synthetic biology man will not be fruitfully multiplying with love and nurture, but rather multiplying from nothing. In other words, with synthetic biology we will be multiplying without being fruitful and in turn, multiplying without limits. This questions whether these new species will have a conscience.

Genesis 2:16-17, states, “And the Lord God commanded the man, saying, ‘Of every tree of the garden, you may freely eat; but of the tree of knowledge of good and evil you shall not eat,

¹⁶³ *Id.*

¹⁶⁴ GENESIS 1:27-28.

¹⁶⁵ Bible Hub, *Memshalah*, <http://biblehub.com/hebrew/4475.htm> (last visited Dec. 4, 2014).

for in the day that you eat of it you shall surely die.”¹⁶⁶ Contrary to what the Pontifical Academy for Life believes, here we have the first example of God directly commanding man and placing limits to the source of knowledge. In other words, this was our first test of obedience and once we did otherwise, as Adam and Eve did, we committed sin.¹⁶⁷ This serves as a perfect example why we should not overstep our bounds. Once we overstep this imaginary line, drastic things will follow. With Adam and Eve, once they ate from the forbidden fruit, they were susceptible to death as we are today.¹⁶⁸ This shows that once we separate from God, suffering, illness, death, and mayhem will ensue right afterwards. Synthetic biologists are purposely separating from God in order to say they have the ability to create a new order of beings as God has. We need to keep in mind that we do not know what will happen once these new “species” are released to our ecosystems and how will they react to us – but most importantly we do not know what punishment we will receive from God because of our acts.

Synthetic biology is very similar to the story of the Tower of Babel¹⁶⁹ and the Great Flood.¹⁷⁰ In both instances, man had overstepped his bounds through acts that impinged on God’s creative role. Once this occurred, God acted directly in order to confound their plans. Whether God will punish the synthetic biologists now after they continue with their work, we do not know. What we do know, is if they do not stop this technology, God will punish them.¹⁷¹ If we halt the advancement, we can prevent any further repercussions that may result from the continuance of synthetic biology. Furthermore, nowhere in the Biblical text does it mention that

¹⁶⁶ GENESIS 2:16-17.

¹⁶⁷ *Id.*

¹⁶⁸ GENESIS 3:19.

¹⁶⁹ GENESIS 11:1-9, *supra* note 121.

¹⁷⁰ “Then the Lord saw that the wickedness of man *was* great in the earth, and *that every* intent of the thoughts of his heart was only evil continually. And the Lord was sorry that He had made man on the earth, and He was grieved in His heart. So the Lord said ‘I will destroy man whom I have created from the face of the earth, both man and beast, creeping thing and birds of the air, for I am sorry that I have made them.’” GENESIS 6:5-7.

¹⁷¹ “Remember therefore from where you have fallen; repent and do the first works, or else I will come to you quickly and remove your lampstand from its place – unless you repent.” REVELATION 2:5.

man is co-creator with God as interpreted by the Talmudic scholars. God has not given us the authority to create or to “synthetically” make anything. We need to keep in mind that creation is not our role and we are to guard nature not exploit it. If we do otherwise, we would be committing further sin and who is to say there will not be higher consequences because of the higher level of threat that this new technology may bring.

Respectfully, Rabbi Akiva is misguided in saying that the earth was created in an incomplete form. In *Genesis*, 1:1-31 it states, “In the beginning God created the heavens and the earth... Then God saw everything that He had made, and indeed *it was* very good.”¹⁷² Again, this goes to show that our earth was created in a healthy and fine state and we do not need synthetic biology in order to better it. If it was created in an incomplete form, then God would not have been satisfied with His creation. Instead, it would logically follow that God would have continued to create until He was satisfied with His work since His power is infinite. The reason for our flaws and lack of resources is not because God created the earth in an incomplete form, but rather because of our own hubris. We destroyed what was already good because we wanted to know from good and evil and be like God.¹⁷³ Because of our ability to choose, we are tempted into believing we know better than the Almighty. Synthetic biology goes hand in hand with egoism since most of these synthetic biologists are blinded by wanting to become creators themselves.

“Then the eyes of both of them were opened, and they knew that they were naked; and they sewed fig leaves together and made themselves coverings... Also for Adam and his wife the Lord God made tunics of skin, and clothed them.”¹⁷⁴ This is an example showing how mankind’s attempt to better himself will never be as good as God’s. Regardless of how many times

¹⁷² GENESIS 1:1-31.

¹⁷³ GENESIS 3:4-6.

¹⁷⁴ GENESIS 3:7-21.

mankind, in this case synthetic biologists, attempt to better the world, it is done in vain because God is the only One that can create our needs in a perfect state. No matter how many times synthetic biologists conduct their experiments, they will be doing a disservice to themselves and hurting innocent animals because they will never achieve a “perfect” result. This will continue to open the doors of humanism and hubris among scientists in their futile attempts to achieve their desired outcomes.

The Catholic Church also fails to see its own err in its own interpretation for ethical limits. It suggests that there should be limits among the creation in synthetic biology, but never states what these limits should be. At an ambiguous state, this essentially opens the floodgates for abuse in this area. History has shown us how easy it is for a worthy goal to be perverted as the Nazis demonstrated during the eugenics movements. The Nazis, believing they were doing this for the better of mankind and scientific development, murdered millions of innocent families. This is not to suggest that synthetic biology will ultimately cause mass murder among society through the intentions of scientists. Instead, there might come a time when these new species may either turn against their own “creators” and us, or create mass chaos due to their synthetic nature. When humans are born naturally, we are born with a sense of conscience – we cannot be sure that this same conscience or side of reason and rational will be equally applicable to these new species. There has to be a line drawn somewhere, because without an exact point of where to stop, scientists can run wild with synthetic biology and have these potential scenarios occur.

As mentioned previously, synthetic biology opens the doors to environmental destructions and public safety concerns. Regarding bioerrorism, these new species could possibly

escape and turn out to have features that were not originally intended.¹⁷⁵ Not only will mankind suffer, but animals too.¹⁷⁶ Animals will suffer during the laboratory testing and in their habitats, assuming these new synthetic species pose a threat to animals as well. Once we are playing with the creation of life, we are essentially playing with our own existence.

Economically speaking, synthetic biology requires more than billions of dollars of heavy funding and investment for it to continue. Government spending should be placed elsewhere where the need is more imminent, such as for an AIDS virus cure or more recently, an Ebola virus prevention shot. Instead of investing billions of dollars in synthetic biology, we can use that money to prevent world hunger. Some may argue that there is not enough money to prevent total world hunger. However, if we have the money to spend on science necessities that are for mere achievement and desire, and not for the human well-being, then we can use that money wisely to help our brothers and sisters in the Eastern and Southern regions of the world. We need to get out of the “me” mentality that the Western hemisphere is so very used to. Science brings egoism and selfishness and this is what God warns us about.

In order to prevent any misuse in the synthetic biology realm, it is best that we halt any further experiments and not deal with this new science in the first place. God and history are our best guide posts and thus, we should learn from our predecessors’ mistakes in order to not perish into the same tragic falls. However, we know that most synthetic biologists will not want to take this route due to their eagerness in wanting to explore this area. For this matter, if for whatever reason synthetic biology continues, the United States and among other leading countries should adopt legislation where it would take a more precautionary approach as to what gets released into the market, or what gets “created.” This approach would place a heavy burden on the scientists

¹⁷⁵ See *supra* note 79.

¹⁷⁶ See *supra* note 91.

performing these experiments, and demand a heighten scrutiny where they would have to demonstrate that these new species do not pose a public threat. Specific review boards for this type of research should include not only scientists and legislatures, but religious leaders and scholars from different religious faiths in order to have a broader perspective on the ethical ramifications that may potentially arise. This all would require decades of research and investment. Again, we can see why it would best to not continue with this science due to the vast amount of time and money consumption that will have to be invested in mere risk assessment.

V. Conclusion

The best decision regarding synthetic biology would be to discontinue any further research in order to prevent any potential or unknown ramifications later down the road. We should be grateful with the world God has given us and realize that we cannot make it better until Jesus's return when he removes all sins from this world.¹⁷⁷ Till then, we should be happy with whom we are and not try to alter our existence because that is not what God intended. May we continue to live in a world where mankind strives to live in obedience under God's law,¹⁷⁸ and not stray away through our own arrogance. God Bless.

“The Lord *is* my shepherd; I shall not want. He makes me to lie down in green pastures; He leads me beside the still waters. He restores my soul; He leads me in the paths of righteousness for His name's sake. Yea, though I walk through the valley of the shadow of death, I will fear no evil; For You *are* with me; Your rod and Your staff, they comfort me. You prepare a table before me in the presence of my enemies; You anoint my head with oil; My cup runs

¹⁷⁷ “And there shall be no more curse, but the throne of God and of the Lamb shall be in it, and His servants shall serve Him. They shall see His face, and His name *shall be* on their foreheads. There shall be no night there: They need no lamp nor light of the sun, for the Lord God gives them light. And they shall reign forever and ever.”
REVELATION 22:3-5.

¹⁷⁸ EXODUS 20:1-17.

over. Surely goodness and mercy shall follow me All the days of my life; And I will dwell in the house of the Lord Forever.”¹⁷⁹

¹⁷⁹ PSALM 23: 1-6.

Certification

This paper is submitted to Professor Jordan Paradise in satisfaction of the requirements of Biotechnology and the Law. This paper is submitted in satisfaction of the Seton Hall Law School's Advanced Writing Requirement. This paper is approved _____ not approved _____ for AWR Certification.

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