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To Be or Not to Be Human: Human Enhancement – an Eternal Temptation

Abstract: Exploring the architecture of the human mind manifest in storytelling, J.R.R. Tolkien noted that "the great mythical significance of prohibition" cast in fairy-story is depicted as "The Locked Door" which "stands as an eternal Temptation."
This article asks – do human enhancement technologies tempt us to ignore a prohibition seemingly universal and somehow innate, an eternal Temptation, urging us to pry open the Locked door, a closed garden, and eat a forbidden fruit that promises to lift the strictures of human nature?
This article presents an overview of the basic characteristics of human enhancement and applies ethical principles drawn from Catholic social teaching to the legal and public policy controversies surrounding genetic and physical human enhancement technologies as well as the patent eligibility of human DNA segments. I argue that human enhancement technologies that assist but do not replace integral human nature contribute to human ecology while those that tempt us to go beyond the bounds of human nature contribute to a new eugenics.

Keywords: Human enhancement, gene editing, eugenics, human ecology, patenting human DNA

The very process of 'subduing the earth', that is to say work, is marked in the course of history, and especially in recent centuries, by an immense development of technological means. This is an advantageous and positive phenomenon, on condition that the objective dimension of work does not gain the upper hand over the subjective dimension, depriving man of his dignity and inalienable rights or reducing them.

John Paul II, *Laborem Exercens* (1981)

Introduction

Exploring the architecture of the human mind manifest in storytelling, J.R.R. Tolkien [1947] noted that "the great mythical significance of prohibition" cast in fairy-story is depicted as "The Locked Door" which "stands as an eternal Temptation".

The question is – do human enhancement technologies tempt us to defy a prohibition seemingly universal and innate, an eternal Temptation, to pry open a Locked Door, enter an enclosed garden, and eat a forbidden fruit that promises to allow us to lift the strictures of human nature?

> "The prohibition against eating 'of the tree of the knowledge of good and evil' … symbolically evokes the insurmountable limits that man, being a creature, must freely recognize and respect with trust. Man is dependent on his Creator and subject to the laws of creation and to the moral norms that govern the use of freedom" [Catechism of the Catholic Church 1994].

A [2016] Pew study of more than 4,000 Americans revealed general anxiety about genetic editing that confirms Tolkien perennial fairy-story metaphor of disquiet at opening the Locked Door and "meddling with nature" or "crossing a line we should not cross".

Some human enhancement technologies such as those that promise disembodied cognitive immortality openly aspire with Icarian hubris to transcend embodied human nature [Hanif et. al. 2024]. The Greek myth of Icarus is a story about a boy whose father, Daedalus, made for him wings composed of wax and feathers but warned his son not to fly too close to the sun or the sea least his wings fall apart. However, headless of his father's warning Icarus flew too close to the sun and the wax that held in place the feathers on his wings melted and, so, he fell to his death:

> "From then on, the story of Daedalus and Icarus became a cautionary tale … the myth teaches us that the same gifts of skill and daring that allow us to soar to great heights can also, if not tempered with humility and caution, lead us to plummet to our ruin" [The Myth of Deadalus and Icarus].

The following sections consider various human enhancements technologies to determine if they fly too close to the sun and promising to enhance human nature, they deliver less falling below the level of human dignity.

Part I. Human Enhancement – Genetic and Physical

Human Enhancement may be defined as "[a] modification aimed at improving human performance and brought by science-based and/or technology-based interventions in or on the human body" [The Sienna Project 2019]. Improvement in human performance means two things. For persons with a disability improvement would mean restoring them to normal function. This is often referred to as therapy to be distinguished from augmentative enhancement, that is, interventions on the human body that seemingly capacitate persons with no disabilities beyond the range of normal human function. Of course, defining what "normal," means is problematic:

> "Enhancement has been variously defined as 'boosting our capabilities beyond the species-typical level or statistical normal range of function, '[or] 'a nontherapeutic intervention intended to improve or extend a human trait,' or 'improvements in the capacities of existing individuals or future generations [or]… interventions that improve bodily condition or function beyond what is needed to restore or sustain health" [National Library of Medicine, National Center for Biotechnology Information 2016].

Human enhancement, therapeutic or augmentative, can be brought about by either genetic or physical interventions.

A) Genetic Enhancements

Genetic enhancements include those gene editing interventions on human DNA that are inheritable (germline therapy) as well as those that are non-inheritable (somatic gene therapy). Gene editing has been greatly facilitated by the development of Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR/Cas-9) technology. This gene editing technique is a three-step operation consisting of recognition, cleavage, and repair:

> Guide RNA (gRNA) and CRISPR-associated (Cas-9) proteins are the two essential components in CRISPR/Cas-9 system. The mechanism of CRISPR/Cas-9 genome editing contains three steps, recognition,

> cleavage, and repair. The designed sgRNA recognizes the target sequence in the gene of interest through a complementary base pair. While the Cas-9 nuclease makes double-stranded breaks at a site 3 base pair upstream to protospacer adjacent motif, then the double-stranded break is repaired by either non-homologous end joining or homology-directed repair cellular mechanisms [Asmamaw, Zawdie 2021].

Germline gene therapy modifies the genetic material of reproductive cells (sperm and eggs), so that the changes are passed down to future generations in order to correct or prevent genetic disorders by altering the DNA in germ cells. However, germline gene editing is controversial for two basic reasons: its unknown effects on the children whose inheritable DNA has been modified and subsequently on their progeny and, also, its potential for eugenic purposes. The gene editing technique, CRISPR/Cas-9 is fraught with uncertainties:

> "It can alter DNA at locations other than the target, which could inactivate essential genes, activate cancer-causing genes, or cause chromosomal rearrangements. It can change the DNA in some cells but not all, resulting in a mosaic of altered and unaltered cells. It can generate immune responses if introduced into the body… CRISPR-Cas9 system is still undergoing development to reach the level of safety where it could be used in clinical applications" [National Library of Medicine, National Center for Biotechnology Information 2015].

A Chinese researcher, He Jiankui, was convicted of violating a Chinese government ban on germline editing by carrying out his own experiments on human embryos, to try to give them protection against HIV. He was globally condemned when he announced his experiments and the birth of twin germline edited babies in 2019 [Ruwitch 2023].

That same year, 2019, the United States Congress reinstated a ban on federal funding of germline therapy and prohibited the Food and Drug Administration from approving any clinical trial „in which a human embryo is intentionally created or modified to include a heritable genetic modification Kaiser 2019]. However there is no restrictions on privately funded research and development of germline edited "designer babies" in the United States. Approximately 75% of clinical trials in the USA receive private funding [DeVito 2025]. Theoretically, "you could operate a privately funded lab and conduct non-clinical, human gene

therapy research. However, if someone wanted to sell that therapy in the US, they would need FDA approval for clinical studies and marketing. No proposals have been submitted" [Regulation Tracker 2020]. The FDA would consider any privately funded germline editing applications as it would a new drug or biological product:

> "[T]he U.S. Food and Drug Administration (FDA) has taken the position that any genetically, or otherwise substantially-modified, human embryo is a drug or biological product, the clinical use of which requires FDA approval. Full clinical use would require a sponsor to receive a New Drug Approval (NDA) (if it is viewed as a drug) or a Biological License Approval (BLA) (if a biological product). Each would require lengthy, expensive, and painstaking proof that the process was safe and effective" [Greely 2019].

The Food and Drug Administration [2019] issued the following statement regarding the danger of unforeseeable consequences with human germline editing:

> "While it could spare future generations in a family from having a particular genetic disorder, it might affect the development of a fetus in unexpected ways or have long-term side effects that are not yet known. Because people who would be affected by germline gene therapy are not yet born, they can't choose whether to have the treatment. Because of these ethical concerns, the U.S. Government does not allow federal funds to be used for research on germline gene therapy in people".

The precautionary principle requires that If an activity raises threats of serious harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically. It effectively shifts the burden to the advocate of change to prove that no harm will result from the proposed activity. In *Laudato Si'* Pope Francis [2015] said, the "precautionary principle makes it possible to protect those who are most vulnerable… If objective information suggests that serious and irreversible damage may result, a project should be halted or modified, even in the absence of indisputable proof. Here the burden of proof is effectively reversed…".

Environmental law requires that precaution be taken whenever a human intervention threatens to disrupt the "natural use" and natural laws of a given

ecosystem.[1] Germline therapy, even with the intention of curing genetic defects, nonetheless threatens the natural order of human ecology with unforeseeable consequences. The jurisprudential doctrine of the *ordre public* supports the natural use principle. For example, the World Trade Organization, Agreement on Trade-Related Aspects of Intellectual Property Rights, Article 27(2) provides "Members may exclude from patentability inventions, the prevention within their territory of commercial exploitation of which is necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment…" [The Sienna Project 2019: 29; D3.2]. The right to contract is also limited by principles of public morality: "As a general rule, a contract may be deemed invalid, if it violates social norms. Different general clauses are used by domestic laws to address this issue and limit the freedom of contract. Contracts, too, may be deemed invalid if they violate, e.g., rules of social coexistence, principles of community life, (public) morality, good practice, or good customs" [ibid.: 55]. United States constitutional law does not confer an absolute right for one to dispose of one's body as one may wish.[2] Environmental law, *order public*, public morality and United States constitutional law all point to a higher order of value that limits personal autonomy and, also, what others may do to modify the human body.

Gene editing has been greatly affected recently by artificial technology. CRISPR-GPT (Clustered Regularly Interspaced Short Palindromic Repeats – Generative Pre-trained Transformer) uses large language models (LLM) to automate and seemingly enhance CRISPR/Cas-9:

> "CRISPR-GPT leverages the reasoning capabilities of LLMs for complex task decomposition, decision-making and interactive human–artificial intelligence (AI) collaboration. This system incorporates domain expertise, retrieval techniques, external tools and a specialized LLM

[1] Under the "Natural Use" Principle – there is no right to develop land to change "its natural character" to "non-indigenous property uses" because a landowner is only entitled to reasonable expectations of what can be done to the land given "the natural character of the property and nature's laws" [Blumm et al. 2014: 50; 55].

[2] "The privacy right involved, therefore, cannot be said to be absolute. In fact, it is not clear to us that the claim asserted by some amici that one has an unlimited right to do with one's body as one pleases bears a close relationship to the right of privacy previously articulated in the Court's decisions. The Court has refused to recognize an unlimited right of this kind in the past. Jacobson v. Massachusetts, 197 U. S. 11 (1905) (vaccination); Buck v. Bell, 274 U. S. 200 (1927) (sterilization)" [Roe v. Wade 1973].

> fine tuned with open-forum discussions among scientists. CRISPR-GPT assists users in selecting CRISPR systems, experiment planning, designing guide RNAs, choosing delivery methods, drafting protocols, designing assays and analysing data" [Qu et al. 2025].

A researcher using CRISPR-GPT sends a text to an AI chat box "providing experimental goals, context, and relevant gene sequences" so as to "generate designs, analyze data, and troubleshoot design flaws" [Kay 2025]. It uses information from "leading practitioners and peer-reviewed published literature in gene-editing for retrieval-augmented generation" which greatly increases the speed and supposedly the efficiency of gene editing [Qu 2025]. Not only does it increase the speed of gene editing, but it also enables researchers with no prior experience to edit genes who "scored higher on accuracy, reasoning and action, completeness and conciseness across all major gene editing tasks" [Nebius 2025]. CRISPR-GPT allows researchers to "accurately predict the activity and specificity of different Cas9 variants" and "optimize conditions, adjust the RNA guide designs, and streamline gene editing" so that a patient can receive an accurate diagnosis and treatment plan tailored to their medical condition [Dara 2024].

AI enhanced gene editing has recently been able to modify genes inside of living cells thereby "affecting genes only in selected cell types or tissues, rather than across an entire organism" by creating "DNA switches", that is, cis-regulatory elements (CREs) that "control the expression and repression of genes." Researchers at the Jackson Laboratory (JAX) [2024], the Broad Institute of MIT, Harvard University, and Yale University, stated that they "have used artificial intelligence to design thousands of new DNA switches that can precisely control the expression of a gene in different cell types".

However, the ability of CRISPR-GPT to analyze, recommend, and decide which specific gene alterations or expressions should be undertaken in a particular case is problematic. This technology placed in the hands of inexperienced researchers in privately funded underregulated labs raises serious ethical and legal concerns discussed later in this article under "biohackers." At the very least CRISPR-GPT presents a temptation associated with AI in general, that is, to disassociate the researcher from the final decision-making process without sufficient verification and ethical review. Even though the designers of CRISPR-GPT insist the at "the decisions are ultimately made by human scientists" the temptation is present for researchers to submit their conscience to AI gene editing commands blindly like

Nazis concentration camp guards who justified their criminal actions saying that they were just "following orders".

Human Cloning

Human cloning produces a body genetically identical to that of the donor's body through the use of somatic cell nuclear transfer (SCNT):

> "First, the genetic information in the egg of a female is removed or neutralized. Somatic (i.e., body) cells are taken from the individual selected to be cloned, and the cell nucleus (where the genetic information is stored) of one cell is transferred with a micropipette into the host oocyte. The egg, so "fertilized," is stimulated to start embryonic development" [Ayala 2015].

The same technique (SCNT) is used to produce clones for therapeutic or reproductive ends the only difference being that those produced for therapeutic purposes are destroyed by the removal of their stem cells for research purposes rather than allowing the cloned human embryo to implanted in a surrogate mother's womb and brought to term:

> "In «reproductive» cloning, this embryo is implanted into a woman's womb and allowed to grow. In what has been called «therapeutic», «research» and «experimental» cloning, the stem cells are removed from the embryo, destroying this nascent human life" [United States Department of State, Archive, Fact Sheet, Bureau of Public Affairs 2004].

It has been suggested that reproductive cloning might be a tool for positive eugenics, that is, by increasing the genetic percentage of exceptional persons in the human gene pool. But this is non-science nonsense: "The proposal to enhance the human genetic endowment by genetic cloning of eminent individuals is not warranted. Genomes can be cloned; individuals cannot" [ibid.]. The human genotype, one's genetic structure, may be cloned but not one's phenotype which is a factor of an individual's interaction with his environment:

> "The genetic makeup of an individual is its genotype. The phenotype refers to what the individual is, which includes not only the individual's external appearance or anatomy, but also its physiology, as well as

> behavioral predispositions and attributes, encompassing intellectual abilities, moral values, aesthetic preferences, religious values… If an adult person is cloned, the disparate life circumstances experienced many years later would surely result in a very different individual, even if anatomically the individual would resemble the genome's donor at a similar age" [ibid.].

In 2005 the United Nations issued the "Declaration on Human Cloning" [2003] prohibiting all forms of human cloning, therapeutic as well as reproductive: "Member States are called upon to prohibit all forms of human cloning because they are incompatible with human dignity and the protection of human life". The United States supported the UN ban on all forms of human cloning in order to preserve human dignity:

> "The United States supports efforts to ban all forms of human cloning. Human cloning, for any purpose whatsoever, is unethical and morally reprehensible, and ignores respect for human dignity….
>
> A ban that differentiates between human reproductive and experimental cloning would essentially authorize the creation of a human embryo for the purpose of killing it, thus elevating the value of research and experimentation above that of a human life. Experimental embryonic cloning would therefore turn nascent human life into a natural resource to be mined and exploited, eroding the sense of worth and dignity of the individual. A partial ban that prohibits reproductive cloning but permits therapeutic, research, or experimental cloning is unacceptable to the United States and many other countries" [ibid.].

Many nations have outlawed in domestic legislation the cloning of human zygotes [Center for Genetics and Society, Human Cloning Policies]. However, except for restrictions on federal funding for human cloning research, there is no nationwide federal legislation in the United States banning human cloning Bonetta 2001]. Recently, April 9, 2025, the Alabama House of Representatives voted to make human cloning a felony. The bill sponsor, Representative Phillip Rigsby, noted human cloning place human dignity in jeopardy: "We stand at a crossroads in science, ethics, and human dignity. The prospect of human cloning, once confined to science-fiction, now challenges us to make a firm moral and legal stand" [Barrett 2025].

Somatic Gene Therapy

On the other hand, somatic gene therapy modifies the DNA of an individual's non-reproductive cells to treat or cure a disease, but the changes are not passed down to future generations. This type of gene therapy offers the potential to address both inherited and acquired diseases, but the changes are limited to the treated individual and may be available only for participants involved in a clinical trial:

> "Gene therapy aims to fix a faulty gene or replace it with a healthy gene to try to cure disease or make the body better able to fight disease…. The U.S. Food and Drug Administration (FDA) has approved gene therapy products for several conditions, including cancer, spinal muscular atrophy, hemophilia and sickle cell disease. But for most people, gene therapy is available only as part of a clinical trial" [Mayo Clinic].

Somatic gene editing using CRISPR/cas-9 cuts DNA and then harnesses the "natural DNA repair processes to modify the gene in the desired manner" to disrupt, delete, or correct/insert DNA. When scientists delete DNA, a section of the DNA is removed, and then "the two separate ends are joined together while the intervening sequence is removed." To correct or insert a gene, a genetic template is added into the cell. This process can either happen "*Ex Vivo* (outside the body) or *In Vivo* (inside the body)." If done ex vivo, scientists collect cells from the body and apply the CRISPR/Cas9 in a way that achieves their desired outcome. After this process, the cells are delivered back to the patient. When done in vivo, gene editing process is applied directly to the targeted area, and CRISPR/Cas9 is "packaged in a delivery vehicle such as lipid nanoparticles" [CRISPR Therapeutics].

There are known risks associated with somatic gene therapy including unwanted immune system reactions, targeting the wrong cells, infections caused by the vector virus and the possibility of causing errors in one's genes [ibid.]. Even so, somatic gene therapy clinical trials have helped people with severe combined immunodeficiency, hemophilia and other blood disorder, blindness caused by retinitis pigmentosa, leukemia, inherited neurological disorders, cancer, heart and blood vessel diseases and infectious diseases [ibid.].

Genetic Enhancements

In sum, legal concerns:

Germline editing is not directly prohibited in the United States. However, Congress has prohibited federal funding of germline therapy and prohibited the FDA from

approving any clinical trials involving germline edited human embryos. And even though privately funded research could conduct non-clinical human germline research, they would need approval from the Food and Drug Administration to conduct clinical trials to establish the therapy's safety, risks, benefits, and effectiveness and whether this therapy should be approved and marketed. Should Congress lift the ban and allow clinical trials on germline edited human embryos the likelihood of successfully passing clinical trials would be very doubtful due to the length and expense of the trials and the safety issues involved.[3]

Research involving human cloning, whether therapeutic or reproductive, is not illegal per se in the United States. However, just as in the case of germline editing, it is not federally funded. However, privately funded research on human cloning is legal. Moreover, ten states provide funding for therapeutic human cloning research, i.e., clone and kill laws.[4]

Genetic Enhancements

In sum, ethical concerns:

The precautionary principle requires that germline editing be explicitly prohibited by federal law in the United States given its uncertain and unpredictable effects on future generations. Human cloning, therapeutic and reproductive, should, also, be explicitly prohibited by federal law in the United States because human cloning in all its forms objectives and commodifies the human body. The human body must not be treated as an object because it shares a derivative dignity as an essential dimension of each human person.

Moreover, as the United States declared in signing the United Nations ban on human cloning, reproductive or so called therapeutic/experimental, results in the mass killing of nascent human beings sacrificed in the interests of science: "Experimental embryonic cloning would therefore turn nascent human life into a natural resource to be mined and exploited, eroding the sense of worth and dignity of the individual."[5] Because human cloning undermines human dignity and universal human rights it should be counted as a crime against humanity along with genocide, both of which present an "eternal Temptation," that withers human ecology.[6]

[3] See [Kaiser 2019; DeVito 2025; Regulation Tracker 2020].
[4] See [Ayala 2015] .
[5] See [Dara 2024].
[6] See [John Paul 1991: 38] first reference to human ecology. Also see for further references to human ecology [Benedict XVI (2009): 33] and [Francis 2015: 117].

B) Physical Enhancements

The subjects who benefit from human enhancement technologies are either competent adults or incompetent individuals including prenatal children, minor children, and persons with disabilities including the elderly. Equity requires that special considerations and safeguards apply with regards to human enhancements for persons incompetent in one manner or another such as informed consent and surrogate decision makers, safety, commodification of the human body, and prohibition on eugenic practices [The Sienna Project 2019: D3.2].

Removable versus Implanted Physical Enhancements

Physical enhancements treat the body (including mental function or emotional equilibrium) either permanently or temporarily with drugs, therapies, or devices. Such devices may be removable or implanted in the body. For example, removable devices such as hearing aids are therapeutic human enhancements that have been around for years. Cochlear implants, however, are new, more invasive and permanently affixed to the body. They are electronic devices surgically implanted to help people with severe to profound hearing loss to hear and understand sound. They bypass the damaged parts of the inner ear and directly stimulate the auditory nerve, sending sound signals to the brain. This process can improve speech recognition, even in noisy environments, and can help individuals regain confidence and connect with others [National Institute on Deafness and Other Communication Diseases 2016].

Cognitive Training Exercises

Games like checkers and chess are also used as enhancement therapy for memory impaired individuals. Cognitive training exercises can involve a variety of activities aimed at stimulating and improving mental skills. These exercises can range from simple puzzles and games to more complex activities like learning new languages or playing musical instruments. Some cognitive training exercises have solicited customers offering more benefits than they can deliver. They have been sued by the Federal Trade Commission for false advertising:

> "The FTC has filed complaints against companies that have made unsubstantiated cognitive enhancement claims, such as in the case of the brain training product Jungle Rangers. More recently, the FTC entered into a settlement with Lumos Labs, makers of the brain training game Lumosity, for purporting medical benefits" [American Academy of Arts & Sciences 2016].

Nootropics

Nootropics, or "smart drugs," are substances that may improve cognitive function. Some prescription nootropics include Adderall and Ritalin, which doctors prescribe for conditions such as ADHD and narcolepsy. Some over the counter nootropics include caffeine and L-theanine. Modafinil is used to treat excessive sleepiness caused by narcolepsy (a condition that causes excessive daytime sleepiness) or shift work sleep disorder (sleepiness during scheduled waking hours and difficulty falling asleep or staying asleep during scheduled sleeping hours in people who work at night or on rotating schedule. These same drugs may be used by persons with anormal range of functioning to enhance their test-taking ability [Varvatsis 2021].

Doping

Just as academic pursuits may be artificially augmented by various smart drugs so, too, athletes have been tempted to enhance their natural prowess by "doping," i.e., any drug or technique that "fundamentally alter[s] the athlete's 'natural' or 'gifted' levels of physical and mental strength [Coleman, Coleman 2008]. Doping is considered cheating and contrary to the "spirit of the sport" that tests an athlete's innate ability and acquired good habits (virtues developed through repetitive exercise, rest, disciple, routine, and determination), that is, his "natural or gifted baselines," natural excellence, or prowess [ibid.].

The same drug or device used therapeutically to heal an athlete and restore bodily integrity may become doping if used to enhance an athlete beyond his body's natural use - innate ability augmented only by good habits/virtues: "We recognize, however, that some might permit this use [steroids or human growth hormone (HgH) or even to have surgery] if it facilitated only a return to baseline levels" but this would be "difficult if not impossible to police in practice" [ibid.].

Ethical principles applicable to reproductive technology may be applied to doping. For instance, if a drug, device, or technique *assists* the conjugal act in its performance or to attain its natural end once performed naturally, it is morally licit while those that *replace* the conjugal act in its performance, etc. are illicit. Likewise, in competitive sports, the goal of which is to test natural prowess of an athlete, therefore, any drug, device or technique that assists an athlete's natural and virtuous baseline performance is licit, whereas any technique or modality that replaces or artificially substitutes for the athlete's prowess is illicit.

Good running shoes for a marathon runner are fine, but taking a bus ride for part of the race is cheating. In 1980 Rosie Ruiz won the New York City Marathon. Later it was found out that she had only run a short distance, the beginning and the end of the race having jumped on a subway train that covered most of distance of the race [ibid.: 1772]. Good diet, sleep and exercise at high altitudes naturally build up an athlete's respiration and increase the blood's oxygen carrying capacity. On the other hand, blood doping, i.e., secretly undergoing homologous blood transfusions, that is, blood taken from an athlete prior to competition and then transfused back to that athlete while undergoing the competition, while bicycling in the Tour de France, for instance, replaces an athlete's metabolic processes and is illicit and illegal. However, homologous blood transfusions after surgery to aid a compromised patient's recovery and chance of survival would be medically indicated [Plumb, Otto, Grocott 2016]. The same human enhancement technology can be put to good or bad purposes depending on the context and whether it is therapeutic or augmentative.

Exoskeletons

Similarly, in activities that simply maximize efficiency, such as industrialized work settings prosthetics like exoskeletons may legitimately augment or completely replace natural human abilities such as lifting heavy objects whereas this would be completely ridiculous in an Olympic weightlifting competition. Wearable exoskeletons offer great benefit as therapy designed to assist individuals with impaired mobility like patients recovering from spinal cord injuries or strokes. These devices offer support for walking, standing, and other movements, helping to retrain muscles and the brain [Sivily et al. 2024].

Neurostimulation

Electrical neurostimulation is a common non-invasive physical therapy enhancement technique that uses mild electrical currents to stimulate muscles or nerves by placing electrode pads on the patient's skin for a measured period of time. It is commonly used for pain management, muscle strengthening, and aiding in rehabilitation after injuries or surgeries. Besides electrical impulses neurostimulation also includes magnetic, or ultrasound signals to modulate or stimulate the activity of the nervous system. It's employed to treat various conditions, including chronic pain, neurological disorders affecting speech and sight, and certain psychiatric conditions [Davidson et al. 2024].

Brian Implants

Neurostimulation can be invasive (implants, surgery) or non-invasive (transcranial magnetic stimulation, etc.). Cognitive enhancement neuroimplants used for therapeutic purposes that assist and restore human ability are licit:

> "Brain implants are already used on a regular basis to help prevent seizures in patients with severe epilepsy, treat movement disorders such as Parkinson's disease, and manage symptoms of psychiatric conditions, including obsessive-compulsive disorder (OCD). A growing body of evidence shows that they will soon be able to restore movement to people who are paralyzed, speech to people with locked-in syndrome or stroke, and vision to people who have lost it" [Abrams 2024].

New human enhancement technologies that link brain-computer interfaces to assist normal human cognitive abilities may be morally licit. Neuralink, a startup company by Leon Musk, has developed a brain implant that the company hopes will allow a person with a cognitive disability to interface with a computer through the electrical impulses in his brain:

> "The company is developing a brain implant that aims to help patients with severe paralysis control external technologies using only neural signals. Neuralink began recruiting patients for its first in-human clinical trial in the fall after it received approval from the U.S. Food and Drug Administration to conduct the study back in May, according to a blog post….
> If the technology functions properly, patients with severe degenerative diseases like ALS could someday use the implant to communicate or access social media by moving cursors and typing with their minds" [Capoot 2024].

Medical Enhancement Devises

Patents in need of new and advanced therapeutic medical enhancement devices, need relief as soon as practical. Therefore, the United States Congress passed the 21st Century Cures Act in 2016 which amended the Federal Food, Drug, and Cosmetics Act (FDCA) that regulates the Food and Drug Administration (FDA) [The Sienna Project 2019: 47; D.3.2]. The Cures Act excluded certain "devices" from FDA review, namely, those "that include a software function that is intended … for maintaining or encouraging a healthy lifestyle and is unrelated to the diagnosis, cure,

mitigation, prevention, or treatment of a disease or condition." Premarket review was deemed unnecessary and additional oversight would only delay in development and increase costs. Congress determined that the benefits of medical enhancement devises outweighed the risk of potential harms of releasing these devises under less stringent standards than those provided by the FDA: "In doing so, the Act ostensibly allows manufacturers to develop and sell (some) devices—those which include such a nonmedical software function—for enhancement purposes without having to meet FDA standards for safety and efficacy" [ibid.].

Non-medical augmentative Cognitive Enhancement Devises (CEDs)
Non-medical augmentative cognitive enhancement devises, removeable or implanted, that attempt to exceed normal human capacities replacing it with computer/AI driven augmentation must under the precautionary principle be presumed to be illicit until proven otherwise on a case-by-case basis. For example, some researchers dream of man "dancing with machines":

> "Michio Kaku claimed that there is the possibility of uploading the human brain in iCloud till 2040 & the total body exoskeleton is the dream of transhumanist researchers too. If scientists can connect both then the era of post-humanity will start where the human uploaded brain will control the exoskeleton in the absence of a real brain & termed as Homo Zombies. Genetic engineering and machine technology may ultimately allow people to become conscious machines (not recognizably human) at least on the outer look" [Homo Intelligentes in Industrial Revolution 5.0 2024].

Given that both medical and non-medical human enhancement devises are unregulated by the FDA such devises may still be regulated by the Consumer Product Safety Commission (CPSC) that has authority to create safety standards for consumer products it deems potentially hazardous, that is, any product sold for use in or around the "any product sold for use in or around the household, mainly for recreational rather than medical purposes…." However, the CPSC does not have the expertise that the FDA has and so it would likely provide less oversight and enforcement [American Academy of Arts & Sciences 2016].

Biohackers: Self-Administered Human Enhancement – Genetic and Physical
In the United States and elsewhere there is an underground of "biohackers," persons engaged in self-experimentation using biological and cognitive enhancement

products, inventions, and techniques that share the results of their research with each other:

> "Biohacking includes many types of activities: using devices (such as fitness trackers) to measure biological functions, changing eating and sleeping habits or other behaviors to tweak performance (including chemical experimentation), modifying bodies with implants or other surgical procedures, or modifying the DNA of organisms…. Some DIY [Do it Yourself] biohackers have turned their attention toward hacking the human body, sometimes tinkering with their own gut bacteria and personal microbiome, but also sometimes attempting to edit their own DNA…" [Center for Navel Analysis 2020: 32; 34].

> "The Food and Drug Administration considers gene therapy biohacking is illegal but there are loopholes if nothing is for sale:

> The FDA released a statement about "Self-Administration of Gene Therapy"… noting that the "sale of ['do-it-yourself' kits to produce gene therapies for self-administration] is against the law. Proponents have countered that their experiments are legal if nothing is for sale, and they cite a long history of self experimenting scientists. Ultimately, the FDA has little control over the activities of experimentally-inclined hobbyists in their private garages and basements" [ibid.: 35].

Biohackers websites recommend implants for installation be done by professionals. However, they get around going to a licensed physician having implants surgically implanted at tattoo parlors without the use of anesthetics:

> "Professional installation in these cases typically refers to tattoo parlors and piercing studios. These businesses may not use any form of anesthetic, which would constitute the practice of medicine. These procedures also fall into the area of «consented assault» [ibid.: 38].

The United States military "Uniform Code of Military Justice" does not address genetic or non-medical enhancement or self-experimentation directly. Article 112 addresses anabolic steroids but fails to mention gene editing substances or human enhancement bioengineering devices. "However, service-specific uniform

regulations, which largely address the dress code and physical appearance of service members, may apply to aspects of this issue" [ibid.: 43].

Physical Enhancements

In sum, legal concerns

Those who develop *therapeutic* physical human enhancements need to provide at a minimum that their inventions, devices, or therapies are safe for public use or consumption and that their advertisements for such products are accurate and do not promise more than can reasonably be expected. Those who develop *augmentative* human enhancement products designed to produce effects in the human body that exceed the range of normal human capacity must be presumed to be illicit. This is a rebuttable presumption. The inventors of augmentative human enhancement technologies have the burden of proving that their products are safe and do not threaten human ecology with irreparable harm at present or in the future. All forms of human enhancement must do no more than assist the human body's natural use and not attempt to replace the psycho-somatic unity of human nature.

In sum, ethical concerns

It should be noted that Christians believe that God became man.[7] He did so not only to reveal God to man but, also, to reveal man to man, that is, to reveal man's true dignity augmented by grace that heals, transforms, and divinizes human nature: "God became man so that we might become God".[8]

Christ came to redeem mankind and gave him the power, sanctifying grace, to love like God. He did not come to restore the preternatural gifts of immortality, integrity, and infused knowledge lost by our first parents after the Fall from

[7] See the Nicaean Creed: "I believe in one God, the Father almighty, maker of heaven and earth, of all things visible and invisible. I believe in one Lord Jesus Christ, the Only Begotten Son of God, born of the Father before all ages. God from God, Light from Light, true God from true God, begotten, not made, consubstantial with the Father; through him all things were made. For us men and for our salvation he came down from heaven, and by the Holy Spirit was incarnate of the Virgin Mary, and became man…." [United States Catholic Conference of Bishops]

[8] "The Word became flesh to make us „partakers of the divine nature": „For this is why the Word became man, and the Son of God became the Son of man: so that man, by entering into communion with the Word and thus receiving divine sonship, might become a son of God." „*For the Son of God became man so that we might become God*" [St. Athanasius]. "The only-begotten Son of God, wanting to make us sharers in his divinity, assumed our nature, so that he, made man, might make men gods" (emphasis added and internal citations omitted) [Cathehism of the Catholic Church 2004: n. 460].

God's grace of Original Justice.[9] The restoration of the preternatural gifts without God's grace presents an "eternal Temptation" that radical transhumanists strive to regain:

> "Post-humanity or Homo Zombies (not-recognizably human): They will be No More Human & advancing gene editing through genetic engineering (CRISPR), brain emulsion & total body exoskeletons and AI machine technology may ultimately allow people to become conscious machines i.e., Homo Zombies as per our conceptual framework" [Hanif et al. 2024].

Part II. Eugenics

In the previous section ethical principles, including the precautionary and natural use principles and whether various methods of human enhancement assist or replace normal human functions, were used to determine whether gene editing and physical human enhancements advance or threaten human dignity. A closer look at human dignity will show that its foundation must be grounded in natural law and sound medical ethics for it to be an effective paradigm to confront a looming "new eugenics."

Human Dignity

Since the promulgation of the *Universal Declaration of Human Rights* (1948) the concept of human dignity has become axiomatic to any consideration of human rights. Human rights are universal, inalienable, indivisible, interdependent, and

[9] "The three gifts of bodily immortality, integrity and infused knowledge are called *preternatural* because they are not strictly due to human nature but do not, of themselves, surpass the capacities and exigencies of created nature as such. In other words, they are not entitatively supernatural. *Bodily immortality* is the converse of mortality, i.e., the possibility of separation of soul from body. Adam was therefore capable of not dying. Yet the gift was *conditional*, provided he did not sin; it was *gratuitous*, since Adam's nature by itself did not postulate this prerogative but came from the divine bounty; and it was *participated*, since only God enjoys essential immortality. The gift of *integrity* is equivalent to exemption from concupiscence. It is called „integrity" because it effected a harmonious relation between flesh and spirit by completely subordinating man's lower passions to his reason…. Adam's *infused knowledge* was not acquired, in the sense of natural cognition derived from experience and the reasoning process; nor was it intrinsically supernatural as giving a knowledge of the mysteries, such as the souls enjoy in the beatific vision. It was infused because not naturally acquired, but yet entitatively not beyond the capacity of man's faculties in his *statu viae.* Theologians commonly refer to three areas of special knowledge possessed by Adam: regarding God and His attributes, the moral law or man's relations to God, and the physical universe both material and spiritual" [Hardon 1999].

interrelated because they promote and defend human dignity [*United Nations Population Fund, Human Rights Principles* 2005]. So, any restoration or augmentation of the human body, emotions, or mind must promote and not jeopardize human dignity.

However, there is no agreement on the foundation of human dignity. Some believe that it is innate and absolute which each human being possesses simply because he or she is a human being, an essential quality of human nature that all civilized states must recognize. Others believe that human dignity is contingent and depends on some trait or functionality, i.e., a privilege conferred by the state on those who pass a test be it mere sentients or an ability to survive outside the womb or an ability to self-consciously interact with their environment, etc. Jacques Maritian, who was instrumental in drafting the Universal Declaration on Human Rights, held that these are two irreconcilable positions:

> "From the point of view of philosophic doctrine, it may be said, without over-simplification, that, as regards the question of Human Rights, men are today divided – as the readers of this collection will easily perceive – into two antagonistic groups: those who to a greater or lesser extent explicitly accept, and those who to a greater or lesser extent explicitly reject "Natural Law" as the basis of those rights.
>
> In the eyes of the first the requirements of his being endow man with certain fundamental and inalienable rights antecedent in nature, and superior, to society, and are the source whence social life itself, with the duties and rights which that implies originates and develops. For the second school man's rights are relative to the historical development of society and are themselves constantly variable and in a state of flux; they are a product of society itself as it advances with the forward march of history.
>
> Such an ideological contrast is irreducible, and no theoretical reconciliation is possible…" [United Nations Educational, Scientific and Cultural Organization 1948].

Medical Ethics

Medical ethics, too, exhibits a similar divide between those who limit it to therapies that restore bodily health to what has been understood as its natural levels of

functioning versus those who expand its scope to include psychological and social "well-being" including augmentative enhancement [Hirsch 2025]. For those who believe in limiting medical ethics to restoring a patient to a natural as opposed to pathological condition, human enhancement violates the canons of medical ethics traditionally understood: "Medicine has always been about healing. The role of physicians is not a matter of what they may have the knowledge and skills to do, but about what constitutes healing. Enhancing, though, is not healing. Therefore, it is not within the purview of medicine" [Hoffmann 2017: 13-21].[10]

New Eugenics

If enhancing human nature is beyond the realm of medical ethics, is it any wonder that the specter of eugenics haunts human enhancement [Vizcarrondo 2024]. Since World War II and the fall of Nazi Germany negative eugenics that used force to cull those considered unfit to reproduce through sterilization has been discredited. There are laws against improving the human race by sterilizing the unfit, the useless eaters, the overpopulation of poor or feebleminded persons incapable of buying or selling, a useless and restive burden on society and the free market [Buck and Bell 1927].

Ironically while negative eugenics forced reduction of the fertility of disfavored classes of human beings has been disparaged, Developed Nations are still imposing fertility reduction on Developing Nations in the name of sexual and reproductive rights, i.e., contraception, abortion and sterilization, and sexual orientation and gender identity rights, i.e., promoting infertile same-sex sexual expressions: "Archbishop Robert Sarah of Guinea, currently the secretary of the Congregation for the Evangelization of Peoples, condemned a Western "theory of gender" which he said is trying to push Africa "to write laws favorable to … contraceptive and abortion services (the concept of 'reproductive health') as well as homosexuality" [Allen 2009].

None dare call it eugenics if the targeted classes volunteer to reduce their fertility or better yet if they can be convinced to tweak the genes of their progeny to resemble "people of the better sort," their rich and powerful genetic betters: "[T]he old eugenics would have required a continual selection for breeding of

[10] Other ethical principles, also, factor into considerations of medical ethics such as self-determination, autonomy, informed consent, freedom of contract, free speech, cognitive liberty, and social justice (fairness and equal access) as well as a cost/benefit analysis and freedom of scientific research. See Sienna. D3.2.

the fit, and a culling of the unfit. The new eugenics would permit in principle the conversion of all the unfit to the highest genetic level… for [then] we should have the potential to create new genes and new qualities yet undreamed in the human species" [National Library of Medicine, National Center for Biotechnology Information 2016].

Legal contraception, sterilization, and abortion are the blunt instruments of the "new eugenics." Force is not used but, rather, the subtle coercion of poverty and a miasma of powerlessness blind and compel the intended victims to cull their own progeny. Legal abortion is not *de jure* on its face eugenic but, rather, it is *de facto* eugenic due to its disparate impact on poor and marginalized ethnic minorities. New eugenics is also referred to as "private eugenics" that emphasizes a private duty, a "parental obligation to improve the genetic qualities of offspring" [Raposa 2022].

Supreme Court Justice, Clarence Thomas, in his concurring opinion in *Box v. Planned Parenthood* [2019] explains how forced sterilization and legal abortion achieve the same eugenic ends by disproportionately reducing the total fertility of ethnic minorities. The law under review in *Box* made it illegal to abort a child if the mother was choosing to do so because of the child's "race, sex, diagnosis of Down syndrome, disability, or related characteristics" [ibid.: 2]. Thomas drew attention to the fact that Margaret Sanger, foundress of Planned Parenthood, was a fanatic eugenicist. He quotes her own words that contraception was an effective eugenic tool for "reducing the «ever increasing, unceasing spawning class of human beings who never should have been born at all»" [ibid.: 3].

Even though there are significant differences between contraception and abortion and even though Sanger did not in the early half of the Twentieth Century openly advocate for abortion, still the same logic applies, he says, "making it significantly more effective as a tool of eugenics." Why? Because with the advance of prenatal diagnosis abortion can be more selective in eliminating children with dysgenic qualities rather than simply eliminating all children from a set of parents [ibid.: 3-4]. Thomas shows that this positive eugenic trend also impacts persons with disabilities in Europe where Down syndrome babies have all but been eliminated and voluntary legal abortion has, also, caused a significant reduction in the birth of female babies in Asia and Asian families in the United States [ibid.: 16-17].

Critics claim that Thomas glosses over the difference between the old eugenics epitomized by forced sterilization of targeted classes, and voluntary abortion

with a mere disparate impact on those same classes [Roberts 2019]. This is a distinction to be sure, but one without a constitutional difference. Under the Fourteenth Amendment's Equal Protection clause the Supreme Court will apply strict scrutiny, the most rigorous standard, when reviewing a law that expresses discriminatory intent on its face and, sometimes depending on circumstances, applies strict scrutiny when a law neutral on its face nonetheless falls more heavily on a suspect class: "Disparate-impact discrimination occurs when a seemingly neutral policy or action causes a disproportionate and unjustified negative harm to an historically suspect group, regardless of intent" [Congress.Gov 2025].

For instance, in *Washington v. Davis* [1976] the Court said, "invidious discriminatory purpose may often be inferred from the totality of the relevant facts, including the fact, if it is true, that the law bears more heavily on one race than another." Likewise in *Rogers v. Lodge* [1982] the Supreme Court cited *Davis* approvingly: "[A]n invidious purpose may often be inferred from the totality of the relevant facts, including the fact, if it is true, that the law bears more heavily on one race than another".

Thomas tailored his analysis in *Box* to meet the *Davis* and *Lodge* disparate impact test showing that the effect of legal abortion in the United States has a decided negative impact on the African American population. He wrote, "[w]hatever the reasons for these disparities, they suggest that, insofar as abortion is viewed as a method of «family planning», black people do indeed «tak[e] the brunt of the «planning»" [Thomas 2019: 17].

Justice Thomas's argument comes down to this: Regardless of the means – whether directly through legal forced sterilization as in the past or indirectly today through legal abortion – African American's total fertility rate has been and is being suppressed. In the case of negative eugenics, it was achieved openly by the operation of law. Now, a new eugenics achieves the same end through the in-operation of law that fails to protect the same suspect class from a disparate impact that reduces its total fertility. Whether a suspect class's fertility is suppressed by means of commission, *de jure* through the intentional operation of eugenic sterilization laws or by means of omission, *de facto* through the in-operation of seemingly neutral abortion laws, the total fertility and biodiversity of this same suspect class is harmed. He concludes, the failure of the Supreme Court to rule trait selective abortion unconstitutional "would constitutionalize the views of the 20th-century eugenics movement" [ibid.: 20].

Justice Thomas argument prohibiting the blunt instrument of *trait-specific abortion* to inflict a disparate impact on the reproductive capacity and biodiversity of suspect classes applies even more to the technologically refined instruments of the new eugenics utilizing *trait-specific gene editing* that "would permit in principle the conversion of all the unfit to the highest genetic level" [ibid.: footnote 56].

Eugenics

In sum, legal concerns

Although negative eugenics is for now legally off-limits in the United States certain remnants remain. *Buck v. Bell* that found the sterilization of the feeble-minded constitutional has never been overturned. It was cited in *Roe v. Wade* along with *Jackson v. Massachusetts* (requiring forced sterilization) as precedent for the rule of law that persons do not have an absolute right to dispose of their bodies as they please [footnote 70]. *Buck* must be explicitly reversed and a new eugenics prohibited [footnotes 74-83]. Eugenics, whether directly by force of law or by the in-operation of law that tacitly permits a disparate impact upon historically suspect classes through legal abortion or through germline editing that in effect reduces the total fertility and biodiversity of suspect classes, must, also, be regarded as a crime against humanity.

In sum, ethical concerns

Whether one sees the human body as sharing the dignity of an embodied person and endowed with derivative rights is critically important. For if the human body is considered merely as an object, then human enhancement will have no guardrails, if you will, and trait-specific gene editing and other modalities of human enhancement that substantially alter our embodied humanity will contribute to new eugenics. If one's body is merely an object that one owns much like a house in fee simple, then except for government regulations, one may do with one's body as one pleases. This is so, some will argue, even if the exercise of one's autonomy has a cumulative disparate impact on the genetic diversity and reproductive capacity of a suspect class to which one belongs [Bjorkman, Hansson 2006].

However, when the human body is understood to share in the intrinsic dignity of the human person then the path of law opens the door to a renewed and transcendent humanism and not a dysphoric transhumanism. For the body has sacramental significance. In an analogous sense it, too, is an outward sign of an

inward reality that conveys what it symbolizes.[11] John Paul II [2006: 203] in his *Man and Woman He Created Them: A Theology of the Body* explains the "only the body is capable of making visible what is invisible: the spiritual and the divine. It has been created to transfer into the visible reality of the world the mystery hidden from eternity in God, and thus to be a sign of it".

John Paul II rejected the dead-end path of "Cartesian dualism – the idea that the body is merely a vessel for the mind, something to be discarded or transcended" [Bilodeau 2024]. A Catholic understanding of human dignity rests upon relationality not functionality and ultimately on God's creative, sustaining and redeeming relationship with each human being. Whether or not other persons value someone with a disability, each human being bears the image of God and has lovingly been brought into existence by God and redeemed by Christ and, so, each human being is offered the possibility of eternal life by God. This relationship of God with every human being, regardless of that person's talents, of level of functionality, is the only secure foundation of human dignity and equality:

> "Created in the image of the one God and equally endowed with rational souls, all men have the same nature and the same origin. Redeemed by the sacrifice of Christ, all are called to participate in the same divine beatitude: all therefore enjoy an equal dignity" [Catechism of the Catholic Church 2004: n. 1934].

John Paull II [1994: n. 19] described the personal, social, economic and political matrix in which the equal dignity of each person may be lived to the fullest in various ways. For instance, highlighting the principles of solidarity and the common good he referred to such a society as a "civilization of love" and the "Gospel of life" in contrast with a "civilization of use" and a "culture of death" and a "new-Manichaeism" in which the mind and the body are separate and the body is regarded as a prison that the soul, mind and will, must escape.

> The human family is facing the challenge of a *new Manichaeanism*, in which body and spirit are put in radical opposition; the body does not

[11] "The sacraments are efficacious signs of grace, instituted by Christ and entrusted to the Church, by which divine life is dispensed to us. the visible rites by which the sacraments are celebrated signify and make present the graces proper to each sacrament. They bear fruit in those who receive them with the required dispositions" [Catechism of the Catholic Church 2004: n. 1131].

> receive life from the spirit, and the spirit does not give life to the body. Man thus ceases to live as a person and a subject. Regardless of all intentions and declarations to the contrary, he becomes merely an object.[12]

John Paul II [1991: n. 38] referred to human relational wellbeing as a "human ecology". In doing so, he gave renewed vigor to the perennial notion of natural law. Human ecology is one that respects the laws of human flourishing in ways similar to how a naturalist promotes the well-being of nature by conserving its vitality, safeguarding its natural rhythms, promoting its interrelationships, and defending its ecosystems. He and his successors, Pope Benedict XVI [2009: n. 33] and Pope Francis [2015: n. 117], developed this metaphor and insisted that human beings and a truly human civilization no less than flora and fauna have natural laws that must be promoted, that is, a human ecology that must be defended.

Part III. Patenting of Human DNA

Genetic research is incentivized by the prospect of developing marketable tests and products which in turn have caused researchers to move upstream, if you will, and patent whole segments of human DNA. That intellectual property lawsuits have arisen as a result should come as no surprise [TT Consultanst 2024].

DNA is a double helix molecule, a chemical composition of four base chemicals – i.e., Adenine, Guanine, Cytosine and Thymine, constructed of exons (protein code bearing segments) and introns (non-protein code bearing segments). Through human intervention the introns within a segment of the DNA molecule may be removed leaving intact the code bearing portion of the segment referred to as

[12] "The separation of spirit and body in man has led to a growing tendency to consider the human body, not in accordance with the categories of its specific likeness to God, but rather on the basis of its similarity to all the other bodies present in the world of nature, bodies which man uses as raw material in his efforts to produce goods for consumption. But everyone can immediately realize what enormous dangers lurk behind the application of such criteria to man. When the human body, considered apart from spirit and thought, comes to be used as raw material in the same way that the bodies of animals are used—and this actually occurs for example in experimentation on embryos and fetuses—we will inevitably arrive at a dreadful ethical defeat. Within a similar anthropological perspective, the human family is facing the challenge of a *new Manichaeanism*, in which body and spirit are put in radical opposition; the body does not receive life from the spirit, and the spirit does not give life to the body. Man thus ceases to live as a person and a subject. Regardless of all intentions and declarations to the contrary, he becomes merely an object. This neo-Manichaean culture has led, for example, to human sexuality being regarded more as an area for manipulation and exploitation than as the basis of that primordial wonder…" [John Paul II 1995].

cDNA. Various segments on the DNA molecule affect, condition, and control protein transcription and, so, the production of various traits, anything and everything from eye color and height to longevity and propensities for certain illnesses, etc. Mapping the human genome and identifying which DNA segments express which traits have largely been accomplished through the international research efforts of the human genome project.

In the United States until 2013 if a researcher was able to locate where on the human DNA molecule a specific trait was expressed and then isolate that segment from the rest of the DNA molecule by CRISPR/Cas-9 or other gene editing techniques that was sufficient for the US Patent Office to grant a patent. A patent owner has an exclusive right for twenty years to research and develop tests and marketable products specifically identified in the patent application. The discovery and isolation of a DNA segment that expresses certain properties may be compared to discovering a new plant and removing it from its native soil and putting it in a pot and then claiming it as one's own invention.

Even unknown properties not identified in the patent application are nonetheless covered by patents on human DNA granted by the US Patent Office. Such broad patent coverage is similar to a land grant company at the height of the 19th Century gold rush era of American history issuing title to thousands of acres of land to a mining company to extract gold and, also, any other valuable mineral not yet identified but found on or buried deep under that land, such as iron ore, uranium, or oil and gas, etc. Many such broad human DNA patents were granted prior to 2013 by the US Patent Office. Moreover, if a researcher wants to study a patented DNA segment, they first need to obtain a costly license from the patent holder.

In brief, patent eligibility requires that a "man-made," human artifact be an invention. To qualify as an invention an artifact must exhibit four marks: 1) It must be able to be used and not be simply a theory; 2) The Patentee must provide a clear description as to how to make and use it; 3) The artifact must be new or "novel" and not something done before; 4) The artifact must be "not obvious," that is, not a mere change to something already invented [United States Patent Office].

However, an important characteristic for patent eligibility largely overlook by the U.S. Patent Office until 2013 was whether it is a natural phenomenon, i.e., "products of nature":

> "The Supreme Court has observed that Congress intended anything under the sun that is made by man to be patentable. Nonetheless, despite the broad statutory language, the Court has held that three types of discoveries are categorically nonpatentable: laws of nature, natural phenomena, and abstract ideas. The Court has reasoned that to permit a patent monopoly on the ‚basic tools of scientific and technological work' . . . might tend to impede innovation more than it would tend to promote it" [Constitution Annotated].

The emergence and prominence of the products of nature exclusion from patentability occurred because of a lawsuit filed by Myriad Genetics against Association for Molecular Pathology for a patent infringement of a gene segment, BRCA1 and BRCA2, associated with a genetic predisposition in women for breast cancer. Utilizing its patent on this gene segment, Myriad had developed a test that revealed the propensity for developing breast cancer. However, other companies, including the Association for Molecular Pathology, had developed more comprehensive genetic tests for detecting the likelihood of breast cancer and were willing to market their products at lower costs than Myriad:

> "Scientific peer review shows that Myriad Genetics' tests fail to detect ten to twenty percent of expected mutations in the BRCA1 mutation alone. This uncertainty causes many women to have needless mastectomies or oophorectomies. (internal citations removed) The danger of incorrect diagnoses prompted France to challenge Myriad Genetics' patents, just as the Association for Molecular Pathology does today" [Ethics & Religious Liberty Commission of the Southern Baptist Convention & Prof. D. Brian Scarnecchia as Amici Curiae in Support of Petitioners 2013].

Eventually this matter of general interest came before the United States Supreme Court [ibid.]. Many concerned parties filed amicus curiae briefs (friend of the court) urging the Supreme Court to overturn the Myriad's patents. This author was asked by the Ethics and Religious Liberty Commission of the Southern Baptist Convention to file one such amici curiae brief [ibid.]. We argued that merely identifying and isolating a DNA segment was not an invention but a "fact of nature," hence ineligible for patent protection. More importantly, our brief was the only one to bring God into the discussion of patent eligibility. We argued that Myriad's patents infringed God's rights over his creation and treated the human body as an object, a commodity:

> "Products of nature, which are gifts given to all of humanity by God, cannot be exclusively claimed by an individual or corporation. The genetic code is a divine gift and an intrinsic, inseparable part of human existence. Permitting a corporation or person to own this fundamental component of a person corrupts the relationships between human beings and the Creator, and between human beings. The person should not be treated as commodity for sale to the highest bidder" [ibid.: 2-3].

The Court ruled in favor of the Association of Molecular Pathology and overruled the U.S. Patent Office's grant of a patent on BRCA DNA gene segment to Myriad. However, the Court upheld the grant of patent protection to Myriad for products utilizing BRCA cDNA. The Court argued that cDNA, which removes non-coding introns from the BRCA segment of human DNA, was an invention, that did not generally occur naturally. Therefore, because Myriad had removed the non-transcribing introns from the BRCA DNA segment it satisfied the patent criteria, i.e., that patents only be given for a human invention.

Two years later a similar case came before the High Court of Australia [2015], *D'arcy v. Myriad Genetics*. The High Court ruled that both human DNA and cDNA associated with BRCA1 and BRCA2 were ineligible for patent protection. This author believes that the High Court of Australia got it right and the United States Supreme Court was wrong. Why? Because both human DNA and its associated cDNA are *essentially/formally* the same:

> "Due to the Supreme Court's ruling in *AMP v. Myriad*, naturally occurring DNA is not patentable. We shall liken this to a tree, another piece of nature that is unpatentable. Merely cutting down and moving the tree to a different location is not transformative enough to be granted… a patent, given the wide availability and obviousness of this technique. Therefore, by analogy, cDNA, which is merely the product of replicating DNA, should not receive unique intellectual property protections" [Jack 2024].

The United States Supreme Court like the Sophists of old considered only two of the four causes or explanatory hypothesis identified by Aristotle. They looked at material and efficient causality and found a difference between BRCA DNA and BRCA cDNA. Whereas the High Court of Australia considering all four causes

including formal and final causality and found BRCA DNA and BRACA cDNA essentially/formally the same and, therefore, ineligible for patent protection.

If one considers DNA as a mere chemical compound, focusing only on its material cause and the exigencies by which it transcribes protein production, i.e., its efficient cause, then by removing the non-protein transcribing introns one creates a new chemical compound not generally occurring in nature that qualifies as a patentable human invention. However, DNA is not so much a chemical compound consisting of four base chemicals, i.e., Adenine, Guanine, Cytosine and Thymine but, rather, it is essentially an information code. That is its formal cause. And its final cause is purposeful protein development. Therefore, cDNA, which retains the same code, i.e., exons for precise protein transcription as naturally occurring DNA, is essentially/formally the same thing and should not be patent eligible under the products of nature exclusion. Altering DNA's chemical composition that leaves intact its information code is a mere accidental change, not a substantial change.

The upshot of regarding cDNA as patentable or not patentable is significant. Leaving cDNA patentable allows large pharmaceutical companies to continue to monopolize genetic research and development stifling open scientific access. So, in the United States not much has changed:

> "[A]fter *Myriad*, cDNA patents are ideally positioned to nevertheless effectively monopolize the natural phenomena reflected in gDNA [«g» for genomic or naturally occurring DNA] sequences"… "claims to cDNA monopolize the same genetic code as isolated gDNA; there is no difference between the *information* monopolized by a patent on isolated gDNA and one on cDNA because they both code for the same thing" [ibid.].

Ethically, the controversy over whether naturally occurring human DNA or technically altered cDNA are patentable depends on how we view the human body – either we see it as a naked fact, an object, or we view it as a relational fact, a subject of sacramental significance, making visible what cannot be grasped directly with our five senses. The human genome is not the foundation of human dignity as the United Nations suggested [General Conference of the United Nations Educational, Scientific and Cultural Organization, 29th session 1997]. Rather, it has dignity because of its relation to a human person, a composite substance of body and a rational soul. The Holy See in its *Observations on the Universal Declaration on*

the Human Genome and Human Rights stated – "In reality, it is human dignity and the unity of the human family which confer value upon the human genome and requires that it be protected in a special way" [Holy See 1997].

The final cause of human DNA, i.e., protein transcription, leaves unexplained human genius, love, empathy and the desire for immortality and spiritual transcendence. The human body and human DNA have a derivative dignity because of the innate dignity of the human person. In an address to the Pontifical Academy of Science, Pope John Paul II [1994] emphasized that human dignity and DNA are bound together: "Man cannot be separated from his DNA any more than he can be separated from his spirit".

That the United States Supreme Court has allowed human cDNA, essentially the same as naturally occurring DNA, to be patented denigrates human dignity insofar as it codifies in law the mistaken notion that the informational architectural part of the human body can be an object of ownership. In our amici curiae brief we compare the patent office to a salve market wherein segments of humanity are auctioned off according to the property law principle – *first in time, best in right* – in a race to the patent office:

> "Attempting to divvy up the person to the highest bidder for commercial purposes runs the "serious risk of suppressing the person's very nature" and reducing him to a mere object…. [Ethics & Religious Liberty Commission of the Southern Baptist Convention & Prof. D. Brian Scarnecchia as Amici Curiae in Support of Petitioners 2013]. Marketing human life is a form of genetic slavery. Instead of whole persons being marched in shackles to the market block, human gene sequences are labeled, patented, and sold to the highest bidders . . . That the U.S. Patent Office would grant such applications is absolutely chilling" [ibid.: 16].

Patenting of Human DNA

In sum, legal concerns

The United States Supreme Court got it wrong when in *The Association for Molecular Genetics v. Myriad Genetics* it ruled only human DNA was not patentable being a product of nature, but human cDNA was a human invention and not a product of nature and, so, human cDNA is patent eligible. On the other hand, and on other side of the world, the High Court of Australia was correct when it held in *D'arcy v. Myriad Genetics* that both human DNA and human cDNA are

patent ineligible. DNA is formally an information code for portent transcription. Its material cause, if you will, is a chemical compound. Altering DNA's chemical composition that leaves intact its information code is a mere accidental change, not a substantial change. Therefore, the United States Supreme Court should revisit and revise its opinion and hold both human DNA and human cDNA patent ineligible.

In sum, ethical concerns

So long as cDNA remains patent eligible, a technique that objectives and commodifies the human body, a dangerous precedent is set that leaves open the door to other technologies that thingify the human body such as human cloning, germline editing, and transhumanist cognitive enhancement devices. Therefore, United States Supreme Court should revisit and revise its opinion in the *Association of Molecular Pathology v. Myriad Genetics* and rule human cDNA is patent ineligible least we dare to open "the Locked Door" that leads to new eugenics.

Conclusion

This article asks – do human enhancement technologies tempt us to ignore a prohibition seemingly universal and somehow innate, an eternal Temptation, urging us to pry open the Locked door, a closed garden, and eat a forbidden fruit that promises to lift the strictures of human nature?

Having considered the characteristics of human enhancement, genetic and physical, from the perspective of Catholic social teaching it has been shown that human enhancement technologies that assist but do not replace integral human nature contribute to human ecology while those that tempt us to go beyond the bounds of human nature lead to new eugenics.

The architecture of the human mind manifest in storytelling, as J.R.R. Tolkien noted in his essay "On Fairy Stories", reveals "the great mythical significance of prohibition" depicted as "the Locked Door" which "stands as an eternal Temptation." The legalization of human germline editing, human cloning, and human cognitive augmentation, should this occur, will not be an enhancement but an "Abolition of Man": "What we call Man's power over Nature turns out to be a power exercised by some men over other men with Nature as its instrument" [Lewis 1947: 34-35]. To be or not to be human, that is the decisive issue of our day.

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