Biotechnologies and Human Nature:
What We Should Not Change in Who We Are

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For the first time in human history the clear distinctions between the natural world and artificial world are being blurred. Throughout most of human history the natural world was the given world evident in humans, animals and plant life. It was the way things are. The artificial world was the humanly created world, the world of artifacts and technology. While humans invented and controlled this artificial world, humans as a species remained ontologically distinct from it. Enter the world of biotechnology and the traditional distinctions become quite blurred.

We of course recognize the great therapeutic good that can come from biotechnologies. But with the good come pressing philosophical, theological and ethical questions of immense significance. By biotechnologies we mean “a set of technologies aimed at manipulating living things, including human beings themselves, arguably for the common good.” Or as the former President’s Council on Bioethics put it, “Biotechnology is bigger than its processes and products; it is a form of human empowerment. By means of its techniques (for example, recombining genes), instruments (for example, DNA sequencers), and products (for example, new drugs or vaccines), biotechnology empowers us human beings to assume greater control over our lives, diminishing our subjection to disease and misfortune, chance and necessity.” Biotechnologies thus include a broad array of therapeutic mechanisms for the human good including: drugs, gene therapy and manipulation, psychopharmaceuticals, hormones, organ transplants, new forms of orthopedic appliances and neural implants.

But of course with the good and therapeutic possibilities come the potential for using these technologies in other ways. The biotechnologies themselves may be deemed morally neutral with the ethical judgment focused on their usage. Though, we should note that even the very employment of certain technologies often carry with them a trajectory with moral concerns. That is the technologies have a way of controlling us, even as we
control them. What is clear is that biotechnologies have the potential to move us not just beyond therapy, but beyond the realm of current human nature to what some have called a posthuman situation or a transhuman context. This means that human beings as we now know them could either cease to be or would be radically altered. Short of that cataclysmic modification, the biotechnologies can have an immense impact upon various human endeavors and patterns that are common to human life now.

As we look at these potential changes through biotechnology we need to ask what are the essential ethical criteria for judging these new technologies. It of course will not do to simply give a Luddite response and reject the technologies out of hand. We need more careful criteria to discern what can be accepted and what should be called into question ethically.

**Ethical Criteria for Biotechnologies**

Several different criteria for judging biotechnologies have been suggested. These are not mutually exclusive and can be of help in ethical assessment, though I want to suggest another paradigm for us to consider beyond the following three criteria.

**Nature of Medicine Criterion** - Here the focus is on two very different conceptions of what medicine is about in terms of its ends, purposes or *telos*—namely therapy or enhancement. This ethical approach to biotechnology is rooted in the Aristotelian tradition, that every human endeavor and natural realm has a particular end or telos. The ethical good corresponds to the particular ends for which it exists. It is interesting to note that Aristotle’s ethic is not rooted in a theistic framework of divine givens, but it certainly functions that way with givens or ends from nature itself, which are ethically binding.

Traditionally the end of medicine was healing or therapy. It supposed a clear understanding about the nature of disease or physical deformities, and medicine’s *telos* was healing for the good of the patient, which in turn meant the good of society. With new biotechnologies we now have the capacity to use medicine in a different way, namely to enhance certain personal or human characteristics: physical, mental, social, psychological etc.

With this framework the judgment has to do with the perceived ends of medicine and how far that *telos* can extend. If medicine is primarily about healing or has only therapeutic ends, then enhancement is rejected or at least questioned. But if medicine and the related
biotechnological world can include enhancement as an end then it is accepted. Arthur Caplan exemplifies this when he states, "I see nothing wrong with trying to enhance and optimize our brains." iv

While the nature of medicine as an ethical criterion has some merit and is employed by a number of Christian thinkers, it faces a significant challenge—namely, that the dividing line between enhancement and therapy is not always so clear. For example, at what point does growth enhancement hormone become an enhancement and not therapy? For a male, would it be 5’7”; 5’3” or 4’10”? Or would a nanotechnological increase of IQ for a person with an IQ of 80 be therapy or enhancement? Would a chip in the brain to help curtail violent behavior of a person be enhancement or therapy? Suppose there were only occasional outbursts?

These kinds of questions point to the difficulty of using the ends of medicine as the only ethical guide. It does not mean we should scrap the framework, it but it is highly problematic to clearly define what is therapy and what is enhancement.

The Eugenics criterion- Here the criterion is that biotechnologies can be used, but there is a limit in terms of eugenics, the attempt to develop a good genetic stock. Eugenics is an old agenda going back to at least Plato and his attempt to develop a high caliber of Athenian citizens. Today eugenics with biotechnologies can be understood as enhancement gone social, meaning an attempt to enhance particular human beings or groups of humans with a social or cultural end in view.

Eugenics embodies two approaches. First, is negative eugenics--breeding out bad genes through various forms of elimination, such as preimplantation genetic diagnosis (PGD) to then eliminate a non-desired child. This is already being done with regards to Downs Syndrome children, as nearly 90% of detected Down syndrome pregnancies are now ending in abortion. Some women report accusations of irresponsibility by peers if they carry the child to full term. This is a form of negative eugenics.v

Second, is positive eugenics, the breeding in of good genes. It can be accomplished by selective mating or various reproductive technologies, such as: artificial insemination, surrogacy, selective in vitro fertilizations, and potentially through cloning.

While the Nazi shadow hangs over eugenics, there are many contemporary proponents, arguing that we have a moral responsibility to overcome those genetic tendencies that
make life burdensome, challenging or painful. Robert Sinsheimer a molecular biologist called for a new eugenics back in 1969 when he wrote, “The new eugenics would permit in principle the conversion of all the unfit to the highest genetic level.” Eugenics isn’t just about given individuals and their condition but the overall social condition. And therein is a major problem with eugenics; it is inherently prejudicial against certain people or groups whose genetic configurations don’t meet the desired criteria. Thus, to move in a eugenics direction is to move into a slippery slope of discrimination against groups of people.

The eugenics criterion is helpful and very important for societal and individual good, but it does not cover all the cases that need to be covered in biotechnologies.

**Justice Criterion**— Many have pointed out that a potentially major problem with biotechnologies is their use in certain human endeavors that would undercut justice. By justice I simply mean the classical definition of what is owed persons, including an essential fairness in various spheres of life and various human endeavors.

We know that nature never yields a fully even playing field. Yet, nature does allow a great deal of flexibility in attempting to make the playing field more even. By human efforts, personal responsibility, taking advantage of opportunities, and societal impetus, we can seek to change our situation in life and the situation of others. But all of this presupposes a basic justice or fairness in terms of opportunities to do so.

Biotechnologies could radically change this. When a person enhances his/herself through effort or taking advantage of opportunities, that form of enhancement depends primarily upon their own initiative. They are being rewarded for something they have done. But with biotechnology enhancement they would be rewarded for what a technology has done. Take the issue of attempting to enhance SAT scores to get into the college of choice. Certainly we already have a certain kind of enhancement: courses, books to read, computer programs guaranteed to boost one’s score and the like. We know that in reality not all persons are able to take advantage of these enhancements due to lack of wealth or information about them. But they are not precluded from them by nature. Initiative, the help of others, ingenuity, and educational or societal programs often can aid access and achieve a greater degree of justice or fairness in the opportunity to enhance one’s score. The potential for greater justice still exists.
But a chip in the brain to enhance memory or mathematical precision and thereby boost one’s score would by its very nature destroy justice. For now the person is rewarded not for some effort they have put into the process, but rather by something external to themselves and their effort. Just because one downloads a particular set of data into the brain does not make them a true knower of that data and its implications. Thus, justice would be destroyed when that technological intervention impacts spheres of reality where one’s true knowledge is determinative of access to jobs, schools and other rewards.

Or take other forms of genetic or biotech enhancement such as athletic ability for a given sport or feat within a sport, enhancement of physical characteristics for a beauty contest, or enhancement of one’s personality in order to achieve a given job. In each of these areas justice is thwarted. One is no longer being rewarded for something they have achieved, but something a mechanical device or genetic change has achieved. In fact we might even say the very nature of the enterprise, its telos, has been changed. Sport is no longer sport.

Justice is certainly a helpful framework for ethical judgments of biotechnologies, but it does not cover the whole of what can be done with these technologies.

The Posthuman Impetus in Biotechnology

The criteria we have examined thus far are important elements in the ethical evaluation of biotechnology. But they overlook a major dimension of contemporary interest and impetus in biotechnology. A number of major thinkers and initiatives believe that biotechnologies will enable us to transcend what we now know as human beings. Through the desire to enhance certain human characteristics and to delete others, or to eradicate certain perceived threats to human happiness, advocates envision a state of posthumanity or a transhuman context.

There are various proponents of this significant alteration of human life and realities, but among the best known are Ray Kurzweil and Nick Bostrom. Kurzweil comes from a strong science and technology background, having taught for a number of years at MIT. Some of his research enabled the emergence of voice recognition technologies and the development of numerous other technologies utilized in various computer devices. Today he spends much of his time holding seminars for business and technology leaders in his Singularity University, “An interdisciplinary university whose mission is to assemble,
educate and inspire leaders who strive to understand and facilitate the development of exponentially advancing technologies in order to address humanity’s grand challenges.”

Kurzweil is best know for his prediction of the emergence of what he calls the Singularity, which “will represent the culmination of the merger of our biological thinking and existence with our technology, resulting in a world that is still human but that transcends our biological roots.” In this world “there will be no distinction... between human and machine or between physical and virtual reality.” With the merging of human beings and machines he believes that poor health, old age and even death could be a thing of the past. His father died at the age of 58 and “since then, Mr. Kurzweil has filled a storage space with his father’s effects—photographs, letters, bills and newspaper clippings. In a world where computers and humans merge,... [he] expects that these documents can be combined with memories harvested from his own brain, and then possibly with Fredric’s DNA, to effect a partial resurrection of his father.”

Nick Bostrom, a philosopher at Oxford University, is a major leader in what he and others term transhumanism. Bostrom and his cohorts deplore the current state of humanity with its pain, suffering, poverty, disease and mortality. They believe that technology can enable humans to overcome their finitude, which causes these dire conditions, and can lead to a whole new kind of being within the world, free from current limitations. In an article contending that human dignity can be understood as a certain kind of quality of life, Bostrom writes:

Let us make a leap into an imaginary future posthuman world, in which technology has reached its logical limits. The superintelligent inhabitants of this world are autopotent, meaning that they have complete power over and operational understanding of themselves, so that they are able to remold themselves at will and assume any internal state they choose. An autopotent being could, for example, easily transform itself into the shape of a woman, a man, or a tree. Such a being could also easily enter any subjective state it wants to be in, such as state of pleasure or indignation, or a state of experiencing the visual and tactile sensations of a dolphin swimming in the sea. We can also assume that these posthumans have thorough control over their environment, so that they can make molecularly exact copies of objects and implement any physical design for which they have conceived of a detailed blueprint.... They would have the same kind of control of physical reality as programmers and designers today have over virtual reality.
Human Nature Criterion

It is clear that Kurzweil, Bostrom and their cohorts have a goal of using biotechnology to actually change human nature as we now know it. They desire to take hold of the “evolutionary process” of humanity and to modify those characteristics of human nature that are deemed limiting or problematic. Thus there is a very real possibility of changing the human species and specific features of human beings.

This raises the question of what we ought not change in human nature. Or to put it positively, as we utilize biotechnologies what are the essential features of humans, made in the image of God, that ought to be preserved. If of course there is no human nature that is normative or given, as many claim, there is no issue. This is precisely the position of posthuman and transhumanist advocates like Kurzweil and Bostrom.

As Christians who affirm a particular theological anthropology, we need to probe whether there are indeed features of human nature that are divine givens and ought not be eradicated or significantly altered. I want to suggest several different dimensions of human nature that I believe are divine givens and should be preserved. These can be argued theologically, but also through a more natural law type of argument. My focus here will be primarily theological.

The integrity (uniqueness) of the human species--The desire to re-shape human beings to make them other than they are, or have been, goes way back in history. The chimera of Greek mythology is a classic example of the dream to engineer and merge new species, and many have dreamed of extending it to include humans.

Today with sophisticated technologies the desire to mix animals and humans has intensified. Already scientists in the UK have formed human-animal embryos by inserting human DNA into cows’ eggs (U. of Newcastle, 2008). The goal is to produce stem cell models for investigating various diseases and developing new drugs. Called cytoplasmic hybrids or cybrids, the genetic material is 99.9% human. While the goal of the technology at this point is research and therapy, it opens up the possibility of developing a hybrid being. The rationale for doing so is supported by the fact that all living things share DNA consisting of the same four chemical building blocks, nucleotides. The differences then between human, animal, and plant life is in the sequencing of the nucleotides. Chimpanzee
DNA and human DNA, for example, are 95% the same in overall sequencing, though chimpanzees have 48 chromosomes and humans have 46.

Moreover, with the new biotech possibilities of computer brain implants and chips we have the future possibility of Kurzweil’s Singularity, the point when the distinction between human and machine will be blurred. The potential for this is certainly debated, but we must not shy away from the potential reality, given the strong advocacy among posthuman enthusiasts.

The possibility of a posthuman being, whether part animal and part human, or part machine and human, runs counter to biblical and theological affirmations of the human person as distinct from the rest of creation. Creation in the image of God (Gen. 1:27-28) belongs only to humans, not other parts of God’s good creation. This in way lessens the significance, intrinsic value and beauty of other pars of creation. It simply means there is an ontological distinction between humans and the rest of nature that sets them part with a unique dignity and value.

Moreover, in Genesis 2 humans are given the task of naming or classifying the animals:

Now the Lord God had formed out of the ground all the wild animals and all the birds in the sky. He brought them to the man to see what he would name them; and whatever the man called each living creature, that was its name. So the man gave names to all the livestock, the birds in the sky and all the wild animals (Gen. 2:19-20).

God also gave humans the task of caring for and ruling over the rest of creation as seen in Genesis 1:28-30 and 2:15, “The lord God took the man and put him in the Garden of Eden to work it and take care of it.” Implied in this is a clear distinction within creation between humans, animals and plants, despite the DNA that they share in common. The fact that they share commonality only reinforces the value and need for caring for the rest of creation by not blurring the distinction between the various entities.

It is true that animal parts have been used in human therapy (i.e. pig valves), but that is different than mixing DNA that would form something other than a homo sapiens. Moreover, we know that some diseases (i.e. venereal diseases) stem from intimate human-animal contact that crosses the barrier of the distinction. Many scientists fear that the mixing of humans with animal could create an onslaught of diseases that would be
devastating to human life. This very possibility provides a natural effect reason for questioning the move to seek a being that is no longer unique in creation.

Thus, one limit of biotechnologies (whether genetic or computer generated) is the integrity of the human race, homosapiens. Any technology that attempts to eradicate or modify that essential uniqueness and integrity should be rejected.

**Human Finitude**— Humans have long desired to escape their finitude. From the desire to “build ourselves a city, with a tower that reaches the heavens” at Babel (Genesis 11:4), to the attempts to drastically lengthen life, or find a solution to aging that creates a fountain of youth, humans have sought to escape their finitude, their essential limitedness.

Newly emerging or hoped-for biotechnologies have engendered a desire to transcend the limitations of age, disease, and cognitive confines. The perfectibility of the human species is a goal of transhumanists and posthuman advocates through the use of biotechnology, bionics and pharmacology. A major thrust of the movement is to achieve a kind of immortality, as advocated by Aubrey de Gray, who believes that technology could lead us one day to live not just 300-400 years, but indefinitely.

From a Christian standpoint there are two essential understandings of human limitation that are affirmed: our finitude and our fallenness. We have often accentuated the later and overlooked the former. Finitude is first affirmed by the fact that we are from the “dust of the ground” (Gen. 2:7). “For dust you are and to dust you will return” (3:19). This is not so much a scientific rendition of how God created humans as a designation that we are finite, limited creatures who cannot and should not transcend our humanness.

Finitude is clearly implied by the Genesis account in that we are dependent beings in a two-fold way: dependent upon God (Gen. 2:17) and dependent upon each other (2:18), “It is not good for the man to be alone.” Being dependent beings we are therefore interdependent beings who need other than self to live as God intended. We are even dependent upon the rest of nature to survive and live.

Even the Incarnation, God taking on human flesh, affirms the significance of finitude. Brent Waters writes, “In the incarnation the necessity of finitude and mortality, of human limitation more broadly, are affirmed rather than eliminated”\textsuperscript{xi} God identifies with us in Christ’s suffering and death and hence embraces our finitude, since suffering and death are the most visible expressions of it.
This finitude is what enables us to recognize the foibles, needs and suffering of others and thereby respond with empathy and healing. Attempting to transcend finitude potentially leads to a loss of being capable of identifying with “the least of these.” To strip away limitedness and vulnerability is to strip away that which makes us human, even before the fall. While in heaven the effects of the fall will be overcome, there is nothing in Scripture to suggest that we will transcend our finitude. To do so would mean we had become God, the infinite One.

Throughout history the utopian attempts to transcend finitude have actually lead to some of the greatest atrocities in the treatment of fellow-humans. Francis Fukuyama writes, “Beginning with the French Revolution, the world has been convulsed with a series of utopian political movements that sought to create an earthy heaven by radically rearranging the most basic institutions of society.” The utopian dreams failed in part because they overlooked the reality of human nature. And one significant aspect of that nature is our finitude.

Accepting finitude does not mean a rejection of all attempts to overcome human limitations. We do and should work to overcome the effects of the Fall, and we legitimately seek to advance certain human capabilities. But these pursuits should be understood within a framework of stewardship over creation and an acceptance of our essential finitude. Without acknowledging it and factoring it into the social equation, we develop visions of grandeur that are self-defeating and undermine the very beauty and value of human life itself.

**Embodied Souls (or Ensouled Bodies)**-- Though posthumanists and transhumanists are naturalistic in their worldview, believing that all reality can be reduced to the material realm, they are ironically anti-body, at least as the body presently exists. Brent Waters points to a Manichean dualism in their thinking and objectives, in that they long to be saved from their bodies. As Waters puts it, in the posthuman project, “In order for humans to achieve their full potential they must destroy their bodies, but in so doing they destroy the very thing which makes them human.” The project is driven by “a hatred and loathing of the body.”

New technologies could, believe the advocates, make possible the transcending of current bodily limitations. Thus, new genetic engineering or new biotechnologies could
limit the body to allow the ingenious mind to transcend bodily restrictions. "Extending longevity and improving physical and mental functions is merely an interim strategy until such time that virtual immortality is achieved, liberating humans from their weak and fragile bodies."xiv

Christians have long debated the relationship of body and soul, or the material and non-material dimensions of human life. The debate is compounded by the fact that the Bible uses multiple images and words to describe this intricate inter-relationship, and sometimes uses them interchangeably: soul, spirit, mind, body, and heart. Today the debate has focused primarily on non-reductionist materialism versus substance dualism.xv But it is safe to say that most biblical scholars and theologians, who look to biblical authority as the starting point, attempt in some fashion to hold in unity the material and non-material dimensions of the self. We are whole beings.

In Genesis 2 we begin to see this sense of wholeness, of embodied souls, or if you will, ensouled bodies: “Then the Lord God formed a man [adam] from the dust of the ground and breathed into his nostrils the breath of life, and the man became a living being [nephes-
or soul]” (2:7). Jesus, citing the greatest commandment, calls for a love which brings together the holistic embodied self, “Love the Lord your God with all your heart, soul and mind” (Mt. 22:37). What this implies is that we must always guard the intricate balance between the material and non-material dimensions of human life.

It is precisely the ensouled body concept that implies that humans are always a unique mix of nature and nurture. New biotechnologies threaten to destroy this blend by their artificial creation of purely mechanistic factors to shape human behavior. The authors of Biotechnology and the Human Good note that some advocates of biotechnology envision a technology of uploading information from one person’s brain into the body of another. “Kurzweil and others suggest that at some point it will be possible not only to have neural enhancements but also to scan the brain with its entire neural system and transfer it to a computer or to another body, a process they term instantiation.”xvi

The ensouled body (or embodied soul) sets humans apart from the rest of the created order. This is evident in the fact that animals’ essential behavioral repertoire is given genetically at birth, and thus the bodily or genetic factors dominate learning and behavior. In contrast the human person has a minimal genetic package for learning and behavior. It
is precisely this under-developed self that sets the human being apart as a moral and spiritual being who chooses, within the framework of genetic givens, to relate to God and engage in a way of life reflecting his or her essential moral nature.\textsuperscript{xvii} To destroy by biotechnologies the unique ensouled body matrix is to destroy that which is essentially human.

**Male/Femaleness**-- New forms of genetic engineering and new biotechnologies have the potential to eradicate a distinction that has been at the heart of all societies throughout history-- the distinction between male and female. While this essential physical and ontological distinction has been worked out historically in various ways, in terms of gender functions, there has always been an essential distinction between the sexes.

Given the ideological commitment to minimize or even eradicate this distinction, new technologies that could overcome the divide would be clearly welcomed by many who embrace a posthuman and hence post-gender distinction. As Nick Bostrom noted in our earlier quote on *autopotent* beings, they could have “complete power over and operational understanding of themselves, so that they are able to remold themselves at will and assume any internal state they choose. An autopotent being could, for example, easily transform itself into the shape of a woman, a man, or a tree.”\textsuperscript{xviii}

The givenness of creation regarding matters sexual is strongly rejected by many today, including some theologians and biblical scholars. This is seen, for example in *Sex and the Single Savior* by Dale Martin, professor of Religious Studies at Yale. Martin rejects the notion that there is inherent meaning in sex derived from the Bible. In one chapter, “The Queer History of Galatians 3:28,” he contends that there is no coherent and consistent reading of the phrase, “In Christ there is no male or female.” He suggests that because there are varied readings of the text, we cannot arrive at a clear meaning for guiding our sexual lives. Thus, we could legitimately imagine a rendering in which, “No person could be masculine without becoming fully feminine, and no person could be feminine without also at the same time becoming fully masculine.”\textsuperscript{xxix}

But, even better yet, argues Martin, we can eliminate any duality of male and female. In this framework: “We admit the queer observation that gender is multiplex, not duplex. In the words of the editors of the feminist book *Third Wave Agenda*, 'girls who want to be boys, boys who want to be girls, boys and girls who insist they are both…'” Once we
destabilize the duality, all sorts of new ways of being human, not just two and not just combinations of two, may be invented. The gender made possible by the new creation in Christ opens as yet unknowable ways of gendering human experience.”

A similar perspective is given by Lone Fatum as she rejects liberal, feminist, and egalitarian readings of Galatians 3:28 and concludes that “male and female gender are both annulled as a sexual duality in favor of… asexuality.” For Paul “sexual liberation is in fact liberation from sexuality.”

The dual creation of male and female is an ontological given of creation from which come other givens: the potential of procreation (1:28), the significance of sexual intercourse (2:24c), and marriage as the context in which intercourse and procreation are to take place (2:18, 21-22, 24-25). These givens are affirmed by Jesus in Matthew 19: “Haven’t you read, he replied, that at the beginning the Creator made them male and female, and said, for this reason a man will leave his father and mother and be united to his wife, and the two will become one flesh. So they are no longer two, but one. Therefore, what God has joined together, let no one separate” (vs. 4-6). That these are creational givens, affirmed by our Lord, and then affirmed explicitly and implicitly in the rest of Scripture, gives strong support to the God-given dual nature of being human. Thus, the male/female distinction is a given of human nature that ought not to be eradicated through new forms of biotechnology.

Granted there are sexual anomalies physically and psychologically in our fallen and broken world. But the Fall of human nature is not our normative framework, though we must take its realities seriously in the midst of human aspirations and our work with broken individuals. The creational norm of male and female is an ontological reality that ought not be altered or eradicated.

**Conclusion**

Other dimensions of human nature could be added to the list. For example, we are created as moral/believing beings who by our very human nature are morally and spiritually responsible for what we do and how we believe. We are relational creatures who by our very nature are to live not as automatons, but in community with each other. A full exposition of these human characteristics could be easily added to our list.
Biotechnologies have great potential to bring healing and therapy to our broken and fallen world. Healing is a moral imperative as God’s viceroys on this earth who pattern our own lives after the Great Physician, our Savior and Lord. But biotechnologies also have the potential to radically change or even eradicate dimensions of human nature that are God-given and central to human life for our own good. I have suggested in rudimentary form four of these: the integrity of the human race, our finitude, our embodied soulness, and our male/femaleness. These are dimension that ought to be preserved. They are elements essential to human welfare and to the good of society. They are moreover essential theologically in understanding humanity, God and our relationship with Him.

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3 This approach to technology in general was particularly articulated by Jacques Ellul in his now classic work, The Technological Society (New York: Knopf, 1964).
5 For a helpful overview of contemporary forms of eugenics with regards to reproduction see Amy Laura Hall, Conceiving Parenthood: American Protestantism and the Spirit of Reproduction (Grand Rapids: Eerdmans, 2008).
11 Brent Waters, 10.
12 Ibid.
14 Francis Fukuyama, Our Posthuman Future: Consequences of the Biotechnology Revolution (New York: Farrar, Straus and Giroux, 2002). Neither approach reflects the more radical approaches of pure dualism or naturalistic materialism.
15 Biotechnology and the Human Good, 43
Bostrom.


Ibid.