

# Proleptic Ethics vs. Stop Sign Ethics: Theology and Future of Genetics

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«Where do we draw the lines?» is a frequently asked question. News reporters ask this question of bioethicists. And some bioethicists think they need to answer by saying just where the lines should be drawn. Draw a line. Put up a stop sign. And demand that no one proceed. This is the prevailing image of how ethics should be done. Well, according to some, that is.

Note the presupposition: the task of ethics here is to say «stop.» When it comes to New and Emerging Science and Technology (NEST), the intuitive impulse of NEST-ethicists is to put up a blockade, to halt the development before it can get out of control. This impulse leads to what I call *stop sign ethics*. All that remains is for the ethicist to ask: where should we draw the line and hold up the stop sign?

Now, suppose one operates out of an alternative ethical mandate? Suppose one does not believe the task of the ethicist is to say «stop,» or, at least the primary task. What then? Well, we would need to reformulate the ethical questions.

In this article I would like to contrast stop sign ethics with an alternative: *proleptic ethics*. And I would like to propose that a foundation for bioethics be constructed on a vision of a healthier future for the human race. That vision of a healthier future begins with the apocalyptic vision of St. John: <sup>NRS</sup> Revelation 21:4 «[God] will wipe every tear from their eyes. Death will be no more; mourning and crying and pain will

be no more, for the first things have passed away.» This transcendent vision finds a this-worldly corollary in our understanding of what constitutes human health. The World Health Organization (WHO) holds that «health is a state of complete physical, mental, and social well being and not merely the absence of disease or infirmity».<sup>1</sup> The late Pope John Paul II offers a similar definition. «From a Christian perspective, then, health envisions optimal functioning of the human person to meet physiological, psychological, social, and spiritual needs in an integrated manner.»<sup>2</sup> Such a vision of health is attuned to the Christian vision of eschatological transformation, when unhealth will have been replaced by salvation.

Ethical guidance, I believe, begins with such a vision of human health and wellbeing. In anticipation of God's redemptive future, our ethical task is to invest creative energies in approximating it, in creating a fragmentary yet authentic embodiment of it ahead of time.

The task of the proleptic ethicist, it seems to me, is to lift up and make visible the possibilities

<sup>1</sup> [http://policy.who.int/cgibin/om\\_isapi.dll? hitsperheading=on&infobase=basicdoc&jump=Relations%20with%20NGOs&softpage=Document42#JUMP\\_DEST\\_Relations%20with%20NGOs](http://policy.who.int/cgibin/om_isapi.dll? hitsperheading=on&infobase=basicdoc&jump=Relations%20with%20NGOs&softpage=Document42#JUMP_DEST_Relations%20with%20NGOs)

<sup>2</sup> Pope John Paul II, «The Ethics of Genetic Manipulation.» *Origins*, 13: 23 (1983) 385.

of a healthy human future — a just, sustainable, and healthy society — and to encourage pursuit of transformation in light of such a vision. Rather than say «no,» the ethicist should say «go.» Rather than say «stop,» the ethicist should say «hop.» Because we Christians operate out of a divine promise that the future will be better than the past or present, we should exude faith and enthusiasm for transformation. Our ethics should be oriented toward seizing opportunities for growth and betterment.

The theoretical task of the proleptic ethicist is to project a vision of a possible and desirable future, and then to formulate middle axioms to help pave the road toward actualizing that future. However, such future projecting ought not to be done willy nilly. Possible futures need to be selected by imparting wholesome values that focus our attention on preferred or desirable futures. The impetus to enlist resources to fulfill our visions of a better future should be constrained by two considerations, a reality assessment and the precautionary principle.<sup>3</sup>

With the combination of vision and precaution in mind, how should we go about constructing middle axioms? In each ethical domain I suggest we ask questions such as these: (1) what is possible for the future? (2) what is ethically desirable for the future? (3) how realistic, scientifically or politically speaking, is such a future? (4) what precautions should we invoke? (5) then, what vision of the future should we lift up as guidance? In what follows, I would like to distinguish proleptic ethics from stop sign ethics; and then I would like to offer a brief analysis of four domains of bioethical deliberation: genomics, life extension, stem cells, and nanotechnology. In each the Christian ethicist should ask: what is our preferred future and how can we help our church members and the wider society

make moral decisions that will make this preferred future an actuality?<sup>4</sup>

In anticipation of where this essay will end up, let me offer my concluding list of proposed middle axioms. Beginning with a vision of a just, sustainable, and healthy society, Christian ethicists should encourage individuals to make family decisions and society to set public policy that will:

1. maximize genetic information without discrimination;
2. affirm life extension without expecting immortality;
3. encourage stem cell research and, if necessary, therapeutic or even chimeric cloning;
4. encourage nanobiotechnological research aimed at improving human health and wellbeing, while registering skeptical caution about enhancements that might lead us beyond the pale of what constitutes human personhood.

To fleshing out these bones I now turn.

## Proleptic Ethics

The *good* is that toward which all things aim, said Aristotle.<sup>5</sup> The good is that for which we strive, because we do not yet possess it, at least not in its fullness. Striving for the good is inescapably future oriented.

This tension between the future good and the present which hopes for it is reflected in the structure of Christian eschatology and the life of beatitude. Biblical symbols such as the Kingdom of God, the New Jerusalem, the new creation, elicit within us a vision of a tomorrow that will be the transformation of today, the fulfillment of our hopes for what is better. Today's church anticipates tomorrow's kingdom. *Prolepsis* is the term for this anticipatory embodiment of hope. «Situated between memory and hope,» writes Hans Schwarz, Christians «are allowed to anticipate proleptically the new world to come.

<sup>3</sup> By *Precautionary Principle* I have in mind the Wingspread Conference statement of 1998: «When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.» See: David Appell, «the New Uncertainty Principle,» *Scientific American* (Jan. 18, 2001) 18.

<sup>4</sup> I tend to use the term *ethics* to refer to theoretical reflection and background work; and I tend to use the term *morality* to refer to concrete decision making and action. Middle axioms connect the two.

<sup>5</sup> Aristotle, *Nicomachean Ethics*, I:1.

In this context the church plays a vital role, as the symbol of the future in which eschatological hope is kept alive, as the semblance of the whole people of God, and as the anticipation of the heavenly city.»<sup>6</sup>

Ethics anticipates.<sup>7</sup> «The key term is *proleptic*», writes Carl Braaten. «The kingdom of God which is really future retains its futurity in the very historical events which anticipate it in the present. Christian ethics is not to be understood as the means of producing the future kingdom of God, but only as annunciation, anticipation, and approximation, let us say as «signs of the coming kingdom»».<sup>8</sup>

What is being said theologically is consonant with what we observe daily, namely, things change. The actual world in which we live is changing constantly. Today was different from yesterday; and we can be confident that tomorrow will be still different. To fix one's ethic on retrieval of the past or on maintaining present reality is like building a house on sand where the foundation will soon be eroded away. What Christian theology adds to common daily observation is the promise of transformation. The future will not be only different from today, it will be better. It is this vision of a better future, based upon the eschatological promise of God, that provides the foundation for the ethical vision out of which today's church should live and move and have its being.

<sup>6</sup> Hans Schwarz, *Eschatology* (Grand Rapids MI: William B. Eerdmans, 2000) 370.

<sup>7</sup> According to Carl E. Braaten, «It is the task of Christian eschatology to develop the contents of hope's vision of the future; it is the task of ethics to describe the actions which follow from this vision in the here and now.» «The Phenomenology of Hope,» in *Christian Hope and the Future of Humanity*, edited by Franklin Sherman (Minneapolis: Augsburg Publishing House, 1969) 11.

<sup>8</sup> Carl E. Braaten, *Eschatology and Ethics* (Minneapolis: Augsburg Press, 1974) 110. «The kingdom of God ... may be viewed as perennially present; as future; and as future-present, or proleptically present.» Franklin Sherman, «The Church and the Proximate Goals of History: A Theological Perspective», in *Christian Hope and the Future of Humanity*, 82.

What we are calling *proleptic ethics* begins with the ontology of Wolfhart Pannenberg, according to which God's future is the reality upon which the present moment is dependent. This means that as the present is impacted by the future, new possibilities for transformation open up. Our response should be an ethic of transformation that avoids absolutizing past or present in order to determine what is right. «The futurity of the Kingdom opens ever-new possibilities for action while still denying any human institution the glory of perfection that might warrant its making an absolute claim ... From such a future spring impulses for relevant criticism and change toward the yet fuller future of freedom, peace, and community life marked by mutual respect and care of its members.»<sup>9</sup>

Proleptic ethics leads to creativity, not conformity. Creative attempts to make life better become anticipations, fragmentary yet authentic, of God's promise of fulfillment. According to James Childs, «each response to the norms of the kingdom will be a fragmentary prolepsis of the fulfillment of humanity ... a witness in history that is transparent to the ultimate synthesis with the transcendent promised in the fulfillment of history.»<sup>10</sup>

The task of the church ethicist in our time, I believe, is to draw from the eschatological vision *middle axioms* that will guide without dictating human moral choice as we face a dizzying array of options. The kind of middle axioms I have in mind would prompt a broad appreciation for loving relationships oriented toward human dignity; and they would encourage creative impulses for new ways to realize them. Middle axioms are more concrete than universal ethical principles; yet they are less specific than a program that prescribes the details of public policy.<sup>11</sup>

The proleptic approach would differ markedly from what has been dominant in Christian bioethics in recent decades, the approach I dub

<sup>9</sup> Wolfhart Pannenberg, *Theology and the Kingdom of God* (Louisville: Westminster John Knox Press, 1969) 115.

<sup>10</sup> James M. Childs, Jr., *Christian Anthropology and Ethics* (Minneapolis: Fortress Press, 1978) 156.

«stop sign ethics.» To a description of that position I now turn.

## Stop Sign Ethics

An example of stop sign ethics within the Lutheran communion would be the work of Gilbert Meilaender. On the one hand, Meilaender rightly espouses a Reformation understanding of faith that generates Christian freedom; but then, on the other hand, he conceives of the ethical task as one of curtailing that freedom. He does not conceive of ethics as guiding or encouraging freedom, but rather as limiting it.

Meilaender understands Christian faith in terms of *fiducia*, as trust in God on the part of a sinful person. *Fiducia* is our response to God's grace. The combination of God's grace and our faith holds us in a relationship even while we engage in sinful actions. Immoral actions do not break this relationship. We need room in faith for the divided self, *simul justus et peccator*, to remain secure. Herein lays the foundation for Christian freedom, the freedom to act out of the self-giving love of God that feeds us in faith. Meilaender cites the Augsburg Confession which cites Galatians 5:6: faith is active through love.<sup>12</sup>

Now that we have established this freedom, what is the foundation for ethics? Can we construct ethics on the basis of this freedom? No, says Meilaender. «No Christian ethic can say everything that needs saying solely through the Reformation language of {faith active in love}».<sup>13</sup> What else needs to be said? We need to say that some actions are intrinsically evil, and

the ethicist needs to condemn them. «We must never construct an ethic that makes it impossible for us both to condemn (when appropriate) and to comfort (when appropriate) the consciences of those for whom we are responsible.»<sup>14</sup> His moral vision is «prepared to say no to some exercises of human freedom.»<sup>15</sup> When Meilaender proceeds to deal with ethical issues he constantly asks the question: what might we condemn and why? What is missing in Meilaender's approach, to my reading, is the construction of an ethic that guides or encourages the expression of the very freedom with which he began. The task of the ethicist in this case is one of putting up stop signs, to telling free persons where they cannot go.

Freedom, understandably, is an enigmatic factor. Lutheran ethicists need to deal with two types of freedom. The first is Christian freedom, rightly understood by Meilaender and precious to all Lutherans who have been grasped by it. To be held securely by faith in God's grace means we are free to express ourselves as we give of ourselves solely for the welfare of the neighbor. By the power of the Holy Spirit we can experience moments of liberation from our own self-orientation; and we can orient ourselves in

<sup>13</sup> Ibid., 33. For many followers of Luther, an ontology underlies «faith active in love.» In faith Christ is actually present; so the love of the believer expresses and participates in Christ's love. «Human moral power flows primarily from deep communion between God, human creatures, and the broader community of life,» writes Cynthia Moe-Lobeda, *Healing a Broken World: Globalization and God* (Minneapolis: Augsburg, 2002) 103.

<sup>14</sup> Meilaender, *Freedom of a Christian*, 32. To curtail our freedom through ethics, Meilaender appeals to limits set by natural law. Yet, he wistfully recognizes that natural law cannot make way for self-giving love. «Thus, however useful such a natural law ethic may be, it cannot capture successfully one of the great themes of the Christian life: self-giving and even self-sacrifice on behalf of the neighbor, done with a glad and willing heart.» *Faith and Faithfulness: Basic Themes in Christian Ethics* (Notre Dame IN: University of Notre Dame Press, 1991) 123.

<sup>15</sup> Gilbert Meilaender, *Bioethics: A Primer for Christians* (Grand Rapids MI: William B. Eerdmans, 1996) 5.

<sup>11</sup> See: Childs, *Christian Anthropology and Ethics*, 148. Solid preparation for theological reflection leading to such ethical deliberation is found in the excellent workbook, *Genetics! Where Do We Stand As Christians?* prepared in 2001 by the Department of Studies of the Division for Church and Society at the ELCA, 8765 W. Higgins Road, Chicago IL 60631-4190 USA. Here, «theology is ... sustained and orderly thought about life under God from the standpoint of faith.» 18.

<sup>12</sup> Gilbert Meilaender, *The Freedom of a Christian* (Grand Rapids MI: Brazos, 2006) 28.

loving service to others. Further, because our relationship with God is held secure by faith, we are free to make mistakes. We are free to make faulty judgments, even to screw up morally, in our attempt to give expression to this loving disposition. One implication is this: we are free to be creative. We are free to pursue new forms of loving in new ways, not constrained by having to get it right.

The second form of freedom with which we must work is garden variety Enlightenment freedom. This we know as freedom of choice or subjective arbitrariness; we know it as political liberty that grants us the right to fulfill our self's desires. This kind of freedom is the exercise of choice based upon decisions made by individuals. Self-expression is the hallmark of Enlightenment freedom, and it remains freedom whether it expresses selfishness or self-giving. What is undeniable is that the fast moving frontier of biotechnology is increasing the range of choices that lie before us. New options are becoming available. We are losing the option of whether or not we can choose. We must choose. We are, as philosopher Jean Paul Sartre said, «condemned to be free».<sup>16</sup> My question is this: can an ethicist help people who are condemned to making choices?

Relevant here is the distinction between liberal Protestant theology and evangelical theology, at least evangelical theology at its best. Liberal theology promotes freedom, as its name from *libertas* suggests. Yet, liberal Protestants seem to confuse these two types of freedom. For example, Peter C. Hodgson says dramatically, «Above all it is *God* who is free, the One who *is* freedom and who *makes* for freedom or *gives* freedom. God's liberality is boundless, extending to all that God has made and to all of God's peoples.»<sup>17</sup> Despite the eloquence, missing here is the distinction between freedom from self to love, on the one hand, and political freedom as the right to fulfill the self's desires, on the other hand. Even if these two freedoms overlap and

appear daily only in mixed form, the evangelical theologian can distinguish them and engage them appropriately.

Although these two types of freedom are not identical, they overlap. What they share is freedom to choose along with the responsibility that accompanies decision making. Even in the case of Christian freedom exercised by a divided self as Lutherans understand it, self-expression through choice is a mixture of selfishness and self-giving love. So, the dynamics of choice are not sharply distinguishable between these two types of freedom. The chief characteristic of our cultural context is the freedom to choose. Can the ethicist aid us in our choice making?

Unless we recognize that politically free persons confronted with an ever widening array of options are experiencing an increased responsibility to choose, we will not be able to construct an ethic that could be helpful. Constructing an ethic that is based on taking away choice — an ethic that sees itself as curtailing freedom — ought not to be attractive to us. Rather, our situation calls for an ethic of understanding, deliberation, guidance, and support for responsible decision making. We need an ethical posture that encourages freedom while guiding it toward a vision of a new and better future. With this task in mind, I believe a posture of proleptic ethics will be more helpful than stop sign ethics.

## Should we Play God? Genomic Novelty and the Gene Myth

Stop sign ethics become the preferred form of bioethics for those who believe in the gene myth. The question I pose to our theologians is this: should we believe the gene myth? My answer is: no.

This is where it is important to attend to what we are learning scientifically about embryonic development in human beings. Stop sign ethicists falsely assume that nature provides bright red ethical «X» marks, locating the very spot for us to plant our stop signs. A closer look at what happens in nature, however, makes it quite difficult to find those X marks. One reason stop sign ethicists persist in making this mistake is their susceptibility to believing the gene myth.

<sup>16</sup> Jean-Paul Sartre, *Existentialism and Human Emotions* (New York: Philosophical Library, 1957) 23.

<sup>17</sup> Peter C. Hodgson, *Liberal Theology: A Radical Vision* (Minneapolis: Fortress Press, 2007) 14.

According to the cultural myth rising out of the Human Genome Project (HGP) — and even predating HGP back as far as the discovery of the double helix in 1953 — is the tacit belief that «it's all in the genes». James Watson described the human genome as the «blueprint» of humanity, suggesting that our essence could be found in our genetic code. The key tenet of the gene myth is that our personhood is essentially determined by what we find in the DNA. This is not science; rather, it is myth associated with science.<sup>18</sup>

The ethical corollary of the gene myth is that we should avoid «playing God» — that is, avoid «tampering with genetic nature».<sup>19</sup> The commandment against playing God is a secular commandment, not a religious one. It rides on the assumption that the human genome provides the unique essence of each one of us. To violate this essence is to violate our nature. Our nature is tacitly sacred. Should a theologian believe such a myth? Should a theologian baptize our genome? Should a theologian construct an ethic that protects the human genome from intervention, alteration, or re-construction? If we engage in genetic alteration, are we violating God's will communicated to us through nature? My answer is this: theologians should not believe the gene myth — or any other myth, for that matter — and should avoid constructing an ethic based upon this myth.

<sup>18</sup> I try to provide a detailed analysis of the gene myth in *Playing God? Genetic Determinism and Human Freedom* (London and New York: Routledge, 2<sup>nd</sup> ed., 2002). Elizabeth Bettenhausen refers to the gene myth when warning us: «Biological determinism or biological essentialism claims that biology (or nature or genes) causes identity.» «Genes in Society: Whose Body?» in *Genetic Testing and Screening*, edited by Roger A. Willer (Minneapolis: Kirk House Publishers, 1998) 104. One of the lessons learned from the Human Genome Project is that «blueprint» is a misleading metaphor for the human genome. The genome is more like the hard drive on a computer, which could deliver multiple phenotypical expressions depending on the software added to it. No scientific reason exists to identify our genome with our personal essence.

<sup>19</sup> ELCA, *Genetics!* 18.

Examples can be adumbrated of Roman Catholic, Greek Orthodox, and Lutheran spokespersons who base their ethics on the gene myth. Let's start with the Vatican. We see in *Donum Vitae* of 1987 and elsewhere how the merging of sperm and egg is considered natural. Also, the establishment of a unique single genome is considered natural. And, further, the Vatican sees what is allegedly natural as divinely intended. The message nature appears to be giving us — a message that the Vatican hears as the voice of God — is that, when the genetic code of the father and the genetic code of the mother combine into a single new genome, a historically unique person is for the first time established.

*Donum Vitae* relies on its predecessor, *Declaration on Procured Abortion* to enunciate the logic: «From the time that the ovum is fertilized, a new life is begun which is neither that of the father nor of the mother; it is rather the life of a new human being with his own growth. It would never be made human if it were not human already. To this perpetual evidence ... modern genetic science brings valuable confirmation. It has demonstrated that, from the first instant, the programme is fixed as to what this living being will be: a man, this individual-man with his characteristic aspects already well determined.»<sup>20</sup>

The apparently awesome moment when the genome is set and our individual program is determined seems just right for God to honor it with the impartation of a freshly created soul, a spiritual and immortal soul. With the fixing of the unique genome we find «nothing less than a human life, preparing for and calling for a soul ...»<sup>21</sup> God responds. «... the spiritual soul of each man is «immediately created» by

<sup>20</sup> Congregation for the Doctrine of the Faith, *Declaration on Procured Abortion*, 12-13: AAS 66 (1974) 738. Cited in Congregation for the Doctrine of the Faith, «Instruction on Respect for Human Life in its Origin and on the Dignity of Procreation: Replies to Certain Questions of the Day (*Donum Vitae*) I:1 in *Bioethics*, edited by Thomas A. Shannon (New York: Paulist Press, 3<sup>rd</sup> ed., 1987) 596.

<sup>21</sup> Congregation for the Doctrine of the Faith, *Declaration on Procured Abortion*, November 18, 1974, (Boston: St. Paul Books & Media, 1974) 26.

God.»<sup>22</sup> A new soul for a new individual. That is the Vatican logic.

This logic is shared by John Breck, an Orthodox theologian and bioethicist, who reports that «The Orthodox Church has always taught that human life begins at conception, when a sperm unites with an ovum to produce a genetically unique, living being».<sup>23</sup> Breck assumes here a connection between three items: fertilization, genetic uniqueness, and moral protection.

Gilbert Meilaender follows suit. «When sperm and ovum join to form the zygote, the individual's genotype is established. In it lies the uniqueness, the novelty, of the individual, and we can think of the rest of life a working out and developing what has been established in conception.»<sup>24</sup> In sum, who we are as an individual person is established when our genome is established; and this genetic uniqueness is a sign of God's intentional establishment of a unique human person with morally protectable dignity. What we find here is an application of the gene myth to theological anthropology in order to lay a theological foundation for an ethic of human dignity.

The problem is that nature just does not operate the way the Vatican, Father Breck, or Gilbert Meilaender think it does. The moment of conception may be the moment in which a unique genome is established (at least in some cases), to be sure; but it is not the moment in which a new individual person is created. Nor, is it the case that each new human person possesses a single unique genome.

<sup>22</sup> *Donum Vitae*, Introduction 5, p. 595: «immediately created» cites Pope Pius XII, Encyclical *Humani Generis*: AAS 42 (195) 575; Pope Paul VI, *Professio Fidei*: AAS 60 (1968) 436.

<sup>23</sup> John Breck, *The Sacred Gift of Life* (Crestwood NY: St. Vladimir's Seminary Press, 1998) 259. For additional Orthodox contributions to the discussions of cloning and stem cells, see Demetri Demopoulos, «A Parallel to the Care Given the Soul: An Orthodox View of Cloning and Related Technologies» in *Beyond Cloning*, 124-136; and Archimandrite Makarios Griniezakis, «Bioethical Dilemmas through Patristic Thought,» *Human Reproduction and Genetic Ethics: An International Journal*, 8:2 (2002) 32-37.

<sup>24</sup> Meilaender, *Bioethics*, 30.

## Why Genomic Novelty Fails to Support Our Stop Signs

Three phenomena occurring within nature are relevant. First, *fetal wastage*. The mother's body does not necessarily honor this awesome moment with as much respect as the ethicists do. Estimates range from 50% to 80% of naturally fertilized eggs are flushed from the mother's body before they can adhere to the uterine wall. Consider how many unique genomes get flushed right out of the system! We have learned from the theory of evolution that nature is profligate with regard to offspring — that is, each species produces far more offspring than is needed for sustaining the species. Nature seems almost prescient that most will die and only a percentage survive to reproductive age. Nature seems quite content to eliminate the vast majority of fertilized ova and retain only a few to bring to birth. If the Vatican is serious about associating a divine soul with each and every zygote, and if the mother's body by nature eliminates the majority of ensouled embryos, then theologically it would be difficult to see God's intentions as carried out by natural processes.

As one can imagine, it would give a Roman Catholic nightmares to think that God would be flushing ensouled persons so egregiously from a mother's body. Fetal wastage should be deemed intolerable. This leads some ethicists such as Benedict Ashley, O.P. and Kevin O'Rourke, O.P., to speculate. «Probably many of these imperfectly fertilized ova were never prepared for ensoulment.»<sup>25</sup> Note what they assume. Flushed ova are «imperfect». Does this imply those retained are perfect? Or, at least ensoulable? Apparently, something about the physical character of the embryo becomes here a necessary prerequisite for God to create a special soul; and the flushed embryos do not meet the specifications warranting ensoulment. In my judgment, this amounts to a tendentious grasping at metaphysical straws. It would be so much easier

<sup>25</sup> Benedict M. Ashley, O.P., and Kevin D. O'Rourke, O.P., *Health Care Ethics: A Theological Analysis* (Washington DC: Georgetown University Press, 4<sup>th</sup> ed., 1997) 235.

to admit that nature herself does not communicate to us what stop sign ethicists think it does.

Second, twinning. The early embryo is preformed. Each cell is totipotent — that is, each cell can make not only any tissue in the body, it can also make an entire person. In the first few days, the agglomeration of cells can divide into twins, quadruplets, octuplets, or even rarely into sixteen individual embryos. All of these would have the same genetic code, even if they become separate individuals. Monozygotic twins — what we call «identical» twins — are the result of such cell division. If identical triplets are born, we know that the early embryo had split into four and one of them was flushed from the mother's body at some point. Further, during these early stages which can last up to twelve or fourteen days, these divided embryos can recombine. Potential twins can become a single person again. It is possible that each person reading this was once a twin at an early stage of embryonic development, even though now we are individuals. All this is possible because the cells that are dividing during early embryo development are preformed, not yet differentiated, not yet committed to making one or more individual human being.

The result of the twinning process, of course, is that two or more babies can be born with identical genomes. Nature does not connect genetic uniqueness with the uniqueness of being a human individual. The connection between genetic uniqueness and individual personhood is not a scientific judgment; it is a theological overlay. This overlay has tied some radical Roman Catholic ethicists into knots. One knot suggests that twinning constitutes the destruction of a previous zygotic individual with a soul in order to make way for two new persons with souls.<sup>26</sup> The other knot suggests that twinning is unnatural, that twins are aberrations or freaks. To be a twin, according to this logic, is to be ontologically outside God's intention. Such extreme Catholic interpretations represent a minority view; but their logic demonstrates the basic incongruity between what Catholic theology says is «natural» from what actually occurs in nature. If one would like theologically to declare that identical twins violate God's will, this should be considered a partisan theological judgment; we

should avoid attributing it to some sort of aberration of nature.

The third phenomenon within nature that undercuts the association of an individual human person with a unique genome is chimerism. A chimera is a single individual with two or more genomes. Within the mother's body, *in vivo*, frequently two or more eggs can be fertilized at the same time. If two separate fertilized eggs develop simultaneously and each create its own pregnancy, two babies will be born at the same time. We know these as «fraternal» twins — that is, twins with different genomes. Fraternal twins are the equivalent of any other pair of brothers and sisters.

However, something else can take place during the first few days of embryonic development. This pair of zygotes can combine to form a single embryo. If brought to term, the resulting baby is a chimera, a single person with two genetic codes.<sup>27</sup> If the two fertilized ova are of the same gender, then the baby girl or baby boy may grow up, live a normal life, and never know that he or she began as fraternal twins. If, however, a male and female combine, then the resulting baby is mixed sex, a form of hermaphrodite. The

<sup>26</sup> «Cases of ... twinning, which is natural cloning ... constitute obstacles to recognizing a person from the moment of human conception, it is important to notice that individuation is not synonymous with indivisibility ... After division, either the first individual dies and two new individuals arise, or, more likely one of the two is the first individual since cell division is truly replication, not annihilation.» Thomas K. Nelson, «A Human Being Must Be a Person», *The National Catholic Bioethics Quarterly*, 7:2 (Summer 2007) 304–305.

<sup>27</sup> This form of chimera is very rare, even though it does occur in nature. When the question of making human-nonhuman chimeras through gene transfer arises, what remains decisive for a Roman Catholic ethicist is that the individual is preserved. «Identity should not be grounded in the quantity of human versus animal cells,» writes Thomas Nelson; «but in the formal organization and consequent behavior additions or conglomerations of subhuman genes and cells would be accidents which exit in, but would be subsumed by and not alter the underlying substantial reality of, a human being..» «A Human Being Must Be a Person,» 305.



term «hermaphrodite» combines the names of two Greek gods, the male Hermes with the female Aphrodite. Doctors may look at such a newborn baby and wonder, «now, just what is it? A boy? A girl?» Frequently early surgery steers the newborn in the direction of one gender or the other. In such a case, a genetic test is likely to reveal two genomes, one with a Y chromosome and the other with two XX's.<sup>28</sup>

How should we handle this theologically? If God allegedly creates a unique soul for a unique genome, what happens here? Does God create two souls, one for each zygote? Or, does God create one soul, a single soul for a single person? One must admit that this position simply unravels at this point. What Vatican and like-minded theologians should have done is identify ensoulment with the human person and not with the genome.<sup>29</sup> The genome is not the person; and it seems bioethicists ought to be concerned about persons. Another observation is this: contemporary Lutherans are likely to have difficulty accepting the premodern metaphysical assumptions upon which this understanding of the spiritual and immortal soul is predicated.

What I suggest we take away from this discussion of the gene myth and the commandment against playing God is this: when constructing middle axioms to guide moral decision making we should open ourselves to advancing knowledge about genomic composition and early embryo development. The ELCA refers to this attention to the science as *critical engagement*, which means «that the only satisfactory way to approach genetics is by openly engaging the scientific, medical, and economic knowledge involved ... An uninformed rejection or complacent acceptance is not an adequate response.

<sup>28</sup> Most hermaphrodite phenotypes are due to signal blockages between the X and Y chromosomes in a male. The chimeric form is more rare.

<sup>29</sup> Separating personhood from the genome might be difficult, given the precedents of *Donum Vitae* and recent ethical arguments. Yet, Pope Benedict XVI gives us a little wiggle room. «Human dignity cannot be identified with the genes of the human being's DNA,» he once said. «Giving a Fresh Face to Pastoral Healthcare,» *L'Observatore Romano*, English edition 49, 1922 (December 7, 2005) 6.

Critical engagement further signifies that the emerging genetic knowledge and its application are to be affirmed in principle as a means to aid human endeavors for healing.»<sup>30</sup> In sum, what we learn scientifically should inform our ethical construction, especially if new scientific knowledge makes things look different from the pre-scientific metaphysics and moral codes we have inherited.

## Ethics and Evolving Anthropology

For centuries ethicists could work within the framework of a traditional anthropology forged by a merger of biblical assumptions and Greek philosophy. Whether framed in dualistic or holistic terms, traditional metaphysics presumed that the physical body could be distinguished from the spiritual soul. Bringing the body or lower nature into line with the truths enunciated by the spirit or higher nature became the moral task. Deontological ethics made sense when God's will could be formulated apodictically in terms of biblical commands and natural law within this framework.

In our own era, however, the explosion of knowledge rising up from evolutionary biology and genetics and related fields is spreading intellectual fallout in all directions. Theologians have still not picked up the broken pieces of a shattered metaphysics with its shattered anthropology. It is not yet clear whether we will be able to rebuild the traditional anthropology, or whether we will have to move on toward reconstruction. In the meantime, ethical urgency is pressing theological ethicists to provide direction for decision making in both family life and public policy.

Decades prior to the Human Genome Project, prescient theologian Joseph Sittler formulated the need for ethicists to make a transition. Ethics would need to incorporate new knowledge gained from the various sciences, Sittler stressed. Traditional ethics, though right and valuable for its time, would need to undergo self-examination and self-reform.

<sup>30</sup> ELCA, *Genetics!* 21.

Sittler wrote in his 1972 book, *Essays on Nature and Grace*, «Systems of Christian ethics have most generally been elaborated out of a natural law postulate coordinated with a doctrine of the divine creation, or out of a more biblically oriented sin–grace pattern in which the Incarnation is the appearing, the mandate, the model, and the power whereby the righteousness of God is given to man and required of him. Both patterns have been able by means of principles, models, and existential analysis of the decisive <ought> as clarified by situationally focused demands to speak to man of the righteousness of God and to call and direct him to obedience to it. But both of these large ways in ethics have become less and less commanding and clear, not because they are wrong theologically, but because they are anachronistic anthropologically.»<sup>31</sup>

Sittler then turned to the growth in human self-understanding provided by the biological and psychological sciences combined with our growth in technological ability to alter both the environment and the self. Alluding to Martin Heidegger's description of the human «being-in-the-world,» Sittler enjoined theologians to ask: just *how* are we in the world? Sittler hinted that we are not «in» the world like a visitor, like a spirit which has just dropped in to visit the body. Rather, who we are is fundamentally and totally connected to the natural world. This leads to a related question: just how do we relate to God's grace — which is also already in the world of nature?

These considerations led Sittler to suggest a move in ethics toward «work» combined with «waiting», creativity combined with anticipation. «Knowledge gained by man's probing into

the structure and process of the physical world, the accumulation of evolutionary, genetic, psychological, and social facts is so astounding as to shatter the sufficiency of older ways of specifying and relating grace and nature and, on the positive side, suggests a quite fresh and more comprehensive anthropology.»<sup>32</sup> Almost paradoxically, active working becomes the partner to passive waiting. «It may be possible by working obediently to wait creatively.»<sup>33</sup>

What we do not see specifically in this treatment of ethics by Sittler is the concept of prolepsis. Yet, I should add that the idea first entered my mind in a conversation I had with Sittler. As a graduate student at the University of Chicago, I visited him frequently in his office to talk about my studies. On one occasion when we were discussing what would later be known as «ecological theology», he lifted up the idea of Point Omega in the evolutionary scheme of Teilhard de Chardin. By beginning with a vision of God's future, he said, we can structure our ethics in the present to anticipate it. Upon retrospect, this was a breakthrough moment in my own intellectual development.

Proleptic ethics begins with a teleology that orients present values toward a vision of God's promised future. Then it moves toward formulating middle axioms as principles to guide decision making in a liberal society where free people are confronted by choices.<sup>34</sup> Because so

<sup>32</sup> Sittler, *Nature and Grace*, 18.

<sup>33</sup> Ibid. See the recent tribute by James M. Childs, Jr., «Nothing Less than Everything: Thoughts on a Sittler Legacy,» *Dialog* 46:2 (Summer 2007) 104–111.

<sup>34</sup> Such an approach to ethics fits a fast moving secular culture or those segments of society already globalized within a traditional culture. It would not likely fit appropriately a strictly traditional context, even though a strictly traditional culture unaffected by the now globalized movements of science and technology is difficult to find. Wanda Deifelt advises the ethicist to incorporate «a more complex understanding of culture, one that is not a homogeneous, unified, and consistent totality. Rather, cultures also include alternatives and dissonant voices.» «Intercultural Ethics: Sameness and Otherness Revisited.» *Dialog* 46:2 (Summer 2007) 114.

<sup>31</sup> Joseph Sittler, *Essays on Nature and Grace* (Minneapolis: Fortress Press, 1972) 16. Lou Ann Trost reminds us that our ethical posture toward nature is due not to the fact that nature is sacred but rather that nature is graced by God's real presence. «It is not just a sacramental view of the world that calls for care of the earth and all its creatures, but the gift of God's very self in creation, reconciliation and sanctification, the gift of God's dwelling in the world.» «Theology's Need for a New Interpretation of Nature: Correlate of the Doctrine of Grace,» *Dialog*, 46:3 (Fall 2007) 252.

many of these choices are the product of scientific and technological advances which could not have been predicted in the past, appeal to apodictic or definitive «oughts» is no longer an option which makes sense. What does make sense is to recognize and respect the situation of freedom within which families and the larger society finds itself, and then offer guidance based upon values which contribute to human flowering, stress social justice, and edify human dignity.

With the distinction between proleptic ethics and stop sign ethics now in hand, I would like to turn to four domains of frontier scientific research that deserve ethical attention: genomics, life extension, stem cells, and nanotechnology. In each case, we will look for a middle axiom that will connect a broad vision of a just, sustainable, and healthy society with guidance for decision making.

## Genomics

*Genomics* is the domain of scientific research which seeks new knowledge from sequencing the DNA nucleotides and identifying genes, both human genes and those of other species. It is the basic science of genomics that underlies other work in molecular biology and the application of genetic technologies. The Human Genome Project from 1990 to 2001 and continuing is the primary source of our new knowledge, because it provides the basic library of information accessed in other domains of genetic research.

When it comes to applications of new genomic knowledge, ethicists will need to deal specifically with four sub-domains of forecasted importance: diagnosis, engineering, duplication,<sup>35</sup> and reconstruction of evolutionary history. The first, genetic *diagnosis*, refers to examining an individual person's genotype. Three applications of genetic diagnosis stand up and ask for the ethicist's attention. First, adults might have their genome examined to determine genetic predispositions to disease; and this will aid in prescribing therapy. Genomic knowledge will

provide the pathway to better health. Second, suspected criminals are routinely given DNA tests to see if a match can be made with evidence at the crime scene. Genes will become our identification tag. Third, pre-implantation genetic diagnosis (PGD), already routine, will likely be used extensively on IVF embryos to determine which are healthy enough to be placed in a mother's uterus and brought to term. Genetic selection will become increasingly the norm for determining just what kind of children will get born. Future families will be condemned to increased choice.

Fourth on our list of genomic ethical issues is discrimination. The chief ethical question posed by the U.S. Human Genome Project from 1990 to 2001 was this: could public knowledge of disease-predisposing genes within one's genome become the cause of genetic discrimination in health insurance, employment, and elsewhere? Should legislatures pass laws protecting 'genetic privacy'? Are there other ways beside privacy to employ genetic knowledge for health purposes yet avoid discrimination against those discovered to have bad genes — that is, expensive genes?<sup>36</sup>

These four uses of genomics — therapy, identification, family planning, and discrimination — will provide an honest living for bioethicists who are willing to offer moral guidance. Let's now turn to the second on our list of genomic sub-domains, genetic *engineering* (GE). GE will likely enter the pre-implantation procedure at some point. Parents-to-be will alter existing DNA sequences or even splice in desired genes. More than merely selecting out genes which dispose a future child toward disease, engineering could be used for genetic enhancement. Enhancements in physical prowess or musical talent or even intelligence could become the routine for families who can afford hiring a genetic engineer. Existing issues of eco-

<sup>36</sup> For a more comprehensive analysis of ethical issues rising out of the Human Genome Project, see: *Genetics: Issues of Social Justice*, edited by Ted Peters (Cleveland: Pilgrim Press, 1998). Regarding economic justice, of particular value is Karen Lebacqz, Chapter 11, «Genetic Privacy: No Deal for the Poor.»

<sup>35</sup> See: ELCA, *Genetics!* 14.

conomic justice will become exacerbated as the line between the genrich and the genpoor becomes wider.

Within the category of genetic selection and engineering, we raise the question of germ line intervention and alteration. Should we alter the genome of the germ line, so that we influence future generations in perpetuity? If we make a permanent change in the human genome, might we be contributing to the future of human evolution? Might we make a mistake, a mistake that could grow in proportion so that many individuals in a future generation would suffer because of our ill informed actions? Should we invoke the precautionary principle here, and hold off on germline modification until we know more about the impact such intervention might have? Or, should we cease even considering it? On this point, Gilbert Meilaender considers invoking the commandment about playing God to put up a stop sign; but then he proceeds with a tone of expectation that invites anticipatory ethics. «If anything amounts to <playing God> illicitly, germ cell therapy might seem to. Nevertheless, germ cell therapy, were it possible, offers an obvious benefit. It treats a disease not just in one sufferer but in all of her descendants ...To draw back in fear here might seem to be the sin that was once called <slloth> — an unwillingness to seize new possibilities.»<sup>37</sup> In short, if the science eventually makes it possible to select out genes predisposing us to disease or even engineer superior genomes, might this provide an opportunity for the ethicist to embrace, at least to embrace with caution?

As an aside, I believe the array of choices regarding the genetic make-up of future children ought to prompt Christian theologians to ask themselves: just what investment, if any, does Christian theology have in establishing genetic continuity between parents and children? My hypothesis is: none. Quite the contrary, I interpret Jesus' Sermon on the Mount (Matthew 5–7) to suggest that no biological factor in human relationships determines either our relationship to God or to one another. If future children become increasingly distant genetically from

their parents, theologically informed ethicists will need to place increased emphasis on love or freely chosen social links to establish a family as a family. This would be a healthy advance in Christian thinking, in my judgment.

The third in our list of genomic forecasts, genetic *duplication*, refers to reproductive cloning, the creation of new human beings through DNA somatic cell nuclear transfer (SCNT). Like Dolly the sheep, babies might be born with somebody else's genome. Even though to date nuclear transfer of human DNA has proved difficult if not impossible, ethical speculation has been rife. Virtually all scientists and all theologians oppose reproductive cloning, although their reasons differ. Most opposition is based on the safety issue, according to which cloning is an imperfect process which could lead to suffering on the part of the cloned person. Some naturalists and some theologians who are sympathetic to naturalism invoke the gene myth and the commandment against playing God.<sup>38</sup> Cloning, to a naturalist, represents playing God, because it overly manipulates nature. It is difficult to find an ethicist who approves of human duplication through reproductive cloning.

The fourth in our list of genomic forecasts has to do with current research on the Hap Map, on cataloging the various nucleotide sequences in both our genes and junk DNA. Of particular interest are single nucleotide polymorphisms (SNPs) on a single chromatid that are statistically analyzed. SNPs common to population groups can be compared, and their heritable influences charted. Such analysis may lead to the reconstruction of the evolutionary history of the human race. This will be science for the sake of science, the need to know. It is not likely in itself to lead to a new genetic technology. However, by retrieving the history of population groups, the question of racial identity will arise.

<sup>38</sup> Leon Kass provides the paradigmatic example of naturalist opposition to cloning on the basis of playing God. Duplicating oneself through cloning constitutes «the Frankensteinian hubris to create a human life and increasingly to control its destiny; men playing at being God». *Life, Liberty and the Defense of Dignity: The Challenge for Bioethicists* (San Francisco: Encounter Books, 2002) 149.

<sup>37</sup> Meilaender, *Bioethics*, 42.

Race, from a scientific point of view, is not a genetic category. But, it is a social category. Based on what we know about human proclivities regarding matters of racial identity, we can forecast that some groups bent on supporting doctrines of racial superiority may try to capitalize on information emerging from the International Hap Map project.

When the science of genomics yields to developments in genetic technology and we become ready to alter the genotype of some individuals, ethicists will have to confront an unavoidable question: what is the relationship between *health* and *enhancement*? And, does health have a moral priority over enhancement? This becomes difficult because the line between good health and enhancement might be difficult to draw. A line is especially difficult to draw when definitions of health such as those proposed by WHO and the Vatican mentioned earlier include qualities beyond disease or infirmity; health includes optimal functioning of «physiological, psychological, social, and spiritual needs in an integrated manner.» The World Council of Churches stresses the difficulty of distinguishing between therapy and enhancement: «there is no absolute distinction between eliminating «defects» and «improving» heredity. Correction of mental deficiency can move imperceptibly into enhancement of intelligence, and remedies of severe physical disabilities into enhancement of prowess.»<sup>39</sup> We need to ask whether we need to draw this line and, if so, why and where? Our vision of a healthy individual and a healthy society is at stake.

With all of these things in mind, let me tender a middle axiom on genomics: based upon our vision of a future society that is just, sustainable, and healthy, we should pursue maximum *genetic information without discrimination*. This means, among other things, that the pursuit of increased information regarding genetic predispositions to disease ought not put an individual at risk for losing health insurance or employment. Nor, should we halt criminal investigations due to genetic privacy. Nor, should new learning re-

garding the evolutionary history of the human race be construed in such a way that racial discrimination or hatred can be supported. Although precaution should be taken regarding genetic engineering and germ line alteration, nothing inherent in the genome should shock us into avoiding experimentation. Theologically, I like to translate loosely, <sup>NRS</sup> 1 John 4:11 «Beloved, since God loved us so much, we also ought to love one another,» this way: «God loves each of us regardless of our genetic code, and we should do likewise.»<sup>40</sup>

## Life Extension

When the Geron Corporation in Menlo Park, California, was founded in 1990, its less than modest goal was to pursue genetic research for the purposes of life extension, even immortality. The floating of the telomerase theory of aging was Geron's first accomplishment, and the success of initial experiments to lengthen chromosomal telomeres has led scientists to reasonably expect a human life span of 120 years. This figure, however, was the result of scaling back more extravagant claims regarding the possibility of attaining human immortality through genetic engineering.

The personal mission of Geron's founder, Michael D. West, was nothing short of this: to «defeat death.»<sup>41</sup> He named his new company with the Greek word, *geron*, meaning «old man» in the New Testament. This name connotes Nicodemus who asked about being born a second time and then receiving new life. West's method would not be baptism but rather science.<sup>42</sup> He would try to blunt if not reverse the aging process at the cellular level. This led West to his plan for enhancing totipotent (now called pluripotent) human embryonic stem cells (hES or es cells). With this move, the contemporary

<sup>39</sup> World Council of Churches, Church and Society, *Manipulating Life: Ethical Issues in Genetic Engineering* (Geneva: World Council of Churches, 1982) 7.

<sup>40</sup> I develop this theme more fully in *For the Love of Children: Genetic Technology and the Future of the Family* (Louisville KY: Westminster John Knox Press, 1996).

<sup>41</sup> Michael D. West, *The Immortal Cell* (New York: Doubleday, 2003) 30.

<sup>42</sup> *Ibid.*, 90.

field of regenerative medicine was born. West provided the funding and the contracts that led to the dramatic breakthroughs with which we are now familiar: the isolation of hES cells at the University of Wisconsin in August 1998, and the isolation of hEG (human embryonic germ) cells at Johns Hopkins University in September 1998. By lengthening the telomeres of hES cells, these stem cells would become immortal cells, West thought; and these immortal cells just might lead to immortal people.

Beyond longevity, Stanley Shostak similarly looks to immortality. He argues that «immortalization requires three major adjustments in human beings: (1) they must be *permanently juvenilized* in order to remain in a developmental mode and prevent net-negative changes from gaining an edge; (2) they must be equipped with *exotic stem (es) cells*; (3) they must be provided with an indwelling *generator*, a new organ, introduced into embryos and capable of generating es stem cells in perpetuity. Miraculously, these requirements may work synergistically.»<sup>43</sup> The agenda here is to attain by science what previously only religious hope could inspire, namely, everlasting life.

Even if increased longevity is scientifically realistic, is immortality? No. Death is still our lot, our biological lot. As already mentioned, what has emerged as a reasonable expectation among scientists is a life span of 120 years. The next task for researchers is to insure that all of these 120 years are healthy ones. The hope for hES cells is to regenerate the tissue of organs within the body so that a person can remain healthy right up to nearly his or her final day on earth. Gone would be the long degeneration period which causes so much agony and so much expense, gone if the potential for stem cell therapy becomes an actuality.

How should we think about this theologically? Even if science would be capable of indefinite life extension, this would not mean what the Bible means by *eternal life*. Resurrection to eternal life is a divine act; and it refers to a qualitative relationship to God which is more

than merely extending the days of our lives on earth. Perhaps, then, immortality through regenerative medicine is not in itself a theological issue.

How we view life extension is a theological issue, to be sure. On the one hand, we would applaud genetic science if it could enhance our health and wellbeing for an increased number of years. On the other hand, health enhancement and life extension could tempt us away from understanding our fundamental relationship to our eternal God. There may be no reason to put up a stop sign. Yet, there may be good reason to alert the human psyche to resist expecting too much from genetic enhancement. Ulf Görman reminds us soberly: «It is an important aspect of human life not only to fight death, but also to come to terms with it.»<sup>44</sup>

What middle axiom might we offer here? From within our vision of a future society that is just, sustainable, and healthy, the Christian ethicist should *affirm life extension without expecting immortality*.

## Stem Cells and Regenerative Medicine

Perhaps the most dramatic potential breakthroughs in human health care are forecasted for human embryonic stem cell (hES cell) research. The regenerative potential of stem cells is rightly receiving global attention and drawing both public and private investment. Through the regeneration of organ tissue researchers are intent on looking for therapies for heart disease, diabetes, spinal cord injury, brain deterioration due to Alzheimer's or Parkinson's, and even cancer. Regenerated tissue will lead to regenerated persons, whose lives will thrive even into advanced ages.

To count as regenerative therapy, a stem cell must have the power to regenerate tissue. Multipotent adult stem cells are capable of regener-

<sup>43</sup> Stanley Shostak, *Becoming Immortal: Combining Cloning and Stem-Cell Therapy* (Albany NY: SUNY, 2002) 186.

<sup>44</sup> Ulf Görman, «Never Too Late to Live a Little Longer?» in *Future Perfect? God, Medicine, and Human Identity*, ed. by Celia E. Deane-Drummond and Peter Scott (London and New York: T. & T. Clark, 2007).

ating specific tissues of their own kind. Hematopoietic or blood stem cells within the mesoderm tissue type, for example, can make two different kinds of blood cells, red and white. But, as only multipotent, hematopoietic stem cells cannot make brain cells. In order for a stem cell to *become* the very tissue within which it is placed, scientists require pluripotency. To date, only hES cells meet the criterion of pluripotency. Initial experiments show that hES cells are capable of ingression and becoming any and every tissue type in the body. Pluripotent cells can renew the heart, brain, pancreas, liver, or any other tissue.

The worldwide controversy over the permissibility of scientists to pursue pluripotent stem cell research can be confusing, even baffling. What is going on? Risking oversimplification, one might reduce the battle between fighting ethicists as a rivalry between two Hippocratic principles, beneficence and nonmaleficence. Our medical practitioners still listen to what Hippocrates said, «benefit, and do not harm» (*primum non nocere*). Now, which trumps? Benefit? Or, avoiding harm?

It is obvious that stem cell research has the potential to benefit those among us who suffer from a wide variety of traumas and diseases. Whom might it harm? Because hES cells are derived from *ex vivo* embryos at the blastocyst stage, four to six days after activation, one might ask: does laboratory disaggregation of an early embryo in the Petri dish constitute destruction of a human person? Is it murder? Is it abortion? If it fits one of these final categories, then protecting the blastocyst from destruction might seem to be more important than the medical benefits. Nonmaleficence toward the *ex vivo* embryo trumps beneficence toward existing human persons who suffer and could benefit from stem cell therapies. This certainly is the logic of Pope Benedict XVI. «No one can dispose of human life. An insurmountable limit to our possibilities of doing and of experimenting must be established. The human being is not a disposable object, but every single individual represents God's presence in the world.»<sup>45</sup> This pontif, like his pre-

decessor, Pope John Paul II, puts up a stop sign: no hES cell research.

The Vatican position is understandable, given the premises on which the conclusion is based. Today's conscientious Roman Catholic moralist is aware of the dilemma posed by competing values, nonmaleficence and beneficence. «In embryonic stem cell research, there is a conflict between the obligation of beneficence, wherein there is a wish to prevent or alleviate suffering through the promise of this new technology, and the duty to respect the value of human life, which falls under the principle of nonmaleficence.» writes Bethanne Smith. In confronting this dilemma, Smith believes nonmaleficence should trump beneficence. «Obligations of nonmaleficence are more rigorous than obligations of beneficence and at times override them.»<sup>46</sup> This position needs to be respected. The values employed by such a stop sign ethics position are the right ones. The question I pose here is this: should nonmaleficence apply to the *ex vivo* blastocyst? It is my considered judgment that it does not apply; and this allows us to put our weight behind beneficence toward those who could benefit from regenerative medicine.

With beneficence toward living persons who suffer combined with nonmaleficence toward research embryos at the center of the controversy, my Berkeley colleagues and I have identified four different and noncompossible ethical frameworks within which moral arguments are currently being raised:<sup>47</sup> (1) the *embryo protection framework*, within which the orienting question is whether to protect the *ex vivo* blastocyst from destruction in the laboratory; (2) the *nature protection framework*, within which the orienting question fits within the larger proscrip-

<sup>45</sup> Pope Benedict XVI, «Stem Cells: What Future for Therapy,» Christmas 2006-Epiphany 2007, [http://www.wf-f.org/06-4Benedict\\_StemCells.html](http://www.wf-f.org/06-4Benedict_StemCells.html).

<sup>46</sup> Bethanne Smith, «A Kantian Analysis of Embryonic Stem Cell Research,» *The National Catholic Bioethics Quarterly*, 7:2 (Summer 2007) 259–260.

<sup>47</sup> My Berkeley colleagues to whom I am indebted are Karen Lebacqz and Gaymon Bennett. A summary of the ethical frameworks can be found in a theological brief at the website of the Institute for Theology and Ethics (ITE) at PLTS, <http://www.plts.edu/resources/ite.html> as well as the book, Ted Peters, *The Stem Cell Debate* (Minneapolis: Fortress Press, 2007).

tion against playing God; (3) the *medical benefits framework*, within which the orienting question is how to support a path of scientific research that could lead to increased human health and flowering; and (4) the *professional research standards framework* which, presupposing medical benefits, establishes guidelines to investigators that protects human dignity along with promoting honesty and public scrutiny by researchers.<sup>48</sup> This is not a list of issues per se; rather, it is a list of ethical frameworks through which contending parties are viewing the issues. Stop sign ethicists usually work from within the first two frameworks, embryo protection and nature protection; whereas, proleptic ethicists are more likely to view issues through the lens of the medical benefits framework.

## Stem Cells, Cytoplasmic Reprogramming, and Cloning

Some nervous ethicists day dream for a moral silver bullet, a scientific breakthrough that will take away the tension without compromising previous commitments. Might cytoplasmic reprogramming resolve the ethical tension? If we could reprogram the cytoplasm of an ordinary cell — say, a skin cell — then we would not need to employ an egg for producing lines of pluripotent stem cells. If we could avoid employing an egg, would we also avoid embryo destruction? «Yes» has become the first blush of moral logic articulated at the announcement early in 2007 about modifying skin cells in mice. By simply splicing in four genes, Shinya Yamanaka of Kyoto University accomplishes the key reprogramming task. The skin cell now functions almost as the egg does in precipitating pluripotent DNA activity. The moral «yes» comes from spokesperson for the U.S. Conference of Catholic Bishops, Richard Doerflinger,

who was quoted saying: this procedure «raises no serious moral problem, because it creates embryonic like stem cells without creating, harming or destroying human lives at any stage.»<sup>49</sup> What Doerflinger does not yet see are the anthropological implications should such experiments in cytoplasmic reprogramming prove successful in human beings. Such a breakthrough would indicate that reproduction could occur by using any healthy cell in the body. Making pluripotent stem cells in this manner is right next door to making totipotent cells. This means we could make a baby from a skin cell. Reproduction would not be limited to gametes alone. Making babies the old fashioned way might become just that, old fashioned. Embryo protectionists might have to re-examine their biological ontologies and their theories of natural law.

Let us now turn to another related issue. Before stem cell research can proceed from theory to practice, it needs to jump an enormous hurdle, namely, histocompatibility. How can we avoid immunal rejection of injected stem cells? A colony of stem cells from the laboratory will not be accepted by the patient undergoing therapy, because the immune receptors of the patient will prevent the incoming cells from making a home in his or her body. One theoretical solution is to make a colony of stem cells from the DNA of the patient. If both the stem cells and the patient have the same genome, then histocompatibility will have been achieved.

How might this be done? Cloning — that is, SCNT. Laboratory technicians would take an oocyte (an egg from a donating woman's body), enucleate it (remove the DNA nucleus), and then insert the DNA of the future recipient. To accomplish this, technicians would have to do for human DNA what Ian Wilmut did for Dolly's DNA, namely, to run it back from its differentiated state to its pre-differentiated state. Once the patient's DNA nucleus is in a quiescent pre-differentiated state, it could be inserted into the

<sup>48</sup> For a map of countries with hES cell research, go to: <http://www.mbbnet.umn.edu/scmap.html>. An instructive example of professional research guidelines in stem cell research would be the California Institute for Regenerative Medicine's «The CIRM Medical and Ethical Standards Regulation», [http://www.cirm.ca.gov/laws/pdf/Compiled\\_Regulations\\_2.pdf](http://www.cirm.ca.gov/laws/pdf/Compiled_Regulations_2.pdf)

<sup>49</sup> See: Nicholas Wade, «Biologists Make Skin Cells Work Like Stem Cells,» *The New York Times* (June 7, 2007) <http://www.nytimes.com/2007/06/07/science/07cell.html?ex=1181880000&en=761ce90dca1b449a&ei=5070&emc=eta1>.



enucleated oocyte. Then, when activated, this new embryo could be cultivated to the blastocyst stage, disaggregated, and the pluripotent stem cells could be cultivated for insertion into the body of the patient. The introduction of stem cells would not precipitate immunal rejection; and tissue regeneration would begin.

To date, this hurdle has not been jumped. Cloning human embryos is proving much more difficult than cloning embryos for sheep, goats, cows, and mice. Like a pot of gold at the end of the rainbow, laboratory searchers have come up with nothing to show for years of dedicated work. One cannot safely forecast that SCNT will provide what we need for histocompatibility. Perhaps some other method will be turned to.

Among the other methods, some scientists are experimenting with chimeras — that is, they are placing the human DNA nucleus into a mouse oocyte (actually a mouse zygote temporarily arrested in mitosis). If the cytoplasm of the mouse zygote becomes reprogrammed to create an embryo, then perhaps a stem cell line could be drawn off — a human stem cell line, not a mouse stem cell line. If the DNA selected would belong to a prospective human patient, the human-mouse chimera might solve the histocompatibility problem and lead to the «creation of patient-derived human embryonic stem cells».<sup>50</sup> Will this be successful? Time will tell.

In the meantime, bioethicists should anticipate what might be coming. They need to ask: does opposition to reproductive cloning carry over to opposition to therapeutic cloning? to chimeric cloning? Is there a moral difference between using SCNT to bring a new child to birth, on the one hand, and creating a blastocyst for disaggregation, on the other hand? Bioethicists working from within the embryo protection and nature protection frameworks frequently put up stop signs for therapeutic cloning right along with reproductive cloning.<sup>51</sup> Will this apply in the future?

Much more could be said regarding the worldwide stem cell debate. Let it suffice to

<sup>50</sup> Dieter Egil, Jacqueline Rosains, Garrett Birkhoff, and Kevin Eggan, «Developmental reprogramming after chromosome transfer into mitotic mouse zygotes,» *Nature* 447:7145 (7 June 2007) 679–685.

observe that in country after country public policy makers are soliciting counsel and guidance from informed religious leaders. This provides an opportunity for proleptic ethicists to offer their services — to offer wisdom and sound judgment — to those who find themselves burdened with making choices about how to proceed. With this as our context, let me proffer another middle axiom: *Encourage pluripotent stem cell research and, if necessary, therapeutic or chimeric cloning.*

## Synthetic Life

Before exiting this highway of life extension and enhancement, we should peer at an off ramp leading to life creation. Scientists at the University of California and Lawrence Berkeley Laboratories along with researchers at the University of Illinois and M.I.T. are pursuing synthetic life creation. They are planning to build from physical elements a new plant, a corn like plant with enough cellulous to be burned with 95% efficiency. Between harvest and the gas tank, a microbial bacterium breaks down the cellulous, turning it into a portable fuel product. What is

<sup>51</sup> By no means is this an exhaustive list of relevant ethical issues deserving theological attention. Three come immediately to mind. One has to do with the health risks to women donating oocytes for research. See: *Assessing the Medical Risks of Human Oocyte Donation for Stem Cell Research*, Institute of Medicine and National Research Council (Washington DC: National Academies Press, 2007, [www.nap.edu](http://www.nap.edu)). The second is a revival of the theological discussion surrounding intellectual property (IP) rights to genetic information. See, for example, the new policies of the California Institute for Regenerative Medicine, <http://www.cirm.ca.gov/policies/>. In my judgment, our theological concern is not with the question of patenting living beings; rather, it has to do with access to therapeutic products, with economic justice. A third is chimerism. Chimerism might provide the alternate path to histocompatibility if SCNT fails. See: Ted Peters, «The Return of the Chimera,» *Theology and Science*, 4:3 (November 2006) 247–260 and «A theological argument for chimeras» in *Nature Reports Stem Cells*: <http://www.nature.com/stemcells/2007/0706/070614/full/stemcells.2007.31.html>.

needed is the invention of the new plant and perhaps a new microbe. A breakthrough here would lead to a form of biofuel that would be much more economical than current ethanol made from corn; and it could partially protect us from the impending global energy shortage. What should be of interest to the theologian is this: will the line between non-life and life become blurred? Or, should such a line have been drawn in the first place? What is not being attempted here scientifically is the creation of life from scratch, *ex nihilo*. Rather, novel pathways and forms of chemical activity are being formed so as to synthesize new and previously never existing life forms.

Might one object on the grounds that creating life is a form of playing God? Already such objections have been raised against renegade genomist Craig Venter, who claims to have produced a new microbe. He claims to have invented a new form of life, which he names «Synthia.» Synthia is a microbe — *mycoplasma laboratorium* — which could aid in the production of ethanol or even hydrogen. On May 31, 2007, the J. Craig Venter Institute of Rockville, Maryland, filed US Patent application #20070122826, which claims exclusive ownership of a set of essential genes and a synthetic «free-living organism that can grow and replicate», which is made by using those genes. A year earlier, the Venter Institute also filed an international patent application with the World Intellectual Property Organization — #WO2007047148, published April 27, 2007 — which names more than 100 countries where it may seek monopoly patents. Some critics say the Venter Institute researchers had probably not achieved a fully-functioning organism at the time of the filing. Perhaps the jury is still out.

Let us look at Venter's project a bit more closely. In one experiment, Venter's scientists moved the genome from one bacterium, *Mycoplasma mycoides*, to another, *Mycoplasma capricolum*. The recipient cells were activated with the new genome. This transplant converted one species into another. The next step in the research programme is to devise a synthetic genome, a combination of selected genetic components from a variety of sources. Yes, this should be thought of as a new life form. Because

this phase constructs a genome from nucleotides drawn from other existing genomes, however, it ought not yet be considered creating life from scratch. But, we might ask: is this a step along the way? One commentator thinks so: this innovation «presages the dawn of organisms redesigned from scratch».<sup>52</sup>

Two moral queries might arise here. One has to do with whether one might pat the scientist on the back who is the first to create life from non-life; or, whether one might object from within the nature protection framework (see discussion of ethical frameworks above) that this amounts to *hubris*, to playing God. The other query has to do with whether or not anyone should be permitted to patent a living creature. If this bacterium becomes a new species in the long history of earth's evolution, should we worry that patenting it might reduce it to a commodity?

The ETC Group, a society opposed to such patenting, calls Venter's new bacterium the «original syn organism.» The ETC Group argues: «before syns are allowed to go forward, society must debate whether they are socially acceptable or desirable: How could their accidental release into the environment be prevented or the effects of their intentional release be evaluated? Who will control them, and how? How will research be regulated?»<sup>53</sup> A version of the precautionary principle is being appealed to here.

In itself the appearance of synthetic life might not be considered a bioethical issue within the parameters of genetic considerations. Yet, the synthetic life project reminds us that theological ethicists need to attend to fundamental categories, such as life and non-life. Perhaps the synthetic life project and its sister, nano-science (see below), warrant theological reflection before seeking a grounding for genetic ethics.

<sup>52</sup> Phillip Ball, «Designs for life.» *Nature* 448:7149 (5 July 2007) 32.

<sup>53</sup> «Patenting Pandora's Bug», [http://www.etcgroup.org/en/materials/publications.html?pub\\_id=631](http://www.etcgroup.org/en/materials/publications.html?pub_id=631), accessed June 8, 2007.

## Nanotechnology: Where Size Matters

Perhaps the newest kid on the block is nano-science and its sister, nano-technology. The term *nanotechnology* refers to the manipulation of matter on the scale of atoms and molecules and even smaller. From the Greek word, *nanos*, meaning dwarf, a nanometer (nm) equals one billionth of a meter. It takes ten atoms of hydrogen side-by-side to equal one nanometer. Compare this to a DNA molecule which is 2.5 nm wide, or a human hair which is 80,000 nm thick. The nano motto is: size matters.

Only atomic microscopes are able to see things on the nanoscale. Currently, the Lawrence Berkeley Laboratories at the University of California are, in concert with others, developing an electronic microscope that can see layers of physical reality at 25 to 35 nanounits. (This project overlaps with the synthetic life project; but they are not co-extensive.) The STXM or «Scanning Transmission X-Ray Microscopy» process, as of this writing, has set the record of viewing something as small as 22 nano units. Reality at this level deals with physical phenomenon that make up both inanimate matter and life, assuming life functions only at a higher level of complex organization. Nanoscience, therefore, has virtually erased the material line between life and non-life.

Now, let's add the genetic component. When we do this, the field becomes *nanobiotechnology*. This field integrates biological materials with synthetic materials to build new molecular structures. New living systems may be built in laboratories out of a synthesis of living and non-living parts which will be programmed to perform specific tasks. For example, envisioned nanosized robotic machines — called *nanobots* or *nanites* — could circulate in the human blood stream transporting oxygen or hormones faster and more efficiently than what nature to date has been able to do.<sup>54</sup> Ray Kurzweil's scientific imagination projects a marvelous nanofuture. «A conservative analysis of these robotic respiratory cells shows that if you were to replace 10 per-

cent of your red blood cells with these robotic versions you could do an Olympic sprint for 15 minutes without taking a breath or sit at the bottom of your pool for four hours.»<sup>55</sup> Such nanobots would travel inside the body and brain to perform therapeutic functions as well as enhance our bodies and brains. We can expect experiments on enhancement of intelligence and life extension.

If we find ourselves in a bioetch horse race, it appears nanobiotechnology will take the lead over GE. «With the rapid emergence of nanobiotechnology, genetic engineering is suddenly so last-century.»<sup>56</sup> Yet, genetic engineering will not disappear just because nanotechnology has moved into the front of the race. Closely related to nanobiotechnology is *bio fab*, the application of engineering methods to living systems, most likely at the genetic level. The task here will be to synthesize long, accurate pieces of DNA, or to generate novel proteins for gene therapy and pathogen destruction. Rather than wait for nature to evolve, bio fab technologists will design and then fabricate DNA sequences on a made to order basis. The design will be drawn on a computer, and then the DNA sequences will be manufactured on any scale the industry would require. «We are progressing toward first designing and modeling biological devices in computers, then <cutting> them into biological form as the final step — much as silicon chips are planned, then etched.»<sup>57</sup> Bio fab employs engineering methods to create synthetic biological forms; nanotechnology employs engineering methods to create synthetic bio/machine forms.

<sup>55</sup> Ray Kurzweil, «The Golden Era of nanotechnology,» *Science and Theology News*, 6:8 (April 2006) 8; see: [www.stnews.org](http://www.stnews.org).

<sup>56</sup> Hope Shand and Kathy Jo Wetter, «Shrinking Science: An Introduction to Nanotechnology,» in *State of the World: 2006*, ed. by Linda Starke of the Worldwatch Institute (New York and London: W.W. Norton & Co., 2006) 92.

<sup>57</sup> <sup>7</sup> David Baker, George Church, Jim Collins, Drew Endy, Joseph Jacobson, Jay Keasling, Paul Modrich, Christina Smolke, Ron Weiss, «Engineering Life: Building a FAB for Biology,» *Scientific American*, 294:6 (June 2006) 51.

<sup>54</sup> <http://www.geocities.com/TimesSquare/8976/nanite.htm> (accessed 28 May 2006).

Both could be employed together or separately in human therapy and, especially, enhancement.

How should the ethicist think about such matters? As happened with the new thrust in genomics when the Human Genome Project began in 1990, so also now in the field of nanotechnology research and ethics work hand in hand. Deborah Johnson at the University of Virginia sees nanoethics as internal to nanotechnology. «Nanoethics has as much *promise* and *uncertainty* as the endeavor to develop nanotechnology. Both are being promoted as activities that can make a difference in building the future — nanotechnology as a research and development activity that will improve quality of life, nanoethics as a component of nanotechnology development that will ensure good results and help to eschew negative, unintended consequences.»<sup>58</sup>

Let us pause here and ask: what might characterize nanoethics? Would we simply borrow existing forms of ethical deliberation and apply them to nanobiotechnology? Or, because size matters and the small size could in itself lead to emergent properties, should nanoethics become a distinct domain? If we elect the former, then we could borrow from existing discussion of NEST-ethics, perhaps even from genethics. Consequentialists will have to ask whether the benefits to nanotechnology are greater than the costs; and utilitarians will have to ask whether the level of human happiness will be sufficiently enhanced. Deontologists will have to ask whether and to what extent we have a duty to improve human health and well being through the use of New and Emerging Science and Technology. Justice

<sup>58</sup> Deborah G. Johnson, «Ethics and Technology <in the Making>: An Essay on the Challenge of Nanoethics», *NanoEthics* 1:1 (2007) 21. Although Johnson warns the ethicist against becoming co-opted into supporting all nanotechnology, she encourages the ethicist to get involved. «It would be unfortunate if in order to avoid co-optation, nanoethicists refused to become part of the nanotechnology enterprise, refused funding, and, thereby refused to sit at the table and shape the development of nanotechnology. This would be to say <no> to the possibility of nanoethics making a difference. It would be a shame for nanotechnology and a shame for ethics, dooming the latter to the role of outside critic, a role that may well be perceived as irrelevant.» *Ibid.*, 28–29.

oriented ethicists will have to ask whether nano-products will be distributed in such a way that the poor nations and poor peoples of the world will benefit. Virtue ethicists will ask whether nano-enhancement contributes to the good life or the genuinely good society. Now, each of these ethical questions subsume nanoethics under NEST-ethics; they could apply to projected directions that any New and Emerging Science and Technology might take.

Within the context of NEST-ethics the question of planting a stop sign gets asked. Tsjalling Swierstra and Arie Rip in the Netherlands pose it this way: «In NEST-debates <ethics> is often positioned as a brake on technology (like technology assessment used to be labeled as technology <harassment>). But positions promoting technology are every inch as ethical as positions harassing or limiting technology in the name of some higher value.»<sup>59</sup>

If we elect the second alternative, ethicists would need to ask: are there emergent properties to new phenomena at the nano scale which require special attention? If so, then nanoethics might require a distinctive agenda rather than simply borrowing from existing NEST issues or even genomic issues. As of this date, those properties distinctive to nanoscience and nanotechnology have yet to be identified.

## From Bio-Nano-Enhancement to Singularity to Post-Humanity

If size matters and if at the nano-scale new properties emerge, we will need to ask: would nanobiotechnology change human nature? Even though a nanotech myth has not yet developed, might ethicists wish to jump in with the kinds of concerns that led, in the case of genomics, to the commandment against playing God?<sup>60</sup> Suppose

<sup>59</sup> Tsjalling Swierstra and Arie Rip, «Nano-ethics as NEST-ethics: Patterns of Moral Argumentation About New and Emerging Science and Technology», *NanoEthics* 1:1 (2007) 6.

<sup>60</sup> «The concrete reference [to playing God] was to the possibility of recreating nature. God's Creation would then be a shorthand, somewhat independent of theistic religious connotations, for respect towards

nanobiotechnology could lead us into something post-human or trans-human? If today's human beings are capable of giving technological birth to a new and superior species, is it ethical to pursue this? Would such a goal violate something intrinsically valuable or even sacred lying within our biologically inherited natural state? Does nanotechnology put human personhood at risk?<sup>61</sup>

Enhancement of human intelligence will open the gate and allow us to take the first steps down this road. Can we and should we use nanotechnology to make human beings smarter? Briefly, scientific research has begun on human intelligence augmentation, also known as «neuro-cognitive enhancement». Sometimes it is named «intelligence amplification» (IA) or «cognitive augmentation» and even «machine augmented intelligence». Nano engineers are projecting the possible use of information technology and even genetic technology to augment or expand the range of human intelligence. What the next decades could bring is a new advance in the cybernetic revolution already begun in the 1950s and 1960s.

What is likely to happen? Here is a scenario put forth by the Enhancement Technologies Group that wants to increase the capability of a person to approach a complex problem and solve it. «Increased capability in this respect is taken to mean a mixture of the following: more-rapid comprehension, better comprehension, the possibility of gaining a useful degree of comprehension in a situation that previously was too complex, speedier solutions, better solutions,

what has evolved, instead of it being objectified, instrumentalized, commodified, subjected and manipulated.» Swierstra and Rip, *ibid.*, 15–16.

<sup>61</sup> It is difficult scientifically to posit something like an essential human nature. To believe in «an ideal human type ... makes little sense,» says Robert Pollack of Columbia University. It flies «in the face of the first tenet of natural selection, that the survival of a species over the long term will depend above all on the existence of a maximum of variation from individual to individual.» Robert E. Pollack, «The Price of Science without Moral Constraints,» *Cross Currents*, 56:1 (Spring 2006) 8.

and the possibility of finding solutions to problems that before seemed insolvable.»<sup>62</sup>

Now, let's ask again: is IA sufficiently radical to be considered a change in human nature? No. IA up to this point relies upon a vision of present humanity with augments, with tools to increase a person's performance. That is all.

Yet, still more dramatic changes can be projected. Suppose smaller incremental enhancements are introduced but then amplified and re-amplified until they grow exponentially? *These new levels of intelligence could transfer themselves to accelerated computing platforms, such as optical nanocomputers or quantum nanocomputers.* This would allow them to accelerate the brain's thinking speed significantly.

Futurists have called the possibility of such an event the «Singularity». The idea of this singularity implies an impact upon our world that could «exceed that of any other foreseeable technological advance,» says the Accelerating Futures group. «A Singularity, if successful, would create a massive upward spike in the quantity of intelligence here on Earth, a persistent positive-feedback process, continuously enhancing itself. In a favorable scenario, our freedom and potential could be maximized, opening up astonishing new possibilities that might have taken trillions of years for unaided humans to create alone.»<sup>63</sup> We need to ask whether this Singularity scenario might count as an alteration of our human nature. And, if so, is it theologically significant?<sup>64</sup>

Future visions within nanotechnology can become even more dramatic. One postulated sequence goes something like this. First, Artificial Intelligence (AI, distinguishable from IA or intelligence amplification) researchers will simulate human intelligence in a computer, in a

<sup>62</sup> Enhancement Technologies Group. <http://www.ucl.ac.uk/~ucbt/dag/bioethics/layintro.html> (accessed 29 May 2006).

<sup>63</sup> Accelerating Future. <http://www.acceleratingfuture.com/> (accessed 28 May 2006).

<sup>64</sup> One of the first comprehensive catalogs of ethical issues arising from nanobiotechnology can be found in: *Nanoethics: A Brave New World*, ed. by Fritz Allhoff, Patrick Lin, James Moor, and John Weckert. (New York: Wiley, 2007).

robot. Second, humans and machines will merge step by step, replacing portions of our brains with mechanical parts. Third, AI researchers will reduce existing human intelligence to a pattern of information processing and download this into a computer or a robot. Human minds will then live in a machine. This will constitute an evolutionary advance, actually a leap forward that could lead to cybernetic immortality — that is, immortal intelligent life in a machine that gets constant backups.

Ray Kurzweil's vivid imagination tantalizes us once again. He predicts that by the end of the 21<sup>st</sup> century human beings will attain cybernetic immortality. Up until now, he says, our mortality has been tied to the longevity of our hardware. So, when our hardware crashes, our thought processes crash with it. When we instantiate ourselves in our computational technology, our software and hence our immortality will no longer be dependent on the survival of our body. Our immortality will be contingent on our being careful to make frequent backups.<sup>65</sup>

Now, let us pose the reality question. How likely is this to come to pass? Is this a possible future? Computer scientist and theologian, Noreen Herzfeld, has tracked earlier projections of AI achievements since the 1950s. Previous promises have gone unfulfilled. Previous goals have not been reached. Even now in the early 21<sup>st</sup> century, despite enormous progress in computer development, no computer yet in existence

<sup>65</sup> Ray Kurzweil, *The Age of Spiritual Machines* (New York: Viking, 1999), Chapter 6. Ian Barbour is slow to grant the assumption that we can transfer human consciousness to silicon. «I suspect that it will turn out that conscious awareness requires forms of organized complexity or properties of neural cells and networks that have no parallels in silicon-based systems. I do not think we can exclude the possibility of conscious computers on metaphysical grounds, but there may be empirical grounds for the impossibility of computer consciousness ... I am willing to leave this question open.» Ian G. Barbour, «Neuroscience, Artificial Intelligence, and Human Nature», in *Neuroscience and the Person: Scientific Perspectives on Divine Action*, ed. by Robert John Rusecell, Nancey Murphy, Theo C. Meyering, and Michael A. Arbib (Vatican City State and Berkeley CA: Vatican Observatory and CTNS, 1999) 266.

can be deemed intelligent. «While computing in general has advanced dramatically in the last fifty years, advances in AI have been limited. Neural networks remain at a level far below the complexity of the human brain. Current research in neuroscience suggests that the workings of the brain are far more complicated than was initially supposed and may not be capturable in neural net technology as we currently conceive it.»<sup>66</sup> So, when we listen to the extravagant dreams of nanoengineers, we will need to retain cautious judgment as we watch or participate in the experiments.

If projections of a post-human intelligence are unrealistic, what about the ethicist who speculates on a future that is not possible? Would such ethical speculation be a waste of time? Alfred Nordmann at the Institut für Philosophie, Technische Universität in Darmstadt would say, yes, speculative ethics could be misleading. Nordmann distinguishes between nanotechnology that would enhance practical abilities of the present human race from a nanotechnology that would alter human essence. The latter is unlikely; and to invest ethical energy here might divert attention from more present and more urgent concerns. «There are envisioned human enhancement technologies that are subject of much current debate, that are claimed to expand human lifespan, engineer new senses, construct faster information processing and reaction times, introduce new physical and perceptual skills, and finally render us entirely independent of our physical bodies.»<sup>67</sup> Nordmann takes a stance against ethics that speculates on what is not possible in this list. The task of the ethicist, he says, is to press nanotechnology into the service of enhancing our existing humanity.

Are we ready yet for a middle axiom that connects our vision of future health with guidance now that we are looking at an array of nanotech possibilities? Let's try this one on for size: *Encourage nanobiotechnological research aimed at improving human health and well-*

<sup>66</sup> Noreen L. Herzfeld, *In Our Image: Artificial Intelligence and the Human Spirit* (Minneapolis: Fortress Press, 2002) 72-73.

<sup>67</sup> Alfred Nordmann, «If and Then: A Critique of Speculative NanoEthics,» *NanoEthics* 1:1 (2007) 43.

*being, while registering skeptical caution about enhancements that might lead us beyond the pale of what constitutes human personhood.*

## Conclusion

Proleptic ethics begins by projecting a vision of a preferred future. Then it seeks creative opportunities to actualize the vision. When engaged in bioethics, this preferred future takes the form of a vision of a just, sustainable, and healthy society. For the Christian theologian, the proleptic vision is grounded in God's eschatological promise for a new creation replete with redemptive healing. This eschatological promise reminds us that our daily life is dynamic, changing, renewable, and ever open to transformation. Proleptic ethics pursues creative transformation in the confidence that God promises newness and salvation.

The next generation of people within our churches and within our wider society will be confronted by an increased array of choices regarding their genetic and biological futures. Opportunities — more realistically, demands — to influence the genetic make-up of future children will increase. Whether and to what extent genetic and nanotechnological enhancements should be employed will appear on the list of decisions to be made. If Christian bioethicists want to be helpful, they should acknowledge this situation of growing choice and provide guidance in decision making. Bioethicists can be most helpful when they lift up a vision of a just, sustainable, and healthy future for both individuals and our community, and then suggest middle axioms by which today's decisions will contribute to making this vision tomorrow's actuality.

### *Summary:*

*Proleptic ethics* begins by projecting a vision of a preferred future; then it seeks creative opportunities to actualize the vision. Grounded in God's eschatological promise of transformation and new creation, proleptic ethics projects a vision of a just, sustainable, and healthy society. This approach is contrasted with the ethical task according to *stop sign ethics*, which is to identify limits and put up barriers to scientific and technological advance. Stop sign ethics currently dominates the field of bioethics; and it can be identified by its commandment to «stop playing God.» In this essay, which advocates the approach of proleptic ethics, middle axioms connecting the projected vision of a preferred future with present choice and decision making are proposed for four scientific domains: genomics, life extension, stem cell research, and nanotechnology.

