

# Bioethics Past, Present, and Future: Important Signposts in Human Dignity

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As medical research and technological innovations offer more effective means to alleviate suffering, extend and improve the quality of life, and cure many diseases that have plagued human history, we are confronted with evermore complex ethical choices regarding the extent to which we will pursue these interventions. Our age has been identified as the biotech century,<sup>1</sup> given the significance and promise afforded to biotechnology in the medical arena. For many people ethical questions regarding embryonic stem cell research, gene therapy, synthetic biology and therapeutic cloning are a far cry from the early days of medical ethics, when patient care (relationships between patients and healthcare providers), and professionalism among healthcare providers themselves were the dominant ethical concerns.<sup>2</sup> As bioethics has evolved into an interdisciplinary field of engagement, the questions it addresses have expanded well beyond the bounds of initial concerns relevant to the realm of medical ethics. Indeed, as medical research and technological innovations have progressed and accelerated, the very nature of medicine itself is now being questioned. Concerns regarding patient care and the importance of human touch in clinical practice are being replaced by the drive for disease cures and the cold efficiency of protocol and technique.

In this essay, we will traverse the evolving landscape of bioethics beginning with its traditional origin in medical ethics and following it through the complex dilemmas of our contemporary, technologically immersed age. We begin with a survey of the questions and concerns of traditional bioethics. We then move to explore the contemporary and emerging landscape of what we will refer to as Bioethics 2.0. We conclude by examining the opportunities for the Church to engage the broader culture on these important bioethical issues.

## **Classical Bioethics: From Medical Ethics, Reproductive Technology, and End of Life Issues to the Rise of Biotechnology**

Many in the field of bioethics point to a 1962 Life magazine article, entitled “They Decide Who Lives, Who Dies,”<sup>3</sup> as the emergence of public awareness to the concerns of bioethics introduced through the innovation of kidney dialysis. Bioethics as a specialized field of inquiry emerged as a contemporary discipline within a long history of ethical reflection.<sup>4</sup> Though the term “bioethics” is of recent origin, many of the core concepts of bioethics and its historic sibling medical ethics are found in the Hippocratic tradition and the philosophical tradition.

The Hippocratic tradition served as a primary foundation of Western medicine going back to the Oath of Hippocrates in the fourth century B.C. up through the very recent history of medicine, and is still regarded by many as a primary directive of sorts to the medical profession. The Hippocratic Oath, faithfully recited by generations of medical students, is known for its high ideal of medical professionalism and for its famous promotion of the patient’s welfare through the principle of “do no harm.” This oath and the subsequent

tradition of Western medicine that followed in its footsteps held to a principled practice of medicine. When combined with the Judeo-Christian worldview, these combined affirmations yielded an unprecedented regard for the value and dignity of human life. These two affirmations functioned as dominant guidelines for Western medicine until the advent of the modern era in the wake of the Enlightenment.<sup>5</sup>

The eighteenth and nineteenth centuries saw the impact of the scientific revolution<sup>6</sup> in the rise of modern medicine and with it the moral responsibility to ask questions regarding the ethics of care and treatment. In this period of medical advances new questions were asked crossing the boundaries of medicine, philosophy (specifically ethics) and religion (specifically theology). The resulting conversation of medical ethics (and later what became more commonly known as clinical ethics) was born as a field of inquiry.

In the twentieth century, the horrors of World War II and the human rights violations prevalent in the push toward eugenics in Nazi Germany (and in the United States as well, though this often is not as well known),<sup>7</sup> brought greater scrutiny to the medical profession. This scrutiny led to reflections on the responsibility of medical professionals to their patients, greater attention being given to patient autonomy and rights and the importance of informed consent in medical practice. Furthermore, special concern was given to the protection of patients in medical experimentation, which since has evolved into the contemporary concern regarding human subject research ethics.

Etymologically, bioethics refers to the “ethics” of “life” or perhaps more specifically the “ethics of the life sciences,” though early in its usage this term was more directly linked to the medical profession. As scientific research and technological innovation have continued, the broader sense of this term has garnered greater interest expanding the field of inquiry to include ethical questions not directly applicable to the human, such as animal ethics and environmental ethics. As is clear from the term itself, bioethics is a sub-discipline within the broader disciplines of ethics. Specifically, it is a category of applied ethics that reflects upon developments in the life sciences, particularly as these relate to our common humanity. The tension between the practical concerns of bioethics, which tend toward case-based evaluation, and the overarching concerns of theory and methodology has been an ongoing debate within bioethics. This tension has grown more thorns as bioethics has diversified in its interdisciplinary nature. The conversation has expanded to include specialists and practitioners from the academy (philosophers, theologians, as well as research scientists and physicians) and the medical practitioners (physicians, nurses, technicians, etc.) to the legal and policy realm (lawyers, government officials and lobbyists) and even to those in social services and counseling. The diverse interdisciplinary nature of bioethics often has led to the general inability to forge agreements in the public square due to the vast methodological differences and assumptions brought to the table by each of these divergent disciplines.<sup>8</sup>

## Bioethics 1: The Expanding Concerns

Many people have noted that the traditional questions surrounding classical bioethics dealt with the ethics of life and death. Not surprisingly these traditional concerns focused quite heavily upon the beginning and end of life, asking such questions about when human life begins and/or how human life should end. Indeed, these have been noted as the two initial phases of traditional bioethics, which theologian Nigel Cameron referred to as the era of the “making” and “taking” of human life.<sup>9</sup> For ease of reference, we can label these categories “Bioethics 1,” the first era of bioethics, since the categories generally overlap in their timing and find their origins in the early days of bioethics. Cameron proposes a third category which he names the “faking” of human life, which we will examine in the next section of this essay and to which I will refer as “Bioethics 2.0.” As we will see, there is a distinct transition in the changing face of bioethics between these two phases of bioethics.

Bioethics 1 is identified by a series of key medical advances, landmark legislation and court rulings, as well as the subsequent ethical questions they raised. Some of the pivotal medical advances included: the

first successful kidney transplant in 1954, the first amniocentesis in 1966 and the first heart transplant in 1967. In the legal and legislative realms, the Supreme Court decision of *Roe v. Wade* in 1973 and the passage of the first living will law in California in 1976 were equally watershed moments for the nascent field of bioethics.<sup>10</sup> Suddenly unknown questions introduced increasing moral complexity into the care of the patient. These questions included the allocation of scarce organs and lifesaving treatments, the knowledge of abnormalities of children still in the womb, the codification of patient autonomy through the recognition of living wills, and the reproductive rights of a woman's choice.

For many, bioethics has been represented primarily by the abortion debate. This issue more than any other has been a hallmark of Christian bioethics and what became known as the pro-life movement. The longstanding legal and legislative battles in the wake of *Roe v. Wade* have attempted to limit and/or overturn the precedent of the permissibility of abortion. Furthermore, abortion as a bioethical issue is seen by many as a watershed topic since it engages some of the fundamental questions regarding the so-called "right to life" or what is referred to by many as "the sanctity of life."

Relevant questions addressed by abortion include whether humans have inherent value and dignity, as well as the much disputed question of when human life begins,<sup>11</sup> particularly as these are weighed in the context of maternal autonomy, safety and risk. From a Christian bioethical standpoint, key questions regarding human personhood and the theological concept of the image of God are heavily considered. More recent considerations of abortion have focused on the concern for a physician's right of conscience—a position which claims that physicians should not be required to perform (or refer patients for) practices that the physician is ethically opposed to. Recent moves within the obstetric and gynecological credentialing organizations, as well as discussions regarding healthcare reform, have raised this to a prominent concern for many Christian physicians.

Another early bioethical concern alongside abortion was that of contraception and reproductive ethics as a whole. In the wake of the sexual revolution, concerns regarding abortion and contraceptives took on an entirely different quality with the advent of reproductive ethics. Contraception serves in many respects as an extension of the issues reflected in abortion particularly for the use of certain birth control methods (e.g., certain types of oral contraceptives, intrauterine devices, and emergency contraceptives) that demonstrate abortifacient qualities (i.e., allowing fertilization of the egg and the sperm, but either discouraging/preventing implantation of the fertilized egg or expelling it from the uterus). For others more concerned about the implications to sexual ethics as a whole, contraceptives reflect the separation of the sexual activity from procreation.<sup>12</sup> Thus, within the ethical considerations of contraception there are a variety of questions regarding the meaning of sexuality and the appropriateness of the use of any form of artificial birth control. More recently, ethical considerations raised by the development of RU-486 and the "morning after pill" have added professional concerns regarding whether there also exists a right of conscience for pharmacists who do not want to fill prescriptions for known abortifacients.

With the first successful human birth resulting from *in vitro* fertilization (IVF) in 1978, assisted reproductive technologies (also known as "artificial reproductive technologies" or ART) moved the proverbial line of how life begins. Procreation, a concept that had theological ties to the divine role in the origin of children and the miracle of childbirth, was transformed in the face of such beginning of life technologies and procedures. Suddenly we were faced with the question of whether children are begotten or made, in which children become more like products and commodities rather than gifts.<sup>13</sup> Contemporary usage of "reproduction" as the language for childbearing redefined our ideas of how children may be born in terms of products, procedures, and technological categories of efficiency and quality through a firestorm of medical and technological advances. The evolution in reproductive medicine and technology moved from simple procedures (e.g., artificial insemination) to more complex procedures (e.g., IVF), and finally on to the introduction of third party gamete donors (egg and/or sperm) and surrogacy (i.e., the provision of a woman's womb to carry a baby to term for another couple). The expansion of third parties, donors

and surrogates, involved in these reproductive procedures have further complicated marital relationships and the relationship of parents with their children, as well as creating a host of legal and ethical questions surrounding the nexus of children, property rights, and third party donors.

Additional reproductive ethics issues also have arisen in the contemporary context. With the increasing value of human eggs for fertility, concerns have been raised over the exploitation of women through the procurement of eggs by payment for IVF and in some limited cases for research. Furthermore, the explosion of IVF as an unregulated industry in the U.S. has led to a host of questionable practices including the abortive practice of selective reduction due to the unnecessary implantation of too many embryos and the freezing of so-called “excess embryos.” As of 2009, between 400,000 and 1 million embryos sit in a cryogenic equivalent to limbo in U.S. fertility clinics, raising the question of appropriate ends for these embryos (e.g., embryo adoption/donation, termination through unfreezing, destruction through medical/scientific research). The removal of human eggs through IVF and the subsequent fertilization of human embryos outside of the uterus also contributed to a scientific journey that culminates in stem cell research and cloning.

The final classic arena of Bioethics 1 is that of end-of-life issues. As life expectancies were extended through modern medicine, the elderly progressively face the prospect of dying from long-term disease rather than as the result of sudden onset death (e.g., from a heart attack or stroke). While the benefits of extending life are clear, this increasingly extended dying process raises numerous questions such as resource allocation of limited resources, whether artificial nutrition and hydration are essential basic procedures, the appropriateness of withholding and withdrawing certain medical technologies and procedures, and the ethical debates over physician-assisted suicide and euthanasia. As aging research continues to develop, these issues are being replaced in the contemporary arena by those related to radical life extension and immortality research.

While the preceding represents the classic arenas of bioethical discussion, the ongoing realities of limited resources raises a host of healthcare issues related to the philosophy of medicine and competing economic and policy models of medical practice. The continuing pace of medical advances and the rising cost of healthcare have led to significant conversations regarding the allocation of resources and the strained relationship between patients, physicians, and managed care entities. This ranges from clinical ethics and the cost of care, to the structure of medical education, insurance and medical liability, pharmaceutical research and drug prices, and the list goes on.

The mapping of the human genome completed in 2003 was the culmination of a 13-year international project with profound implications and in many ways designates a key transition from Bioethics 1 to Bioethics 2.0. This magnificent achievement has led to fantastic scientific discoveries in the realm of genetics and particularly in understanding human DNA. While early ethical concerns focused on research into genetic therapies, contemporary concern has turned to the rise of genetic testing options, the specter of eugenics, and the possibility of designer babies. Particularly when combined with the advances in ART, these technologies prove to be a dangerous combination. Nearly 90 percent of all babies diagnosed *in utero* with genetic anomalies (especially those with Down syndrome) are now aborted.<sup>14</sup> With the push toward affordable personal genome testing, there also has been rising public anxiety over genetic information and privacy. This concern eventually led to the successful passage of U.S. federal legislation in 2008 that set in place protections from genetic discrimination by employers and health insurance companies. While this legislation was viewed as a success in addressing the concerns of genetic information, it came in the wake of nearly a decade of failed legislative attempts and multiple years beyond the mapping of the human genome itself. This legislative delay serves as a demonstration of how public policy and legislation often lags significantly behind the science and technology.<sup>15</sup> Other bioethical considerations have arisen in that genetic awareness has led to confusion regarding the distinction between genetic predispositions and genetic determinism. This confusion has led many to redefine what it means to be human in a purely materialist reading, reducing humanity to mere automatons of our genetic makeup. Furthermore as genetic

sequences are better understood the older questions of genetic therapies are again on the rise, with their prospects of redefining what it means to be human.

Biotechnology and other emerging technologies serve as the final categories of traditional bioethics and also serve as bridges between Bioethics 1 and Bioethics 2.0. In many respects these are the latest generation of discoveries and “advances” in medical, scientific, and technological research. The most prominent discussions in biotechnology have been those surrounding stem cell research, human cloning, and the creation of animal-human hybrids (also referred to as chimeras or cybrids). Other emerging technological concerns on the horizon include nanotechnology, synthetic life forms, cybernetic technologies, and the rise of human replacement agendas such as transhumanism. Key issues of ethical concern regarding these biotechnologies include the status of the human embryo, the appropriateness and limitations of technological interventions, and the difficulty of discerning the difference between therapy and enhancement.

Much of the public awareness concerning biotechnology has focused on the question of regenerative medicine, with stem cell research receiving the majority of the attention. Stem cell research is divided into two types. Embryonic stem cell (ESC) research, which currently requires the destruction of embryos, receives the majority of the attention but has yet to yield any successful clinical treatments. Non-embryo destructive stem cell research on the other hand includes adult stem cells, which are derived from such sources as bone marrow, fetal tissue, and umbilical cord blood. These adult stem cell sources have proven to be quite beneficial in the successful treatment of a variety of cancers, auto-immune diseases, and blood disorders.<sup>16</sup> Initially, the flexibility of embryonic stem cells was believed to have greater potential for the development of treatments and cures. With the development of induced pluripotent stem cells, which are derived from skin cells or other mature cells and demonstrate the same sort of flexibility of ESC, as well as several studies that are beginning to point to greater flexibility within traditional adult stem cells, many are beginning to question whether it is necessary or even effective to use embryonic stem cells.

## **Bioethics 2.0: The Evolving Terrain of Contemporary Bioethics**

With the advent of the last two categories of technological advances (i.e., genetics and biotechnology) and the issues raised, we discern the departure from Bioethics 1. This transition is not to suggest that the questions raised by Bioethics 1 have ceased or that they have lost their relevance, because they continue to challenge our common humanity on a daily basis. Rather the departure from Bioethics 1 to Bioethics 2.0 is the advent of an entirely new set of questions and issues. The key issues in Bioethics 1 surrounded identifying the following: When does human life begin? When does it end? Does quality of life matter? Are all human beings entitled to special value and dignity? What does this entail? The implications of the decisions tended to be personal and isolated or at least confined to the sphere of personal or familial decision-making while perhaps at the same time being legislated and judged at a societal level.

Bioethics 2.0, however, sees a radical shift in the nature and implications of our ethical questions due to the shift in the very nature of the technologies and their potential impact upon humanity. As science pushes the boundaries on controlling both the beginning and end of life, leaving the marginal cases fewer and much more limited in scope, we are less concerned with when life begins and ends. The impact of these new issues shifts from the person to society with global implications. Even the best intentions, if misplaced, can lead to catastrophic consequences. The challenges of Bioethics 2.0 force us to begin to ask what it means to be human.

The rise of the computer age and the biotech revolution are finding and will find growing convergence in the remaking and commodification of the human. With the predilection of our contemporary society toward technology and science to improve the quality of our lives, resistance against the technological imperative is becoming progressively difficult. As the President’s Council on Bioethics noted in a report, the challenge with these technologies is that they are not likely to be created with nefarious ends in mind.

On the contrary, it is their potential for dual-use, offering simultaneously the power both to treat therapeutically and to enhance, that makes them so very difficult to assess.<sup>17</sup> It is not the danger of parents trying to create a super child that will end in designer babies, but rather the parent who wants the best for their child and tries to secure every genetic advantage possible. It is in those moments when human beings become mere commodities, instruments as means, rather than ends in themselves. With all of these pressures, it is no wonder that author Katherine Hayles assesses the belief of researchers such as Hans Moravec and Michael Dyer that “the age of the human is coming to a close.”<sup>18</sup>

## **Bioengagement: Opportunities for the Church to Engage Culture through Contemporary Bioethics**

Bioethics 2.0 calls for a much more comprehensive strategy to respond to the issues before us. The responses to issues of Bioethics 1 often times have been casuistic, in their attempts to discern proper conduct to difficult decisions. As the concept of being pro-life became a bumper sticker, the justification for human dignity became a vacuous placeholder filled with whatever context one deemed appropriate. The theological moorings of the special value and dignity of life as rooted in the image of God were lost. The lesson learned is that there must be theological substance behind the bioethical positions we take. They must be rooted in thoughtful reflection of Scripture, but also of the technologies themselves. These questions rely on technologies and situations that were inconceivable in biblical times.

We must become adept at understanding the world theologically, moving from convictions regarding what it means to be human and the relationship of humanity both to the rest of creation and to the tools that we make. We cannot live as if these bioethical concerns are the domain of science fiction films and literature. They are genuine concerns, some of which are already here, some still on the horizon, and some still off in the technological distance. This reality demands that the Church must overcome its fear of the technical. Whether it is Bioethics 1 or 2.0, both demand that we establish a basic understanding of the sciences, particularly in biology, if we are to develop informed responses to the new scientific discoveries and technological innovations of our day. This is nowhere more evident than in the discussions over embryonic stem cell research, where so much misinformation is prevalent with both the general public and within the Church.

Bioethics is a sphere in which the Church has great opportunities for engaging the broader culture for a variety of reasons. As mentioned earlier, one primary factor is that bioethics deals at the core of human existence, in all of its frailties and physical imperfections. Additionally, bioethical issues often occur in the context of great personal struggles. These personal times of difficulty are opportunities for care and support, for guidance and the demonstration of love. It is worth highlighting that in 2004 the Lausanne Committee for World Evangelism identified bioethics as one of the 31 most significant issues in the world relevant to the work of evangelism. The opportunities for the Church in bioethics will include such traditional approaches as activism and advocacy, but will also demand education and equipping. The Church must move from being reactive to proactive on these pressing issues of our day.

Furthermore, as Nigel Cameron has noted, Bioethics 2.0 is going to demand both a new pro-life paradigm and a new kind of politics. According to Cameron, this new pro-life paradigm will demand that we must become better at addressing the emerging bioethical questions, which “are of equal gravity to our conscience and our civilization in their threat to the sanctity of human life,”<sup>19</sup> rather than reducing everything down to the issue and politics surrounding abortion.<sup>20</sup> Furthermore, the changing bioethical landscape demands that we make uneasy alliances with those who do not share pro-life sentiments, but care deeply for human dignity after birth and are suspicious of technological interventions.<sup>21</sup> The ability to transcend certain differences in beliefs will be necessary as we consider the impact of these technologies upon our common humanity, for we are merely talking about the future of what it means to be human.

## Additional Suggested Reading

- Bevington, Linda, et al. *Basic Questions on Genetics, Stem Cell Research, and Cloning: Are These Technologies Okay to Use?* (Grand Rapids: Kregel, 2004).
- Kilner, John, and C. Ben Mitchell. *Does God Need Our Help? Cloning, Assisted Suicide, & Other Challenges in Bioethics* (Wheaton, IL: Tyndale, 2003).
- Mitchell, C. Ben, Edmund Pellegrino, Jean Bethke Elshtain, John Kilner, and Scott Rae. *Biotechnology and the Human Good* (Washington, DC: Georgetown University Press, 2007).
- Stewart, Gary, et al. *Basic Questions on End of Life Decisions: How Do We Know What's Right?* (Grand Rapids: Kregel, 1998).
- Stewart, Gary. *Basic Questions on Sexuality and Reproductive Ethics: When Is It Right to Intervene?* (Grand Rapids: Kregel, 1998).
- Stewart, Gary. *Basic Questions on Suicide and Euthanasia: Are They Ever Right?* (Grand Rapids: Kregel, 1998).
- Tada, Joni Eareckson, and Nigel M. de S. Cameron. *How to Be a Christian in a Brave New World* (Grand Rapids: Zondervan, 2006).

## Notes

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1. Jeremy Rifkin, *The Biotech Century: Harness the Gene and Remaking the World* (New York: Putnam, 1999). Indeed, theologian Brent Waters has noted that “technology is the way we live and move and have our being in today’s age.”
2. For a detailed history of bioethics consult Albert Jonsen, *The Birth of Bioethics* (New York: Oxford University Press, 2003).
3. S. Alexander, “They Decide Who Lives, Who Dies,” *Life* 53 (1962): 102–25. Albert Jonsen notes that these two questions along with “who decides?” form the three perennial questions addressed by bioethics. Albert Jonsen, *Bioethics Beyond the Headlines: Who Lives? Who Dies? Who Decides?* (Lanham, MD: Rowman & Littlefield, 2005), 7–8.
4. As a subset of applied or practical ethics, bioethics stands in the lineage of ethical reflection within the philosophical tradition. Simply put, applied ethics are a form of ethics which deals with the application of ethical theory to a particular profession or context. Ethical theory represents the more abstract form of philosophical reflection in ethics, dealing not first and foremost with everyday situations so much as with the bigger picture questions of methodology and overarching theories.
5. The Enlightenment marks a historic period in philosophy roughly beginning with the writings of René Descartes (1596–1650) and concluding with Immanuel Kant (1724–1804). While specifics regarding the precise nature, players, and impact of the Enlightenment are disputed within various academic circles, this period in Western history marked a profound revolution of sorts in ethics, philosophy, politics, religion, and science among other fields.
6. As with the Enlightenment, the scientific revolution is a historical marker in Western thought with a particular interest in the transition from classic theories of science to modern paradigms of science. Notable figures in this transition which spans the sixteenth and seventeenth centuries include: Copernicus, Kepler, Newton, and Galileo.
7. Cf. Edwin Black, *War Against the Weak: Eugenics and America’s Campaign to Create a Master Race* (New York: Four Walls Eight Windows, 2003); Christine Rosen, *Preaching Eugenics: Religious Leaders and the American Eugenics Movement* (New York: Oxford University Press, 2004); Richard Weikart, *From Darwin to Hitler: Evolutionary Ethics, Eugenics, and Racism in Germany* (New York: Palgrave Macmillan, 2004).
8. Cf. H. Tristram Engelhardt, Jr., ed., *Global Bioethics: The Collapse of Consensus* (Salem, MA: Scrivener, 2006). To be sure the methodological differences are not solely to blame in this inability to come to agreement. Since bioethics deals with a variety of questions concerning human life, many of the disagreements lay in fundamental differences in the value and beliefs one attaches to human beings. Thus, it is also a question of worldview.
9. Nigel M. de S. Cameron, “Christian Vision for the Biotech Century” in *Human Dignity in the Biotech Century* (Downers Grove: InterVarsity, 2004), 25–26. According to Cameron, the three phases are Bioethics 1 (the taking of human life), Bioethics 2 (the making of human life), and Bioethics 3 (the faking of human life).
10. Gilbert Meilaender, *Bioethics: A Primer for Christians* (Grand Rapids: Eerdmans, 1996), ix. Christian ethicist C. Ben Mitchell has noted on several occasions that the invention of something as simple as flexible tubing was one of these watershed moments leading to such medical technologies as ventilators and IV lines.

11. Among others the views represented include conception/fertilization, implantation, the point after which twinning can no longer occur, the introduction of the primitive streak, viability, birth, and the development of sentience.
12. This separation of sexual activity from procreation is referred to as the unitive-procreative principle, which holds that all sexual acts must be both unitive (the joining of the couple) and procreative (that there must be no artificial hindrance to the possibility of producing children from the unitive act). Within Christian contexts this is the dominant position of the Roman Catholic Church and is prominent among many Protestants as well.
13. A passing reference to Oliver O'Donovan's classic discussion on this topic, Oliver O'Donovan, *Begotten or Made: Human Procreation and Medical Technique* (New York: Oxford, 1984).
14. Caroline Mansfield, Suellen Hopfer, Theresa Marteau, "Termination Rates after Prenatal Diagnosis of Down Syndrome, Spina Bifida, Anencephaly, and Turner and Klinefelter Syndromes: A Systematic Literature Review" *Prenatal Diagnosis* 19(9): 808–812.
15. Genetic Information Nondiscrimination Act of 2008 (GINA).
16. For the latest information on successful trials utilizing adult stem cell sources consult <http://www.stemcellresearch.org>.
17. President's Council on Bioethics, *Beyond Therapy: Biotechnology and the Pursuit of Happiness* (New York: Harper Collins, 2003), 19–20.
18. N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: University of Chicago Press, 1999), 283. Cf. Hans Moravec, *Robot: Mere Machine to Transcendent Mind* (New York: Oxford University Press, 1999), 134.
19. Cameron, 34.
20. *Ibid.*, 35–37.
21. *Ibid.*, 37–39. Examples of some of these "uneasy alliances" include initiatives such as Hands off Our Ovaries, Institute on Biotechnology & the Human Future, and the recently formed Center for Policy on Emerging Technologies.

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