# The Politics and Philosophy of Anti-Science

David E. Tabachnick
Nipissing University

Earlier this year, the Cambridge-based group the Union of Concerned Scientists (UCS) released a statement accusing the Bush administration in the United States of anti-science practices and policies. They write, "A growing number of scientists, policy makers, and technical specialists both inside and outside the government allege that the current Bush administration has suppressed or distorted the scientific analyses of federal agencies to bring these results in line with administration policy" (2004, 7). They go on to charge the White House with distorting scientific data on a diverse array of issues from global warming to condom use; air pollutants to endangered species; forest health to weapons of mass destruction. They conclude, "There is significant evidence that the scope and scale of the manipulation, suppression, and misrepresentation of science by the Bush administration is unprecedented" (8). Science, they say, is being obstructed for the sake of politics.

I begin this paper by highlighting how this antagonism between science and politics relates to education policy. This is followed by a consideration of another area of administration policy criticized by the Union of Concerned Scientists: stem cell research and therapeutic cloning. I then consider the work of Francis Fukuyama and Leon Kass to help clarify the overarching philosophy that may guide all of these "anti-science" policies.

Actually, instead of one philosophy I argue that it is a strange mix of two philosophies. On the one hand, the administration adopts an Aristotelian view of politics—that the higher goods of politics must subordinate and regulate the lower goods of technology—and, on the other hand, they accept the Heideggerian view of technology—that technology has a dehumanizing effect. But, I as suggest, these two philosophies do not mix easily. In turn, the Bush administration seems to at once embrace all the benefits of technological progress and recoil at the prospect of a society dominated by technological control.

## I

The anti-science position of the Bush administration has an indirect but far reaching affect on the way science is taught in schools. While the formation of

curriculum is done on the state and local levels, federally funded programs have the affect of promoting anti-science education and opening critical discussion of accepted scientific conclusions. For example, the UCS report states:

> Since his tenure as governor of Texas, President George W. Bush has made no secret of his view that sex education should teach teenagers "abstinence only" rather than including information on other ways to avoid sexually transmitted diseases and pregnancy. Unfortunately, despite spending more than $10 million on abstinence-only programs in Texas alone, this strategy has not been shown to be effective at curbing teen pregnancies or halting the spread of HIV and other sexually transmitted diseases (16).

In fact, the rates of teenage pregnancy actually increase when students are not exposed to comprehensive sex education. Beyond the clearly negative impact this program has, "the Bush administration went further by distorting science-based performance measures" (17) and suppressing effective sex education information. Similar efforts have been made on issues such as the link between breast cancer and abortion as well as condom use and HIV/AIDS.

On the surface, the motivation behind this distortion and suppression is political, to "satisfy conservative constituents" (Clymer 2002, 17). This in itself is nothing new. During his 1980 campaign for President, Ronald Reagan called evolution "a scientific theory only" and not "infallible as it was once believed" out of fear that he would alienate the religious right. George W. Bush similarly argued that when it comes to evolution "the jury is still out" (NYT 2000, 29 Oct.).

But, this also suggests that this is more than just an ideological battle or crass political maneuvering. Instead, it is a reflection of the President's deep religious convictions. For example, Bush made it be known that he would not object to the Kansas Board of Education decision in the late 1990s that demanded the state's school districts teach creationism alongside evolution. He explained**, "**people ought to be exposed to different theories as to how the world was formed" (Associated Press 1999, 14 Nov.). And, in recent years, there has been an active effort to challenge the scientific validity of evolution in public schools. The Ohio State Board of Education put forward an amendment to the curriculum that would ask students to "to investigate and critically analyze aspects of evolutionary theory."[1]

**II**

The same religious conviction was also readily apparent in President Bush's original announcement of the moratorium on stem cell research in August of 2001. He said:

> while we must devote enormous energy to conquering disease, it is equally important that we pay attention to the moral concerns raised by the new frontier of human embryo stem cell research. Even the most noble ends do not justify any means…My position on these issues is shaped by deeply held beliefs. I'm a strong supporter of science and technology, and believe they have the potential for incredible good—to improve lives, to save life, to conquer disease. Research offers hope that millions of our loved ones may be cured of a disease and rid of their suffering…And, like all Americans, I have great hope for cures. I also believe human life is a sacred gift from our Creator. I worry about a culture that devalues life, and believe as your President I have an important obligation to foster and encourage respect for life in America and throughout the world (Bush, 2001).

At once he applauds science and technology research but also suggests that the effects of that work represent a potential affront to his own Christian beliefs and the sacredness of human life. These contradictory positions have led to the adoption of an ambiguous middle ground policy on stem cells: allowing the research to continue but only on existing stem cell lines.[2] This policy has angered both opponents and advocates of stem cell research. On the one hand, it takes advantage of stem cells that have already been harvested from embryos where, as Bush says, "the life and death decision has already been made" (2001). Opponents argue that it is immoral to exploit human embryos for the sake of scientific advancement, regardless of any timeline or previous work. On the other hand, researchers and individuals that could benefit from new stem cell derived therapies argue that the United States is being left behind, that there are far too few stem cell lines to engage in effective research.[3] Either way, the policy was intended as a stopgap measure rather than providing a clear direction for stem cell research in the United States.

To be fair, President Bush's impasse may reflect the hesitancy of the rest of the country, if not the world, to fully embrace stem cells, cloning, and other new biotechnologies. There is general agreement that we need time to reflect on and clearly articulate what these technologies will provide, their long-term impact,

and potential dangers. This was the idea behind the creation of the President's Council on Bioethics. In their first major report in July 2002, *Human Cloning and Human Dignity* (HCHD), the council presented recommendations for two types of cloning: reproductive cloning and therapeutic cloning. The council expressed unanimous opposition to reproductive cloning or, what they call, "cloning-to-produce-children." While they recognized some of the potential merits of the technology,[4] they decided that, when considered within the larger context of society, any potentially good outcomes would be far outweighed by wider negative impacts.[5]

Overall, the council's opposition to reproductive cloning did not focus so much on the act of cloning itself but the problems that may arise post-cloning. Questions of long-term health, freedom, family, identity and society were at the forefront. The council recognizes that the cloning debate cannot remain solely focused on technical and safety issues but must also consider the larger societal effects of the technology. Robert Wachbroit, a research scholar at the Institute for Philosophy and Public Policy in Maryland, agrees, writes: "the ethical issues of greatest importance in the cloning debate…do not involve possible failures of cloning technology, but rather the consequences of its success" (1997, 2). Wachbroit argues that the real problems of cloning are philosophical, ethical, political, and social and cannot be addressed on only scientific grounds. The implication is that in order to understand fully the impact of cloning and, it can be assumed, other biotechnologies we must go beyond the expertise of scientists and technologists and include ethicists, philosophers, sociologists, and others to advise on larger issues and dilemmas.

Following this logic, membership on President's Council is divided between a bioethicist, a political philosopher, a professor of Christian Ethics, a neo-conservative columnist, a professor of metaphysics and other distinguished philosophers, law professors, *as well as* medical doctors, biochemists and neuroscientists. And, despite this diversity, they all agreed that reproductive cloning should be banned.

However, the council was spilt on whether to allow therapeutic cloning. In a 10 to 7 decision, they recommended that the original moratorium on federal funding be extended for four more years.[6] In contrast to the thinking that went into their reproductive cloning decision, the council now focused on the harvesting of stem cells rather than the post-cloning, social and political implications. The main issue for many council members was that the cloned embryos must be destroyed

in order to harvest stem cells. In other words, the council split on the rights of the unborn. Therefore, where they thought through the long-term, post-cloning implications of reproductive cloning, there was less consideration of the societal affects of genetic treatments, therapies, and enhancements derived from therapeutic cloning and stem cell research.[7] The debate remained centered on the status of the embryo.[8]

## III

Still, this outcome cannot be understood simply as an extrapolation of the well-established conflict between the "pro-choice" and "pro-life" movements. The work of two of the most well-known and influential council members suggest that there is a deeper set of philosophical concerns that led to the council's recommendations and the White House's policies.

It is not that Francis Fukuyama and Leon Kass espouse anti-science philosophies or are neo-Luddites (although Kass seems to come close at times). Instead, their understanding of politics and technology leads them to at once assume that all technology requires some form of regulation and that the introduction of new technologies represent a threat to human dignity, natural limitations, or the things that define us as human.

In his recent book *Our Posthuman Future: Consequences of the Biotechnology Revolution* (2002b), Francis Fukuyama argues that politicians and legislators must pay more attention to new developments in technology and, more specifically, biotechnology. He writes "countries must regulate the development and use of technology politically, setting up institutions that will discriminate between those technological advances that promote human flourishing, and those that pose a threat to human dignity and well being" (Fukuyama 2002b, 182).

The Bush administration has adopted this thesis: allowing politics to rule over science. Of course, it may seem more sensible to allow scientists and technologists regulate themselves. Arguably, only those that fully understand the technology—who understand what it can and cannot do—are qualified to make decisions about its larger health and social effects. For example, a few years ago the late world-renowned computer scientist Mark Weiser, then the chief technologist at the Xerox Palo Alto Research Center, expressed some alarm at his company's work on "invisible thinking computers." He worried that it might lead

to "dumber people" unable to think for themselves and, by consequence, unable to control technology. Weiser explained:

> Early on we confronted the question of how to do this work most ethically. We concluded that it is vitally important for everyone, scientists and consumers alike, to remain alert to the ethical issues we may face as the world becomes filled with embedded, invisible computers…With a little vigilance and planning, we can reap the benefits of this new technology without compromising our intelligence, our opportunities or our freedom (Weiser 1997, 118).

Here, Weiser seems the person who best understands the full range of dangers and benefits that this new type of computer presents. Most politicians are probably not even aware that this kind of technology exists and that these dangers are on the horizon. A similar example comes from William Joy, co-founder of Sun Microsystems. In an interview on PBS, Joy expressed his concerns about "self-replicating nanotechnology," "If you can let something loose that can make more copies of itself it is very difficult to recall. They are everywhere and make more of themselves. If attacked, they mutate and become immune…That creates the possibility of empowering individuals for extreme evil…Sun has always struggled with being an ethical innovator" (2000). Again, only Joy and a few others have the expertise to understand the full possibilities that this technology presents. In turn, it could be argued that legislators and regulators should heed the advice of people like Weiser and Joy and develop appropriate laws and prohibitions. Conventional thinking suggests that the scientists should lead the politician not, as Fukuyama argues, the other way around.

Still, Fukuyama contends that, while politicians do not necessarily have a sophisticated understanding of science, they do understand the goals which science pursues. That is to say, while scientists and technologists may be experts in technical means, political leaders are the ones who decide on the ends. Scientists can create plutonium but political leaders decide whether it is put into bombs or power plants. Likewise, scientists can develop cloning technology but politicians ultimately decide whether it will be used for reproductive, therapeutic purposes or, perhaps, not all.

While Weiser and Joy have expertise in computer science and robotics, they do not have an authoritative knowledge of social values, morality or ethics. Despite

the fact that they "remain alert to the ethical issues" and that their company is an "ethical innovator," it is wrong to assume that they really understand what it means to be ethical. Consider Robert Oppenheimer's (1954) infamous statement about experiment: "When you see something that is technically sweet you go ahead and do it and you argue about what to do about it only after you have had your technical success. That is the way it was with the atomic bomb." Obviously, Oppenheimer's startling, disturbing admission about the ethical sensibilities of the Manhattan Project scientists cannot be universally applied to all scientists and technologists. Nevertheless, it is true that ethics is not in and of itself the purpose of science and technology. Many unethical things can still be rightly called scientific and technological. Nazi experiments on concentration camp prisoners were evil, horrible, and unethical yet still qualify as science. The same point applies to American radiation experiments on military personnel during the Cold War. Oppenheimer himself came to view atomic and nuclear weaponry as unethical but, despite this, the Bomb is still clearly technology. According to Oppenheimer, technical success is the goal of experiment. Ethics is something else.

Of course, we could just as well argue that ethics is not the goal of politics and that political leaders are in an equally bad position to make ethical judgments about technology or anything else for that matter—they are self-interested, corruptible, and partisan. This being the case, they are in no position to tell anyone what to do. However, Fukuyama has a different idea:

> The case that I will lay out here might be called Aristotelian, not because I am appealing to Aristotle's authority as a philosopher, but because I take his mode of rational philosophical argument about politics and nature as a model for what I hope to accomplish…Aristotle argued, in effect, that human notions of right and wrong—what we today call human rights—were ultimately based on human nature. That is, without understanding how natural desires, purposes, traits, and behaviors fit together into a human whole, we cannot understand human ends or make judgments about right and wrong, good and bad, just and unjust (2002b, 12).

Fukuyama's "case" is Aristotelian because he argues that the politician or statesman best exemplifies an ethical understanding between right and wrong, good and bad, just and unjust, etc. In the Aristotelian model, politics necessarily implies ethics, and the statesman necessarily implies a person of good and ethical

judgment. In both *Ethics* and *Politics*, Aristotle argues that the statesman or *phronimos* is the person with the *greatest* capacity to understand what is ethical and, more importantly, the *most* able to apply that understanding to the laws and policies of the city.

In fact, in the *Politics* he is clear that the intellectual virtue of good judgment or *phronesis* is the exclusive virtue of the statesman— *phronesis*, he writes, is "the only form of goodness which is peculiar to the ruler" (Aristotle 1958, III, iv, §17). In Book VII of the same text, the statesman is described similarly as the person who knows "what is the end or aim to which a good life is directed" (§8). Aristotle's statesman/*phronimos* is not a cobbler, a blacksmith, or a house builder but still understands the ends to which all of these technical crafts aspire: the good and happy life. Likewise, Fukuyama's political leader may not be a geneticist, biochemist, or roboticist but can still judge whether these technologies are directed toward good ends. Because the statesman or *phronimos* understands the ends of the city, human flourishing, and human dignity, they are in the best position to judge what crafts or technologies belong in the city, not the craftsman, scientist or technologist. So, as President, George W. Bush is cast in the role of the Aristotelian *phronimos*, attempting to find a middle way through the contentious cloning debate and the evolution debate but also exercising the power of a statesman to enforce his decision.

Importantly, though, Aristotle's statesman does not hold a fundamental suspicion against technology. The point for Aristotle is that technology is good only when subordinated by higher virtues such as those associated with ethics and politics. In the *Politics*, he is clear that we need the products of *techne* or "technical knowledge" in order to live good and full lives (1958, VII, i, 13) but also writes that "…it is for the sake of the soul that these other things [external goods] are desirable, and should accordingly be desired by every man of good sense — not the soul for the sake of them" (9). This is a warning that external goods, the products of technology, should be used in the service of being a good person and living a good life. In other words, for Aristotle, there is a hierarchy of goods or virtues that makes the higher ends of politics the guiding principles of the lower ends of technical knowledge. Because politics has a higher end, it determines the lower ends of technology rather than the other way around.

Therefore, according to Fukuyama, a great onus is placed upon the judgment of our political leaders to find the right balance between human flourishing and potential affronts to human dignity. This is the same idea expressed by Leon

Kass, the chairman of the Bioethics council, in his 1997 testimony in front of the American Bioethics Advisory Commission, on the subject of cloning:

> You have been asked to give advice on nothing less than whether human procreation is going to remain human, whether children are going to be made rather than begotten, and whether it is a good thing, humanly speaking, to say yes to the road which leads (at best) to the dehumanized rationality of Brave New World. If I could persuade you of nothing else, it would be this: What we have here is not business as usual, to be fretted about for a while but finally to be given our seal of approval, not least because it appears to be inevitable. Rise to the occasion, address the subject in all its profundity, and advise as if the future of our humanity may hang in the balance.[9]

He concludes, "The President has given this Commission a glorious opportunity. In a truly unprecedented way, you can strike a blow for the human control of the technological project, for wisdom, prudence, and human dignity." Kass makes an unequivocal plea to ban reproductive cloning not simply because it is unethical but also because it suggests the loss of "human control" of technology. This is the same premise of the Fukuyama thesis: government and legislators must assert themselves over and *against* the ends of science.

Kass, however, does not limit his concern about technology to the issue of cloning. He also has reservations about organ transplants:

> we have made a start on a road that leads imperceptibly but surely toward a destination that none of us wants to reach…Yet the first step, overcoming reluctance, was defensible on benevolent and rational grounds: save life using organs no longer useful to their owners and otherwise lost to worms. Now, embarked on the journey, we cannot go back…there is neither a natural nor a rational place to stop (1992, 86).

He also raises similar concerns about other "techniques of prolonging life" such as respirators, cardiac pacemakers, artificial kidneys and all forms of genetic engineering (Kass 1976, 297-301). Inspired by such philosophers as Hans Jonas and Martin Heidegger (Mooney 2001; Kass 1993, 3-4), Kass is not so concerned about this or that technology but accepts a certain truth about all technology: technology in its essence represents a potential threat to human dignity.

His opposition to the above set of technologies is reminiscent of Heidegger's infamous statement on the character of technology:

> Agriculture is now a motorized food industry—in essence the same thing as the manufacture of corpses in the gas chambers and extermination camps, the same thing as the blockading and starvation of nations, the same thing as the manufacture of hydrogen bombs.[10]

According to Heidegger, all "technologies" share the same essence. He says in *The Question Concerning Technology,* "the essence of technology is by no means anything technological" (Heidegger 1993, 311). So, rather than being distracted by the many technical differences between diverse technologies, Heidegger asks us to consider the common quality or character of all technologies. In the above passage, Heidegger argues that mass agriculture, the gas chambers of the holocaust, current global politics and the development of weapons of mass destruction all result from a shared conceptualization of the world and nature as standing-reserve (*Bestand*). Rather than accepting that plants, human beings, cultures, or even war have a given nature or essence, technology treats all things as "stuff" to be manipulated. Likewise, it matters not whether it is organ transplants, prosthetic limbs or cloning, biotechnologies are all the same. Heidegger writes, "Everywhere everything is ordered to stand by, to be immediately at hand, indeed to stand there just so that it may be on call for a further ordering" (1993, 332). This includes the ordering of human beings: Heidegger writes, "man…comes to the very brink of a precipitous fall; that is, he comes to the point where he himself will have to be taken as standing-reserve" (332).

In the same essay, Heidegger explains that just as a hydroelectric damn on the River Rhine submerges the Rhine River valley, technology as a whole obscures the rest of existence. Fukuyama also seems to adopt this Heideggerian view of technology. In his short essay "In Defense of Nature, Human and Non-Human," he strikes a Heideggerian tone when he warns, "…the attempt to master human nature through biotechnology will be even more dangerous and consequential than the efforts of industrial societies to master non-human nature through earlier generations of technology" (2002, 30). Again, whether massive coal-mining operations, the construction of the Hoover Dam or genetically modified organisms, all technology is the same: it threatens nature, both human and non-human. In the same piece, Fukuyama goes onto argue that "we use the power of

the state to regulate the way in which technology is developed and deployed…" (31).

Considering both Fukuyama's and Kass's shared belief that biotechnology represents a fundamental threat to human dignity and will lead to a dehumanization, how can they allow for any form of genetic engineering, enhancement or therapy? For them, as for Heidegger, it is all a threat. Likewise, if they also share Heidegger's belief that technology in general threatens nature, both human and non-human, how can they allow for any technological advancement, including knowledge of evolution, sexual transmitted disease or global warming? Of course, Fukuyama and Kass do not call for a prohibition or moratorium on all new technologies and scientific knowledge. The point is that their argument against therapeutic cloning leads to that very conclusion. One cannot distinguish between this or that kind of technology, biotechnology and all other technology; the Heideggerian argument includes all of it.

In the end, the conviction that politics is a higher virtue that can guide society to good ends combined with the idea that technology represents an essential threat to human life leads to a political doctrine permeated with an anti-science stance. This is reflected in the antagonism between politics and science indicative of the Bush administration.

IV

I do not want the above remarks to be taken to mean that I do not support the regulation of science and technology. I believe that specific dangers of biotechnology, for example, are not well understood and therefore demand caution and consideration.

There is no doubt that technology allows humans to control the harshness of nature and gives us the ability to satisfy our needs and mitigate suffering. The concern is that when we are completely ruled by technology, we lose all connection to the natural order in lieu of the prescribed order of technical control. Considering this trade off, the political philosopher Martha Nussbaum writes:

> In a time of deep need, feeling that our very survival is at stake, we may turn ourselves over to a new art. Sometimes this art will simply do what we ask of it, providing efficient instrumental means to the ends that we already have. Sometimes, however…the art will so deeply transform

> ways of life that we will feel that it has created a new type of creature. If, then, we contemplate curing our current ethical diseases by a new art, we must imagine, as well, and with the utmost care, the life that we will live with this new art and the aims and ends that go with it. For we may not want a radical solution, if its cost will be to be no longer human. This would hardly count as saving our lives (1986, 106).

Without some "cure" human life would be harsh and at the mercy of the natural elements. But, with too much medicine, human life will lose all connection to nature. When left unchecked, our efforts to overcome "inhumane" disease and death result in dehumanization. Of course, this is the paradox of technologies such as cloning and genetic engineering. They seem to have unlimited potential to overcome disease and death and yet this cure may come at a cost we are unwilling to pay. Hence, we may choose to embrace suffering and mortality over the alternative.

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[1] According to the Ohio Board of Education's December 2002, Newsletter:

> At its business meeting on Tuesday, December 10, the State Board of Education adopted academic content standards for science and social studies. There was an amendment to the science standards that added a sentence to Grade 10 life science Indicator # 23 and Grade 9—10 Benchmark H. Portions of the indicator and benchmark now read, "Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. The intent of this indicator/benchmark does not mandate the teaching or testing of intelligent design.

[2]He also announced funding for research on umbilical cord placenta, adult and animal stem cells "which do not involve the same moral dilemma."

[3]Days after the policy announcement, The National Academy of Sciences released its report *Stem Cells and the Future of Regenerative Medicine* which maintained that 60 or so stem cell lines permitted to receive federal funds are far too few.

[4]For example, "providing a 'biologically related child' for an infertile or same sex couple; avoiding the risk of genetic disease; securing a genetically identical source of organs; 'replacing' a loved spouse or child who is dying or has died; or producing individuals of great genius, talent or beauty" (HCHD 2002, 78).

[5]For example, the council warns that reproductive cloning might lead to the breakdown of the family (HCHD 2002, 85). They explain, "Procreation as traditionally understood invites acceptance, rather than reshaping, engineering, or designing the next generation. It invites us to accept limits to our control over the next generation."

[6]It has been argued that membership on the Council was stacked against therapeutic cloning (Mooney 2001; Hall 2002). Even when not explicit, as is the case with high-profile Bush supporters like Leon Kass, the chairman of the council, Francis Fukuyama, and Charles Krauthammer, many members of the council had publicly spoken out against all forms of cloning. Council member Robert P. George, for example, writes in the journal *National Review* that harvesting stem cells from human embryos is "grotesquely immoral" and decries any efforts to publicly fund and promote this "injustice" (2001). Council member Mary Ann Glendon is a signatory to the "Statement of the Catholic Leadership Conference on Human Cloning." It reads:

> The CLC endorses the position of President George W. Bush which he stated in his first formal address to the American people: I strongly oppose human cloning, as do most Americans. We recoil at the idea of growing human beings for spare body parts or creating life for our convenience.... Even the most noble ends do not justify any means… The moral justification of any research cannot be based upon the dehumanizing promise that a good end justifies the use of any means necessary. Destroying human life in order to help human life is intrinsically evil (1 November, 2001).

Not long after the report's release, the members on the other side of the debate expressed frustration with the direction the council had taken. Janet D. Rowley, Elizabeth Blackburn, Michael S. Gazzaniga, and Daniel W. Foster, all traditional university scientists, objected to the moratorium. In an open letter, they write:

> The President's Council, composed primarily of academics, now proposes to maintain our ignorance by preventing any research for four more years. That proposal is short-sighted: It will force U.S. scientists who have private funding to stop their research, and it will accelerate the brain drain to more enlightened countries… Our ignorance in this vitally important area is profound, and the potential for meaningful medical advances is very high indeed. To realize that potential, we must remove the current impediments to this critical research. Scientists should become more active in urging Congress to lift the ban and to establish the proposed, broadly constituted regulatory board NOW (2002, 1957).

The frustration of these scientists reflects a broader alienation of the scientific community from the administration. To add more fuel to the fire, on February 27 of this year, Professor Blackburn and William May were told their services would be no longer needed and were dismissed from serving on the council. Blackburn said she believed she was let go because her political views do not match those of the president and of Kass, with whom she has often been at odds at council meetings. "I think this is Bush stacking the council with the compliant," Blackburn said to the Washington Post. Three new members were named to take their places. They include a doctor who has called for

more religion in public life, a political scientist who has spoken out precisely against stem cell research and another who has written about the "threats of biotechnology."

[7]Stem cells research, therapeutic cloning, and genetic enhancement are related but are different things:

> i) Stem cells are cells that have yet to become specialized and have the ability to become any type of cell to form skin, bones, organs or other body parts. They come in three forms: embryonic stem cells, embryonic germ cells and adult stem cells. Embryonic stem cells come from embryos, embryonic germ cells from testes, and adult stem cells can come from bone marrow. Right now, scientists generally agreed that embryonic stem cells have greater plasticity than adult stem cells. In other words, they can develop into more diverse tissues. This is why much of the focus has been on the "embryonic" aspects of stem cell research. In order to harvest embryonic stem cells, an embryo has to be destroyed.
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> ii) A big question then is where the embryos come from. Therapeutic cloning is a technique that produces cloned embryos. It is "therapeutic," rather than reproductive because its sole purpose it to create stem cells not produce a child. The person or patient in need of stem cells would donate a non-egg, non-sperm cell. The DNA from that donated cell would be removed and inserted into a donor egg that has had its own nucleus and DNA removed. The egg with the introduced DNA would act like it had just been fertilized and begin to divide, forming an embryo. Stem cells from that embryo would be removed and cultured to provide the needed tissue.
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> There are some obvious controversies associated with this practice. Opponents object to the creation of a pre-human life for the expressed purpose to destroy that life. To avoid the controversy associate with "therapeutic cloning," an alternative source for stem cells has been suggested. Unused embryos, for example, are left over from in-vitro-fertilization (IVF) sit frozen in vats and will likely be disposed of anyhow. However, the most promising aspect of stem cell research is the elimination of tissue and organ rejection. Unless the stem cells are harvested from the patient's own genetic material, the problem of rejection remains. As of now, therapeutic cloning is the only way to harvest matching stem cells that will develop into organs and be used to repair damaged or defective tissue in the parent of the cloned cells.
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> iii) Genetic enhancement technology is "any technology that directly alters the expression of genes that are already present in humans, or that involves the addition of genes that have not previously appeared within the human population (including plant, animal, or custom-designed genes), for the purpose of human physical, intellectual, psychological, or moral improvement" (Baylis and Robert 2004, 15). Under this definition, both stem cell research and therapeutic cloning are part of the larger project of genetic enhancement. Importantly, though, the idea here is not simply to treat sickness or disease but to enhance abilities and capacities: physical performance, intellectual prowess, you name it. Therefore, perfectly healthy people may seek out genetic enhancement: not as a treatment but as a lifestyle choice.

[8] Many bioethicists seek an "ethical bypass" (Mahowald and Mahowald 2002) out of this debate. A promising way out is adult stem cell research. Marlyn Coors writes, "…the challenge lies in making cells derived from adult stem cells function effectively. If this hurdle can be overcome, adult stem cells promise to be a practical, efficient, and therapeutic option that avoids the ethical problems associated with the therapeutic cloning" (Almeida-Porada, 2001, 306). Harvesting adult stem cells from blood, bone marrow, or tissue does not require the creation or destruction on embryo. Just as we give blood or tissue for medical tests for the benefit of our own health, we will provide stem cells for the development of therapies and organs. But, as it stands, therapeutic cloning is the best way to get stem cells.

[9] It is not without its irony that the term "dehumanization" has its origins in Marxist ideas of manual labourers becoming cogs in the machine of capitalism or industrial society However, Kass is not using the term in this sense. He is not saying that the capitalist establishment or industrialists are oppressing and thus dehumanizing a certain class or group of citizens. Instead, Kass seems to think that technology is itself or by itself devaluing the quality of all human life. "Dehumanization" is also associated with existentialists and critical theorists such as Søren Kierkegaard, Arthur Schopenhauer, Jean-Paul Sartre, Frantz Fannon, Simone de Beauvoir, and Theodore Adorno.

[10]The passage itself is from an unpublished cycle of four lectures on technology Heidegger gave in 1949. It was first quoted in Wolfgang Schirmacher's *Technik und Gelassensheit*. Freiburg: Alber, 1983.