Reviewing recent developments in the animal rights movement, Damon Linker, in "Rights for Rodents," *Commentary* (April 2001), concludes, "Can anyone really doubt that, were the misanthropic agenda of the animal-rights movement actually to succeed, the result would be an increase in man's inhumanity, to man and animal alike? In the end, fostering our age-old 'prejudice' in favor of human dignity may be the best thing we can do for animals, not to mention for ourselves." An editorial in *Lancet* (September 4, 2004), "Animal Research Is a Source of Human Compassion, Not Shame," insists that the use of animals in biomedical research is both an essentially humanistic endeavor and necessary. Assistant professor of anesthesiology and radiology at the University of Pittsburgh Stuart Derbyshire writes in "Vivisection: Put Human Welfare First," *Spiked-Online* (June 1, 2004), that the use of animals in research is justified by the search for knowledge, not just the search for medical treatments, and reflects a moral choice to put humans first. John J. Miller, "In the Name of the Animals," *National Review* (July 3, 2006), equates U.S. animal rights activists to terrorists and says that their activities delay or prevent medical progress and disrupt the nation's economy. This view has resulted in legislation designed to fight "animal activist extremism by closing loopholes and increasing penalties in federal law dealing with criminal acts against animal enterprises [including] animal research organizations, farms, zoos and pet stores"; see "Anti-Terrorism Bill Passes," *DVM: The Newsmagazine of Veterinary Medicine* (January 2007).

Charles Colson and Anne Morse agree that the animal rights movement assaults human dignity in "Taming Beasts," *Christianity Today* (April 2003). Yet the idea that animals have rights too continues to gain ground. Steven M. Wise finds in *Drawing the Line: Science and the Case for Animal Rights* (Perseus, 2002) that there is a spectrum of mental capacities for different species, which supports the argument for rights. Niall Shanks, in "Animal Rights in the Light of Animal Cognition," *Social Alternatives* (Summer 2003) considers the moral/philosophical justifications for animal rights and stresses the question of consciousness. Jim Motavalli, in "Rights from Wrongs," *E Magazine* (March/April 2003), describes with approval the movement toward giving animals legal rights (though not necessarily human rights). Erin E. Williams and Margo Demello, *Why Animals Matter: The Case for Animal Protection* (Prometheus, 2007), link the mistreatment of animals in labs, slaughterhouses, and other venues with the mistreatment of immigrants and workers.

You can find the benefits of the use of animals discussed on a number of Web sites. Begin with Americans for Medical Progress (http://www.amprogress.org). For lists of specific benefits, visit Michigan State University at http://www.msu.edu/unit/ular/biomed/biomed_index.htm and the Pennsylvania Society for Biomedical Research at http://www.psbr.org/society/ABOUT.htm.

ISSUE 19

Is It Ethically Permissible to Clone Human Cells?

YES: Julian Savulescu, from "Should We Clone Human Beings? Cloning as a Source of Tissue for Transplantation," *Journal of Medical Ethics* (April 1, 1999)

NO: David van Gend, from "Prometheus, Pandora, and the Myths of Cloning," *Human Life Review* (Summer/Fall 2006)

ISSUE SUMMARY

YES: Julian Savulescu, director of the Ethics Program of the Murdoch Institute at the Royal Children's Hospital in Melbourne, Australia, argues that it is not only permissible but morally required to use human cloning to create embryos as a source of tissue for transplantation.

NO: Physician David van Gend argues that not only is the cloning of embryonic stem cells morally indefensible, but recent progress with adult stem cells makes it unnecessary as well.

In February 1997 Ian Wilmut and Keith H. S. Campbell of the Roslin Institute in Edinburgh, Scotland, announced that they had cloned a sheep by transferring the gene-containing nucleus from a single cell of an adult sheep's mammary gland into an egg cell whose own nucleus had been removed and discarded. The resulting combination cell then developed into an embryo and eventually a lamb in the same way a normal egg cell does after being fertilized with a sperm cell. That lamb, named Dolly, was a genetic duplicate of the ewe from which the udder cell's nucleus was taken. Similar feats had been accomplished years before with fish and frogs, and mammal embryos had previously been split to produce artificial twins. It was not long before researchers successfully cloned monkeys and other animals. But the reactions of the media, politicians, ethicists, and lay-people have been largely negative. Dr. Donald Bruce, director of the Church of Scotland's Society, Religion and Technology Project, for example, has argued at some length about how "nature is not ours to do exactly what we like with."

Many people seem to agree. In 1994 the U.S. National Advisory Board on Ethics in Reproduction called the whole idea of cloning oneself "bizarre . . . narcissistic and ethically impoverished." Arthur Caplan, director of the Center for Bioethics at the University of Pennsylvania, wonders, "What is the ethical purpose of even trying?" Conservative columnist George Will asks whether humans are now uniquely endangered since "the great given—a human being is the product of the union of a man and a woman—is no longer a given" and "humanity is supposed to be an endless chain, not a series of mirrors." Leon R. Kass, "The Wisdom of Repugnance," *The New Republic* (June 2, 1997), argues that human cloning is "so repulsive to contemplate" that it should be prohibited entirely.

Others go further. President Bill Clinton asked the National Bioethics Advisory Commission (see http://bioethics.georgetown.edu/nbac/), chaired by Harold T. Shapiro, president of Princeton University, to investigate the implications of this "stunning" research and to issue a final report by the end of May 1997. He also barred the use of U.S. funds to support work on human cloning. The commission's report called for extending the ban and called any attempt to clone a human "morally unacceptable" for now. Many countries besides the United States agreed, and bans on cloning research were widely imposed.

Yet, says J. Madeleine Nash in "The Case for Cloning," *Time* (February 9, 1998), "hasty legislation could easily be too restrictive." Cloning could serve a great many useful purposes, and further development of the technology could lead to much less alarming procedures, such as growing replacement organs within a patient's body. See Arlene Judith Klotzko, "We Can Rebuild . . . ," *New Scientist* (February 27, 1999). Some of these benefits were considered when George Washington University researchers, using nonviable embryos, demonstrated that single cells could be removed from human embryos and induced to grow into new embryos. If permitted to develop normally, the cells would grow into genetically identical adults. The resulting adults would be duplicates, but only of each other (like identical twins), not of some preexisting adult.

Did Dolly represent something entirely new? For the very first time, it seemed more than science fiction to say it might soon be possible to duplicate an adult human, not just an embryo. But when ethicist John A. Robertson spoke at the National Bioethics Advisory Commission conference held in Washington, D.C., March 13–14, 1997, he said, "At this early stage in the development of mammalian cloning a ban on all human cloning is both imprudent and unjustified. Enough good uses can be imagined that it would be unwise to ban all cloning and cloning research because of vague and highly speculative fears."

In the following selection, Julian Savulescu argues, in part, that because cloned embryos have no moral value beyond that of the cells from which they are cloned, and because human suffering can be relieved, it is not only permissible but morally required to use human cloning to create embryos as a source of tissue for transplantation.

In the second selection, physician David van Gend takes strong exception to the idea that embryos—cloned or not—have no moral value. The cloning of embryonic stem cells, he says, is morally indefensible. In addition, recent progress with adult stem cells makes it unnecessary.

YES

Julian Savulescu

Should We Clone Human Beings?

Introduction

When news broke in 1997 that Ian Wilmut and his colleagues had successfully cloned an adult sheep, there was an ill-informed wave of public, professional and bureaucratic fear and rejection of the new technique. Almost universally, human cloning was condemned. Germany, Denmark and Spain have legislation banning cloning; Norway, Slovakia, Sweden and Switzerland have legislation implicitly banning cloning. Some states in Australia, such as Victoria, ban cloning. There are two bills before congress in the US which would comprehensively ban it. There is no explicit or implicit ban on cloning in England, Greece, Ireland or the Netherlands, though in England the Human Embryology and Fertilisation Authority, which issues licences for the use of embryos, has indicated that it would not issue any licence for research into "reproductive cloning." This is understood to be cloning to produce a fetus or live birth. Research into cloning in the first 14 days of life might be possible in England.

There have been several arguments given against human reproductive cloning:

1. It is liable to abuse.
2. It violates a person's right to individuality, autonomy, selfhood, etc.
3. It violates a person's right to genetic individuality (whatever that is—identical twins cannot have such a right).
4. It allows eugenic selection.
5. It uses people as a means.
6. Clones are worse off in terms of wellbeing, especially psychological wellbeing.
7. There are safety concerns, especially an increased risk of serious genetic malformation, cancer or shortened lifespan.

There are, however, a number of arguments in favour of human reproductive cloning. These include:

1. General liberty justifications.
2. Freedom to make personal reproductive choices.
3. Freedom of scientific enquiry.
4. Achieving a sense of immortality.

From Julian Savulescu, "Should We Clone Human Beings? Cloning as a Source of Tissue for Transplantation," *Journal of Medical Ethics*, vol. 25, no. 2 (April 1, 1999).

5. Eugenic selection (with or without gene therapy/enhancement).
6. Social utility—cloning socially important people.
7. Treatment of infertility (with or without gene therapy/enhancement).
8. Replacement of a loved dead relative (with or without gene therapy/enhancement).
9. "Insurance"—freeze a split embryo in case something happens to the first: as a source of tissue or as replacement for the first.
10. Source of human cells or tissue.
11. Research into stem cell differentiation to provide an understanding of aging and oncogenesis.
12. Cloning to prevent a genetic disease.

The arguments against cloning have been critically examined elsewhere and I will not repeat them here. Few people have given arguments in favour of it. Exceptions include arguments in favour of 7–12, with some commentators favouring only 10–11 or 11–12. Justifications 10–12 (and possibly 7) all regard cloning as a way of treating or avoiding disease. These have emerged as arguably the strongest justifications for cloning. This paper examines 10 and to some extent 11.

Human Cloning as a Source of Cells or Tissue

Cloning is the production of an identical or near-identical genetic copy. Cloning can occur by fission or fusion. Fission is the division of a cell mass into two equal and identical parts, and the development of each into a separate but genetically identical or near-identical individual. This occurs in nature as identical twins.

Cloning by fusion involves taking the nucleus from one cell and transferring it to an egg which has had its nucleus removed. Placing the nucleus in the egg reprogrammes the DNA in the nucleus to replicate the whole individual from which the nucleus was derived: nuclear transfer. It differs from fission in that the offspring has only one genetic parent, whose genome is nearly identical to that of the offspring. In fission, the offspring, like the offspring of normal sexual reproduction, inherits half of its genetic material from each of two parents. Henceforth, by "cloning," I mean cloning by fusion.

Human cloning could be used in several ways to produce cells, tissues or organs for the treatment of human disease.

Human Cloning as a Source of Multipotent Stem Cells

In this paper I will differentiate between totipotent and multipotent stem cells. Stem cells are cells which are early in developmental lineage and have the ability to differentiate into several different mature cell types. Totipotent stem cells are very immature stem cells with the potential to develop into any of the mature cell types in the adult (liver, lung, skin, blood, etc). Multipotential stem cells are more mature stem cells with the potential to develop into different mature forms of a particular cell lineage, for example, bone marrow stem cells can form either white or red blood cells, but they cannot form liver cells.

Multipotential stem cells can be used as

1. a vector for gene therapy.
2. cells for transplantation, especially in bone marrow.

Attempts have been made to use embryonic stem cells from other animals as vectors for gene therapy and as universal transplantation cells in humans. Problems include limited differentiation and rejection. Somatic cells are differentiated cells of the body, and not sex cells which give rise to sperm and eggs. Cloning of somatic cells from a person who is intended as the recipient of cell therapy would provide a source of multipotential stem cells that are not rejected. These could also be vectors for gene therapy. A gene could be inserted into a somatic cell from the patient, followed by selection, nuclear transfer and the culture of the appropriate clonal population of cells in vitro. These cells could then be returned to the patient as a source of new tissue (for example bone marrow in the case of leukaemia) or as tissue without genetic abnormality (in the case of inherited genetic disease). The major experimental issues which would need to be addressed are developing clonal stability during cell amplification and ensuring differentiation into the cell type needed. It should be noted that this procedure does not necessarily involve the production of a multicellular embryo, nor its implantation in vivo or artificially. (Indeed, cross-species cloning—fusing human cells with cow eggs—produces embryos which will not develop into fetuses, let alone viable offspring.)

A related procedure would produce totipotent stem cells which could differentiate into multipotent cells of a particular line or function, or even into a specific tissue. This is much closer to reproductive cloning. Embryonic stem cells from mice have been directed to differentiate into vascular endothelium, myocardial and skeletal tissue, haemopoietic precursors and neurons. However, it is not known whether the differentiation of human totipotent stem cells can be controlled in vitro. Unlike the previous application, the production of organs could involve reproductive cloning (the production of a totipotent cell which forms a blastomere), but then differentiates into a tissue after some days. Initially, however, all early embryonic cells are identical. Producing totipotent stem cells in this way is equivalent to the creation of an early embryo.

Production of Embryo/Fetus/Child/Adult as a Source of Tissue

An embryo, fetus, child or adult could be produced by cloning, and solid organs or differentiated tissue could be extracted from it.

Cloning as Source of Organs, Tissue and Cells for Transplantation

The Need for More Organs and Tissues

Jeffrey Platts reports: "So great is the demand that as few as 5% of the organs needed in the United States ever become available." According to David K C

Cooper, this is getting worse: "The discrepancy between the number of potential recipients and donor organs is increasing by approximately 10–15% annually." Increasing procurement of cadaveric organs may not be the solution. Anthony Dorling and colleagues write:

> "A study from Seattle, USA, in 1992 identified an annual maximum of only 7,000 brain dead donors in the USA. Assuming 100% consent and suitability, these 14,000 potential kidney grafts would still not match the numbers of new patients commencing dialysis each year. The clear implication is that an alternative source of organs is needed."

Not only is there a shortage of tissue or organs for those with organ failure, but there remain serious problems with the compatibility of tissue or organs used, requiring immunosuppressive therapy with serious side effects. Using cloned tissue would have enormous theoretical advantages, as it could be abundant and there is near perfect immunocompatibility.

There are several ways human cloning could be used to address the shortfall of organs and tissues, and each raises different ethical concerns.

1. Production of Tissue or Cells Only by Controlling Differentiation

I will now give an argument to support the use of cloning to produce cells or tissues through control of cellular differentiation.

The fate of one's own tissue. Individuals have a strong interest or right in determining the fate of their own body parts, including their own cells and tissues, at least when this affects the length and quality of their own life. A right might be defended in terms of autonomy or property rights in body parts.

This right extends (under some circumstances) both to the proliferation of cells and to their transmutation into other cell types (which I will call the Principle of Tissue Transmutation).

Defending the Principle of Tissue Transmutation

Consider the following hypothetical example:

Lucas I Lucas is a 22-year-old man with leukaemia. The only effective treatment will be a bone marrow transplant. There is no compatible donor. However, there is a drug which selects a healthy bone marrow cell and causes it to multiply. A doctor would be negligent if he or she did not employ such a drug for the treatment of Lucas's leukaemia. Indeed, there is a moral imperative to develop such drugs if we can and use them. Colony-stimulating factors, which cause blood cells to multiply, are already used in the treatment of leukaemia, and with stored marrow from those in remission in leukaemia before use for reconstitution during relapse.

Lucas II In this version of the example, the drug causes Lucas's healthy skin cells to turn into healthy bone marrow stem cells. There is no relevant moral difference between Lucas I and II. We should develop such drugs and doctors would be negligent if they did not use them.

If this is right, there is nothing problematic about cloning to produce cells or tissues for transplantation by controlling differentiation. All we would be doing is taking, say, a skin cell and turning on and off some components of the total genetic complement to cause the cell to divide as a bone marrow cell. We are causing a differentiated cell (skin cell) to turn directly into a multipotent stem cell (bone marrow stem cell).

Are there any objections? The major objection is one of practicality. It is going to be very difficult to cause a skin cell to turn *directly* into a bone marrow cell. There are also safety considerations. Because we are taking a cell which has already undergone many cell divisions during terminal differentiation to give a mature cell such as a skin cell, and accumulated mutations, there is a theoretical concern about an increased likelihood of malignancy in that clonal population. However, the donor cell in these cases is the same age as the recipient (exactly), and a shorter life span would not be expected. There may also be an advantage in some diseases, such as leukaemia, to having a degree of incompatibility between donor and recipient bone marrow so as to enable the donor cells to recognise and destroy malignant recipient cells. This would not apply to non-malignant diseases in which bone marrow transplant is employed, such as the leukodystrophies. Most importantly, all these concerns need to be addressed by further research.

Lucas IIA In practice, it is most likely that skin cells will not be able to be turned directly into bone marrow cells: there will need to be a stage of totipotency in between. The most likely way of producing cells to treat Lucas II is via the cloning route, where a skin cell nucleus is passed through an oocyte to give a totipotent cell. The production of a totipotent stem cell is the production of an embryo.

Production of an embryo as a source of cells or tissues. There are two ways in which an embryo could be a source of cells and tissues. Firstly, the early embryonic cells could be made to differentiate into cells of one tissue type, for example, bone marrow. Secondly, differentiated cells or tissues from an older embryo could be extracted and used directly.

Are these permissible?

In England, the Royal Society has given limited support to cloning for the purposes of treating human disease. The Human Genetics Advisory Commission (HGAC) defines this as "therapeutic cloning," differentiating it from "reproductive cloning." Both bodies claim that embryo experimentation in the first 14 days is permitted by English law, and question whether cloning in this period would raise any new ethical issues.

Cloning in this circumstance raises few ethical issues. What is produced, at least in the first few days of division after a totipotent cell has been produced from an adult skin cell, is just a skin cell from that person with an altered gene expression profile (some genes turned on and some turned off). In one way, it is just an existing skin cell behaving differently from normal

skin cells, perhaps more like a malignant skin cell. The significant processes are ones of *cellular multiplication* and later, *cellular differentiation.*

If this is true, why stop at research at 14 days? Consider the third version of the Lucas case:

Lucas III The same as Lucas IIA, but in this case, Lucas also needs a kidney transplant. Therefore, in addition to the skin cell developing blood stem cells (via the embryo), the process is adjusted so that a kidney is produced.

The production of another tissue type or organ does not raise any new relevant ethical consideration. Indeed, if Lucas did not need the kidney, it could be used for someone else who required a kidney (if, of course, in vitro maturation techniques had been developed to the extent that a functioning organ of sufficient size could be produced).

Consider now:

Lucas IV In addition to the blood cells, all the tissue of a normal human embryo is produced, organised in the anatomical arrangement of an embryo. This (in principle) might or might not involve development in a womb. For simplicity, let us assume that this occurs in vitro (though this is impossible at present).

Is there any morally relevant difference from the previous versions? It is not relevant that many different tissues are produced rather than one. Nor is the size of these tissues or their arrangement morally relevant. If there is a difference, it must be that a special kind of tissue has been produced, or that some special relationship develops between existing tissues, and that a morally significant entity then exists. When does this special point in embryonic development occur?

The most plausible point is some point during the development of the brain. There are two main candidates:

1. when tissue differentiates and the first identifiable brain structures come into existence as the neural plate around day 19.
2. when the brain supports some morally significant function: consciousness or self-consciousness or rational self-consciousness. The earliest of these, consciousness, does not occur until well into fetal development.

On the first view, utilisation of cloning techniques in the first two weeks to study cellular differentiation is justifiable. The most defensible view, I believe, is that our continued existence only becomes morally relevant when we become self-conscious. (Of course, if a fetus can feel pain at some earlier point, but is not self-conscious, its existence is morally relevant in a different way: we ought not to inflict unnecessary pain on it, though it may be permissible to end its life painlessly.) On this view, we should use the drug to cause Lucas IV's skin cells to transmutate and remove bone marrow from these. What is going on in Lucas IV is no different, morally speaking, from cloning. If this is right, it is justifiable to extract differentiated tissues from young fetuses which have been cloned. . . .

I cannot see any intrinsic morally significant difference between a mature skin cell, the totipotent stem cell derived from it, and a fertilised egg. They are all cells which could give rise to a person if certain conditions are obtained. (Thus, to claim that experimentation on cloned embryos is acceptable, but the same experimentation on non-cloned embryos is not acceptable, because the former are not embryos but totipotent stem cells, is sophistry.)

Looking at cloning this way exposes new difficulties for those who appeal to the potential of embryos to become persons and the moral significance of conception as a basis for opposition to abortion. If all our cells could be persons, then we cannot appeal to the fact that an embryo could be a person to justify the special treatment we give it. Cloning forces us to abandon the old arguments supporting special treatment of fertilised eggs.

Production of a Fetus

If one believes that the morally significant event in development is something related to consciousness, then extracting tissue or organs from a cloned fetus up until that point at which the morally relevant event occurs is acceptable. Indeed, in law, a legal persona does not come into existence until birth. At least in Australia and England, abortion is permissible throughout fetal development.

Production of a Child or Adult as a Source of Cells or Tissues

Like the production of a self-conscious fetus, the production of a cloned child or adult is liable to all the usual cloning objections, together with the severe limitations on the ways in which tissue can be taken from donors for transplantation.

Many writers support cloning for the purposes of studying cellular differentiation because they argue that cloning does not raise serious new issues above those raised by embryo experimentation. Such support for cloning is too limited. On one view, there is no relevant difference between early embryo research and later embryo/early fetal research. Indeed, the latter stand more chance of providing viable tissue for transplantation, at least in the near future. While producing a cloned live child as a source of tissue for transplantation would raise new and important issues, producing embryos and early fetuses as a source of tissue for transplantation may be morally obligatory.

Consistency

Is this a significant deviation from existing practice?

1. Fetal Tissue Transplantation

In fact, fetal tissue has been widely used in medicine. Human fetal thymus transplantation is standard therapy for thymic aplasia or Di George's syndrome. It has also been used in conjunction with fetal liver for the treatment of subacute combined immunodeficiency.

Human fetal liver and umbilical cord blood have been used as a source of haematopoietic cells in the treatment of acute leukaemia and aplastic anaemia. Liver has also been used for radiation accidents and storage disorders. The main problem has been immune rejection.

One woman with aplastic anaemia received fetal liver from her own 22-week fetus subsequent to elective abortion over 20 years ago.

Fetal brain tissue from aborted fetuses has been used as source of tissue for the treatment of Parkinson's disease. Neural grafts show long term survival and function in patients with Parkinson's disease, though significant problems remain.

Fetal tissue holds promise as treatment for Huntington's disease, spinal cord injuries, demyelinating disorders, retinal degeneration in retinitis pigmentosa, hippocampal lesions associated with temporal lobe epilepsy, cerebral ischaemia, stroke and head injury, and beta thalassemia in utero using fetal liver. Fetal pancreas has also been used in the treatment of diabetes.

Fetal Tissue Banks

Indeed, in the US and England, fetal tissue banks exist to distribute fetal tissues from abortion clinics for the purposes of medical research and treatment. In the US, the Central Laboratory for Human Embryology in Washington, the National Diseases Research Interchange, and the International Institute for the Advancement of Medicine and the National Abortion Federation, all distribute fetal tissue.

In the UK, the Medical Research Council's fetal tissue bank was established in 1957 and disperses about 5,000 tissues a year.

2. Conception of a Non-Cloned Child as a Source of Bone Marrow: Ayala Case

Not only has fetal tissue been used for the treatment of human disease, but human individuals have been deliberately conceived as a source of tissue for transplantation. In the widely discussed Ayala case, a 17-year-old girl, Anissa, had leukaemia. No donor had been found in two years. Her father had his vasectomy reversed with the intention of having another child to serve as a bone marrow donor. There was a one in four chance the child would be compatible with Anissa. The child, Marissa, was born and was a compatible donor and a successful transplant was performed.

A report four years later noted: "Marissa is now a healthy four-year-old, and, by all accounts, as loved and cherished a child as her parents said she would be. The marrow transplant was a success, and Anissa is now a married, leukaemia-free, bank clerk."

Assisted reproduction (IVF) has been used to produce children to serve as bone marrow donors. It is worth noting that had cloning been available, there would have been a 100% chance of perfect tissue compatibility and a live child need not have been produced.

Objections

While there are some precedents for the proposal to use cloning to produce tissue for transplantation, what is distinctive about this proposal is that human tissue will be: (i) cloned and (ii) deliberately created with abortion in mind. This raises new objections.

Abortion Is Wrong

Burtchaell, a Catholic theologian, in considering the ethics of fetal tissue research, claims that abortion is morally wrong and that fetal tissue cannot be used for research because no one can give informed consent for its use and to use it would be complicity in wrongful killing. He claims that mothers cannot consent: "The flaw in this claim [that mothers can consent] is that the tissue is from within her body but is the body of another, with distinct genotype, blood, gender, etc." Claims such as those of Burtchaell are more problematic in the case of cloning. If the embryo were cloned from the mother, it would be of the same genotype as her, and, arguably, one of her tissues. Now at some point a cloned tissue is no longer just a tissue from its clone: it exists as an individual in its own right and at some point has interests as other individuals do. But the latter point occurs, I believe, when the cloned individual becomes self-conscious. The presence or absence of a distinct genotype is irrelevant. We are not justified in treating an identical twin differently from a non-identical twin because the latter has a distinct genotype.

In a society that permits abortion on demand, sometimes for little or no reason, it is hard to see how women can justifiably be prevented from aborting a fetus for the purpose of saving someone's life. And surely it is more respectful of the fetus, if the fetus is an object of respect, that its body parts be used for good rather than for no good purpose at all.

It Is Worse to Be a Clone

Some have argued that it is worse to be a clone. This may be plausible in the sense that a person suffers in virtue of being a clone—living in the shadow of its "parent," feeling less like an individual, treated as a means and not an end, etc. Thus cloning in the Ayala case would raise some new (but I do not believe overwhelming) issues which need consideration. But cloning followed by abortion does not. I can't make any sense of the claim that it is worse to be a cloned cell or tissue. These are not the things we ascribe these kinds of interests to. Cloning is bad when it is bad for a person. Likewise, arguments regarding "instrumentalisation" apply to persons, and not to tissues and cells.

Creating Life with the Intention of Ending It to Provide Tissue

Using cloning to produce embryos or fetuses as a source of tissue would involve deliberately creating life for the purposes of destroying it. It involves intentionally killing the fetus. This differs from abortion where women do not intend to become pregnant for the purpose of having an abortion.

Is it wrong deliberately to conceive a fetus for the sake of providing tissue? Most of the guidelines on the use of fetal tissue aim to stop women having children just to provide tissues. The reason behind this is some background belief that abortion is itself wrong. These guidelines aim to avoid moral taint objections that we cannot benefit from wrong-doing. More importantly, there is a concern that promoting some good outcome from abortion would encourage abortion. However, in this case, abortion would not be encouraged because this is abortion in a very special context: it is abortion of a *cloned* fetus for medical purposes.

But is it wrong deliberately to use abortion to bring about some good outcome?

In some countries (for example those in the former Eastern bloc), abortion is or was the main available form of birth control. A woman who had intercourse knowing that she might fall pregnant, in which case she would have an abortion, would not necessarily be acting wrongly in such a country, if the alternative was celibacy. When the only way to achieve some worthwhile end–sexual expression–is through abortion, it seems justifiable.

The question is: is the use of cloned fetal tissue the best way of increasing the pool of transplantable tissues and organs?

An Objection to the Principle of Tissue Transmutation

Another objection to the proposal is that we do not have the right to determine the fate of all our cells. For example, we are limited in what we can do with our sex cells. However, we should only be constrained in using our own cells when that use puts others at risk. This is not so in transmutation until another individual with moral interests comes into existence.

Surrogacy Concerns

At least at present, later embryonic and fetal development can only occur inside a woman's uterus, so some of the proposals here would require a surrogate. I have assumed that any surrogate would be freely consenting. Concerns with surrogacy have been addressed elsewhere, though cloning for this purpose would raise some different concerns. There would be no surrogacy concerns if the donor cell were derived from the mother (she would be carrying one of her own cells), from the mother's child (she would be carrying her child again) or if an artificial womb were ever developed.

Should We Give Greater Importance to Somatic Cells?

I have claimed that the totipotent cells of the early embryo, and indeed the embryo, do not have greater moral significance than adult skin cells (or indeed lung or colon or any nucleated cells). I have used this observation to downgrade the importance we attach to embryonic cells. However, it might be argued that we should upgrade the importance which we attach to somatic cells.

This is a *reductio ad absurdum* of the position which gives importance to the embryo, and indeed which gives weight to anatomical structure rather than function. If we should show special respect to all cells, surgeons should be attempting to excise the very minimum tissue (down to the last cell) necessary during operations. We should be doing research into preventing the neuronal loss which occurs normally during childhood. The desquamation of a skin cell should be as monumental, according to those who believe that abortion is killing persons, as the loss of a whole person. These claims are, I think, all absurd.

Yuk Factor

Many people would find it shocking for a fetus to be created and then destroyed as a source of organs. But many people found artificial insemination abhorrent, IVF shocking and the use of animal organs revolting. Watching an abortion is horrible. However, the fact that people find something repulsive does not settle whether it is wrong. The achievement in applied ethics, if there is one, of the last 50 years has been to get people to rise above their gut feelings and examine the reasons for a practice.

Permissive and Obstructive Ethics

Many people believe that ethicists should be merely moral watch-dogs, barking when they see something going wrong. However, ethics may also be permissive. Thus ethics may require that we stop interfering, as was the case in the treatment of homosexuals. Ethics should not only be obstructive but constructive. To delay unnecessarily a good piece of research which will result in a life-saving drug is to be responsible for some people's deaths. It is to act wrongly. This debate about cloning illustrates a possible permissive and constructive role for ethics.

Conclusion

The most justified use of human cloning is arguably to produce stem cells for the treatment of disease. I have argued that it is not only reasonable to produce embryos as a source of multipotent stem cells, but that it is morally required to produce embryos and early fetuses as a source of tissue for transplantation. This argument hinges on:

1. The claim that the moral status of the cloned embryo and early fetus is no different from that of the somatic cell from which they are derived.
2. The claim that there is no morally relevant difference between the fetus and the embryo until some critical point in brain development and function.
3. The fact that the practice is consistent with existing practices of fetal tissue transplantation and conceiving humans as a source of tissue for transplantation (the Ayala case).
4. An argument from beneficence. This practice would achieve much good.
5. An argument from autonomy. This was the principle of tissue transmutation: that we should be able to determine the fate of our own cells, including whether they change into other cell types.

This proposal avoids all the usual objections to cloning. The major concerns are practicality and safety. This requires further study.

The HGAC and The Royal Society have broached the possibility of producing clones for up to 14 days: "therapeutic cloning." Those bodies believe that it is acceptable to produce and destroy an embryo but not a fetus. Women abort fetuses up to 20 weeks and later. We could make it mandatory that women have abortions earlier (with rapid pregnancy testing). However, we do not. Moreover, while the decision for most women to have an abortion is a momentous and considered one, in practice, we allow women to abort fetuses regardless of their reasons, indeed occasionally for no or bad reasons. If a woman could abort a fetus because she wanted a child with a certain horoscope sign, surely a woman should be able to abort a fetus to save a person's life.

I have been discussing cloning for the purposes of saving people's lives or drastically improving their quality. While we beat our breasts about human dignity and the rights of cells of different sorts, people are dying of leukaemia and kidney disease. If a woman wants to carry a clone of her or someone else's child to save a life, it may not be society's place to interfere.

David van Gend

NO

Prometheus, Pandora, and the Myths of Cloning

One of the earliest human trials in regenerative medicine was conducted on a crag high in the Caucasus around the dawn of time. Or not strictly human, since Prometheus was a Titan. But for fraternizing with humans he was pegged out on a high rock where the eagle of Hephaestus ate his liver out each day, and it grew back each night.

With remarkable scientific insight, although without specifying the key role of hepatic stem cells, the Greeks observed that the liver is the one internal organ that has a capacity for vigorous regrowth after trauma.

Prometheus was being punished for his beneficence to humans—for teaching them arts practical and aesthetic, and worst of all for stealing the secret fire of Zeus to give humans comfort in their caves and supremacy over the animals.

To call scientists "Promethean" seems to me a compliment. Their role is to benefit humankind by their labours—and scientists who labor in the field of regenerative medicine using adult stem cells are most authentically Promethean.

The proper term for scientists who violate norms of human relationships and ethics, unleashing destructive forces upon us, is not "Promethean" but "Pandoran." She was the other chapter in Zeus's punishment of Prometheus. Pandora was asexually reproduced, "forged on the anvil of Hephaestus," essentially a laboratory creation like the modern clone. Irresistibly packaged, she wowed the impressionable brother of Prometheus, who accepted her gift of a mysterious box—which, upon being opened, released all sorts of corrupt and harmful things into the world. It is said that one thing only remained in Pandora's box after all the noxious things had emerged: hope, groundless and unreasonable hope.

With cloning, modern Pandorans raise unreasonable hope with their attractively packaged deceit. With obscure motives, they threaten forms of harm to humanity that we are only beginning to understand.

Keeping the lid on Pandora's box is still possible if we can show clearly why cloning is both redundant and wrong.

From *Human Life Review*, Summer/Fall 2006, pp. 15 16, 21 27. Notes omitted.

Why Cloning Is Redundant

A patient of mine with advanced Parkinson's disease hopes to be the first man treated with stem cells from the back of his nose. He is among the dozens of patients with various genetic illnesses whose stem cells have been collected for research at the Griffith University Adult Stem Cell Centre, here in Queensland, Australia.

There are cautious, very cautious, grounds for hope for my patient, given that Griffith has successfully used these adult stem cells to treat Parkinson's in rats, and is planning primate trials. If all goes well, human trials will follow.

His case is an example of the true state of stem-cell science, as opposed to its political distortion. In the public mind embryonic stem cells and cloning are the main event, whereas in reality they are a conjurer's sideshow. Adult stem cells are now safely used in 72 human conditions . . . embryonic stem cells remain both unusable and dangerous. The cloning lobby dreams of creating "patient-specific stem cells" for research; adult-stem-cell researchers have already achieved that goal.

Australian cloning advocate Professor Alan Trounson has recently clarified that cloning is not about cell therapies for Parkinson's or spinal injury, but is limited to the modest research goal of creating patient-specific cells for studying disease and developing drugs. That is an important clarification, since the media still pretend that embryonic stem cells, cloned or otherwise, can be used as magic bullets for direct "cell therapy." That has always been false—since, among other things, the risk of tumors inherent in the use of embryonic cells rules out human application. Trounson's revised prospectus for cloning is more honest: "It's not about cells for therapy. This is about cells that give us an opportunity to discover what causes a disease and whether we can interfere with that."[1]

Fine—but even that more realistic goal for cloning has been made redundant, since that is exactly the research capacity Griffith has now achieved with adult stem cells. They possess an expanding range of patient-specific stem cells, easily obtained from patients, readily transformed into the required cell type (brain, muscle, kidney, liver) and useful for genetic study of the disease and development of drugs. These adult stem cells are superior for research because they are cheap, ethically uncomplicated, and free of the genetic damage caused by cloning. And only adult stem cells can be used safely for direct cell therapy without the risk of tumor formation and immune rejection.

Cloning has been left for dead, and Griffith Professor Alan Mackay-Sim has written its obituary telling the Lockhart enquiry into Australia's cloning laws that "it is probable that such stem-cell lines as these will render therapeutic cloning irrelevant and impractical."

If that view is correct, what possible justification is there for pursuing cloning? . . .

Why Cloning Is Wrong

Here is the dual desecration of "research" cloning: not just that a human life is wrongfully killed for the benefit of others, but that a human life is wrongfully created outside of any normal human setting.

To clone is to generate a living human embryo with no mother—think of that! Only an emptied-out female egg is used, with no trace of the mother's genetic identity. And no father, either—for the donor of DNA is not father to the clone, but is instead its identical twin, and could be as anonymous a donor as a piece of human tissue from the laboratory fridge.

Cloning creates a subclass of humans who are nobody's children. Anonymous artifacts, not beloved offspring; scientific objects with no mother or father to defend their interests. The bonds of belonging are broken: A human being is created outside the circle of human kinship and care.

And yet the cloned offspring is a child like any other; if it were allowed to be born, we would care for it as any other orphan. As Australia's religious leaders have pointed out, it would be a lesser evil to let a cloned embryo be born as a child—even considering the sociological distress and genetic disease it will suffer. The greater evil is the one proposed: that it will be created but never allowed to be born, remaining a mere laboratory animal, meat for the consumption of science.

That is not to condone the obvious abuse of "live-birth" cloning. Let Dolly the sheep, Matilda the lamb, or Snuppy the puppy be part of the freak show of cloning, but not a human child. But it is to be clear that the act of asexual reproduction of a human being, regardless of whether the clone lives for days or for years, is an abuse in itself—violating the essential bonds of "blood and belonging" that every human individual needs, willfully creating the world's first absolute orphan. That is a desecration of humanity, and must be condemned as such.

In Australia in 2002, our Parliament was united in condemning cloning—but in 2006, the debate has been reopened. We are at a different stage of the debate than the U.S.; in 2002, we banned cloning but lost the argument over the use of "surplus" IVF embryos, which are now available for research. At that time we argued that there was no good way out for the "surplus" embryos. We advised that it would be a lesser evil to let the current frozen generation of embryos die—acknowledging our shame in allowing them to be stockpiled in the first place, and ensuring it never happened again. We said it was a greater evil to set up a permanent industry exploiting human embryos, since demand would ensure supply: IVF clinics would ensure the ongoing creation of surplus embryos to feed the drug companies.

Our argument failed. In the U.S., there does not appear to be a fixed deadline at which frozen embryos must be thawed out, so they are not so clearly "going to die anyway"; more vividly, the U.S. practice of adopting frozen embryos further negates that fatalistic argument. In Australia, by contrast, the argument that the doomed embryo "may as well be used for research" (in the context of wild claims of miracle cures from the use of embryonic stem cells) carried the majority vote. The prime minister, a fair-minded man, spoke

for the misled majority: "I could not find a sufficiently compelling moral difference between allowing embryos to succumb in this way and destroying them through research that might advance life-saving and life-enhancing therapies. That is why, in the end, I came out in favor of allowing research involving excess IVF embryos to go ahead."

But importantly, an ethical line in the sand was drawn between using IVF embryos that were "going to die anyway" and deliberately creating new embryos specifically for destructive research. The PM made this distinction: "It is also my very strong belief that human embryos should not be created for any purpose other than IVF treatment." On this principle a ban on creating embryos "by any means other than by the fertilization of a human egg by human sperm" was passed unanimously by Parliament.

On the same principle, there was a majority vote (non-binding) against all forms of human cloning at the United Nations last year. One delegate expressed the principle as: "No human life should ever be produced to be destroyed for the benefit of another." They saw the inhumanity of creating a cloned human embryo—identical to you or me at that stage of life—with the sole intention of exploiting it for science. Likewise, the creation of a human embryo purely for research is expressly prohibited in Article 18 of the European Convention on Human Rights and Biomedicine.

Australia's Prohibition of Human Cloning Act 2002 provided for periodical review of the legislation, and in late 2005 a six-person committee, handpicked under the auspices of a pro-cloning cabinet minister, predictably recommended overturning the unanimous vote of Parliament and allowing research cloning. This committee acknowledged that cloning creates a human embryo, which could be born as a baby like any of us. But they callously reasoned that the cloned embryo does not really "matter" to anybody, since nobody intends to bring it to birth—therefore let it be cut up for stem cells, used for drug testing, even hybridized with animals, provided it is killed by the age of 14 days.

The question of whether the embryo "matters" goes straight to the heart of this debate. This is the dividing line for public opinion in every legislature around the world. Interestingly, the question is no longer whether the embryo is a human life, but whether that human life "matters." In the words of our Senate report from the 2002 debate: "There is in fact little disagreement that the embryo is a human life and that its life commences at fertilization. The difficulties arise in specifying exactly in what sense it is to be considered 'a life,' and hence what significance should be attached to it."

The committee referred to an earlier Senate report that had reviewed "the biological facts of the matter" and concluded: "Two universally accepted attributes are that the fertilized ovum has 'life' and that it is genetically human (i.e. it is composed of genetic material entirely from the species homo sapiens). It is also generally agreed that it is an entity (a centrally organized unit which has a purposeful independent function as opposed to an organ or tissues). It also has developmental potential."

One can agree on the bare facts—that the embryo is a living individual member of our species—but whether that individual life "matters" depends on the worldview one brings to the debate. And faced with this key question—the

meaning of a human life in all its embryonic simplicity—the cultural divic shows up most starkly.

A citizen who believes, as C. S. Lewis put it, that human life is "a trai sient and senseless contortion on the idiotic face of infinite matter" is unlikel to grant great meaning to a mere embryonic contortion. If ultimately we ai all just strangely complex lumps of meat floating in time, then the embryo just a very small lump of meat, devoid of real meaning.

For those citizens whose worldview gives a deeper context to human lif even the life of the embryo has meaning. To those who share the Christia theory of life, all of us matter, even the "littlest of these His brethren," pr cisely because we matter to God. Size and age are not a measure of huma meaning; what matters is that the individual life is known and loved in God.

On this understanding, a new name is spelled out at conception ar written on the palm of God's hand—even if the font is too small for us to rea That name, that genetic identity, will take a lifetime to be fully expressed, b it is the same name we carry for our whole existence: a new character scripte into our vast mystery play, which no other character has the right to erase.

It is vital to engage in the battle for the meaning of the human embry for even if there is no hope of persuading card-carrying nihilists, there always the muddled middle of fellow citizens who can be convinced one wa or the other. All future policy on cloning, human-animal hybridization, pr natal eugenics, transgenic manipulation, and other as yet unimagined abus depends on the dominant view of what the human embryo is, and therefo how we are bound to treat it.

There are four key arguments demeaning the human embryo, which ca be rebutted in interesting ways.

First, there are the recurrent dismissive comments that the embryo "smaller than the full stop at the end of this sentence" (which, being translat into American, refers to a "period"). On this, we should play the scientists c their own ground, reminding them that, according to their own theories, th Universe itself was once "smaller than a period." To cosmologists, the fact th such a tiny entity as the embryonic Universe contained within itself the capa ity to unfold into this vast and fruitful cosmos is not a cause for contempt, b intellectual wonder. We need similar eyes of understanding, not of ignora contempt, when we contemplate the embryonic human. This tiny entity, li the embryonic Universe, is unfolding into the vast and fruitful cosmos of human being, and deserves a comparable response of intellectual wonder. Th only event in the physical world comparable in complexity and wonder to t Big Bang is human conception, which creates the only entity that can kno and therefore in a sense transcend, the Universe itself. The embryonic human in that sense a greater being than the embryonic universe.

Second, the logic of the culture of death will work backwards from abo tion to argue that since the fetus does not matter, the embryo matters eve less. . . .

Care is needed here. Policy on how we treat embryos is formed in a entirely different context from policy on abortion. Abortion is portrayed an act of self-defense against the threatening intruder in the womb. In no w

is the laboratory embryo threatening the mother. In the case of the cloned embryo, there is no mother to threaten. Abortion is portrayed as an assertion of moral autonomy over one's private life, often in the context of emotional crisis, while policy on embryonic research is a coldly calculated decision by public committees. The two types of policy must be kept widely separated, and the meaning of the embryo considered on its own merits.

Third, there is the argument that the embryo cannot be considered an individual human being until the stage of possible "twinning" has passed. This is generally taken to be about 14 days of embryonic life. Until that time, we cannot know if the embryo is going to end up as one "entity" or two, which surely casts doubt on its moral status. I admit to finding this a very muddled argument, and it is the phenomenon of cloning itself that finally clears the fog. For with cloning you or I can now undergo "twinning" well past day 14—in fact, tomorrow, if you like. Does that mean that your moral status as a true, unambiguous "individual" today is in question, just because tomorrow you might have split off an identical twin? Is your current "soul" somehow diminished because you have twinned yourself into a clone? The problem is no different for the embryo: If it splits off a twin at day 14 it has merely cloned itself into an identical embryo, a twin that is 14 days younger than the original embryo. So, again, there is a positive way to look at the early embryo: It is a wonder, a marvel, and if it splits off a twin, that is just greater cause for celebration: We now have two marvels, two wonders. At the very least we are looking at one embryonic human; there is the happy chance of a second, younger human being arising a few days later from the phenomenon of natural cloning, or twinning, but that is no cause for downgrading the significance of either life.

Fourth and finally, there is the argument that so many embryos are "wasted" naturally that they surely cannot be considered to have a full human status—even, for some sensible Christian people, full spiritual status in the eyes of God. Estimates vary wildly for embryonic loss, but even if the figure is 30 percent I do not see how the problem is any different from the similar "wastage" of infants in the part of Africa I was born in. Does the fact that some 30 percent died in infancy (including some children of my early missionary ancestors) mean they were not truly human? With all due respect, if God has a problem with taking seriously the moral status of embryos because so many are "wasted," He has the same problem with these wasted African infants, or with the high percentage of Chinese babies wasted through female infanticide. And I remain unconvinced as to why a higher spiritual status should be granted to those of us who, through good luck and good environment, happen to have persisted longer on this earth. None of us matter, in the Christian understanding, unless we matter to God, and it seems wise to give the benefit of the doubt to the most embryonic of these His brethren.

Conclusion

Cloning is wrong. It violates our humanity and the bonds of love and care to manufacture offspring who have no mother or father. It violates the most basic ethical prohibitions to create an embryo with the intention of destroying it in research. Only the parent-child relationship is the legitimate and humane context in which to create a human embryo.

Cloning is redundant. Once we have rejected it on ethical grounds, the great consolation is that we do not need cloning anyway; adult stem cells will get us the good things of stem-cell science, leaving cloning "irrelevant and impractical." But we must remember that the scientific argument is strictly secondary: Even if there were additional scientific benefits from cloned-embryo stem cells over the new disease-specific adult stem cells (and there appear not to be) cloning must still be rejected on grounds of basic humanity: fundamental respect for the dignity of a living member of the human species, which rules out creating such a life with its destruction in mind.

In the magnificent new field of regenerative medicine, we can and must be diligent Prometheans, while keeping the lid locked on Pandora's deceitful and dehumanizing gift.

POSTSCRIPT

Is It Ethically Permissible to Clone Human Cells?

Although the cloning debate became vigorous only after the cloning of an adult animal, it is worth stressing that most of the discussion now centers on the cloning of embryos in order to obtain stem cells that can become any cell type or tissue found in the body. The hope is to be able to replace defective cells and cure disease. Ian Wilmut, "The Case for Cloning Humans," *The Scientist* (April 25, 2005), argues that cloning human embryos may offer the best way to understand and treat difficult diseases; Wilmut's team received a license to clone human embryos in February 2005. For a good overview of the stem cell issue, see Rick Weiss, "The Power to Divide," *National Geographic* (July 2005). See also Ronald Bailey, *Liberation Biology: The Scientific and Moral Case for the Biotech Revolution* (Prometheus, 2005).

Leon Kass develops his objections to cloning in "Preventing a Brave New World," *The Human Life Review* (July 2001), and *Life, Liberty and the Defense of Dignity: The Challenge for Bioethics* (Encounter, 2002). He gains support from Mary Midgley, who in "Biotechnology and Monstrosity: Why We Should Pay Attention to the 'Yuk Factor'," *Hastings Center Report* (September October 2000), argues that intuitive, emotional responses to things such as cloning have a significance that must not be dismissed out of hand. In *Our Posthuman Future: Consequences of the Biotechnological Revolution* (Farras, Strauss & Giroux, 2002; paperback Picador, 2003), Francis Fukuyama argues for limits on cloning and genetic engineering in order to protect human nature and dignity. David Gurnham, "The Mysteries of Human Dignity and the Brave New World of Human Cloning," *Social & Legal Studies* (June 2005), agrees that cloning threatens human dignity. As a result of such arguments, the United States has banned the use of federal funds for reproductive cloning and severely limited the cloning of embryos to obtain stem cells for either research or treatment purposes. However, some states (e.g., California; see Nigel Williams, "California Ramps Up Stem Cell Plans," *Current Biology* [March 2005]) have chosen to develop their own state-funded research programs. In other countries, progress has been more rapid. See Susan Mayor, "UK and Korean Teams Refine Techniques for Human Cloning," *BMJ: British Medical Journal* (May 28, 2005).

Speaking to the National Bioethics Advisory Commission (whose report was summarized by chair Harold T. Shapiro in the July 11, 1997, issue of *Science*), Ruth Macklin, of the Albert Einstein College of Medicine, said, "It is absurd to maintain that the proposition 'cloning is morally wrong' is self-evident. . . . If I cannot point to any great benefits likely to result from cloning, neither do I foresee any probable great harms, provided that a structure of

regulation and oversight is in place. If objectors to cloning can identify no greater harm than a supposed affront to the dignity of the human species, that is a flimsy basis on which to erect barriers to scientific research and its applications." Nathan Myhrvold argues in "Human Clones: Why Not? Opposition to Cloning Isn't Just Luddism—It's Racism," *Slate* (March 13, 1997), that "Calls for a ban on cloning amount to discrimination against people based on another genetic trait—the fact that somebody already has an identical DNA sequence." There are reasons why cloning—at least of embryonic cells—should be permitted. According to Thomas B. Okarma (interviewed by Erika Jonietz, "Cloning, Stem Cells, and Medicine's Future," *Technology Review*, June 2003), they hold great hope for new and useful medical treatments. And according to Robin Marantz Henig, "Pandora's Baby," *Scientific American* (June 2003), when other reproductive technologies such as *in vitro* fertilization were new, they faced similar objections; now they are routine, and it is likely that someday cloning will be too. Daniel J. Kevles agrees; in "Cloning Can't Be Stopped," *Technology Review* (June 2002), he said that if human cloning can but succeed, it will "become commonplace . . . a new commodity in the growing emporium of human reproduction." Seymour W. Itzkoff, in "Intervening with Mother Nature: The Ethics of Human Cloning," *The Mankind Quarterly* (Fall 2003), calls objections to cloning and related issues "reactionary" and notes that "The cloning of humans and the stem cell production issue are . . . the tip of the iceberg, the slippery slope, or any other metaphor that points to the growing impact of scientific research that could undercut the twentieth-century ideological opposition to viewing human behavior as biologically/genetically determined."

So far, the result of the debate is that research continues but under various regulatory and funding restrictions. See Charles C. Mann, "Braving Medicine's Frontier," *Technology Review* (September 2005). Work with adult stem cells has so far proved disappointing, but see Agneta M. Sutton, "'Yes' to Adult Stem Cells," *Southern Medical Journal* (December 2006). Hopes have also been raised by the discovery that stem cells can be obtained from the amniotic fluid surrounding a fetus in the womb; see Constance Holden, "Versatile Stem Cells Without the Ethical Baggage?" *Science* (January 12, 2007).