The Moral Significance of the Therapy-Enhancement Distinction in Human Genetics

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Introduction

The therapy-enhancement distinction occupies a central place in contemporary discussions of human genetics and has been the subject of much debate.[1-7] At a recent conference on gene therapy policy, scientists predicted that within a few years researchers will develop techniques that can be used to enhance human traits.[8] In thinking about the morality of genetic interventions, many writers have defended somatic gene therapy,[9,10] and some have defended germline gene therapy,[11,12] but only a handful of writers defend genetic enhancement[13], or even give it a fair hearing.[14-16] The mere mention of genetic enhancement makes many people cringe and brings to mind the Nazi eugenics programs, Aldous Huxley's *Brave New World*, "The X-Files," or the recent movie "Gattaca." Although many people believe that gene therapy has morally legitimate medical uses,[17,18] others regard genetic enhancement as morally problematic or decidedly evil.[19-21]

The purpose of this essay is to examine the moral significance of the therapy-enhancement distinction in human genetics. Is genetic enhancement inherently unethical? Is genetic therapy inherently ethical? I will argue that the distinction does not mark a firm boundary between moral and immoral genetic interventions, and that genetic enhancement is not inherently immoral. To evaluate the acceptability of any particular genetic intervention, one needs to examine the relevant facts in light of moral principles. Some types of genetic therapy are morally acceptable while some types of genetic enhancement are unacceptable. In defending this view, I will discuss and evaluate several different ways of attempting to draw a solid moral line between therapy and enhancement.[22]

Somatic versus Germline Interventions

Before discussing the therapy-enhancement distinction, it is important that we understand another distinction that should inform our discussions, viz. the distinction between somatic and germline interventions.[23,24] Somatic interventions attempt to modify somatic cells, while germline interventions attempt to modify germ cells. The gene therapy clinical trials that have been performed thus far have been on somatic cells. If we combine these two distinctions, we obtain four types of genetic interventions:

> Somatic genetic therapy (SGT)
> Germline genetic therapy (GLGT)
> Somatic genetic enhancement (SGE)
> Germline genetic enhancement (GLGE)

While I accept the distinction between somatic and germline interventions, it is important to note that even interventions designed to affect somatic cells can also affect germ cells: current SGT trials carry a slight risk of altering germ cells.[25] Even so, one might argue that this is a morally significant distinction because somatic interventions usually affect only the patient, while germline interventions are likely to affect future generations.[26] In any case, the therapy-enhancement distinction encompasses somatic as well as germline interventions, and my discussion of this distinction will include both somatic as well as germline interventions.

The Concepts of Health and Disease

Perhaps the most popular way of thinking about the moral significance of the therapy-enhancement distinction is to argue that the aim of genetic therapy is to treat human diseases while the aim of genetic enhancement is to perform other kinds of interventions, such as altering or "improving" the human body.[27–29] Since genetic therapy serves morally legitimate goals, genetic therapy is morally acceptable; but since genetic enhancement serves morally questionable or illicit goals, genetic enhancement is not morally acceptable.[30–33] I suspect that many people view the distinction and its moral significance in precisely these terms. W. French Anderson states a clear case for the moral significance of genetic enhancement:

> On medical and ethical grounds we should draw a line excluding any form of genetic engineering. We should not step over the line that delineates treatment from enhancement.[34]

However, this way of thinking of medical genetics makes at least two questionable assumptions: (1) that we have a clear and uncontroversial account of health and disease, and (2) that the goal of treating diseases is morally legitimate, while other goals are not. To examine these assumptions, we need to take a quick look at discussions about the concepts of health and disease.

The bioethics literature contains a thoughtful debate about the definitions of health and disease and it is not my aim to survey that terrain here.[35,36] However, I will distinguish between two basic approaches to the definition of health, a value-neutral (or descriptive) approach and a value-laden (or normative) one.[37] According to the value-neutral approach, health and disease are descriptive concepts that have an empirical, factual basis in human biology. Boorse defended one of the most influential descriptive approaches to health and disease: a diseased organism lacks the functional abilities of a normal member of its species.[38] To keep his approach value-neutral, Boorse interprets "normal" in statistical terms, i.e., "normal" = "typical." Daniels expands on Boorse's account of disease by suggesting that natural selection can provide an account of species-typical functions: functional abilities are traits that exist in populations because they have contributed to the reproduction and survival of organisms that possessed them.[39] Thus a human with healthy lungs has specific respiratory capacities that are normal in our species, and these capacities have been "designed" by natural selection. A human who lacks these capacities, such as someone with cystic fibrosis or emphysema, has a disease.

According to the value-laden approach, our concepts of health and disease are based on social, moral, and cultural norms. A healthy person is someone

who falls within these norms; a diseased person deviates from them. Someone who deviates from species-typical functions could be considered healthy in a society that views that deviation as healthy: although schizophrenia has a biological basis, in some cultures schizophrenics are viewed as "gifted" or "sacred," while in other cultures they are viewed as "mentally ill." Likewise, some cultures view homosexuality as a disease, while others do not.[40–42]

Many different writers have tried to work out variants on these two basic approaches to health and disease, and some have tried to develop compromise views,[43,44] but suffice it to say that the first assumption mentioned above—i.e., that we have a clear and uncontroversial account of health and disease—is questionable.

Even if we lack an uncontroversial account of disease, we could still ask whether either of the two basic approaches would condemn genetic enhancement unconditionally. Consider the descriptive approach first. If statements about disease merely describe deviations from species-typical traits, does it follow that we may perform genetic interventions to treat diseases but not to enhance otherwise healthy people? Since we regard the concept of disease as descriptive, we cannot answer this question without making some normative assumptions. Saying that someone has a disease is like saying that he or she has red hair, is five feet tall, or was born in New York City. These descriptions of that person carry no normative import. Hence the descriptive account of disease, by itself, does not provide us with a way of drawing a solid moral line between therapy and enhancement. For this approach to disease to draw moral boundaries between therapy and enhancement, it needs to be supplemented by a normatively rich account of the rightness of therapy and wrongness of enhancement.

Perhaps the normative approach fairs better than the descriptive one. If we accept this view, it follows that therapy has some positive moral value, since therapy is an attempt to treat diseases, which are defined as traits or abilities that do not fall within social or cultural norms. If it is "bad" to have a disease, then we are morally justified in performing interventions that attempt to treat or prevent diseases, since these procedures impart "good" states of being. Thus this normative approach implies that therapy is morally right. But does it imply that enhancement is morally wrong? The answer to this question depends, in large part, on the scope of the concepts of health and disease. If we hold that the concept of health defines a set of traits and abilities that should be possessed by all members of society and that any deviations are diseases, then any intervention that results in a deviation from these norms would be viewed as immoral. Hence, enhancement would be inherently immoral. But this account of health and disease is way too broad; there must be some morally neutral traits and abilities. If there are no morally neutral traits and abilities, then any person that deviates from health norms is "sick." This view would leave very little room for individual variation, to say nothing of the freedom to choose to deviate from health norms. If we accept a narrower account of health and disease, then we will open up some room for morally acceptable deviations from health norms. But this interpretation implies that enhancement interventions could be morally acceptable, provided that they do not violate other moral norms, such as nonmaleficence, autonomy, utility, and so on. Enhancement would not be inherently wrong, on this view, but the rightness or wrongness of any enhancement procedure would depend on its various factual and normative aspects.

The upshot of this discussion is that neither of the two main approaches to health and disease provides us with solid moral boundaries between genetic enhancement and genetic therapy. One might suggest that we examine alternative approaches, but I doubt that other, more refined theories of health and disease will provide us with a way of drawing sharp moral boundaries between genetic enhancement and genetic therapy. Perhaps we should look at other ways of endowing the distinction with moral significance.

The Goals of Medicine

A slightly different approach to these issues asserts that genetic therapy is on solid moral ground because it promotes the goals of medicine, while genetic enhancement promotes other, morally questionable goals. But what are the goals of medicine? This is not an easy question to answer, since medicine seems to serve a variety of purposes, such as the treatment of disease, the prevention of disease, the promotion of human health and well-being, and the relief of suffering. Many of the so-called goals of medicine, such as the prevention of disease and the promotion of human health, may also be promoted by procedures that we would classify as forms of enhancement.[45] For example, some writers have suggested that we might be able to perform genetic interventions that enhance the human immune system by making it better able to fight diseases, including cancer.[46] Most people would accept the idea that providing children with immunizations against the measles, mumps, and rubella promotes the goals of medicine. If we accept the notion that ordinary, nongenetic enhancement of the immune system promotes the goals of medicine, then shouldn't we also agree that genetic enhancements of the immune system serve the same goals? And what about other forms of healthcare, such as rhinoplasty, liposuction, orthodontics, breast augmentation, hair removal, and hair transplants? If these cosmetic procedures serve medical goals, then cosmetic uses of genetic technology, such as somatic gene therapy for baldness, and germline gene therapy for straight teeth, would also seem to serve medical goals. Finally, consider the procedures that are designed to relieve suffering, such as pain control and anesthesia. If we can develop drugs to promote these goals, then why not develop genetic procedures to meet similar objectives? It is not beyond the realm of possibility that we could use genetic therapy to induce the body to produce endorphins. Many forms of enhancement may serve medical goals. Once again, the therapy-enhancement appears not to set any firm moral boundaries in genetic medicine.

One might attempt to avoid this problem by narrowly construing the goals of medicine: the goals of medicine are to treat and prevent diseases in human beings. Other uses of medical technology do not serve the goals of medicine. There are two problems with this response. First, it assumes that we agree on the goals of medicine and the definitions of health and disease. Second, even if we could agree that medicine's goals are to treat and prevent diseases and we can define "health" and "disease," why would it be immoral to use medical technology and science for nonmedical purposes? If a medical procedure, such as mastectomy, is developed for therapeutic purposes, what is wrong with using that procedure for "nonmedical" purposes, such as breast reduction surgery in men with overdeveloped breasts? Admittedly, there are many morally troubling nonmedical uses of medical science and technology, such as the use

of steroids by athletes and the use of laxatives by anorexics, but these morally troubling uses of medicine are morally troubling because they violate various moral principles or values, such as fairness and nonmaleficence, not because they are nonmedical uses of medicine.

One might argue that those who use medical science and technology for nonmedical purposes violate medicine's professional norms, but this point only applies to those who consider themselves to be medical professionals. If a procedure violates medical norms, it is medically unethical, but this does not mean that the procedure is unethical outside of the context of medical care. For example, the American Medical Association holds that it is unethical for physicians to assist the state in executions, but this policy does not constitute an unconditional argument against capital punishment. To make the case against capital punishment, one must appeal to wider moral and political norms. Hence the goals of medicine also do not set a morally sharp dividing line between genetic therapy and enhancement.

Our Humanness

One might try to draw moral boundaries between genetic therapy and genetic enhancement by arguing that genetic enhancement is inherently immoral because it changes the human form. Genetic therapy only attempts to restore or safeguard our humanness, while enhancement changes those very features that make us human. Although GLGE and GLGT can more profoundly change human traits than SGE and SGT, both technologies can alter our humanness (or our humanity). To explore these issues in depth, we need to answer two questions: (1) What traits or abilities make us human? and (2) Why would it be wrong to change those traits or abilities? Philosophers have proposed answers to the first question ever since Aristotle defined man as "the rational animal." A thorough answer to the question of defining our humanness takes us way beyond the scope of this essay, but I will offer the reader a brief perspective.[47]

If we have learned anything from the abortion debate, we have learned that it is not at all easy to specify necessary and sufficient conditions for a thing to be human. Humanness is best understood as a cluster concept in that it can be equated with a list of characteristics but not with a set of necessary and sufficient conditions.[48] Some of these characteristics include:

a) physical traits and abilities, such an opposable thumb, bipedalism, etc.
b) psychosocial traits and abilities, such as cognition, language, emotional responses, sociality, etc.
c) phylogenetic traits, such as membership in the biological species Homo sapiens.

The beings that we call "'human" possess many of these traits and abilities, even though some humans have more of these traits and abilities than others. For example, a newborn and an adult have many of the same physical and phylogenetic traits and abilities, even though the adult has more psychosocial traits and abilities. For my purposes, I do not need to say which of these traits and abilities are more "central" to the concept of humanness, since I am not defending a definition that provides necessary or sufficient conditions.

The question I would like to explore in more depth concerns the wrongness of changing those traits that make us human. Would it be inherently wrong to alter the human form? This question presupposes the pragmatically prior question, Can we alter the human form? The answer to this question depends on two factors: (1) the definition of our humanness; and (2) our scientific and technological abilities. According to the definition I assume in this essay, it is possible to alter the human form, since the human form consists of a collection of physiological, psychosocial, and phylogenetic traits and abilities, which can be changed in principle.[49] Although we lacked the ability to change the traits that constitute our humanness at one time, advances in science and technology have given us the ability to change human traits. Since we have good reasons to believe that we can change our humanness, we can now ask whether we should do so.

Most moral theories, with the notable exception of the natural law approach, imply that there is nothing inherently wrong with changing the human form. For the purposes of this essay, I will not examine all of these moral theories here but will only briefly mention two very different perspectives on morality that reach similar conclusions. According to utilitarianism, an action or policy that alters our humanness could be morally right or it could be morally wrong, depending on the consequences of that action or policy. If genetic enhancement produces a greater balance of good/bad consequences, then enhancement would be morally acceptable. For example, genetic interventions that enhance the human immune system might be morally acceptable, but interventions that result in harmful mutations would be unacceptable. Kantians would object to attempts to alter our humanness if those attempts violate human dignity and autonomy. Some, but not all, genetic interventions could threaten our dignity and autonomy. For example, using SGT to promote hair growth should pose no threat to human dignity and autonomy (if informed consent is not violated), but using GLGE to create a race of "slaves" or "freaks" would pose a dire threat to dignity and autonomy. The main point here is that most moral theories would hold that there is nothing inherently wrong with changing our humanness; the moral rightness or wrongness of such attempts depends on their relation to other moral concerns, such as utility, autonomy, natural rights, virtue, etc.[50]

However, the natural law approach to morality could be interpreted as implying that tampering with the human form is inherently wrong. This argument assumes that the human form has inherent worth and that any changes to that form defile or destroy its worth. The human form is morally sacred and should not be altered.[51] For example, one might hold that a great painting, such as the "Mona Lisa," has inherent worth and it should therefore be left as it is; to change the "Mona Lisa" is to destroy it. Or perhaps one might argue that it would be wrong to change the formula for "Coke" or the plot of "Hamlet." But what is inherently wrong with changing the human form?

One argument that changing the human form is inherently wrong is that natural selection has "designed" us to have specific traits, and that any attempt to change those traits would be a foolhardy and vain intervention in nature's wisdom. It has taken thousands of years of adaptation for the human species to evolve into its present form. How can we possibly improve on nature's perfection? We are more likely to make a major blunder or mistake with human genetic engineering than to make an important advance.[52] Human genetic engi-

neering is likely to produce harmful mutations, gross abnormalities, Franken-stein monsters, etc.[53] There are two problems with this neo-Darwinian view. First, it is Panglossian and naïve: natural selection is not perfect—nature makes mistakes all the time. We possess many traits, such as the appendix, that serve no useful function. There are some traits that we could add, such as enhance-ments to the immune system, that could be very useful. Though we should not underestimate nature's wisdom and our ignorance, it is simply false that nature has made us perfect with no room for change or improvement.[54] Second, the argument overestimates human ignorance and carelessness. The history of med-ical technology allows us to see that while we have had many failures in altering the human form, such as Nazi eugenics programs, we have also had some successes, such as artificial limbs and eyeglasses. Although we should exhibit extreme care, discretion, and circumspection in all genetic interventions, not all changes we make in the human form will result in natural disasters.

A second argument approaches the issue from a theological perspective. According to this view, God, not natural selection, has designed us to have specific traits. Hence any human attempt to change those traits would be a foolish (and arrogant) challenge to God's wisdom. Those who attempt to "play God" by changing human nature commit the mortal sin of hubris. One obvious difficulty with this argument is that it is not likely to convince nonbelievers, but let us set aside that problem and engage in some speculative theology. The question we need to ask in response to this argument is, Would God not want us to change human traits? Changes we can now make to human traits could promote human welfare and justice. Why would God allow us to have this power and not use it? Of course, God would not want us to use our power to increase human suffering or injustice, but why would He not want us to use this power for good purposes? Although several well-known theologians have taken a strong stance against human genetic engineering,[55] religious denomi-nations are not united in their opposition to genetic engineering.[56] For example, the National Council of Churches adopted a resolution that the effort to use genetics to improve on nature is not inherently wrong, and the Council later stated that God has given men and women powers of cocreation, though these powers should be used with care.[57,58]

Regardless of whether one accepts the views of a particular church, it is not at all clear that a theologically based natural law theory provides us with good reasons for thinking that it is inherently wrong to change the human form. One could accept a theologically based approach to morality that leaves some room for human beings to alter the human form, provided that we exhibit wisdom, care, and restraint in changing our form.[59] Some changes (e.g., those that result in suffering or injustice) are morally wrong, but other changes (e.g., those that promote happiness or justice) are morally acceptable.

The Rights of the Unborn

Another way of arguing that at least some forms of genetic enhancement are inherently wrong is to claim that GLGE and GLGT violate the rights of unborn children.[60] These procedures are often said to violate the rights of unborn children because they:

a) are experimental procedures that violate the informed consent of unborn children;[61]

   b) deny unborn children the right to have a germline that has not been genetically manipulated;[62] or
   c) deny unborn children a right to an open future.[63]

All of these arguments make the morally controversial assumption that unborn children have rights. I will not challenge this assertion here.[64] Even if one assumes that unborn children have rights, it still does not follow that GLGE or GLGT violate those rights.

Let's consider (a) first. GLGT and GLGE do not violate the unborn child's right to informed consent because this right can be exercised by competent adults acting in the child's best interests. We allow proxy consent as a legitimate way of exercising informed consent for many procedures that can profoundly affect the welfare of children, such as fetal surgery and experimental surgery on newborns to repair congenital defects. If it makes sense to use proxy consent in these kinds of experiments, then it should also make sense to use proxy consent for other types of experiments, such as GLGT or GLGE, provided that these experiments can be shown to be in the best interests of unborn children.[65]

(B) is a very esoteric position. What kind of right is the "right to have a genome that has not been genetically manipulated"? Most writers conceive of rights in terms of interests: rights function to protect the interests of individuals.[66] Interests are needs and benefits that most people require to have a fulfilling life, such as freedom, health, education, self-esteem, and so on. So do unborn children have an interest in being born with a genome that has not been manipulated? If such an interest exists, then it is highly unusual and certainly not universal. Children whose parents hold specific religious or philosophical doctrines that forbid germline manipulation may have an interest in being born with an unadulterated genome, but other children will not have this interest. For most children, being born with a genome that predisposes them to health and a wide range of opportunities is more important than being born with a genome that has not been manipulated.

This bring us to argument (c). A right to an "open future" is a right to make one's own choices and life plans on reaching adulthood.[67] Parents who excessively impose their own choices, values, and life plans on their children may violate this right. For example, parents who decide to have a son castrated in order to make sure that he becomes a good singer close off many choices and plans that he could have made as an adult, e.g., having children through natural means. The right to an open future is by no means an unusual or esoteric right, since almost all children have the interests that this right protects, e.g., freedom of choice, freedom of opportunity, etc. But even if we admit this much, does it follow that GLGT or GLGE constitute an inherent violation of this right? I don't think so. While some uses of genetic technology could be regarded as an overbearing imposition of parental values on children, other uses of GLGT and GLGE may augment a child's right to an open future. If parents use GLGE to enhance a child's immune system, then they could be increasing his opportunities to an open future by helping him fight diseases, which can limit opportunities. On the other hand, parents who attempt to produce an eight-foot-tall child in order to make her into a basketball player probably are violating her right to an open future by imposing their choices on her life.

However, there is not a sharp distinction between violating a child's right to an open future and being a responsible parent.[68] We readily accept the idea that parents should try to raise children who are healthy, intelligent, responsible, and happy, and we endorse various parental attempts to promote these values, such as private education, athletics, SAT preparation, and so on. Parents that act in the best interests of the children and have hope for their future are simply being good parents. But when does this healthy and responsible concern for a child's future interfere with the child's right to choose his own values and life plans? This is not an easy question to answer. In any case, this quandary supports my claim that GLGT and GLGE do not inherently violate a child's right to an open future. Some uses of these technologies might have this effect; others might not. The upshot of this section is that we have once again debunked several arguments that might be construed as proving that genetic enhancement is inherently wrong. It may be wrong under some circumstances, but not in others.

Eugenics

Some have attacked GLGT and GLGE on the grounds that they constitute a form of eugenics, an attempt to control the human gene pool.[69] Is eugenics inherently wrong? To understand this question, we can distinguish between positive and negative eugenics: positive eugenics attempts to increase the number of favorable or desirable genes in the human gene pool, while negative eugenics attempts to reduce the number of undesirable or harmful genes, e.g., genes that cause genetic diseases. We should also distinguish between state-sponsored and parental eugenics: under state-sponsored eugenics programs the government attempts to control the human gene pool; in parental eugenics parents exert control over the gene pool through their reproductive choices.[70]

Parental eugenics occurs every time people select mates or sperm or egg donors. Most people do not find this kind of eugenics to be as troubling as the state-sponsored eugenics programs envisioned by Aldous Huxley or implemented by Nazi Germany. Indeed, one might argue that this kind of eugenics is a morally acceptable exercise of parental rights.[71] Moreover, most parents do not make their reproductive choices with the sole aim of controlling the human gene pool; any effects these choices have on the gene pool are unintended consequences of parental actions. As long as we accept the idea that parents should be allowed to make some choices that affect the composition of the human gene pool, then parental eugenics is not inherently wrong.

But what about state-sponsored eugenics? One might argue that state-sponsored eugenics programs, such as involuntary sterilization of the mentally disabled or mandatory genetic screening, are morally wrong because they:

a) constitute unjustifiable violations of individual liberty and privacy;
b) are a form of genetic discrimination;
c) can have adverse evolutionary consequences by reducing genetic diversity; and
d) can lead us down a slippery slope toward increased racial and ethnic hatred, bias, and genocide.

Although these arguments do not prove that all forms of state-sponsored eugenics are morally wrong, they place a strong burden of proof on those who

defend these programs. It is not my aim to explore state-sponsored eugenics in depth here.[72] However, even if we assume that state-sponsored eugenics is inherently wrong, this still only proves that some forms are GLGE or GLGT are inherently wrong. There is nothing inherently wrong with parental choices to use GLGE or GLGT to help children achieve health, freedom, and other values. Thus arguments that appeal to our concerns about eugenics do not prove that genetic enhancement is inherently wrong. Some forms of genetic enhancement, e.g., state-sponsored eugenics, are wrong, others are not.

Conclusion: The Significance of the Distinction

Two decades ago, James Rachels challenged the moral significance of the active-passive euthanasia distinction in a widely anthologized essay.[73] This paper has attempted to perform a similar debunking of the therapy-enhancement distinction in human genetics. It has considered and rejected a variety of different ways of arguing that the therapy-enhancement distinction in human genetics marks a solid, moral boundary. Genetic enhancement is not inherently immoral nor is genetic therapy inherently moral. Some forms of enhancement are immoral, others are not; likewise, some types of therapy are immoral, others are not. The implication of this view is that we should not use the therapy-enhancement distinction as our moral compass in human genetics. In evaluating the ethical aspects of any particular genetic intervention, we should ask not whether it is therapy or enhancement but whether the intervention poses significant risks, offers significant benefits, violates or promotes human dignity, is just or unjust, and so on.

Having said this much, I think some forms of enhancement can be morally justified, provided that they can be shown to be safe and effective. For example, using genetic technology to protect people against diseases could be justified on the grounds that it benefits patients. I think one can even justify the use of genetics for cosmetic purposes in terms of benefits to patients. We can also view some forms of genetic therapy as unacceptable (at present) because they pose unjustifiable risks to patients or future generations. For example, all forms of GLGT and some types of SGT, such as a procedure for fighting cancer at the genetic level, are too risky, given our current scientific and technical limitations. In any case, the moral assessment of these procedures depends on consider-ations of probable benefits and harms (as well as other moral qualities), not on their classification as "therapy" or "enhancement."

So what is the significance of the therapy-enhancement distinction? What role should it play in thinking about the ethics of human genetics? Can it guide public policy? The most I can say in favor of the distinction is that it defines moral zones without any sharp boundaries. The significance of the distinction may lie in its ability to address our fears and hopes: we hope that genetic therapy will help us treat diseases and improve human health, but we fear that genetic enhancement will lead us down a slippery slope toward a variety of undesirable consequences, such as discrimination, bias, eugenics, injustice, bio-medical harms, and so on.[74] Genetic enhancement will probably always dwell in shadow of the slippery slope argument, while genetic therapy will probably always bask in the glory of modern medicine. Our hopes and fears may or may not be warranted; only time will tell. In the meantime, even if the therapy-enhancement distinction does not draw any solid moral boundaries, we need to

be aware of the distinction in public dialogues about genetics. In these dialogues, it may be useful to address the fears of enhancement and the hopes of therapy while attempting to grapple with the realities of the genetic revolution.

Notes

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9. See note 4, Anderson 1985.
10. Fowler G, Juengst, E, and Zimmerman B. Germ-line gene therapy and the clinical ethos of medical genetics. *Theoretical Medicine* 1989;19:151–7.
11. See note 3, Berger, Gert 1991.
12. Zimmerman B. Human germ-line gene therapy: the case for its development and use. *Journal of Medicine and Philosophy* 1991;16:593–612.
13. Glover J. *What Sort of People Should There Be?* New York: Penguin Books, 1984.
14. See note 7, McGee 1997.
15. Resnik D. Debunking the slippery slope argument against human germ line gene therapy. *Journal of Medicine and Philosophy* 1993;19:23–40.
16. Resnik D. Genetic engineering and social justice: a Rawlsian approach. *Social Theory and Practice* 1997;23(3):427–48.
17. See note 3, Berger, Gert 1991.
18. See note 4, Anderson 1985.
19. See note 6, Anderson 1990.
20. Rifkin J. *Algeny*. New York: Viking Press, 1983.
21. Ramsey P. *Fabricated Man: The Ethics of Genetic Control*. New Haven: Yale University Press, 1970.
22. It is not my aim in this essay to argue that there is no distinction between therapy and enhancement; I am only attempting to question the moral significance of the distinction. If it turns out that there is not a tenable distinction between therapy and enhancement, so much the worse for the moral significance of this distinction. For the purpose of this essay I will define "enhancement" as a medical intervention that has goals other than therapeutic ones. There may be many types of enhancement on this view. Some forms of enhancement, such as a circumcision, can have therapeutic aims as well, e.g., preventing urinary tract infections. Some forms of therapy, such a heart transplantation, could have enhancement effects, e.g., a person could acquire an above average heart. Some interventions, such as preventative medicine, could straddle the line between enhancement and therapy. For further discussion, see note 1, Juengst 1997.
23. See note 4, Anderson 1985.
24. Suzuki D, Knudtson P. *Genethics*. Cambridge, Mass.: Harvard University Press, 1989.
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26. See note 24, Suzuki, Knudtson 1989.
27. See note 5, Anderson 1989.
28. See note 6, Anderson 1990.
29. Baird P. Altering human genes: social, ethical, and legal implications. *Perspectives in Biology and Medicine* 1994;37:566–75.
30. In the current debate in bioethics, several writers have attempted to use the concepts of health and disease to distinguish between genetic therapy and genetic enhancement.

31. See note 1, Juengst 1997.
32. See note 3, Berger , Gert 1991.
33. See note 5, Anderson 1989.
34. See note 6, Anderson 1990:24.
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42. For an overview of the normative approach, see Caplan A. *Moral Matters*. New York: John Wiley and Sons, 1995.
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44. Lennox J. Health as an objective value. *Journal of Medicine and Philosophy* 1995;20:501–11.
45. See note 44, Lennox 1995.
46. Culver K. The current status of gene therapy research. *The Genetic Resource* 1993;7:5–10.
47. See note 25, Resnik, Langer, Steinkraus 1999.
48. English J. Abortion and the concept of a person. *Canadian Journal of Philosophy* 1975;5(2):233–43.
49. It is possible to define "human" in such a way that it is logically impossible to change our humanness. If we stipulate that possession of single property is a necessary and sufficient condition for being human, then any changes we make in that property would result in people that are not human. For example, we can define "triangle" = "three-sided object." If me make an object that has four sides, it is not an altered triangle; it is not a triangle at all. For a definition of humanness that would seem to imply that it is difficult (though not impossible) to alter our humanness, see Anderson W. Genetic engineering and our humanness. *Human Gene Therapy* 1994;5:755–60.
50. See note 25, Resnik, Langer, Steinkrauss 1999.
51. For the purposes of this essay, I will not attribute this view to any particular author, since I think it deserves consideration on its own merit. For writers who come close to defending this view, see note 8, Vogel 1997, as well as Kass L. *Toward a More Natural Science*. New York: Free Press, 1985.
52. See note 20, Rifkin 1983.
53. These arguments do not address genetic enhancement per se, since they also apply to GLGT and they do not apply to SGT or SGE.
54. See note 25, Resnik, Langer, Steinkrauss 1999.
55. See note 21, Ramsey 1970.
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59. Peters, T. *Playing God?: Genetic Determinism and Human Freedom.* New York: Routledge, 1997.
60. For further discussion see Buchanan A, Brock D. *Deciding for Others*. Cambridge: Cambridge University Press, 1989.
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62. Commission of the European Community. *Adopting a Specific Research and Technological Development Programme in the Field of Health*. Brussels: Commission of the European Community, 1989.
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64. These arguments do not constitute an objection to SGT or SGE.
65. See note 25, Resnik, Langer, Steinkrauss 1999.

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68. See note 7, McGee 1997.
69. For further discussion of eugenics, see Paul D. *Controlling Human Heredity: 1865 to the Present*. Atlantic Highlands, N.J.: Humanities Press International, 1995.
70. Kitcher P. *The Lives to Come*. New York: Simon and Schuster, 1997.
71. Robertson J. *Children of Choice*. Princeton, N.J.: Princeton University Press, 1994.
72. For further discussion, see Parens E. Taking behavioral genetics seriously. *Hastings Center Report* 1996;26(4):13–8.
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74. See note 15, Resnik 1993.