Designing People

A Post-Human Future?

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1 Introduction

The advent of genetic technologies has sparked a variety of questions about their legal, ethical, and social consequences. Issues of discrimination, better medicine, moral status, access, familial obligations, ethnic affiliations, and parental duties are discussed in relation to genetic testing, gene transfer, and genetic enhancement. In the midst of new discoveries and new debates, bioethicists strive to achieve a balance between a responsibility to contemplate theoretical possibilities that might result from current technological advances and a responsibility to convey whether such theoretical possibilities could come to be. (Parens, 2004) The purpose of this chapter is to argue that bioethicists dealing with genetic enhancement technologies are failing to achieve this balance. This failure stems, in part, from an inadequate understanding of human biology. Not only do proponents and critics of genetic enhancement have erroneous presuppositions about the role of genes in human biology, they also espouse incorrect beliefs about knowledge production in the biological sciences. I will conclude by showing some of the problematic consequences that might follow from failing to achieve this balance between a concern for theoretical possibilities related to genetic enhancement and a responsibility to evaluate the feasibility of those promises.

2 On Our Way to the Post-Human?

Human genetic enhancement is often defined as the manipulation of genes in order to improve what are seen as normal human characteristics – physical, psychological, intellectual, and moral – beyond what is necessary to restore or sustain good health. This enhancement can be attempted through either somatic modifications – thus affecting only the particular individual undergoing the intervention – or germ-line

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or inheritable genetic modification – thus affecting future generations. Because my discussion is directed to the possibility of designing humans so as to create a new species of post-humans, i.e., beings whose capacities so greatly exceed current human ones that we cannot longer recognize them as human, I will direct my comments mainly toward this last type of genetic intervention.

As with many other discussions of biotechnology, this one has also become polarized between those who believe that the development and use of any technology to enhance human capabilities and traits is admirable, (Harris, 2004; Hughes, 2004; Bostrom, 2003; Sock, 2002; Silver, 1997) even obligatory, (Savulescu, 2005, and Cerqui and Warwick in this volume, though Cerqui is actually critical of such position) and those who argue that these kinds of interventions threaten human dignity (Habermas, 2003; Kass, 2003; Fukuyama, 2002; Annas et al., 2002). In both cases, however, there seems to be an agreement that genetic enhancement of human beings, far from being something difficult, maybe even a matter of science fiction for the most part, is only a matter of time. Thus, the debate centers on risks and benefits, the need for regulation, or the importance of funding these technologies.

I contend here that both those who oppose genetic enhancement technologies, and those who welcome them, have an inadequate understanding of human biology. First, both groups hold incorrect presuppositions about the role of genes in the development of human traits and behaviors. Moreover, both ignore the relevance of our social environment as a causal contributor to judgments about such traits. But, their misunderstanding of human biology also results from their taking for granted particular presuppositions about what biological theories are telling us about human nature.

Of course, it is hardly surprising that those involved in debates about the relationship between genetics and human traits and behaviors agree that genetic determinism is false, even though sometimes it is difficult to make sense of their claims if premised on the rejection of such determinism. The kinds of determinism they tend to reject are what some have called the "complete information" and the "intervention is useless" versions of genetic determinism (Kaplan, 2000, 11–12). The first version affirms that our genes dictate everything about us. The second strand asserts that for traits that have a genetic component, intervention is powerless. There is however, another version of genetic determinism that is presupposed by many of those who do not see themselves as genetic determinists. In this version, traits with even partial genetic etiologies are best understood as primarily genetic, and only through directed intervention can we avoid or control the expression of genes for such traits. Even when genes are not determining they are perceived as more necessary or more fundamental than other biological, environmental, and social counterparts (Gannet, 1997, 403–419).

Without a presupposition of genetic determinism it is difficult to make sense of many of the arguments used in the debates over human genetic enhancement and the creation of the post-human. Thus, some have claimed that any kind of genetic manipulation forecloses a future that would otherwise be underdetermined because of the natural genetic lottery. When we design human beings by any kind of prenatal genetic intervention, some believe, we are also determining their future. In the

words of Habermas, "[…] genetically programmed persons might no longer regard themselves as the sole authors of their own life history" (2003, 79). Genetic manipulations challenge the moral identity of contemporary humanity and that of future human beings. Similarly, Fukuyama argues that genetic enhancement technologies defy the very idea of a human nature that grounds human dignity and human rights. By tinkering with the genetic constitution of humans we risk undermining the ideal of personal autonomy, and destroying the basis for moral equality (2002, part II). Others have defended the claim that inheritable genetic modifications can be seen as crimes against humanity because they alter the essence of humanity itself by taking human evolution into our own hands and directing it toward the development of the post-human (Annas et al., 2002).

Significantly, those who are cheering for the development of the post-human have a similar understanding of the role of genetics in human life. They hope that by using biotechnologies in presumably responsible ways, we will eventually become beings with vastly greater capacities than present human beings. They want to create the opportunity to live much longer and healthier lives, to enhance our memory and intellectual capacities, such as verbal fluency, memory, abstract reasoning, social intelligence, spatial cognition, numerical ability, or musical talent, to refine our emotional experiences and increase our subjective sense of well-being, and generally to achieve a greater degree of control over our own lives (Bostrom, 2003). Some have embraced the possibility of intellects that can read books in seconds (Bostrom, 2003), envisioned brain-to-brain interactions (Hughes, 2004), or conceived of beings whose capacity for rational thought would make non-rational drives superfluous (Hudson, 2000). Others, imagining the possibilities of doubling our cranial capacities to produce super-intelligent beings, are concerned with the need for a correlative widening of women's birth canal so that these post-human babies can be born (Agar, 2004, 16–17). Some argue that, because traits such as intelligence, memory, temperament, patience, empathy, or sense of humor can profoundly affect our lives, we have a moral obligation to enhance our children (Savulescu, 2005, 37).

It is unclear however, why and how tinkering with people's genomes would affect human dignity or human freedom. It is obvious that there are no genes for dignity or freedom. It is also the case that there is no single human genome representative of all humans, given that genetic variation is the norm. Moreover, humans have been directing human evolution by means of environmental and social factors without anybody thinking that such actions constituted crimes against humanity or that they threatened human dignity. Similarly, there is no available scientific evidence supporting the belief that characteristics such as intelligence, memory, abstract reasoning, musical talent, emotional sensitivity, empathy, or even health are determined, controlled, or influenced exclusively, or even mainly by nuclear DNA.

These arguments then rest on the disputable assumption that one's genetic endowments completely determine one's physical, psychological, and intellectual characteristics. It presupposes that a simple correlation between genotype and phenotype exists for what undeniably are very complex human traits. But such an assumption has no scientific basis. It simply ignores that genotypes have a range of

phenotypic expression, overlooks the importance of the environment, and disregards the significance of one's choices in building a unique and distinctive life. It seems that unless we incorrectly assume that our genome completely determines who we will be, then there are no reasons to believe that genetic manipulation by itself would interfere with human dignity or human freedom, or that it will be able to create creatures so smart, talented, sensitive, or imaginative as to make them unrecognizably human or post-human. Contrary to these ideas, the evidence that we have about the feasibility of using genetic engineering to change or influence these or similar characteristics significantly is that human biology is far more complex than it might appear by reading discussions of human genetic enhancement.

Think of a relatively "simple" characteristic such as, for example, being healthier. We have good evidence that most diseases affecting humans are multifactorial (Weiss, 2005; Becker, 2004; Cummings, 2003; Wilkie, 2001; Risch, 2002). Unlike Mendelian diseases, the transmission of these diseases is governed by multiple factors, and familial patterns of inheritance do not follow a strictly Mendelian mode. Alleles contributing to these complex diseases are neither necessary nor sufficient to cause the particular disease; that is, some people might suffer the disease without having the related mutations, and some people might carry the mutations but might not have the disease in question. For many of these complex diseases, more than one gene at different loci contribute to the disease, and those loci might interact with each other. Depending on their roles on the pathogenesis of diseases, these interactions might be additive, multiplicative, or might have no additional effect. Modifier genes can also interact with mutations involved in the production of some diseases. The effects of interaction between an allele that might predispose to a particular disease and a protective allele might be especially difficult to predict with any accuracy. Similarly, epigenetic factors can modify the expression patterns of genes without altering the DNA sequence (Jiang et al., 2004; Dennis, 2003). The expression of most human diseases also involves the relations of multiple genetic and environmental factors. Additionally, cases of incomplete penetrance and variable expressivity introduce even more difficulties in our ability to predict the risks of developing a particular disease and thus of preventing it (Wilkie, 2001; Risch, 2002). The different penetrance of mutations is not entirely an intrinsic character (Veneis et al., 2001). On the contrary, it appears to depend on several factors such as the importance of the function of the protein encoded by the gene, the functional importance of the mutation, the interactions with other genes, the interactions with the environment, the onset of the disease, and the existence of alternative pathways that can substitute for the lost function. What is more, some of these factors can vary between individuals. Things are then not as simple as sometimes they are made to appear. So, making people healthier by tinkering with their DNA does not seem that easy: and, where there is the possibility of doing so, it does not seem that the changes would be significant enough to talk about a different species of post-humans.

Consider another characteristic often mentioned in the debates on human enhancement: longer life spans by slowing the aging process. Presumably, our first concern would be to ask how much longer a human would need to live to become a

post-human. Advances in public health care and in medical technologies have certainly increased average human life spans considerably during the last few centuries (Wilmoth, 2000). These increases, however, have not been taken to mean that we are on the path to becoming post-humans. Thus, it seems that the increase needs to be more significant. Obviously, immortality would be a candidate. Indeed for some (Kass, 2001; Harris, 2004; Fukuyama, 2002) there is a scientific race to achieve human immortality. Such speculations include claims about whether immortality would produce boredom, how it would affect our, already depleted, economic and environmental resources, whether there will be a loss of personal identity, whether it would make people happier, and about the consequences of having parallel populations of mortals and immortals existing alongside one another (Kass, 2001; Harris, 2004, 2000; Fukuyama, 2002; Glannon, 2002). Yet it hardly seems necessary to say that no evidence whatsoever exists that manipulating human DNA can attain such a goal. Also, longer lives filled with the manifestations of old age would hardly be desirable. Thus, those desiring longer lives for humans also desire to slow the aging process. But, there is no empirical evidence to support the claim that aging in humans has been modified by any means, nor is there any evidence that it is possible to measure biological age (Hayflick, 2004; Turner, 2004; Olshansky et al., 2004; Miller, 2002). It appears then that discussions about changing human life spans and aging processes in ways significant enough to create post-humans are no more than wishful thinking (Turner, 2004, 19–21). Nothing in current biological knowledge suggests that genes alone are responsible for controlling these traits.

The misunderstandings about human biology are not limited only to the incorrect assumption that genes control most human traits and behaviors (or at least that they control those traits that we think represent the "essence" of humanity,) and that thus, other aspects of humans' biology, environmental factors, and social arrangements and institutions are irrelevant as causal contributors to such traits or behaviors. Proponents and opponents of genetic enhancement also err by presupposing that our social environment is immaterial as a causal contributor to the judgments about such traits. That is, these arguments commit the error of assuming that our biological traits and behaviors can be evaluated outside of the environmental, social, and political contexts in which such traits and behaviors are expressed. Genetic predispositions have to be expressed as phenotypic traits, i.e., observable physical or behavioral characteristics that result from the interplay of genes and environments, before we can evaluate whether these characteristics are good or bad things. And, many human phenotypic attributes diverge in value according to the social and environmental contexts in which they are expressed. For instance, homosexuality, assuming for the sake of this argument that this is a genetically determined trait, can be very problematic in societies that place great value on the connection between sexual acts and reproduction, but it would be unlikely to raise much concern in social environments where such a connection is irrelevant.

Let us go back to our interest in making "healthier" humans. As the recent debate on obesity indicates the concepts of "heath" and "disease" as applied to humans are far from uncontroversial (Kaplan, 2000, ch. 8; Mokdad et al., 2004; Flegal et al., 2005; Gard, 2005; Oliver, 2005). It is clear, however, that health and

disease cannot be assessed by simply looking at genes, not even at genes in the context of whole organisms. Consider, for example, the case of allergic reactions to a substance that is only present, and in great quantities, in highly industrialized societies. Even if such allergic reactions were mainly determined by having certain genetic material, we would be hard pressed to call this a disease or disorder, indeed, we would be hard pressed to be concerned with it at all were we living in a non-industrial society. Or, take the case of some Italian speakers who have neurological markers for dyslexia, but show no learning impairment, as compared with English-speaking dyslexics who have a much more difficult time learning to read because of the complexity of their language (Paulesu et al., 2001). It seems then, that to evaluate human diseases, disabilities, or disorders and their effects, one must take into account the ecological and social environment in which human beings grow and develop. Human biology is not independent of where we live and how we live. Most human traits and behaviors need to be evaluated in social contexts. Such social contexts are not fixed. They have changed over human history, and there seem to be no reasons to believe that we cannot change them again to pursue worthy moral goals such as, for example, equality or fairness. Judgments about the desirability of traits such as beauty, health, weight, strength, or life span depend on the environmental context in which they are expressed, which in the case of humans includes social and political contexts. If the value of these traits is not determined by the fact that they are genetic traits or behaviors, then to assume that these traits will be valued by future generations as we now value them presupposes that we must believe that the social and political context will not change. Nothing in human history warrants such a belief.

The failure to achieve a balance between a responsibility to contemplate theoretical possibilities that might result from genetic enhancement, and a responsibility to convey whether such theoretical possibilities would come to be, does not result only from the incorrect conception of the role of genes in the development of human traits. The emphasis on the post-human future betrays the belief, dominant in Western science and philosophy, that the world, and its components, are machines that work in ordered, predictable ways (Dupré, 2001). This belief has extended to include humans who are also modeled as machines with distinct subunits that can be studied and evaluated independently. Our latest concern has been the human genome and its manipulation.

However, much of this discussion on human genetic enhancement and the creation of the post-human neglects the fact that the increasing focus on genes as causes stems from our increasing ability to manipulate DNA in the lab and in some cases in the clinic in an attempt to achieve what are perceived to be desirable ends. Insofar as theory directs action, genetic problems call for genetic, technological, solutions (Gifford, 2002; Gannett, 1997). It is, nonetheless, one thing to say that, for almost any particular human trait, there is a range of genetic influences, as well as a range of environmental influences, which underlie it. It happens to be the case, and for a variety of reasons such as a mechanistic view of the world, research priorities, the presumed intractability of environmental and social factors that we are concentrating on, and in many cases finding, genetic influences. It is quite a different thing, however,

to say that we are trying to find, and in many cases we are finding, the bases of these human traits, and that these bases, it turns out, just happen to be genetic (Han, 2002). If we focus on the genetic influences for traits such as intelligence, sensibility, memory, sympathy, or talent, we will quite likely find them. Of course, this means neither that these are the only influences in the development of such traits nor that they are the most relevant influences (Chakravarti and Little, 2003).

3 Why is this Important?

Failing to achieve a balance between interests in the theoretical possibilities related to genetic enhancement and a responsibility to evaluate the feasibility of those promises is problematic for several reasons. First, it does nothing to promote an informed public dialogue. We are presenting as realities what might be wishful thinking: from immortal beings, to intellects that can read books in seconds, to creatures that can communicate through brain-to-brain interactions, to entities whose moral equality is at stake. It is essential in democratic societies that people be informed about scientific advances. The public should know what current biomedical research can accomplish as well as what is improbable. Overconfidence in the power of science prevents a correct evaluation of the ethical and social implications of biomedical research. It helps nobody, certainly it does not help democratic participation, to have the public and policymakers believing that the genetic enhancement of human beings is a simple endeavor ready to be used in the creation of a new species of post-humans.

Second, discussing the dangers or benefits of a new species of post-humans as if such an event was scientifically and technologically unproblematic might contribute to a possible loss of trust in scientists and the scientific enterprise. Such trust can be threatened when the public perceives that scientists are trying to accomplish what many might see as unjustifiable goals from creating immortals, to building cyborgs, to directing human evolution towards the so-called post-human. And such distrust could in turn encourage the implementation of public policies that might endanger legitimate research programs. Yet trust in science can also be jeopardized by rising expectations that are unlikely to be attained. If people are lead to believe that genetic research is the new panacea, they will not take it kindly when failures occur and hopes are shattered. For example, the very negative public reaction to NASA space research after the accident of the Challenger shuttle might be related to the agency's presentation of space travel as perfectly normal, rather than as an ongoing risky experiment (Dunar and Waring, 1999).

Third, the emphasis on genetic manipulation, whether as a solution to human vulnerabilities or as a threat to human dignity, exaggerates the role of genes in the development of human traits and characteristics and neglects the role of social and environmental influences. Obviously this does not mean that genes are not important; they are, however, not the only important things influencing human beings.

Fourth, because many discussions about the genetic enhancement of human beings are grounded on an incorrect understanding of the role of genes in human biology they help promote genetic determinism. This in turn might contribute to public policies that incorrectly emphasize genetic interventions rather than preventive measures, life style modifications, or transformation of social structures. An erroneous view of the role of genes in human biology might also result in people seeing information about their genetic make up as fate (Senior et al., 1999; Wright et al., 2003). Thus, although life style and institutional changes could improve peoples' well-being, the motivation to do so might be lacking. Moreover, by presenting human traits and behaviors as if they were the result of the exclusive play of our genes, and as completely independent of our social life, we can also miss the opportunity to improve the aspects of our social, political, and legal systems that need to be improved. For example, often the desire to enhance particular traits results from the fact that such an enhanced trait will confer a competitive advantage in our society. Take, for instance, a desire to enhance human height, or, something that is now technologically possible, the desire to choose the sex of a child. The value of these traits is however dependent on our particular social arrangements and not on the fact that height or a particular sex are traits that will increase our well-being in any kind of society that humans can create. Thus, our social arrangements result in presumably unjustifiable disadvantages for people who are short or are female and advantages for people who are tall or are males. It is in this context that we think enhancing this trait or choosing our children's sex would be a good. But if we change our social institutions to address the discrimination against people, then we will have little reason to desire the manipulation of such traits.

If the arguments I have present here are correct, worries or hopes of a post-human future appear to be misplaced. Furthermore, the debate about the risks and benefits of using genetic enhancement to create a new species of post-humans is unlikely to contribute to an informed discussion of these issues or to help further human well-being.

4 Concluding Remarks

The reflection on the theoretical consequences of genetic enhancement has come to be presented as a discussion of whether it is wise for us to proceed with, or whether we have the luxury to prevent, the creation of the post-human. That the post-human – a being whose capacities so greatly exceed current human ones that we cannot recognize it as human anymore – is achievable is not a matter of debate. Scant evidence exists, however, in support of this belief. One of the many difficulties with debates about the creation of post-humans using genetic enhancement is that we are not exactly sure what a post-human would look like. It is obvious that any argument defending or rejecting the creation of these new entities has to presuppose a particular conception of human nature. Those who see human nature as somehow deficient will tend to embrace technologies that can "improve" it. However, those who see

human nature as grounds for human rights, as essentially vulnerable, or as wonderfully fragile, will be inclined to see the possibility of changing these essential characteristics as a danger. In any case, the current debate presumes that unless we pass regulation to prevent it, a post-human future is just around the corner. I have tried to show here that the fears and hopes surrounding the demise of human beings in favor of a new species of post-humans are mistaken. This is so because such fears and hopes are grounded in an inadequate understanding of human biology. Both proponents and critics of genetic enhancement have erroneous presuppositions about the role of genes in human biology. Furthermore, they adopt incorrect beliefs about knowledge production in the biological sciences.

It is obvious that there are a variety of problems that surround many discussions of genetic enhancement. Many of these debates rarely pay attention to issues of what it means to be human, what human nature is, how much we can change human genetics without affecting "human nature," or what it means to be what are called "better humans." My focus here has been only on a different aspect of this debate: the failure to present a balanced view of what might or might not be possible as a result of genetic human enhancement and on the social, political, and ethical consequences of this lopsided debate.

Notice, however, that I have not attempted to deny that genetic technologies might prevent and cure some human diseases or that they might "enhance" some human characteristics. The aim of this chapter has been to point out that at least as far as present biological knowledge indicates, we have no reasons to believe that such genetic manipulations would be such as to give rise to a new species of post-humans. It is surprising that, in spite of current scientific evidence, most of the debate about the presumed consequences – good or bad – of genetic enhancement appears to ignore the complexity of human traits and behaviors. Despite such evidence, discussions of genetic enhancement continue to present genes as the main determinants of human traits, behaviors, or diseases. These discussions often disregard relationships between genes, epigenetic effects, the influence of the cellular environment on gene expression, and the effects of environmental and social factors on human biology and on our judgments about the desirability or undesirability of particular traits.

Notice also that my arguments are not a call to cease reflection on the topic of human nature or on the social context that makes the idea of human enhancement a reasonable scientific goal. Neither am I proposing that we stop thinking and discussing about whether, and if so how, our attempts to control human nature by means of genetic enhancement might affect human self-understanding. On the contrary, I believe that such reflections are badly needed if for no other reason than that they can be very useful in helping us to decide what kind of technologies we want by analyzing the kind of society that we want to construct.

It is in everybody's interest to encourage thoughtful and informed evaluations of the ethical, legal, and social implications of new biomedical research and technologies. Conceptual issues, ethical principles, and political and social practices must be taken into account in performing such analyses. But equally important for many of these discussions is an adequate depiction of the power of scientific

research and a reasonable portrayal of the possibilities of human genetic enhancement. Paying careful attention to current research in human genetics and cell biology shows that many of the alleged urgent concerns about a post-human future seem to be misplaced.

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