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THE INEVITABILITY OF GENETIC ENHANCEMENT TECHNOLOGIES

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ABSTRACT

We outline a number of ethical objections to genetic technologies aimed at enhancing human capacities and traits. We then argue that, despite the persuasiveness of some of these objections, they are insufficient to stop the development and use of genetic enhancement technologies. We contend that the inevitability of the technologies results from a particular guiding worldview of humans as masters of the human evolutionary future, and conclude that recognising this worldview points to new directions for ethical thinking about genetic enhancement technologies.

INTRODUCTION

For some, the development and use of any technology to enhance human capacities and traits is laudable – likely to improve the human condition.[1] For others, the development and use of all but a narrow set of environmental enhancements (such as education) is deeply problematic.[2] Between these extremes are those who are not so much concerned with the technical means of enhancement – that is, whether the alterations are sought by environmental, surgical, pharmacological or genetic means – but rather who are worried about the nature of the alterations sought – that is, whether the enhancement technology will be used (alone or

[1] See, for instance: B. Stableford. 1984. *Future Man.* New York. Crown; and A. Sandberg (n.d.). Genetic Modifications. Available online at: *http://www.aleph.se/Trans/Individual/Body/genes.html* (accessed 7 February, 2002).

[2] For instance: L.J. Kass. 1985. *Toward a More Natural Science: Biology and Human Affairs.* New York. Free Press; and L.J. Kass. The Wisdom of Repugnance. *New Republic* 1997; 216: 17–27.

in combination) to make physical, intellectual, psychological or moral alterations to the self.[3] In the category of *physical enhancements* there might be a range of alterations aimed at improving size, increasing muscle mass, reducing sleep dependence, increasing endurance, decelerating ageing, altering skin colour or changing gender. *Intellectual enhancement*s might include alterations aimed at improving memory and cognitive ability, promoting multi-dimensional thinking, and increasing imagination. *Psychological enhancements* might include efforts to improve sociability, reduce shyness, and instil confidence. And, *moral enhancements* could seek to control violent behaviour, encourage kindness and promote the capacity for sympathy. Some of these types of enhancements are considered worthy of pursuit, while others are thought to be of questionable value.

Moreover, for some individuals the worry is not with the technical means of enhancement or with the human characteristics to be enhanced, but rather with the underlying motivation(s). In very general terms, enhancements may be sought for a variety of reasons: to be in fashion; to improve performance; to gain a competitive advantage; to secure and exercise power; to promote and protect health and well-being; to increase the life-span; to assuage or even overcome existential angst; or to meet the demands of justice.[4] And, depending upon the underlying motivation, the resulting alterations may be conservative (i.e., used to normalise the self), liberal (i.e., used to liberate the self) or radical (i.e., used to fashion a self that effectively challenges others' conception of oneself).[5] From the perspective of some theorists, not all of these reasons for seeking to enhance human capacities and traits are equally meritorious.

With this rough taxonomy of means, objects, and motivations in mind, we turn our attention to genetic enhancement technologies in particular. For our purposes, a *genetic enhancement technology* is any technology that directly alters the expression of genes that are already present in humans, or that involves the addition of genes that have not previously appeared within the human

[3] L. Walters & J.G. Palmer. 1997. *The Ethics of Human Gene Therapy*. New York. Oxford University Press.

[4] Generally, see: E. Parens, ed. 1999. *Enhancing Human Traits: Ethical and Social Implications*. Washington. Georgetown University Press. For considerations of justice specifically, see, for instance: N. Holtug. Does Justice Require Genetic Enhancements? *Journal of Medical Ethics* 1999; 25: 137–143; and A. Buchanan, D.W. Brock, N. Daniels & D. Wikler. 2000. *From Chance to Choice: Genetics and Justice*. New York. Cambridge University Press.

[5] A.D. Dreger, personal communication.

population (including plant, animal, or custom-designed genes), for the purpose of human physical, intellectual, psychological, or moral improvement. This includes somatic cell nuclear transfer (SCNT) technology, somatic and germ line gene transfer technology, cosmetic gene insertion, cosmetic stem cell transfer, and the creation of human-to-human, animal-to-human and human-to-animal chimeras, as well as part-human hybrids. We contend that attempts to develop and use such technologies are inevitable. While the argument offered here might be developed and applied more broadly to encompass additional or even all new forms of (bio) technology, we restrict our attention, and so the scope of our claim, to genetic enhancement technologies as defined above.

To be sure, not all of the envisioned genetic enhancements will come to pass. The complexities of organismal development[6] are such that some of the genetic tinkering imagined and promoted by enhancement enthusiasts will prove to be impossible.[7] This fact is irrelevant to our argument, however. What matters to our argument is that *despite* the likely failure of particular genetic enhancements, there are some among us who will *inevitably attempt* to engineer the human genome[8] for the purpose of improving *Homo sapiens*. And, to our surprise (and perhaps our disgust or delight) some will succeed.

With this in mind, we briefly outline a central argument in favour of the development and use of human genetic enhancement technologies. We then survey a number of discrete objections to this argument. Next, the obvious limitations of some of these objections are noted, while the more promising objections are developed more fully. The strategy is not to provide a point-

[6] J.S. Robert. Interpreting the Homeobox: Metaphors of Gene Action and Activation in Evolution and Development. *Evolution & Development* 2001; 3: 287–295.

[7] J.W. Gordon. Genetic Enhancement in Humans. *Science* 1999; 283: 2023–2024.

[8] A caveat about *the* human genome: at the genetic level, humans differ from each other by 1/10 of 1%, but it is not the case that there is some one genome shared by all humans that is 99.9% identical. There is no single human genome representative of all humans, for genetic variation is the norm. See: A.L. Tauber & S. Sarkar. The Human Genome Project: Has Blind Reductionism Gone too Far? *Perspectives in Biology and Medicine* 1992; 35: 220–235, at 228; see also E.A. Lloyd. 1994. Normality and Variation: The Human Genome Project and the Ideal Human Type. In *Are Genes Us? The Social Consequences of the New Genetics*. C.F. Cranor, ed. New Brunswick, NJ. Rutgers University Press: 99–112; and J.S. Robert. Illich, Education, and the Human Genome Project: Reflections on Paradoxical Counterproductivity. *Bulletin of Science, Technology, and Society* 1998; 18: 228–239, at 229–230.

by-point rebuttal of the arguments against genetic enhancement, but rather to defend the more encompassing claim that moral arguments simply will not suffice to stop attempts at genetic enhancement. We explore various reasons for the inevitability of genetic enhancement technologies, and conclude that accepting the inevitability of genetic enhancement will spur us to profitably redirect ethical energy to the all-important tasks of ensuring that the process of attempting genetic enhancement is morally acceptable, and that successfully developed genetic enhancements are used in a socially responsible manner. In this way, we hope to guard against a defeatist interpretation of our inevitability claim, while simultaneously opening moral space for a more productive dialogue.[9]

ESCHEWING BOUNDARIES: SUPPORT FOR GENETIC ENHANCEMENT TECHNOLOGIES

Some insist that the pursuit of all enhancement technologies is not just ethically permissible, but also a moral imperative for humans,[10] and that specific objections to the development and use of genetic enhancement technologies are wrongheaded. Among the proponents of this view are those who maintain that humans are sorely imperfect, and so humans should do whatever can be done to augment human traits and capacities. In many respects, however, this suggestion is less an argument than a manifesto.[11] What we take to be the standard argument in support of genetic enhancement technologies must be reconstructed;

[9] In a broad discussion of genetic engineering, Heta Häyry has warned against a particular kind of defeatist pessimism, one that we avoid here. That attitude 'cynically assumes that nothing can be done', and that 'the total prohibition of gene-splicing activities is the only way to save humankind from the slippery slope to which mad scientists and big corporations are leading us.' Such pessimism may be self-fulfilling, in the sense that 'ordinary citizens' may decide not even to bother attempting to influence the development and use of genetic engineering technologies. Our inevitability claim, as will become evident below, is a different sort of claim altogether; it does not rest on slippery-slope foundations, and its objective is rather to spur attention to the question of how best to mediate the consequences of the development of genetic enhancement technologies. See: H. Häyry. 1994. How to Assess the Consequences of Genetic Engineering? In *Ethics and Biotechnology*. A. Dyson & J. Harris, eds. New York. Routledge: 144–156, at 152. See also note 52, below.

[10] Sandberg, *op. cit.* note 1.

[11] Stableford, *op. cit.* note 1; see also hints in this direction offered by Joseph Rosen in: L. Slater. Dr. Daedalus: A Radical Plastic Surgeon Wants to Give You Wings. *Harper's Magazine* 2001; July: 57–67.

abstracted, it runs as follows: (1) *enhancing* human capacities and traits is a worthy ideal, as evidenced by the general social commitment to education, medicine, and welfare; (2) *genetically* enhancing human capacities and traits – for example, somatic cell nuclear transfer (i.e., cloning) for the purpose of replicating and improving upon a desired specimen,[12] and cosmetic stem cell transfer to supplement the functioning of normal genes – represents but one end of a continuum of enhancement technologies to pursue the goal of enhancing human capacities and traits; (3) if the *goal* of genetic enhancement is the same as the (laudable) goal of generic enhancement, then the *means* of enhancement do not matter morally; (4) the goal of genetic enhancement is in fact the same as the goal of generic enhancement, and so is itself laudable; therefore, (5) genetic enhancement technologies should be developed and their use promoted and supported.

While the first premise seems unassailable, and the conclusion does indeed follow from the premises taken together, premises (2)–(4) deserve further scrutiny. The second and fourth premises are the subject of many of the objections outlined below. The third premise is the subject of the final objection surveyed.

ESPOUSING LIMITS: OBJECTIONS TO GENETIC ENHANCEMENT TECHNOLOGIES

Current objections to genetic enhancement technologies are many and varied. Though some of the arguments to be discussed below have been treated in considerably more detail by others,[13] it will become evident that sketching them here is necessary to our programmatic endeavour to change the subject and tenor of ethical debates about genetic enhancements. In our view, the objections to genetic enhancement technologies cluster around the following themes: (i) the technologies are intrinsically wrong;

[12] F. Baylis. Human Cloning: Three Mistakes and an Alternative. *Journal of Medicine and Philosophy* 2002; 27: 319–337.

[13] See, for instance: J. Glover. 1984. *What Sort of People Should There Be? Genetic Engineering, Brain Control and Their Impact on Our Future World.* New York. Penguin Books; J. Harris. 1992. *Wonderwoman and Superman: The Ethics of Human Biotechnology.* Oxford. Oxford University Press; D. Heyd. 1992. *Genethics: Moral Issues in the Creation of People.* Berkeley. University of California Press; J. Wood-Harper. 1994. Manipulation of the Germ Line: Towards Elimination of Major Infectious Diseases? In *Ethics and Biotechnology, op. cit.* note 9, pp. 121–143; P. Kitcher. 1996. *The Lives to Come: The Genetic Revolution and Human Possibilities.* New York. Simon & Schuster; Walters & Palmer, *op. cit.* note 4, especially Chapter 4; and M-W. Ho. 1999. *Genetic Engineering: Dream or Nightmare?* Second edition. New York. Continuum.

(ii) whether the technologies are effective or not, there likely will be negative biological consequences; (iii) if the technologies are effective and their use is widespread, this will result in harmful social consequences; and (iv) the means of achieving laudable ends are not all equally morally meritorious. In the first of these four categories there are concerns about the transgression of divine and natural laws. In the second category, the objections involve concerns about the biological fallout of mishaps in genetic engineering, the potential loss of genetic variability among humans, and the worry that the unconstrained use of genetic enhancement technologies will result in the eventual demise of the species. In the third category, there are concerns about the threat to existing social institutions and practices, the misuse of social resources, the widening gap between the well-off and the less-so, the push to social conformity and homogeneity, and the limits on free choice. Finally, in the last category, there is the more encompassing worry that genetic technologies as a means may not be morally neutral in achieving an end widely deemed to be praiseworthy. Below, we briefly elaborate on each of these concerns.[14]

1. *Transgression of divine laws.* There are two major thrusts to the argument against genetic enhancement technologies as 'playing God.' The first focuses on God's omniscience. The claim is that the requisite knowledge and capacities to plan for the physical, intellectual, psychological and moral well-being of distant future generations is beyond the grasp of humans. In this view, volitional evolution – the intentional genetic shaping of human purpose – should remain beyond human reach. It is sheer hubris for anyone to attempt to directly manipulate the human genetic structure, for only God can know (and accordingly plan for) the future of the species. The second major thrust of the argument against 'playing God' focuses on God's omnipotence. The claim is that the planned (hoped for) use of genetic enhancement technologies aimed at creating or modifying life is an unwar-

[14] Nils Holtug has noted that intuitive worries about human gene therapy are generally of the slippery slope variety and, moreover, he has argued that such slippery slope arguments can generally be overcome in the context of human gene therapy. We have thus striven to avoid explicit slippery slope objections to genetic enhancement technologies (though some of the objections may be reconstructed in slippery slope terms). See: N. Holtug. Human Gene Therapy: Down the Slippery Slope? *Bioethics* 1993; 7: 402–419. See also note 52, below.

ranted, unwise, and profoundly immoral attempt to usurp God's power.[15]

2. *Transgression of natural laws.* According to some, the use of genetic enhancement technologies is unnatural for at least two reasons: it is contrary to the natural course of events; and it is contrary to human nature. The putatively unnatural features of genetic enhancement technologies are objectionable from the perspective of those who believe that the natural order has intrinsic value, independently of human valuers. In this view, nature deserves respect; this respect sets limits on human intervention; and these limits preclude the use of genetic enhancement technologies. Despite a wide range of opinion on the nature of human nature,[16] and against the historically prevalent view that humans are by nature meant to master nature,[17] the second, related objection is that as humans are part of nature, rather than separate from nature, the essence of humans is to nurture and protect the natural world, not to dominate it through, for instance, genetic engineering.
3. *Introduction of an unacceptable risk of harm.* There is considerable speculation about the possible negative biological consequences of the introduction and use of genetic enhancement technologies. The possibility of error, and the potential for serious correlative physical, psychological and other harms to individuals, are typical objections to enhancement technologies especially during their early research phases. These objections are particularly significant in the case of genetic enhancement technologies where: (i) any error may be irreversible; (ii) the underlying risk of harm is unknown and unknowable; and (iii) the direct consequences of any error will be borne by many in addition to the individual who may be enhanced, particularly if the error is perpetuated into future generations.
4. *Introduction of a threat to genetic diversity.* It is said that genetic enhancement technologies will have a deleterious impact on the genetic variability characteristic of the human gene pool. Though it is widely recognised that there is no real prospect

[15] P. Ramsey. 1970. *Fabricated Man: The Ethics of Genetic Control.* New Haven. Yale University Press; N. Messer. Human Cloning and Genetic Manipulation: Some Theological and Ethical Issues. *Studies in Christian Ethics* 1999; 12: 1–16.

[16] R. Trigg. 1988. *Ideas of Human Nature: An Historical Introduction.* Oxford. Basil Blackwell.

[17] As documented in: C. Merchant. 1989. *The Death of Nature: Women, Ecology, and the Scientific Revolution.* New York. Harper and Row.

of eliminating genetic diversity altogether,[18] some argue that even small changes could lead to serious harm.[19] One possible reason for concern is that scientists know so little about gene function in organismal development, and not much more about development above the level of the genes. There is no simple one-to-one correspondence between genes and traits (or even proteins), for a variety of genes interact in complex ways in development, and relationships between genes and phenotypic traits are many-to-many. Single genes may, therefore, have multiple, divergent (and sometimes unexpected) effects, a phenomenon known as pleiotropy. One well-known instance of pleiotropy is the alleles involved in sickle-cell anaemia and malaria resistance; another example is the cystic fibrosis transmembrane conductance regulator, or CFTR. CFTR mutations in Caucasian populations may confer heterozygote advantage by increasing resistance to *Salmonella typhi*; but in homozygotes, the mutations are implicated in the development of cystic fibrosis.[20] So, attempts to modify the CFTR in order to intervene in the CF causal pathway may unwittingly increase the incidence of typhoid fever. Until scientists have a better grasp of such pleiotropic gene effects, enhancement efforts could reduce human genetic diversity in dangerous ways.

5. *Introduction of a threat to our common genetic heritage.* The United Nations Educational, Scientific, and Cultural Organization adopted a *Universal Declaration on the Human Genome and Human Rights* in 1997. In Article 1 of that document, UNESCO declared that 'the human genome underlies the fundamental unity of all members of the human family, as well as the recognition of the inherent dignity and diversity of each of its members.'[21] If the human genome represents

[18] G.E. Pence. 1998. *Who's Afraid of Human Cloning?* Lanham, MD. Rowman and Littlefield: 129–131.

[19] D.T. Suzuki & P. Knudtson. 1990. *Genethics: The Ethics of Engineering Life.* Revised edition. Toronto. Stoddart.

[20] G.B. Pier, M. Grout, T. Zaidi, G. Meluleni, S.S. Mueschenborn, G. Banting, R. Ratcliff, M.J. Evans & W.H. Colledge. *Salmonella typhi* Uses CFTR to Enter Intestinal Epithelial Cells. *Nature* 1998; 393: 79–82.

[21] UNESCO. 11 November, 1997. *Universal Declaration on the Human Genome and Human Rights.* 29th Session of the General Conference. Paris. Available online at: http://unesdoc.unesco.org/images/0010/001096/109687eb.pdf (accessed 7 February, 2002); see also: C. Byk. A Map to a New Treasure Island: The Human Genome and the Concept of Common Heritage. *Journal of Medicine and Philosophy* 1998; 23: 234–246.

humanity's common heritage (*patrimoine génétique* in France and *Ergbut* in Germany), then this heritage may be seriously threatened by genetic enhancements. Some believe that there is the distinct possibility that with the genetic enhancement of successive generations – by altering the expression of genes that are already present or adding new genes that have not previously appeared in humans – a segment of society will engineer itself out of the species *Homo sapiens*. Already those who worry about the possibility of radical transformation jest about the creation of a new species – *Homo Glaxo Wellcomus*.[22]

6. *Paradoxical counter-productivity*. In liberal democratic societies, at least, decisions about the use of genetic enhancement technologies are thought to be a private matter. This view is mistaken, however, insofar as there would be enormous social ramifications to the millions of individual decisions to use genetic enhancement technologies. Consider, for example, the potentially devastating social impact of a genetic technology to alter the ageing process and extend life. If it were possible to genetically optimise human biology to be resistant to disease and the ravages of old age, and the middle classes in economically advanced industrialised countries availed themselves of this technology for themselves and their children, enormous social problems would result from ever-increasing population density,[23] not to mention ever-increasing healthcare spending for a population that is (by global standards and at least for now) very healthy.[24] This is an instance of what Ivan Illich refers to as 'paradoxical counter-productivity', the process by which an institution or technology, in its normal course of operation, paradoxically subverts the very purpose it was intended to serve. Note that a city designed around wheels is generally unfriendly to pedestrians, thereby requiring urbanised people to spend an astonishing amount of time (approximately 17% of waking

[22] Anonymous. Editorial: The Big Test. *New Republic* 2001; 223: 9. Of course, it is worth emphasising again that there is no such thing in nature as *the* human genome, given the predominance of genetic variability; moreover, there is no such thing in nature as the *human* genome, given that humans share significant DNA sequences with virtually all extant and extinct creatures from apes to amoebae.

[23] J. Harris. Intimations of Immortality. *Science* 2000; 288: 59.

[24] D. Callahan. 1999. *False Hopes: Overcoming the Obstacles to a Sustainable, Affordable Medicine*. New Brunswick, NJ. Rutgers University Press.

hours) as passengers in motor vehicles.[25] Illich justly calls this 'time-consuming acceleration.'[26] Similarly, a genetically enhanced human species, by threatening to overwhelm existing social institutions and practices, may become, paradoxically, disabled.[27] Consider, for example, the elective use of genetic enhancement technologies to increase height with the aim of securing competitive advantage. Particular social and economic advantages may be accessible only to tall people; but there are of course height limits beyond which being tall would in fact be disadvantageous. As Dan Brock notes, 'to be nine feet tall would on balance be harmful in nearly any human society because our social world is constructed for persons whose height rarely reaches beyond seven feet. One would literally become, in a physical respect, unfit for human company.'[28] Now, if everyone were to be nine feet tall, the expected competitive advantage would dissipate; and if instead the social world were to be reconstituted so as to accommodate those who are nine feet tall (if not everyone were), then the competitive advantage would be a result of social, rather than genetic, enhancement.

7. *A misuse of social resources.* Considerable time, money and talent are typically required for the development of new technologies. When these technologies respond to a widespread need (or even the needs of a very deserving few), and there is the political will to ensure their just distribution, one may legitimately conclude that financial and human resources have been invested wisely. This is not the case, however, when the new technologies address the perceived needs of an affluent minority and serve to entrench existing power relations. In these instances there are likely to be huge opportunity costs, as other needed social and health objectives are not pursued.[29]

[25] Robert, *op. cit.* note 8, p. 229; see also: I. Illich. 1978. *Toward a History of Needs.* Berkeley. Heyday: 35, 117.

[26] I. Illich. 1977. Disabling Professions. In *Disabling Professions.* I.K. Illich, I.K. Zolal, J. McKnight, J. Caplan & H. Shaiken, eds. New York. Marion Boyars: 11–39, at 28–31.

[27] On 'detrimental enhancements', see: D. Shickle. Are 'Genetic Enhancements' Really Enhancements? *Cambridge Quarterly of Healthcare Ethics* 2000; 9: 342–352, at 344–345.

[28] D.W. Brock. 1998. Enhancements of Human Function: Some Distinctions for Policymakers. In *Enhancing Human Traits*, *op. cit.* note 4, pp. 48–69, at 59.

[29] See, for instance: A. Lippman. Led (Astray) by Genetic Maps: The Cartography of the Human Genome and Health Care. *Social Science and Medicine* 1992; 35: 1469–1476.

8. *A widening of the gap between the 'haves' and the 'have-nots'*. The first genetic enhancements available, and quite possibly the only ones, will likely be physical and intellectual enhancements. These enhancements will initially be very expensive and only the rich (and powerful) will be able to gain access. As with other advanced technologies (such as computers and electronics), however, in time the cost of these enhancements should decrease. Even so, in all likelihood the technologies will still only be available to the middle classes, and only in some countries. A potential problem with this is that the widespread use of these technologies by those who can afford them will accentuate both the vagaries of the natural lottery as well as socio-economic differences.[30] The idea that humans are all created equal is a useful political fiction helping to establish solidarity amongst humans and to undergird social commitment to a principle of equality of opportunity, namely that despite the differences between individuals, each individual should have the opportunity to strive for success (however defined). Mehlman notes that, 'in the worst case scenario, unequal access to genetic enhancement will divide society into the enhanced and the un-enhanced.'[31] He argues that this split would critically threaten the basis of the principle of equality of opportunity by freezing prospects of upward social mobility. Shenk, citing Thomas Jefferson's observation that 'the mass of mankind has not been born with saddles on their backs, nor a favored few booted and spurred, ready to ride them', worries that we simply cannot be confident in either the truth or the rhetorical power of those words in future.[32] More globally, Silver notes that:

> . . . the social advantage that wealthy societies currently maintain could be converted into a genetic advantage. And the already wide gap between wealthy and poor nations could widen further and further with each generation until all common heritage is gone. A severed humanity could very well be the ultimate legacy of unfettered global capitalism.[33]

[30] M.H. Shapiro. The Impact of Genetic Enhancement on Equality. *Wake Forest Law Review* 1999; 34: 561–637; L.M. Silver. 1997. *Remaking Eden: Cloning and Beyond in a Brave New World*. New York. Avon Books.

[31] M.J. Mehlman. How Will We Regulate Genetic Enhancement? *Wake Forest Law Review* 1999; 34: 671–714, at 687.

[32] D. Shenk. Biocapitalism: What Price the Genetic Revolution? *Harper's* 1997; December: 37–45, at 45.

[33] L.M. Silver. 9 November, 1999. Reprogenetics: How Do a Scientist's Own Ethical Deliberations Enter into the Process? Paper presented at the conference:

The claim, then, is that use of genetic enhancement technologies will increase the gap between the haves and have-nots, unmask the myth of social equality, and result in significant social disruptions both within and between societies.

9. *Promotion of social conformity and homogeneity.* While genetic enhancement technologies are commonly thought to be liberating, they can be very constraining. Experience shows that enhancement technologies are often used to reinforce inappropriate social roles, prejudices and stereotypes as people seek to advantage themselves or their children relative to others. Consider, for example, cosmetic surgery for women to achieve their ideal(ised) shape, for individuals of Japanese descent to 'Westernise' their eyes, and for individuals of Jewish heritage to alter their 'Jewish' noses. These sorts of physical enhancements promote a harmful conception of normality and hide the fact that such norms are socially and culturally constructed. This problem can only be exacerbated with genetically based physical and intellectual enhancements.[34]
10. *Undermining free choice.* Many are familiar with the aphorism 'more is not always better.' In this context, the point is that 'more options' does not mean necessarily 'more choice.' While the use of genetic enhancement technologies can be described as empowering, as when rational individuals autonomously choose to avail themselves of the technologies,[35] the fact remains that choice is always constrained by context. If the context includes the widespread use of a particular enhancement technology, personal freedom may be seriously threatened as people feel obliged to avail themselves of the technology. For example, if a significant minority of people freely choose to genetically alter their children's ability to produce growth hormone and the average height shifts upward, it will be extremely difficult, if not impossible, for parents to freely choose not to provide their child with

Humans and Genetic Engineering in the New Millenium – How Are We Going to Get 'Genethics' Just in Time? Available online at: http://www.etiskraad.dk/publikationer/genethics/ren.htm#kap02 (accessed 7 February, 2002).

[34] See, for instance: S. Bordo. 1998. *Braveheart, Babe*, and the Contemporary Body. In *Enhancing Human Traits, op. cit.* note 4, pp. 189–221; M.O. Little. 1998. Cosmetic Surgery, Suspect Norms, and the Ethics of Complicity. In *Enhancing Human Traits, op. cit.* note 4, pp. 162–176.

[35] K. Davis. 1995. *Reshaping the Female Body: The Dilemma of Cosmetic Surgery.* New York. Routledge.

this genetic enhancement. There will be strong social pressure to conform, as there already is in the case of prenatal diagnosis;[36] concerning genetic enhancements, parents may well feel the need to conform just to compete.[37]

11. *The means matter morally.* While some would suggest that enhancement technologies from education to germ-line engineering exist on a continuum and are of a piece in promoting a single goal – the laudable augmentation of human capacities and traits – it is not clear that the end justifies the use of any and all possible means. Consider that particular means may be valuable in themselves (because edifying, or taxing, or demanding persistence) – independently of the overarching end – and not merely instrumentally (as means to that pre-specified end, no matter how valuable). The idea is that the experience of accomplishment (the means by which accomplishment is achieved) could itself be valuable, and not just the accomplishment (the end) alone: value is not exclusively consequential. Moreover, different means target different variables, and alternative means may well have different opportunity costs and collateral consequences – some of which will have a moral dimension – independently of shared ends. The objection is, thus, that it is inappropriate to pretend that genetic enhancement technologies are just 'more of the same' and so are therefore ethically unproblematic.[38]

TO STEER, BUT NOT TO STOP

Not all of the ethical objections described above will be persuasive for everyone, and some will persuade no one. For example, those who do not believe in God will hardly find the argument about transgressing divine laws persuasive. As well, some of the arguments that are persuasive in the main may, at most, warrant

[36] B. Duden. 1993. *Disembodying Women: Perspectives on Pregnancy and the Unborn.* Translation by Lee Hoinacki. Cambridge. Harvard University Press; see also: Robert, *op. cit.* note 4; and J.S. Robert. Moral Truthfulness in Genetic Counseling. *Business and Professional Ethics Journal* 1998; 17: 73–93.

[37] W. Gardner. Can Human Genetic Enhancement Be Prohibited? *Journal of Medicine and Philosophy* 1995; 20: 65–84.

[38] Brock, *op. cit.* note 28; see also R. Cole-Turner. 1998. Do Means Matter? In *Enhancing Human Traits*, *op. cit.* note 4, pp. 151–161; E. Parens. Is Better Always Good? The Enhancement Project. *Hastings Center Report* 1998; 28: S1–S15; S. Goering. Gene Therapies and the Pursuit of a Better Human. *Cambridge Quarterly of Healthcare Ethics* 2000; 9: 330–341; and Shickle, *op. cit.* note 27.

a *cautious* stance regarding the development and use of genetic enhancement technologies – and not an outright ban. Consider, for example, the arguments about an unacceptable risk of biological harms; such harms are notoriously difficult to predict, especially when the successful development of organisms 'in the wild' depends on so many variables interacting so reliably that 'the amazing thing about mammalian development is not that it sometimes goes wrong, but that it ever succeeds' at all.[39] But the biological harm issue is resolvable over time, such that to proceed with caution seems the logical sequel to this particular objection – as Glover has noted, 'the risk of some irreversible disaster' is the 'dominating reason' for both caution and gradual introduction of new enhancement technologies.[40]

In our view, however, the concerns raised about the negative social consequences can be developed most persuasively, as can the worry about paradoxical counter-productivity and the notion that means matter morally. Socially, if recent experience with infertility treatments – which are existentially demanding, expensive, and often futile, but nonetheless perceived by many infertile persons and couples to be socially obligatory[41] – is any indication, then the consequences of genetic enhancement technologies will be widespread, complex, and not always uplifting. Consider Gardner's argument that once some parents choose to enhance their children genetically, more parents will follow suit and, moreover, the attractiveness of and demand for genetic enhancement technologies will increase concurrently with any increase in the number of parents using the technologies. In this view, parental adoption of genetic enhancement technologies is likely to be self-reinforcing and to spread to fixation in particular populations in which even a few parents avail themselves of the technologies. Assuming potential biological harms can be minimised as the technologies are used and improved, the demand for genetic enhancements will be fuelled by parents whose un-enhanced children fail to perform compared with enhanced children. Parents with no in-principle objection (e.g., no religious objection) to enhancement will see genetic enhancement as safe, effective, necessary and so therefore desirable.[42] And yet because genetic

[39] V. van Heyningen. Gene Games of the Future. *Nature* 2000; 408: 769–771, at 771.

[40] Glover, *op. cit.* note 13, p. 43.

[41] G. Becker. 2000. *The Elusive Embryo: How Women and Men Approach New Reproductive Technologies*. Berkeley. University of California Press.

[42] Gardner, *op. cit.* note 37, pp. 72–75.

enhancements will never be universally available on demand (e.g., due to cost constraints), the myth of equality of opportunity may well be shattered, thereby dividing human societies into genetic nobilities jockeying biological under-classes.[43]

Moreover, regarding paradoxical counter-productivity, it is certainly plausible to suggest that should efforts at genetic engineering take precedence over attempts to understand and alter complex social conditions that co-conspire in the production of social problems, the problems will intensify. That is, prioritising the use of gene-based techniques to solve particular problems may not only fail to solve those problems, but may also undermine the generation of alternative solutions by delegitimising non-genetic means, whether traditional or innovative. Consider, for example, how attention to genomics has revolutionised scientific research and development, such that it is now difficult even to get funding for basic research at any level of biological organisation above the genome.[44] But even if genetic enhancement technologies are successfully deployed to augment human traits and capacities and to thereby resolve particular social woes, it should by now be clear that there is no guarantee that such technologies themselves will not generate still further problems of their own.[45] That is, regardless of whether genetic enhancement is either an unqualified success or fails to deliver on its promises, should alternative means to similar ends be consequently nowhere to be found, humans may well be worse off than ever.

Finally, we return to the problem of means mattering morally. Means make a moral difference in a variety of ways. We shall focus only on one, closely associated with the claim in the previous paragraph about levels of organisation – namely, that different means may work on different 'objects' (or targets, or levels). Since the inception of the Human Genome Project, and especially since its completion, many scientists and politicians have suggested that identifying disease markers at the level of the genome will lead to significant improvements in preventing a wide range of human diseases. Reducing diseases to their genetic components, and thereby identifying the cause of a disease with a particular allele

[43] Mehlman, *op. cit.* note 31.

[44] R.C. Strohman. Profit Margins and Epistemology. *Nature Biotechnology* 1997; 15: 1224–1226; see also: W. Bains. The Parts List of Life. *Nature Biotechnology* 2001; 19: 401–402.

[45] For a slate of examples of the unforeseen consequences of technological innovations, see: E. Tenner. 1996. *Why Things Bite Back: Technology and the Revenge of Unintended Consequences.* New York. Knopf.

(or alleles), suggests in this context that the appropriate level for intervention is the level of the genome. This in turn suggests that the appropriate medical means for dealing with disease is gene-based (genetic engineering and therapy, genetically engineered pharmaceuticals, prenatal genetic diagnosis followed by therapeutic abortion, pre-implantation genetic diagnosis followed by selective embryo implantation), and that the locus of disease is the individual human (or, more precisely, her genome). But there are, of course, alternative levels at which to describe disease, and at which to target specific interventions – not least because genes are neither necessary nor sufficient for the aetiology of disease. The effects of genes in the genesis of disease are mediated by social, political, and ecological factors, all of which share causal aetiological responsibility and any of which could be targeted by alternative means. Focusing on the genetic level may be a function of the perceived tractability of manipulating genes compared with manipulating complex social structures or ecological phenomena as means toward the prevention of disease,[46] but the enormous investment in genetic research may be morally expensive. For example, it unjustly locates the responsibility for becoming ill in the ill individuals themselves;[47] and it limits the availability of funding for research at other levels of explanation and intervention.[48] Further, the looming prospect of genetic enhancements may foster the belief that since it is easier to change human bodies in order to relieve suffering, societies should forego altering social, political, and ecological structures generative of human suffering – despite the fact that suffering will persist given unequal access to any enhancement technologies that happen to be developed.[49] Alternative means may well carry their own moral costs but, at base, means matter morally.

These objections, taken together, would seem to provide ample good reason to forsake the development and use of genetic enhancement technologies. There is no evidence as yet, however, that these arguments in particular, or any other arguments, *however well developed*, will suffice to stop the refinement and use of genetic enhancement technologies. As it happens, contemporary Western democracies have no experience with permanently halting the development and use of any enhancement technology on ethical grounds.

[46] L. Gannett. What's In a Cause? The Pragmatic Dimensions of Genetic Explanations. *Biology and Philosophy* 1999; 14: 349–374.

[47] Lippman, *op. cit.* note 29.

[48] See Strohman, *op. cit.* note 44; and Bains, *op. cit.* note 44.

[49] Parens, *op. cit.* note 38.

The typical response to the development and use of enhancement technologies involves a complex mix of outright 'condemnation' and what might be described as 'passive-aggressive resignation.' Policy statements and legislative or regulatory prohibitions are introduced with full knowledge (and acceptance) of the fact that these 'barriers' will not be entirely effective. The overarching pragmatic goal is not to stop the development and use of a specific technology, but rather to slow and possibly to steer basic and applied research. Examples in this category include the use of performance enhancement drugs, the use of psychedelic drugs, and the current effort to clone a human being.

Consider the following. Despite significant efforts by governing bodies to prevent the use of performance enhancing drugs, amateur and professional athletes continue to ingest and inject these drugs. Erythropoetin (EPO) stimulates bone marrow to produce oxygen-rich blood cells, thereby increasing athletic performance. The cycling world in particular has been rocked by scandals of EPO-use – entire cycling teams have withdrawn from the *Tour de France* amidst doping allegations; a not insignificant number of riders have died from using EPO; but authorities have been unable to prevent athletes from abusing erythropoetin. Second, despite the long-standing 'War on Drugs', the use of mind-altering drugs in America has increased substantially, even epidemically in some populations.[50] Third, despite an international consensus against human cloning with the intention of producing a whole being, the race is on. There are the cultish Raelians, and the international team of Panayiotis Zavos (United States), Severino Antinori (Italy), and Ali Ben Abraham (Israel) – and possibly others who are more discreet – who flout both law and social mores in their efforts to clone a human being. In each of these instances prohibitions have been, and continue to be, introduced with the putative goal of stopping the deleterious activity, knowing that in practice the prohibitions are at most containment initiatives or speed bumps.

We fully anticipate that a similar pattern of response will prevail with the development and use of human genetic enhancement technologies. If so, we can further anticipate the following progression: 'initial condemnation, followed by ambivalence, questioning and limited use, followed in turn by a change in public perceptions, advocacy and widespread acceptance.'[51] Examples of

[50] J. Stevens. 1989. *Storming Heaven: LSD and the American Dream.* London. Flamingo.

[51] Baylis, *op. cit.* note 12.

enhancement technologies where the progression from 'condemnation' to 'widespread acceptance' are evident include cosmetic surgery, organ transplantation and gender reassignment. Though initially criticised, these alterations to the self are now either commonplace or well on their way to being so considered.

In anticipation of this sequela, we are driven to ask: why do arguments underscoring probable, unsavoury, and unethical consequences have such a limited prospect of stopping the development and use of enhancement technologies, the potential for benefit notwithstanding? More precisely, *why is the development and use of genetic enhancement technologies inevitable?* As will become evident in what follows, by 'inevitability' we do not mean to invoke either a technological imperative or a slippery slope, but rather something more akin to 'resilient to (moral) argument and resultant from particular conceptions of contemporary humanity.'[52]

THE INEVITABILITY THESIS

According to some, genetic enhancement technologies are inevitable – and welcome – because they promise to secure health, success, wealth and happiness, especially for the presently disad-

[52] An anonymous reviewer suggested that we expand on our notion of inevitability, especially to distinguish it from other arguments for inevitability. There is, for instance, a large literature on slippery-slope arguments for inevitability, ably summarised in Holtug, *op. cit.* note 14. Holtug follows W. van der Burg (The Slippery Slope Argument. *Ethics* 1999; 102: 42–65) in distinguishing between logical and empirical versions of the slippery slope argument. Some commentators would, of course, respond to our question ('why is the development and use of genetic enhancement technologies inevitable?') by invoking an argument to the effect that no line (or no principled line) can be drawn to prevent particular enhancements once genetic enhancement technologies have been developed (a logical slippery slope argument), or to the effect that the mere possibility of developing a technology leads to the development of that technology, and further that the mere existence of a technology leads to its inevitable use (and, possibly, abuse) (the technological imperative – an empirical slippery slope argument). It should be evident that our notion of inevitability is not of the slippery slope variety – in fact, we are not certain that there is anything at the bottom of the slope toward which to slip! Rather, we interpret inevitability in the sense of political immunity to moral criticism, on the basis of common views of the nature of humans and/in the contemporary world. This is, of course, an empirical claim; we hope to be shown to be wrong (and if we are wrong, then, ironically, our aim will have been accomplished). But it is not a pessimistic claim in the sense objected to by Häyry; and it is not a slippery-slope claim in any of the senses addressed by Holtug.

vantaged. James Watson holds such a view,[53] as does Gregory Stock,[54] but despite its popularity this hypothesis surely strains one's credulity. Ours is not a kind, caring, compassionate world, but rather a capitalist, heedlessly liberal, curiosity-driven, competition-infused world in which some are intent on controlling the human evolutionary story.

Genetic enhancement technologies are inevitable because so many of us are crass capitalists, eager to embrace biocapitalism.[55] In economically advanced industrialised countries, ours is a corporate world where there is a shared commitment to capitalism, privatisation, and a market-driven global economy. In this world, marked by globalisation, free markets, and consumer choice, there is no enhancement technology that is too dangerous, or too transgressive, for it not to be pursued. Unrestrained consumerism is good and if this results in a free-market eugenic meritocracy, so be it.

In this worldview, only commercial viability (marketability and profitability) matters. If a genetic enhancement technology can be developed and sold (at a profit), it will be made and marketed (and not necessarily in that order). Particular nation-states can try to prohibit the development of the technology, but ultimately are unlikely to be successful. One reason, explored by Gardner, is that once any nation-state endorses human genetic enhancement as a way to gain an industrial-commercial edge, other nation-states will be forced to follow suit.[56] A second reason concerns not nation-states but multinational corporations. The state's authority and power have been seriously eroded by globalisation. Multinationals are widely recognised as more powerful than elected governments and thus, not surprisingly, their commercial interests prevail.[57] Whether at the level of nation-states or multinational industries, ethical concerns are easily swept aside when there is (serious) money to be made.

This mercantile account of the modern world is critically incomplete, however – not least because very many of us aim to transcend crass capitalism. So, eagerness to embrace

[53] As cited in: G. Stock & J. Campbell, eds. 2000. *Engineering the Human Germline: An Exploration of the Science and Ethics of Altering the Genes We Pass to Our Children.* New York. Oxford University Press.

[54] As cited in Shenk, *op. cit.* note 32, p. 41.

[55] Ibid.

[56] Gardner, *op. cit.* note 37.

[57] See, for instance: R. Sandbrook. Neoliberalism's False Promise. *Literary Review of Canada* 2000; 8: 20–24.

biocapitalism cannot completely explain the inevitability of genetic enhancement technologies.

Genetic enhancement technologies are inevitable because heedless liberalism is rampant. Leon Kass observes that prohibitionists are struggling 'against the general liberal prejudice that it is wrong to stop people doing something.'[58] Jeffrey Kahn similarly notes the (perhaps uniquely) American reticence to prohibit certain types of research and development because of the prevailing attitude that 'capitalistic acts between consenting adults are none of its business.'[59] Within states, the liberal reduction of the ethical complexities of genetic enhancement technologies to the sacred paradigm of individual free choice virtually guarantees the inevitability of the technologies; meanwhile, more globally, the liberal reluctance to move beyond this paradigm engenders a more general attitude of cultural relativism whereby there is neither the imperative nor the opportunity to deem some activities as just plain wrong.

Such a political diagnosis of the modern world is also seriously incomplete, however – not least because it invokes an unfair caricature of liberalism and fails to appreciate the complexities of political life both nationally and globally. So heedless liberalism is also unable to completely account for the inevitability of genetic enhancement technologies.[60]

Genetic enhancement technologies are inevitable because humans are naturally inquisitive (and tinkering) beings. Ours is a curiosity-driven, knowledge-based world that is fascinated with technology and in which the guiding mantra is 'if it can be done, it will be done, and so we should do it first.' In this world, the quest for knowledge for knowledge's sake is an all-consuming passion; understanding ourselves, unravelling the mystery of our existence, is our Holy Grail. Add to this our love of technology, and the inevitability of embracing genetic enhancement technology becomes evident. With research on genetic manipulation there is the prospect 'to improve our understanding of the most complex and compelling phenomenon ever observed – the life process. We

[58] As cited in: Anonymous. The Politics of Genes: America's Next Ethical War. *Economist* 2001; 14 April: 21–24, at 21.

[59] Ibid. p. 22.

[60] We make this claim with some hesitation, in as much as Buchanan et al., in *From Chance to Choice* (*op. cit.* note 4), offer a sophisticated defence of liberalism generative of the result that genetic enhancements should in principle be permissible (subject to the satisfaction of particular requirements of justice).

cannot be expected to deny ourselves this knowledge.'[61] Nor can we be expected to restrain ourselves from harnessing and applying this knowledge.

A key feature of this worldview is the belief that scientific knowledge is value-free and yet immensely valuable. Consider the following two recent statements:

> Scientists liberate truth from prejudice, and through their work lend wings to society's aspirations. While poetry titillates and theology obfuscates, science liberates . . . Science, with its currently successful pursuit of universal competence, should be acknowledged king.[62]

> Reliable scientific knowledge has no moral or ethical value . . . Science tells us how the world is . . . Danger and ethical issues come into play when scientific research is done in practice, for example in experiments involving humans and other animals, or when science is applied to technology, or in issues related to safety. There is thus an important distinction between science and technology: between knowledge and understanding on the one hand, and the application of that knowledge to making something, or using it in some practical way, on the other.[63]

In this view, while knowledge can be used to pursue less than praiseworthy technological interventions, this is not sufficient reason to halt the quest for scientific knowledge and understanding. If there are concerns about the misuse of knowledge in the development of a particular technology, then these should appropriately be directed to the eventual application of the technology, not hinder the search for purest scientific knowledge.

Again, some would argue that this view of the world is seriously flawed, not least because scientific knowledge, like all knowledge, is value-laden.[64] Moreover, the distinction between

[61] Gordon, *op. cit.* note 7, p. 2024.

[62] P. Atkins. 1995. The Limitless Power of Science. In *Nature's Imagination: The Frontiers of Scientific Vision*. J. Cornwall, ed. New York. Oxford University Press; as cited by M. Midgley. 1997. Visions of Embattled Science. In *Science Today: Problem or Crisis?* R. Levinson & J.N. Thomas, eds. London. Routledge: 35–50, at 46.

[63] L. Wolpert. Is Science Dangerous? *Science* 1999: 281–282, at 281.

[64] See, for instance: H. Longino. 1990. *Science as Social Knowledge*. Princeton. Princeton University Press; L. Code. 1991. *What Can She Know? Feminist Theory and the Construction of Knowledge*. Ithaca. Cornell University Press; and R. Campbell. 1998. *Illusions of Paradox: A Feminist Epistemology Naturalized*. Lanham, MD. Rowman & Littlefield.

(basic) scientific knowledge and (applied) technology does not withstand critical scrutiny. While some would want to restrict or forbid genetic engineering in humans, it must be remembered 'that it would be difficult to separate . . . knowledge of molecular genetics from the know-how that manipulates the chromosome.'[65]

This account of the inevitability of genetic enhancement technologies is therefore also incomplete, as the pursuit of knowledge is bound up with social and political (and economic) factors. A worldview according to which knowledge is neutral and can be sought for its own sake, is impoverished and so cannot completely explain the inevitability of genetic enhancement technologies.

Genetic enhancement technologies are inevitable because humans are competitive beings, always looking for new and challenging opportunities to maximise personal, social and economic advantage. Competition is (and has been) a valued human activity not only in itself but also instrumentally – competition promotes the drive to succeed and thus fosters improvement. In work, in sport, in reproduction (and in other contexts as well), competition is both encouraged and rewarded. Humans have, throughout the ages, repeatedly shown themselves to be competitive beings driven to succeed (and/or to exceed), and willing to use most any means available to achieve the desired end.

In this view, there can be no doubt that genetic enhancement technologies will be among the means used to secure competitive or positional advantage. To be sure, this use of genetic enhancement technologies may be unfair (as when the genetic enhancements are available only to a small elite) or it may be self-defeating (as when the genetic enhancements are universally available and electively used by all so that no relative advantage is gained).[66] No matter. The point remains that genetic enhancement technologies will be used (by some or all) in attempts to gain a competitive advantage either by strengthening a particular capacity needed to pursue a specific life goal (increased height for the aspiring basketball player, or increased dexterity for the budding pianist), or by strengthening a range of capacities likely to increase one's ability to effectively pursue and master a range of options.

[65] B. Allen. Forbidding Knowledge. *Monist* 1996; 79: 294–310, at 307–308.
[66] Brock, *op. cit.* note 28, p. 60.

This worldview is flawed, however, in its narrow account of the human drive to compete and succeed. As Dan Brock astutely notes, and as we make clear above regarding means mattering morally, 'sometimes a valued human activity is defined in part by the means it employs, not just by the ends at which it aims.'[67] While competition is a valued human activity, this is, in large measure, because of the way it engages our physical, intellectual and other capacities. For many of us it is not only about winning, but also about how the game is played. In large part this explains the ban on the use of performance enhancement drugs in Olympic competition. In this view, achieving success in the workplace or elsewhere by means of genetic enhancement would hardly be worth the candle. As such, our competitive spirit alone cannot account for the inevitability of genetic enhancement technologies.

In sum, a common flaw with each of these characterisations of the modern world – characterisations of worldviews – is that they are one-dimensional: based either in simplistic economic, political, scientific, or sociological terms. The inevitability of genetic enhancement technologies demands a more encompassing, multi-dimensional diagnosis.

Genetic enhancement technologies are inevitable because the future is ours for the shaping. Ours is a dynamic world in which change is a constant, characterised historically by a variety of cultural revolutions (in language development, agriculture, political organisation, physical technologies and, now, biotechnologies), each of which has significantly shaped the human species.[68] Given the economic, political, scientific, and sociological realities sketched above, some firmly believe that the time has come for humans to shape our own destiny and to direct the course of evolution. Genetic enhancement technologies are seen as our most powerful tool for this purpose.

In previous times, humans saw themselves as beings created in the image of a divine God, later as products of natural selection, and more recently as bundles of selfish genes shaped by selection.[69] Now some see humans as self-transforming beings capable of, and intent on, refashioning ourselves in our own image of what

[67] Ibid. p. 58.

[68] J. Lederberg. 1963. Biological Future of Man. In *Man and His Future*. G.E.W. Wolstenholme, ed. Toronto. Little, Brown and Company: 263–273, at 269.

[69] R. Dawkins. 1976. *The Selfish Gene*. Oxford. Oxford University Press.

we should be.[70] In this worldview there are and should be no restrictions – financial, moral, epistemic, biological – on what is possible.

This worldview would appear to rest on a particular understanding of human purpose. Following Maslow,[71] what distinguishes humans is the drive toward self-actualisation – the desire to realise human potentialities. For generations, increasing percentages of the population in many countries have not had to strive to meet lower-order physiological and safety needs. A direct consequence of this is that some humans have been able to direct their energies to the pursuit of higher order needs, the ultimate goal being to satisfy their desire to realise themselves to the fullest. These individuals have tested their physical, intellectual, emotional and moral limits, seeking to learn, for example, what are the limits of the human body? What are the limits of the human mind? What are the limits to human suffering? What are the limits to human evil? These limits have been tested in sport, in business, in play, in war, and in love – not with the hope of actually identifying any limits, but rather with the evolutionary goal of transcending all possible limits.

As needed, some among these few have avidly pursued physical, intellectual, psychological and moral enhancements. Now the option of pursuing these enhancements using genetic technologies is on the horizon and keenly awaited, as is evidenced in the remarks of Robert Sinsheimer, an early pioneer of the Human Genome Project:

> It is a new horizon in the history of man [*sic*]. Some may smile and may feel this is but a new version of the old dream, of the perfection of man. It is that, but it is something more. The old dreams of the cultural perfection of man were always sharply constrained by his inherent, inherited imperfections and limitations. Man is all too clearly an imperfect and flawed creature. Considering his evolution, it is hardly likely that he could be otherwise. To foster his better traits and to curb his worse by cultural means has always been, while clearly not impossible, in many instances most difficult. It has been an Archimedean attempt to move the world, but with the short arm of a lever. We now glimpse another route – the chance to ease the internal strains and heal the internal flaws directly, to carry on and

[70] Stableford, *op. cit.* note 1; Sandberg, *op. cit.* note 1; and Slater, *op. cit.* note 11.

[71] A.H. Maslow. 1954. *Motivation and Personality.* New York. Harper.

> consciously perfect far beyond our present vision this remarkable product of two billion years of evolution.[72]

Sinsheimer's hopes are now more imminent than ever.

Here we offer an *avant garde* sketch of human nature. Humans are indeed imperfect creatures, but imperfection is not a necessary condition for humanness. Humans are not merely inquisitive or competitive; rather, we posit that the essential characteristics of humanness are *perfectibility* and the biosocial drive to pursue perfection. These essential characteristics are neither merely naturally present nor culturally driven, but rather biosocially over-determined. We are on the cusp of what may prove to be our final evolutionary stage.

CONCLUSION

To summarise, there are good reasons to believe that attempts to develop and use genetic enhancement technologies are fraught with moral peril. Nevertheless, in our view, their development and use are inevitable, not simply because of capitalist forces (though these are by no means inconsequential), or because of heedless liberalism (which surely plays a role), or because of a natural desire for knowledge (which is also a significant consideration), or because of a natural or fostered desire to outperform (which, too, is partly explanatory), but also because this is our destiny chosen by those among us who are intent on achieving self-actualisation by controlling the human evolutionary story.

In closing, we maintain that accepting the inevitability of genetic enhancement technologies is an important and necessary step forward in the ethical debate about the development and use of such technologies. We need to change the lens through which we perceive, and therefore approach, the prospect of enhancing humans genetically. In recognising the futility of trying to stop these technologies, we can usefully direct our energies to a systematic analysis of the appropriate scope of their use. The goal of such a project would be to influence how the technologies will be developed, and the individual, social, cultural, political, economic, ecological, and evolutionary ends the technologies should

[72] R.L. Sinsheimer. 1992. The Prospect of Designed Genetic Change. In *Ethics, Reproduction and Genetic Control*. R.F. Chadwick, ed. Revised edition. New York. Routledge; 136–146, at 145.

serve. It is to these tasks that bioethical attention must now fully turn.

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