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The Ethics of Human Enhancement

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Abstract

Ethical debate surrounding human enhancement, especially by biotechnological means, has burgeoned since the turn of the century. Issues discussed include whether specific types of enhancement are permissible or even obligatory, whether they are likely to produce a net good for individuals and for society, and whether there is something intrinsically wrong in playing God with human nature. We characterize the main camps on the issue, identifying three main positions: permissive, restrictive and conservative positions. We present the major sub-debates and lines of argument from each camp. The review also gives a flavor of the general approach of key writers in the literature such as Julian Savulescu, Nick Bostrom, Michael Sandel, and Leon Kass.

1. Introduction

Human enhancement in contemporary philosophical debate refers to biomedical interventions to improve human capacities, performances, dispositions, and well-being beyond the traditional scope of therapeutic medicine. Some forms of enhancement, such as doping in sport or the pharmaceutical improvement of memory and attention span, are already feasible. Others might be available in the near future, such as genetic engineering to increase cognitive capacities. The ethical issues that arise include whether specific enhancements are permissible, obligatory, or a net good for individuals and for society.

Positions in the debate span a continuum between permissive and restrictive views. Authors holding the most permissive positions have no objections to a wide range of enhancements, such as the ones already mentioned. Indeed, at this end of the continuum, there are arguments that some sorts of enhancements are not merely permissible but even morally obligatory. (For an exploration of the conceptual grounds for classifying a given enhancement as permissible, impermissible, or obligatory, see Santoni de Sio et al. 2014). At the restrictive end, there are objections to enhancement *in principle*. Such restrictions may be motivated by a view about proper conduct in a certain sphere of activity, or about the inviolability of certain aspects of human nature. For instance, proper conduct in competitive sports might rule out the use of performance enhancing drugs. Ideas about the sanctity or inviolability of aspects of nature are more readily marshaled to argue against enhancement through genetic selection or design. Between the two ends of the continuum are writers who are in principle open to enhancement in specific spheres, but who raise worries about potentially undesirable consequences, including consequences for autonomy and distributive justice.

The concept of normality often features in definitions of human enhancement, particularly when authors want to distinguish therapy from enhancement. Therapeutic interventions aim to restore normal functions of our body. Enhancements aim to augment a desirable capacity that is already within the normal range for our species (Daniels 2000). For some writers, therapeutic intervention is within the purview of medicine, whereas enhancement is outside it and would need a separate justification that does not appeal to the typical values of medicine

(e.g., Pellegrino 2004, Sandel 2004). However, the concept of normality is ambiguous between a merely descriptive meaning and a normative one. In the descriptive sense, normality is defined in statistical terms as typical contribution of biological functions to survival and reproduction (Boorse 1977, 555), where the typical reference point is obtained 'by averaging over a sufficiently large sample of the population' (Boorse 1977, 557). In the normative sense, normality is defined as compliance with certain moral, social, or cultural norms (by virtue of which, for example, a condition like schizophrenia might or might not be considered a pathological condition that medicine should treat) (Resnik 2000).

It is also ambiguous whether enhancement is concerned with improving specific capabilities or with improving people's lives in an *all things considered* sense (Savulescu 2006, 324). While becoming extremely tall may enhance a person along the dimension of height, for instance, it may fail to improve her life in an all things considered sense.

Given these ambiguities, there is no single shared definition of human enhancement among authors representing different ethical positions. Someone opposed to human enhancement is likely to conceive of enhancement as something that is, by definition, beyond the proper scope of medicine (Pellegrino 2004, Sandel 2004). Those in favor of enhancement, on the other hand, are more likely to endorse a welfarist position in which enhancement means improving an individual's chances of leading a good life all things considered. For the latter position, both therapeutic medicine and enhancement are prima facie acceptable as means to increase welfare. As we elaborate in the next section, neither means is in principle better at achieving the goal. (Savulescu et al 2011; Kamm 2009; Resnik 2000).

There is no consensus on how best to categorize the various positions in the enhancement debate. Roache and Clarke (2009, 1-2) use the label 'bioconservative' to refer to positions that restrict human enhancement because it would undermine something intrinsically valuable about being human; 'biomoderate' to refer to restrictive positions, which are concerned about likely undesirable consequences of enhancement; and 'bioliberal' to refer to positions at the permissive end of the continuum. Jonathan Moreno uses 'bioconservative' to refer to anti-enhancement positions on both the political right (stemming from a concern for the loss of traditional values and dignity) and political left (stemming from worries about social inequality and ecological problems) (Moreno 2011, 121). Ruth Macklin thinks the introduction of the conservative/liberal dichotomy into bioethics debates is a relatively recent phenomenon that does not add to the arguments that already flourished there. Moreover, the dichotomy has odd consequences like classifying as conservative some radical feminists who oppose assisted reproductive technologies (Macklin 2006, 34-5). Arthur Caplan prefers to eschew the political connotations of such terminology and speak of meliorists and anti-meliorists for proponents and opponents of enhancement, respectively (Caplan 2009).

We wish to avoid the impression that some positions are either entailed by a commitment to political liberalism or are only available to those with such commitments. Accordingly, we avoid the term 'bioliberals' and speak of 'proponents of enhancement' or 'permissive positions on enhancement'. Some opponents of human enhancement have explicitly drawn connections to the broader conservative tradition (Levin 2003). An important feature of this conservative strand is its emphasis on the limits of reason. One limit of reason is our inability to foresee all potentially disruptive consequences of radical change to the status quo. Another is that reason (understood narrowly) must be supplemented by intuition and emotion to yield a well-rounded moral position. We reserve the adjective 'conservative' for such positions. We prefer to characterize other arguments for restrictions on enhancement (Sparrow 2011, for instance) as simply 'restrictive' rather than 'conservative', to avoid any suggestion that they bear such a connection to the conservative tradition.

2. Permissive Positions

Different types of enhancements (some already widely used, others merely contemplated) have been defended. These include cognitive enhancements, such as the use of smart drugs to increase IQ (e.g. Bostrom and Ord 2006, Harris 2007, Levy 2007); physical enhancements, such as doping in sport (Savulescu et al. 2004); moral enhancement by modulating moral emotions or dispositions, such as empathy or aggressiveness (Douglas 2008, Persson and Savulescu 2012, Douglas 2013, Kahane and Savulescu 2013); 'love enhancement' through biochemical modulation of lust, attraction, and attachment (Savulescu and Sandberg 2008; Earp et al 2013; Earp et al 2015); and increases to healthy human lifespan (e.g. Bostrom 2005a, de Grey 2004).

Proponents of human enhancement typically embrace the welfarist position introduced above. According to this position, both enhancement and the therapeutic treatment of disease are prima facie acceptable means to increase welfare. Frances Kamm, for example, has suggested that treating a disease does not necessarily bring a higher net gain of well-being than that obtained by enhancing a normal function, given that 'some illnesses produce states that are less bad than, or equal to, being at the low end of a normal range for a property' (Kamm 2009, 103). Depending on their respective effects on net welfare, there may be a stronger case for some enhancements than for some therapeutic interventions. This aims to turn the tables on those who think that, in general, the moral case for therapy is stronger than that for enhancement.

A strategy among proponents has been to emphasize the continuity of *novel* enhancements, e.g. through biotechnology, with familiar means of extending human capacity. Nicholas Agar, for example, talks of the 'moral parity of genetic and environmental engineering' (Agar 1998, p. 140). We can aim to raise intelligence or strength through better education, nutrition, and training (instances of environmental engineering). The contention is that genetic engineering that aims at the same goals is morally on par with the more familiar means (for another example, see Buchanan 2011, 38).

Some proponents make a case that specific projected enhancements are obligatory. Persson and Savulescu, for example, suggest that moral enhancement is morally obligatory, at least if we want to protect the human species from those behaviors – such as terrorist attacks or depletion of natural resources – that put at risk its very existence. They note that our moral dispositions evolved in a social environment very different to today's, namely one characterized by small communities and more rudimentary technologies. As a result, they argue, we are not naturally endowed with the moral dispositions that would allow us to make morally good choices in a technological and globalized world. As a remedy, they propose genetic or pharmacological intervention to alter individuals' levels of empathy and aggression, if these turn out to be thus manipulable (Persson and Savulescu 2012). There are however difficulties in spelling out the notion of moral enhancement (Beck 2014). Perhaps too much empathy can lead to excesses of self-sacrifice, or too little aggression to acquiescence in injustice. Perhaps the manipulation of moral emotions and motivations undermines the good of autonomy.

Savulescu has also argued that when using in-vitro fertilization, parents have a moral *obligation* – and not just the liberty – to select the embryo likely to have the life with the most well-being. This is an example of what he calls the principle of procreative beneficence. In Savulescu's view, the obligation is moral, not legal (Savulescu 2001, 425). Parents should be legally free to ignore the moral obligation. The distinction between the legal and the moral obligation wards off the accusation that procreative beneficence is just eugenics by another name (see Section 5 below).

One important qualification of many pro-enhancement positions stems from the consideration that some forms of genetic manipulation might restrict the offspring's options. Having a

body suitable for running marathons excludes the possibility of excelling as a weightlifter, and vice versa. For this reason, advocates of human enhancement often consider it permissible to enhance only those capacities that represent 'all purpose means' compatible with any life plan the future person might choose (Buchanan et al 2000, Savulescu 2001). Proposed candidates for the role of 'all purpose means' are memory, intelligence, disease resistance, empathy, and ability to concentrate (Agar 1998, Savulescu 2001).

3. Restrictive Positions

We turn to restrictive concerns that have no objection to enhancement in principle, but that worry about unintended consequences of specific enhancements.

3.1. EGALITARIAN CONCERNS

We begin with a variety of egalitarian concerns. Human enhancement technologies may only be available to a small proportion of the world's wealthy, exacerbating the already marked inequalities between the rich and the poor (Mehlman and Botkin 1998). Alternatively, enhancement interventions might drain resources away from more useful medical research aimed at serious diseases that threaten the well-being of the poor majority of the world (Selgelid 2014). Recalling the aforementioned pro-enhancement arguments aiming at downplaying the distinction between therapeutic and enhancing interventions, egalitarian concerns can instead justify the normative significance of the therapy-enhancement distinction. For example, given the limited health care resources available, it might be argued that therapy has priority over enhancement because making everybody a 'normal competitor' is necessary to keep fair equality of opportunity for different members of society (Daniels 1985, Buchanan et al 2000, Daniels 2000).

A separate set of egalitarian concerns has been raised against genetic enhancement of offspring. Some worry that enhancement carried out over several generations may create two separate species, one of which will have the power to dominate the other (Silver 1999). As an instance of the general worry that great inequalities in society tend to undermine its stability and threaten democracy, it has also been argued that a society with significant inequalities due to genetic differences in particular would have the same undesirable effects on the stability of a democratic order (Mehlman 2003).

One response to such concerns is to say that individual liberty, including parents' procreative liberty, trumps egalitarian considerations, because individual rights have priority over duties toward society. This response may settle the question about the permissibility of enhancement, if not questions about whether the permissible action is good or bad. A second response is that there are other consequentialist considerations in favor of enhancement that might countervail the ill of greater inequality, namely, the opportunity cost to society of failing to enhance its members (Levy 2013). Finally, a remedial measure for some of the egalitarian concerns may be public funding to ensure that either the poor (Mehlman 2009) or those at the lower end of the normal range for some traits (e.g. intelligence) can access the enhancements. On the latter view, enhancements are used as a means to the sufficientarian goal of making everyone well off enough to live a decent life (Savulescu 2006, Buchanan 2011).

3.2. CHEATING AND THE 'SPIRIT OF THE GAME'

Some enhancements may constitute cheating. Doping in competitive sports is often seen as an example. Smart drugs, Deep-Brain Stimulation, and Transcranial Magnetic Stimulation enhance cognitive capacities like memory, concentration, and problem solving skills (Farah

and Wolpe 2004, Levy 2007) and may be considered cheating in competitive settings such as education or the job market. Insofar as these constitute cheating, it is because some explicit or implicit rule of competition is violated. Of course, one might question whether such rules are justified in the first place (Schermer 2008, Savulescu et al 2004). However, it might be objected that this response is too dismissive of the value attached to the 'spirit of the rules' that regulate and define the nature of a competitive activity. For example, there is a widely shared intuition that academic success should depend on *merit*, rather than on the use of drugs that enhance cognitive performance (Levy 2007, 91); in the same way, there is a widely shared intuition that changing the rules of sport to accommodate the use of doping would go against the 'spirit of sport' (Schermer 2008; WADA 2015, 14). It is worth pointing out, however, that the objection based on the spirit of a certain activity refers to the intrinsic wrongness of enhancement independently of whether it would be a form of cheating; according to the objection, enhancement would be impermissible even if all the competitors made use of it. Thus, changing the rules of the competition might well address the concern about cheating, but at the price of altering the nature of the activity in question.

3.3. OLD AND NEW EUGENICS

Opponents of human enhancement sometimes draw parallels between contemporary enhancement proposals and state-led eugenics programs in the first half of the 20th century (Sandel 2004, 119-120; Kass 2008, 301; Pellegrino 2008, 515; O'Mathúna 2006). These involved coercive policies adopted in the US and some European countries (including marriage restrictions on the 'unfit' and their forced sterilization, and Nazi era policies toward 'defective children', 'institutionalized deficients', homosexuals, Jews, and other groups).

Proponents of enhancement distinguish their proposals from the 'old eugenics'. The old eugenics was both coercive and based on scientifically and morally flawed premises about the superiority of particular populations. Contemporary proponents of enhancement advocate that people should be left free to decide whether and how to enhance themselves or their offspring (e.g., Savulescu 2001, 425). Some proponents have been happy to adopt the label of 'new eugenics' or 'liberal eugenics' for such a program so long as the dissimilarities with old eugenics are made clear (Agar 2004).

Robert Sparrow argues however that the consequentialist approach of many enhancement proponents makes their liberal eugenics an unstable position. He argues that these proponents are committed to endorsing a unique model of human being that has the highest chances of a good life in any given environment. If so, there is no principled reason for them to resist state imposition of this model on the population (Sparrow 2011, 36).

3.4. FUTURE GENERATIONS

Another set of concerns is about potentially unacceptable infringements of the liberty or moral equality of future generations. Jürgen Habermas claims that viewing ourselves as equals in the shared practices of moral community is incompatible with types of dependence, which are one-way rather than reciprocal. Having one's genome 'programmed', as he puts it, places the younger generation at the receiving end of such a one-way relation – unless the younger generation can be assumed to consent to the programming. He contrasts genetic programming with the socializing influence of parents in child-rearing. Leaning on his wider philosophical theory of communicative action (Habermas 1985), he says that in the latter case, the child is involved in a reciprocal communicative process in which it can respond to the parents. Nonetheless, there are some morally unproblematic cases of enhancement, he thinks, such as aiming at a stronger

immune system or a longer lifespan. These are highly general goals, and can be *assumed* to have the consent of the future child even though these enhancements are one-way and non-reciprocal acts (Habermas 2003, 52). For more specific enhancements, consent cannot be assumed. Consider the more general contrast with the transfer of culture down the generations. Whereas a future generation can question and selectively accept or reject elements of received culture, Habermas suggests that it is not in a position to reject the cumulative effect on the gene pool of generations of decisions guided by the forces of profit and individual preference (Habermas 2003, 72).

4. Conservative Positions

Some positions in the enhancement debate are inspired by the modern conservative tradition dating back to Edmund Burke (Levin 2003). Conservatives in the enhancement debate oppose in principle the use of biotechnologies to significantly alter human nature by offering the following sorts of justifications.

4.1. COMPLEXITY OF HUMAN NATURE

One set of worries relates to our limited understanding of specific genotypes. Francis Fukuyama argues that, because the interactions between single genes and phenotypic traits are very complex, altering any single gene or genetic sequence to obtain a desirable trait might have bad unintended consequences for the expression of other desirable traits (Fukuyama 2002, 74–75 and 92–93). A related view, recognizably conservative, was expressed by the American President's Council on Bioethics when Leon Kass was its Chair. According to the Council, 'the human body and mind, highly complex and delicately balanced as the result of eons of gradual and exacting evolution, are almost certainly at risk from any ill-considered attempt at "improvement"' (President's Council on Bioethics 2002, 287).

Advocates of human enhancement have given various responses to this argument from complexity. For Powell and Buchanan, its force rests on a misunderstanding of evolution (Powell and Buchanan 2011, Buchanan 2011). Buchanan argues that the view expressed by the President's Council wrongly supposes that evolution is a Master Engineer that makes its creation a 'stable, completed masterpiece that can only be ruined by any human attempt to improve it' (Buchanan 2011, 156). The fact that natural selection has operated on a trait does not ensure that the trait is optimal either for a given end, or for human well-being. However, it is debatable whether the prudential approach taken by the President's Council should be interpreted in the way Buchanan suggests. To caution against certain changes is not necessary to claim that the status quo is optimal, or a completed masterpiece.

Nor is such caution necessarily an indicator of what Bostrom and Ord have called status quo bias, defined as 'an inappropriate (irrational) preference for an option because it preserves the status quo' (Bostrom and Ord 2006, 658). To diagnose whether opponents display this bias (rather than having an appropriate reason for opposition), Bostrom and Ord propose a 'reversal test'. Suppose a cognitive enhancement is opposed. Bostrom and Ord ask whether the opponent would favor a diminution in cognitive capacity instead. If not, the burden of justification is on the opponent to provide grounds for thinking that the status quo is a local optimum. To return to the point above, the conservative's caution about changing the status quo needs not entail a belief that the status quo is optimal. The position is compatible with believing that we are ignorant as to which of the options (enhancement or diminution) is better in an all things considered sense.

4.2. INTUITION AND EMOTION IN THE CONSERVATIVE APPROACH

Some conservatives place great weight on intuition and on emotions like disgust, repugnance, and revulsion (which we treat as equivalent here) to ground their opposition to biotechnological human enhancement. Both conservatives (Levin 2003, Cohen 2006) and their opponents (Macklin 2006) recognize that reliance on intuitive and emotive responses is a distinguishing feature of the conservative opposition to the use of biotechnologies for human enhancement. In the conservative tradition, it has been often argued that the feeling of disgust allows a moral agent to recognize moral violations (Kekes 1998, 106). Some conservatives even hold that disgust is at the basis of the moral law (Devlin 1968). This approach descends from the non-rationalist strand in the modern conservative tradition, starting from the skepticism toward human reasoning capacities frequently expressed by Edmund Burke (see Kirk 1994). In continuity with this tradition, Leon Kass defends the role of repugnance as offering reliable moral guidance in the field of biotechnologies. He adds that 'repugnance is the emotional expression of deep wisdom, beyond reason's power to fully articulate it' (Kass 1997, 20).

In trying to articulate his objections to enhancement, Michael Sandel appeals to similar grounds. He claims that modern ethicists generally (and not merely in discussing enhancement) reach first for the language of rights, autonomy, and fairness, but that some hard questions facing bioethics are not readily elucidated in these terms (Sandel 2007, 9-10; Sandel 2004, 51). We must instead point to an intuitive understanding, beyond the reach of narrow modern ethical vocabulary, he contends.

4.3. HUMAN ENHANCEMENT AS A THREAT TO HUMAN DIGNITY

Some avowedly conservative positions invoke the concept of dignity. There is no consensus on a definition of dignity in this literature, and some writers who avail themselves of the concept acknowledge that 'the term itself is abstract and highly ambiguous' (Kass 2008, 306). However, the general idea is that while human individuals vary in their particulars and properties, there is a human nature which does not vary across individuals. The dignity or moral worth of a human, assumed to be equally manifest across human individuals (including, for example, infants and the severely intellectually handicapped), is due to some feature of this human nature (Lee and George 2008, 412). The worry about enhancement is that it may change the key features of human nature, so that the enhanced individual either fails to have dignity or has it to a different degree than unenhanced individuals. For some, the source of human dignity may be the creator God (Meilaender 2008, 264), but dignity is not necessarily cashed out in religious terms. Avoiding religious connotations, the worry is that if one human 'authors' or 'creates' the talents and powers of another by pre-implantation embryo selection or genetic engineering, then the latter loses some of the dignity that comes from being an individual whose powers and talents are to be seen as simply 'gifted' by nature (Sandel 2004, 54-5).

More generally, some assert that if our basic values are defined in response to features of human nature that enhancement might change, then we risk destabilizing those values (Fukuyama 2002, 7). Related worries may be phrased in terms of a loss of authenticity. In particular, some writers fear that cognitive and mood-enhancing drugs may threaten our capacity to be true to ourselves (Elliot 1998).

4.4. PLAYING GOD

Proponents of human enhancement frequently face the accusation that they are 'playing God'. Those leveling the accusation may have in mind quite different objections, and it remains unclear which is most promising as a source of moral objections to specific enhancements.

Objectors may simply be concerned that both the knowledge and the technical means available to us are inadequate for the complex matters enhancers seek to manipulate. Accordingly, even well-meaning efforts may result in serious unintended harm. This returns us to some of the restrictive reasons already considered above.

The charge that someone is playing God may mean that she is interfering in matters that are really in the care of God, and not humans. This implies some account of the proper role of humans in nature. Tony Coady explores the three main models in Christian theology for conceiving the role of humans in relation to nature: domination, stewardship, and co-creation (Coady 2009, 157-60). The first model places nature under human dominion, and so offers no reason to object to the use that humans may make of it. The second model makes humans responsible for the stewardship or care of nature. This imposes greater constraints on humans, allowing criticism of actions that are careless or that transgress substantive accounts of what it is to care for one or another species. Any plausible development of this model must allow for *some* human intervention with non-human nature. Relatively uncontentious interventions include advances in sanitation and antibiotics. Yet these interventions include efforts to wipe out entire pathogenic species from human surroundings, and to develop species-wide resistance to pathogens that may not otherwise have developed in natural human-pathogen interaction. So, a plausible account of stewardship must allow that proper care extends beyond merely conserving the received natural order and includes some human shaping of the natural order. This suggests a third model, co-creation, in which humans are creators or shapers of the natural order alongside God. The main models of human nature relations in Christian theology do not straightforwardly rule out human enhancement on the grounds that it involves human shaping of the natural order. A more promising path for the theologian may be to appeal to scripture, tradition or Church authority to proscribe specific enhancements. Even on this path, Coady urges caution. This approach must still be consistent with the legitimate human role in alleviating human suffering in the stewardship and co-creation models. Moreover, the approach must be mindful of the temptation that human authorities themselves face to 'play God' in interpreting God's will (Coady 2009, 161, 179).

Michael Sandel advances an argument that can be seen as a version of the 'playing God' objection (Sandel 2007, 85-100). He speaks of human societies as having a drive to master nature – the drive to use new and existing technology to change or control ever greater reaches of our surroundings. For Sandel, one of the restraints on this drive is an appreciation for features that are seen as *gifts* to be cherished as they are. What he advocates is, in other words, an attitude of 'openness to the unbidden'. While theists may explain the 'value of giftedness' as appreciation of God's creation, Sandel thinks a secular reason to value the given as a gift is that an unchecked drive to mastery would have undesirable consequences not only for humility (humbly accepting the cards one has been dealt), but also for responsibility and solidarity.

He posits that one of the reasons why solidaristic policies are popular (to the extent that they are) is the high element of chance in the distribution of advantages. Consider health insurance. Given the difficulty of predicting who will fare ill and who will fare well over a lifetime, the relatively healthy are happy to subsidize the relatively unhealthy through insurance premiums. However, beneficiaries of genetic manipulation to remove genetic predispositions to various diseases have greater certainty about their health prospects, and this may undermine their feelings of solidarity with others.

Our understanding of responsibility may also change, Sandel cautions. Features of ourselves that we currently put down to chance may become features for which we (or our designer parents) are held responsible. This 'explosion' of responsibility may be destabilizing

for our ethics – making the individual responsible for many more features of her situation than she is at present.

Guy Kahane has criticized some elements of the 'openness to the unbidden' argument. He argues that in religious worldviews openness to the apparently unbidden is in fact submission to a divine plan (Kahane 2011, 357, 360). If so, and if the reason for valuing the apparently unbidden implicitly relies on a divine plan (which human mastery could only ruin and not improve upon), it would be unconvincing to atheists. Suppose the objection instead addresses the *absolutely* unbidden (not bidden even by God). The fact that much of existence is absolutely unbidden in the atheistic worldview is not about to change regardless of whether we pursue genetic enhancement. Perhaps what Sandel fears is a reduction in the *appreciation* of the unbidden. Like spoiled children who get all they ask for, we may become so engrossed in areas of our lives over which we have a great deal of mastery that we lose sight of the fact that beyond these areas, most of the world is unbidden (Kahane 2011, 360). However, Kahane argues, the way to maintain appreciation for the unbidden cannot be to simply let things happen without seeking to control them. After all, sometimes unbidden events are bad, or at least less than ideal, and our mastery over the relevant sphere can help us attain a greater good.

5. Conclusion

Many of the enhancement options discussed in this paper, particularly genetic interventions, have the potential to significantly alter the human genome or human neurophysiology, and ultimately human nature. Advocates of human bioenhancement have long been happy to speak of a 'new breed' of genetically enhanced individuals (Harris 1992). Terms like 'transhumans' or 'posthumans' are common in the debate (Bostrom 2005b). Given the prospect of such momentous changes, it is not surprising that human enhancement has provoked much philosophical discussion and fierce opposition. At stake are such longstanding philosophical issues as the relationship between humans and (bio)technology and the meaning and normative status of human nature. The recent debate seems promising ground for clarification and development of these issues. Moreover, it retains a particular urgency as timely ethical reflection on a biotechnological era that may prove as transformative as the most revolutionary changes in human history.

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