



Human Enhancement: Unlimited Technology, Conflict of Values and the Welfare Criterion

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ABSTRACT:

Guided by critical and emerging technologies, human enhancement has generated controversy and debate due to the formidable challenge it presents to notions of what it means to be human. This article explores the nature and meanings of enhancement, contextualises the debates surrounding it and engages critically with leading bioethicist Julian Savulescu's normative welfarist account of enhancement.

In view of rapid developments in science and technology, human enhancement is evolving from fictional fantasy to an undeniable reality. Drugs, procedures and technological interventions are today capable of performing many previously unimaginable tasks, from the high end of gene-editing and brain-machine interface to low-level mood enhancers. Applied technology seeking to enhance human functional domains are proliferating in a magnitude and intensity that make it difficult to resist or ignore such technology. In turn, these new capabilities raise provoking questions about the future of humanity in light of the ongoing revolution in human-technology interface.

This paper explores certain dimensions of human enhancement by engaging with the work of philosopher and leading bioethicist Julian Savulescu whose ground-breaking work has mainly revolved around the ethics of human enhancement. The paper is divided in three sections. The first section explores human enhancement as a 'frontier' technology and looks at the philosophical underpinnings of advocates of human enhancement. The second section raises some critical issues in the ongoing debates on human enhancement, posing them in binary pairs to distil the core points of contention. The third section explores the welfarist account of human enhancement coined and elaborated by Julian Savulescu and places it in perspective of the larger debate.

I. The Frontier

Modern science and technology are revolutionising human life in significant ways. For the greater part of mankind's existence, nature has been all-powerful, and human beings have acknowledged the power of nature, most tellingly by ascribing divinity and holding forth a supplicatory visage towards nature. However, it would not be inappropriate to claim today that humanity stands at the precipice of a gigantic revolution that holds the prospect of giving to human beings the power of changing, modifying and transforming nature. Genetics, neuro-sciences, advanced computing, human-machine interfacing are just some of the technologies that are radically transforming the relationship of technology with human beings.

In light of these changes, fundamental questions regarding human nature are bound to arise. For instance, if neuroscience achieves breakthroughs in identifying the neural processes that cause aggression and succeed in overcoming it to induce cooperation, then will the new attitude of cooperation be natural or an artificial mimicry of cooperation? Another instance would be that of brain-machine interface (BMI). The most fundamental privacy available to a human being is keeping his thoughts to himself. BMI challenges this root freedom by making the 'inside' visible outside. If BMI gets so good that an observer is able to identify and track a person's thoughts, then how will it impact the notion of being human?

The concept of human enhancement provides an insightful and comprehensive framework to locate the novelties brought about by technological advances. The fundamental idea of enhancement is improving the naturally existing human condition through scientific-technological interventions. Enhancement can be categorised into different types based on their target fields – cognitive, mood, physical, lifespan extension, moral enhancement etc. All these types of enhancement seek to overcome naturally existing deficiencies and usher in a superior human condition.

Located at the frontier zone of technological development, the idea of human enhancement is challenging the fundamental coordinates of human life and society. As a consequence, it is generating plenty of debate. Some of these involve philosophical themes, while others involve moral and pragmatist themes. Reviewing the large literature on human enhancement, some general lines of its conceptualisation can be enumerated:

1. **Accidental evolution:** Evolution is based on natural selection. Natural selection is a blind and accidental process influenced by environmental factors.
2. **Contingency of human life:** Nature created human beings without necessarily any thought or intention for long life and well-being.

3. **Human agency:** As human beings are products of accident, they have the right to rectify errors and flaws in their biological constitution.
4. **Moral obligation:** When humans possess the knowledge of rectifying such errors, in certain circumstances it becomes an obligation to use enhancement for well-being (eg. Gene-editing of babies with phenylketonuria).

Philosophically, the most far-reaching idea of human enhancement is that of imperfection of the naturally existing human constitution (biological, neurological, psychological). Advocates of enhancement maintain traditional notions of the human (eg. Creationism) invest the naturally existing human constitution with perfection, and oppose this idea on the ground that science has proved that genetical and neurological processes are products of environmental adoption rather than intelligent design. The attributed superiority of the naturally existing state, or the 'default mode', is rejected. They argue enhancements can transcend constitutional vulnerabilities and provide a superior quality of life than the naturally existing state.

The randomness of natural selection and contingency of 'natural' attributes to genetic and environmental influences make it prone to flaws, some of which have potentially fatal and life-altering consequences. Furthermore, the characteristic of randomness negates the urge to attribute sacredness to nature, particularly in light of scientific discoveries of the genetic and neurological sources of disorders. Pro-enhancers argue essentialising nature as the domain of the sacred was a common intellectual response pattern of humanity only so long as it eluded human understanding. When knowledge of natural constitution is gained, it becomes a rational question of rectifying flaws to achieve better outcomes.

II. Distilling the Debate

Whereas philosophical debates engage with questions of meaning and implications of enhancement, moral debates pose questions about the desirability of human enhancement technologies. These debates are taking place in the context of rapidly developing new technologies that are provoking hopes and fears in equal measure. The progressive and beneficial consequences of new technologies are balanced by their negative, regressive effects. However, such is the force of science and technology that invention of newer, more powerful technologies appear as having acquired an unstoppable momentum, giving occasion for the interpretation of the contemporary age as being characterised by technological "singularity". Ray Kurzweil, a technocrat and author, argued in the book *The Singularity is Near* that the law of accelerating returns, which is at work in new technologies such as computers, genetics, nanotechnology, robotics and artificial technology, will create conditions for exponential growth that will eventually enable humans to transcend biology.ⁱⁱ The debates taking place in human enhancement have to be seen in this context. Below are some of the main lines of the debate.

II.1 Technological advance vs 'enlightened' limits

This debate can be narrowed down to conflicting positions on whether science and technology should develop without limits or some limits should be imposed on their development for extraneous reasons such as morality, society etc.

In the enhancement debate, the opponents of human enhancement argue that tinkering with natural biological constitution can lead to unknown negative consequences. The fear argument – namely, altering fundamental characteristics with powerful technology can bring unknown negative results will appeal to the innate disposition of many. But despite numbers, it is a constituency that increasingly appears relatively inconsequential in the purely technocratic domain, not least because bulk of its numbers belong to the non-technology innovating class that leads the transformative changes. Barring a handful of whistle-blowers such as Barrie Trower (the British physicist trained in microwave combat who made the dangers of microwave technology public), the latter class, small but excessively influential, are breaking barriers and crossing frontiers, and creating products that affect all of humanity.

The nature of such activity, notwithstanding isolated instances of moral doubt or self-doubt, engenders an absolute belief in the powers of science and technology in changing things for the better. The large constituency holding traditional views are dismissed as superstitious old-timers who cannot keep up with science. Since the technology practitioners are materially responsible for discoveries and inventions, and their professional standing and social reputation are integrally related to path-breaking work, the activity of science and technology gathers an irresistible momentum. This momentum can be temporarily broken, particularly when findings or technology breakthroughs raise uncomfortable moral questions or extreme harm potential of a given technological application is revealed. But, as in the case of nuclear arms technology, permanent blockage of the developing momentum is near-impossible. Technological innovation, thus, has acquired an intensified autonomy, an air of inevitability.

Opponents of enhancement, particularly major technologies such as gene-editing, brain-machine interface and microwaves will continue to exert counter-pressure to delay, stall and, in certain instances, discontinue particular initiatives. The more intelligent and articulate among them will provide sharp diagnoses of flaws with the understanding of the human as a creator or as a 'co-creator' with God. In some cultures, their weight and influence will act as a greater deterrent than in others. But ultimately, whether they succeed in establishing their case as moral and desirable or otherwise, their efforts will likely fail to prevent the emergence of enhancement technologies.

This dynamic is likely to be further reinforced by competition to acquire more sophisticated and impactful technologies. The 21st century is a time of systemic transformations in international geopolitics, engendering political, economic, military and technological competition. New wars are characterised by technological modernisation that include human enhancement as militaries around the world seek an edge over competitors and adversaries. Use of BMI, augmented cognition, neurostimulatory and modulatory devices for increased vigilance, improving memory, reducing stress and decreasing fatigue are part of modernisation drives in many armies. Dual use research of concern (DURC) is an emerging field of technological applications in the military field.ⁱⁱⁱ Wars and competition are likely to provide sustained rationale for deep technological innovation and application.

II.2 Morality vs Practicality

The moral philosopher Michael Sandel has provided a lucid account of the moral problems that arise due to enhancement technologies. In particular, he enumerated two problems. The first moral problem is enhancement technologies, like everything else, will create two distinct classes, or 'sub-species' of human beings – the haves and the have-nots. By exploiting their access to enhancement, the haves will be able to extract benefits at the expense of the have-nots. The result will be inequality, opposed to the contemporary ideal of equality. However, is inequality not a given quality of nature? Not every human being is endowed with identical properties or capabilities. Therefore, Walzer holds, to be exact, the moral problem of enhancement lies in reinforcing and consciously re-engineering the already existing inequalities in nature:

A lively sense of the contingency of our gifts—a consciousness that none of us is wholly responsible for his or her success—saves a meritocratic society from sliding into the smug assumption that the rich are rich because they are more deserving than the poor. Without this, the successful would become even more likely than they are now to view themselves as self-made and self-sufficient, and hence wholly responsible for their success. Those at the bottom of society would be viewed not as disadvantaged, and thus worthy of a measure of compensation, but as simply unfit, and thus worthy of eugenic repair. The meritocracy, less chastened by chance, would become harder, less forgiving.^{iv}

The second moral problem of enhancement technologies is it would be introduced in an imperfect world where ambitions for growth, prosperity and social status are seemingly endless. New instruments promising facilitation towards those ends are destined to be exploited without rational limits and sense of moderation. Sandel gives the examples of parents admitting their children in expensive schools, providing special tuitions, extra-curricular activities and host of other activities so that the children can perform better. The competition mentality views moderation as an insufficiency and a risk, since others could do more and out-perform those practicing moderation. Neurotropic substances and biological engineering are likely to be adopted as new and more potent, promising facilitators of ambitions.

As against this argument, supporters of enhancement argue that inequality between rich and poor and issues of access are general problems. These are applicable to every domain, and therefore not specific to enhancement. Human motivations influence the uses to which technologies can be implemented. The invention and synthesis of fentanyl provided a major positive breakthrough in anaesthetics, but its use as a street drug has brought about an extreme negative outcome of hundreds of thousands of overdose deaths. Furthermore, enhancement in certain cases can lead to *undoubtedly good* outcomes, such as removal of genetic defects that will enable a baby to live a better life than otherwise. The polemical thrust of this argument against the argument of natural contingency would be that the latter is a good outcome from two standpoints – first, those favoured by nature and second, from the big philosophical standpoint – but is a bad outcome for those who bear the brunt of bad contingency, particularly if solutions were available but not utilised for purposes of abstract justice.

II.3 Conflict of Values

Japanese scholar of medical ethics and medical law Ryuichi Ida made a perceptive contribution on the nature conflict of values and worldviews that are destined to arise in debates on enhancement. It is useful to briefly summarise his central themes as these shed light on the core dilemma of enhancement.

Ryuichi argues that a highly influential stream of Western philosophical thought conceptualises the human being as a compound of mind and body, with the mind/soul holding essential value (for instance, Rene Descartes' 'Cogito ergo Sum' emphasising the intellect and the body being accorded a mechanical existence). This conceptualisation enmeshes seamlessly with the modern Western idea of science as the knowledge of nature with the aim of controlling it. From this standpoint, making the transition in medical terms from 'cure' to 'enhancement' is not a radical step. It merely implies a fuller application of science and technology to human life to enhance its condition and improve its performance.

On the other hand, Ryuichi argues, the Asian conception of humanity and its relationship to nature is based on the holistic idea of humans, other living organisms and even non-living things like soil, rocks, rivers or the earth forming a mutually complementary whole. He elaborates on this holism by invoking the metaphor of the wheel:

The life of all living beings is a kind of a wheel, and the life of human beings and of flora and fauna is in the same circle, and follows an infinite cycle of life. Therefore, every living being stands in a circle of whole life. Just as each human being, as one of the entities living in such a circle, has its own spirit, each of the other living beings has its own spirit too. . . Evolution takes place within this circle of life. . . Human beings do not control Nature, but must recognise the principle of "living together".^v

The wheel is a symbol both of infinite movement and the circular notion of time. In India, it is a central element in Hindu and Buddhist cosmology, as exemplified in the imagery of the *Dharma-charkra* or the wheel of Dharma. It is also to be found in Chinese Daoism. The holism it signifies has a strong altruist-welfarist orientation rooted in notions of cosmic balance and the integral relationship between all things that pervade the universe. It places the responsibility on humans to become aware and adopt right knowledge and act in a benevolent and dutiful manner towards all. In this perspective, nature is better understood as the edifice of all life and ultimate truth is attributed to it. There is a wide gulf between the Western understanding of science and technology as knowledge of nature to control and dominate it, and the Asian understanding of science and technology that emphasises integral harmony and warns against the urge to control and dominate nature as futile and destructive. Thus, the Asian cultural ethos will view human enhancement very differently and will not share the optimism that is characteristic of the West.

There are two possible criticisms of Ryuichi's arguments. First, pro-enhancers would say enhancement is not necessarily anti-nature. Removal of accidental flaws does not amount to rejection of nature. Second, Western medicine has been adopted by Asian countries with many beneficial effects (as

Ida readily acknowledges) and the debate cannot be reduced to a simplistic case of cultural difference. For instance, using enhancement technology to cure a baby with a disabling and potential life-shortening genetic disorder would be considered a moral obligation by both Western rights-oriented individualists and duty-oriented Asian values.

However, there is one dimension in which the Asian worldview has a solid case. The control-domination oriented ethic associated with the West has a tendency of blind pursuit of progress. This problem has been highlighted by several Western philosophers who grew disenchanted at the destructive effects of technological development through the one-dimensional development of technology. Prominent philosophers like Martin Heidegger, Jacques Ellul and Hans Jonas and Gunther Anders have been the most articulate proponents of this blind tendency. The structure of Western nihilism, according to this line of thinking, is the will to power manifested in technology, taking place in the absence of a metaphysical superstructure and turning everything, including the human being, as a material for exploitation.^{vi}

Technology in harmony with society and prevention/elimination of destructive effects of critical emerging technologies have been emphasised as goals on international and national platforms, such as the Global Partnership on Artificial Intelligence's Responsible AI Working Group. Similarly, the Bletchley Declaration brought together 29 countries "to sustain an inclusive global dialogue. . . to continue research on frontier AI safety to ensure that the benefits of the technology can be harnessed responsibly for good and for all."^{vii} While it is simplistic to attribute developing forms of global consensus on revolutionary technologies as the influence of Asian thought, it is reasonable to suggest that the primacy of responsibility in the Asian worldview is better suited to address these new challenges.

II.4 Biological Terrorism vs Biological Guardianship

The term 'biological guardianship' refers to defensive capabilities to tackle destructive propensities of biological weapons. It implies biological engineering capabilities that are akin to the 'great wall', or to 'ethical hacking' – the first and most important line of defence without which humanity at large would be vulnerable to biological terrorism attacks.

The proposition goes thus: in a world where biological weapons of mass destruction capable of killing millions of people can be engineered in backyard and bedroom laboratories, biological counter-terrorism capabilities must be developed in order to remain a step or two ahead of the mischief-makers. For instance, a synthetically engineered lethal variant of small pox virus can lead to an unimaginable number of deaths. In order to prevent such calamities from taking place, resistance encoded in the biological constitution could be one of the more effective and enduring solutions. In this framework, biological enhancement becomes an important and perhaps even indispensable tool of survival.

The threats of biological, neurological, chemical and radiological catastrophes will undoubtedly exercise great influence in thinking and decision-making in the human enhancement field. If the goal is to equip the human being and society with as much effective defensive capability as possible, then technological solutions built-in to the human is bound to emerge as a powerful persuasive argument. Therefore, biological guardianship is an idea on the ascendent, and its influence will only increase in proportion with the likelihood of biological terrorism.

III. The Welfarist Criterion of Enhancement

Julian Savulescu, an Australian philosopher and bioethicist, has worked extensively on the philosophical and moral aspects of human enhancement. His edited volumes on human enhancement are foundational works on the subject provide context and depth to ongoing developments in the field. He has also engaged deeply in the philosophical-moral debates as a supporter and advocate of enhancement technologies provided their outcome leads to improved outcomes. In this section, an outline of Savulescu's conception of human enhancement and his defence of enhancement on the ground of welfare are presented.

The problem of definition and conceptualisation has been acute when thinking about human enhancement. In attempting to answer what constitutes enhancement, Savulescu classifies four definitions that have been generally given:

- (1) Sociological definitions of enhancement, which emphasise the contextual and cultural specificities that shape perceptions of what is and what is not enhancement. In sociological definitions, which Savulescu calls pragmatic, enhancement is defined in terms of how a given society constructs it. Therefore, transcultural differences assume great significance.
- (2) Ideological definitions, which invoke metaphysical, philosophical and theological concepts, values and spirituality. According to Savulescu, "A set of often controversial values are applied to a range of possible technological advances, and these are directly classified as morally wholesome or problematic. Thus, the ideological approach offers a range of specific and contentious value claims but no general conceptual framework for thinking about enhancement."^{viii}
- (3) 'Not medicine' definitions, which distinguish between medicines that cure discrepancies in health to normalcy *and* enhancement that aims to improve normal human functioning. According to Savulescu, the main problem with the 'not-medicine' approach is that it fails to address the relativism that characterises terms like medicine and treatment. He calls it "indeterminate".
- (4) Functional definitions, which define enhancement in terms of enhanced physical, cognitive or other functional capabilities.

To overcome the shortcomings of the preceding four approaches, a new concept is proposed by Savulescu: the welfarist definition of human enhancement. The welfarist account seeks to provide normative justification to enhancement. Its main criterion is 'good life': namely, whether a change in biology or psychology *increases the chance of leading a good life*.

Savulescu notes four ways in which biology and psychology are decided:

- i. Nature or God
- ii. 'Experts' – philosophers, bioethicists, psychologists, scientists
- iii. 'Authorities' – government, doctors
- iv. People themselves – liberty and autonomy

What Savulescu calls the welfarist approach is rooted in the recognition that liberty and autonomy are valuable in themselves. Thus, human enhancement technologies can be enablers of freedom, choice and a higher quality of life as compared to the existing one. As a philosopher, Savulescu is primarily interested in providing moral grounds in support of his welfarist account of human enhancement. The welfarist account seeks to provide normative justification for enhancement. He specifies:

While we have focused on cognitive enhancement, our arguments, and the welfarist account of enhancement, can also be easily applied to potential examples of mood or physical enhancements. What aspects of our biology and psychology we should alter will depend, in major part, on their contribution to a good life.^{ix}

Thus, the welfarist account is comprehensive in the sense that it is capable of being applied across human domains. It provides a general criterion to judge human enhancement – namely, 'good life' – that is both context-specific and domain-transcending. It takes into account cultural specificities, personal and collective attitudes, medical precedents and chances of improving the existing condition if an enhancement is applied. Savulescu claims it is pragmatic, implying technological enhancement is one of several options available to solve a given problem, and it is appropriate only in those cases where it is best suited to do the job.

The ethical dimension of the welfarist conception of enhancement can be understood as a moral imperative: the duty to do the right thing in a given context, and the failure to do which constitutes a moral wrong. For instance, if a new-born child is diagnosed with phenylketonuria, Savulescu argues gene-editing techniques that have been proven safe and effective should be made legally *mandatory* independent of the choice of parents because, on independent logical consideration, such a step would serve the welfare of the child who would otherwise have a poor quality future life and be at risk of a greatly reduced lifespan. The parents must be legally obligated to undertake the required procedure, and if they choose not to then the child must be legally taken over by the state for carrying it out and the parents must be subject to penalisation for failing their legal (and moral) obligation.^x

There is a tension between the legal obligation model of welfarist enhancement and individual choice and autonomy. Individual autonomy gives the power to an individual to choose what is best for him or her. Welfarist enhancement does not follow such a straight path: in the case of adult individuals, it presents a persuasive and reasoned rationale for *why* enhancement is morally good; in the case of dependents such as children, it purports to take away the right of choice from parents and make it legally obligatory to enact welfare measures.

But what exactly determines the welfare quotient? How to discern if a particular intervention is welfarist in nature? The criterion proposed by Savulescu is that of 'good life':

[Any intervention] constitutes an enhancement when it is expected to increase the chances of a person living a good life . . . [that is,] expected to increase the chances of leading a good life, may, *in a probabilistic world*, not result in good life.^{xi}

Further, the value of a particular enhancement to contribute to good life is itself contingent on the two factors of science and subjectivity. Subjecting a particular instrument or intervention to scientific examination yields different results and a considerable period of time passes before results are derived conclusively beyond reasonable doubt. In many cases, adverse consequences manifest in the long-term.

Putting these two criterion side by side, it appears that the thrust of Savulescu's argument is better articulated by using the criterion of 'better life' rather than 'good life'. Since it is a probabilistic world, it is a matter of calculation which outcome would be *better*: the non-enhanced one or the enhanced one.

The criterion of 'good life' is, therefore, the test to determine which enhancements are ethical and which are unethical. However, the additional qualifier that in a probabilistic world, an intervention expected to contribute to making life good might not achieve the expected result leaves a lot of room for interpretation.

Further, the welfare criterion would be put to a real test when the utility of enhancement technologies are viewed in the context of war and international competition. For instance, if one nation-state develops a set of high-grade neurological devices and interventions that give an edge to its armed forces during wartime, then should its adversaries and competitors also develop similar or better devices and interventions? In the nuclear arms field, the concept of deterrence has encouraged proliferation. Should a similar situation come to pass in the bio-weapons field as well? How would the welfare criterion be applied in a competitive situation? Undoubtedly, the welfare of the nation-state lacking defensive and offensive capabilities would be served by possessing these, which in turn would encourage other nation-states to do the same to maintain their welfare, leading to an arms race. Admittedly, Savulescu's conception of welfare does not include such scenarios. In the scenarios he discusses, such as phenylketonuria, the obligation of gene-editing

unambiguously serves welfare. However, for the criterion to have universal application as a moral imperative, it needs to be worked out in more complex and challenging scenarios.

Conclusion

The spectrum of what can be called the biopolitics of enhancement can be largely divided into two axes: **for** and **against**, along a continuum with the extreme ends representing sharp support and sharp opposition. Advocates of enhancement, who can be termed bio-radicals, include trans-humanists, post-humanists; opponents of enhancement, who can be termed bio-conservatives, use a variety of arguments to essentially argue that human efforts to alter the ‘givenness’ of nature is an expression of hubris and are likely to not just precipitate grave dangers but in all probability lead to destruction of humanity.

According to Savulescu, progress in science and technology will confront society and authority figures with tough challenges about the future direction of humanity and the ability to evolve moral concepts to adjust to the changing realities will be the most important and determinant factor. An obstacle to the development of new ethics is the traditional attitude to nature, such as creationism, are no longer relevant as science and technology are able to understand and transform nature. The welfarist account is dedicated to the positing of moral imperatives, based on which policies and laws could be made to absorb technological innovations and change human life for the better.

On a case-to-case basis, certain forms of human enhancement can be morally and practically acceptable to most people. However, not all forms of human enhancement would be equally acceptable. A Pew Research Survey showed targeted genetic interventions to remove disabilities and increase potential longevity of life in babies would be acceptable to many more people than installing chip implants in the brain for whatever purpose.^{xii}

The welfare criterion proposed by Julian Savulescu can play a productive role in this regard. It is playing a productive role in the current debates by bringing the potential of human enhancement technologies to do good and promote welfare. It also encourages examination of each technology on its own merit rather than blanket approval or disapproval, which can be used to create legislative and institutional designs.

However, the destructive potential in emerging technologies challenge fundamental characteristics and even the very existence of humanity. This danger cannot be wished away, in light of biological, chemical and neurological advances which are being weaponised. demonstrated. The welfare criterion makes a case for universal moral application. In order to truly be established as a universal moral norm, it has to be established in complex and challenging scenarios, such as international competitions and biological arms race.

In closing, it would be appropriate to leave the reader with a revolutionary vision of human enhancement and the magnitude of the motivation of its radical advocates to fundamentally alter human nature:

If the preservation of the human genome were really a rational goal we would have to abjure sexual reproduction which involves a random recombination of genes to form a new genetic constitution at each ‘throw of the dice’. Normal sexual reproduction does not preserve the human genome, rather it almost always varies it.^{xiii}

ⁱ Penn Medicine News, “Penn Medicine Researchers Develop Gene Editing Approaches for Phenylketonuria Treatment” (2 November 2023). Can be accessed at <https://www.pennmedicine.org/news/news-releases/2023/november/penn-researchers-develop-gene-editing-approaches-for-pku>

ⁱⁱ Ray Kurzweil, *The Singularity is Near*, Viking (2005)

ⁱⁱⁱ James Giordano and Diane DiEuliis, “Emerging Neuroscience and Technology (NeuroS/T): Current and Near-Term Threats to US – and Global – Biosecurity: A Strategic Multilayer Assessment”, NSI Inc. SMA Invited Perspectives Series edited by Ali Jafri (May 2021). Can be accessed at https://nsiteam.com/social/wp-content/uploads/2021/07/SMA-Invited-Perspective_Emerging-NeuroST_Giordano-and-DiEuliis_FINAL.pdf

^{iv} Michael J Sandel, “The Case Against Perfection”, *Atlantic Monthly* (2004): 51-62

^v Ryuichi Ida, “Should We Improve Human Nature?” in Julian Savulescu and Nick Bostrom (ed.) *Human Enhancement*, Oxford University Press, Oxford (2009): 62-63

^{vi} Martin Heidegger, “The Question Concerning Technology” in *The Question Concerning Technology, and Other Essays*, Harper & Row Publishers Inc. (1977): 3-36; also see Akiro Takeichi, “On the Origin of Nihilism: In View of the Problem of Technology and Karma” in Graham Parkes (ed.) *Heidegger and Asian Thought*, Motilal Banarasidass Publishers (1992): 187-200

^{vii} The Bletchley Declaration by Countries Attending the AI Safety Summit, 1-2 November 2023, Gov.UK; at <https://www.gov.uk/government/publications/ai-safety-summit-2023-the-bletchley-declaration/the-bletchley-declaration-by-countries-attending-the-ai-safety-summit-1-2-november-2023>

^{viii} Julian Savulescu, Anders Sandberg and Guy Kahane, ‘*Well-Being and Enhancement*’ in Julian Savulescu, Ruud ter Meulen and Guy Kahane (ed.) *Enhancing Human Capacities*, Wiley-Blackwell (2011): 7

^{ix} *Ibid.*: 16-17

^x Julian Savulescu, 'Proposition', DNA Manipulation Debate, Oxford Union (2016). Can be accessed at <https://www.youtube.com/watch?v=2q9CMCTJdL0&t=743s>

^{xi} Savulescu et al., "Well-Being and Enhancement": 7

^{xii} Lee Rainee, Cary Funk, Monica Anderson and Alec Tyson, "What Americans think about possibilities ahead for human enhancement", Pew Research Center (17 March 2022). Can be accessed at <https://www.pewresearch.org/internet/2022/03/17/what-americans-think-about-possibilities-ahead-for-human-enhancement/>

^{xiii} John Harris, "Enhancements Are a Moral Obligation" in Julian Savulescu and Nick Bostrom (ed.) *Human Enhancement* (2009): 134