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Ageing and Death: A Focus on How to Transcend Diseases for Transhumanist Movements

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The concept of transhumanism is based on a specific understanding of human limitations that should or could be transcended. Among them, the question of overcoming our own corporeality through the delaying of ageing or death is of major importance for a new understanding of human plasticity and fluidity when shaping ourselves and our environment. As transhumanism advocates for human enhancement through technological means, it considers ageing and death as diseases and criticizes their necessity in the human evolutionary process. In light of this transhumanist question, this article discusses ageing and death as diseases for which there must be technological solutions. It underlines that a philosophical approach is necessary to highlight how correlated and interrelated those subjects are and tries to go beyond humanist dichotomies to make clearer how major notions (health, enhancement, etc.) are intertwined with each other and consequently shape our socio-political subjectivities. Given this context, this article discusses the fact that medicine is traditionally structured on a limit that seems to be more and more plastic to pave the way for new debates, such as human enhancement, morphological freedom, and biocultural capital. It then discusses how transhumanism tries to transcend what is considered human structures by examining death as a fatal degeneration that could be overcome through biological amortality and informational immortality.

The concept of transhumanism is based on a specific understanding of human limitations that should or could be transcended. This article aims to show the interrelations between several transhumanist approaches[i] to ageing and some possible socio-political struggles to come. Whether with or without intrusive technology, transhumanism claims one's right to dispose of their body, their mind, and their evolution as biocultural capital. It crystallizes emerging stakes, such as the evolution of therapy and the condemnation of ageing and death as inhumane, although natural, diseases. By focusing its discourses on ageing and death, transhumanism rewrites the idea of corporeal freedom and anticipates the outbreak of new ontological deconstructions of the human condition. Consequently, it aims to express the plasticity and fluidity both of the body and of the notion of transcendence. For transhumanist movements, it is precisely because of one's experience as an ageing, fragile, and mortal being that the human being is open to change and improvement. As such, they break down the

symbolic and physical representations of the human being and compel us to reflect on how we connect with our own image – with the idea that human beings "have of the material of which they are made, and the way in which it circulates and is exchanged" (Husson 39).

The question of overcoming our own corporeality through the delaying of ageing or death is of major importance for a new understanding of human plasticity and fluidity when shaping ourselves and our environment. Of course, both are biological stages that occur in all living organisms and there is no transhumanist who questions this practical evidence. But if ageing were commonly considered a positive experience, this controversy would not arise. Old age in modern societies is deeply associated with the deficit of support infrastructures and pension systems and social abandonment, as well as with an intrinsic decline in the bodily and mental functions that define adulthood, leading to a drop in fecundity and eventually to death (Finch, 1994). As such, this article discusses ageing and death as several transhumanist movements understand them, and more specifically as *defects* for which there must be technological solutions. Usually, ageing and death are social and political issues that are dealt with by social and political means, such as hospices, cemeteries, care, and grief. However, this article will argue in more detail that they have recently become *biological issues* as well. Moreover, it postulates that ageing and death, which used to be seen exclusively as common biological processes in human life[ii], are nowadays beginning to be understood as unnecessary impairments or *diseases*.

The word 'disease' comes from the privative *dis* and the word *aise* or *eise*, which means, in old French, 'pleasurable', 'enjoyable', or 'ease'. A disease is traditionally a dysfunction leading to unease. However, what is understood to be a disease is brought about by cultural evolutions: homosexuality is not considered a disease anymore (since 1990) whereas obesity recently became a disease (in 1997).[iii] To exemplify this claim, that ageing and death have become biological issues, i.e., diseases, we can make a comparison with disabilities. Several disabilities are no longer considered social and political issues alone, for instance, leading to the internment of the mentally ill or the care of physically disabled individuals. They became diseases, per se, when prenatal testing made it possible to detect defects or mutations before birth, all of which could lead to a tendency towards avoiding genetic disorders (such as Down Syndrome or Tay-Sachs disease). When the possibility of avoiding these defects arose, nowadays by abortion, and maybe later by gene therapy, such disabilities were no longer seen as deterministic, but as biological impairments that could be avoided.

For transhumanism, ageing and death are new biological diseases, not in the sense that they are new in themselves, but because they are, for the first time, considered diseases to possibly be eradicated by technological means and advances (cryogenics, mind-uploading, and genome editing, among others). It is well-known that transhumanists consider ageing and death as diseases: some of them, like Nick Bostrom and Max More (Bostrom, *The Future of Humanity*, 2007; More, 1999), also contest their necessity in the human evolutionary process, as detailed in the famous *Letter to Mother Nature*: "We will no longer tolerate the tyranny of ageing and death. Through genetic alterations, cellular manipulations, synthetic organs, and any necessary means, we will endow ourselves with enduring vitality and remove our expiration date. We will each decide for ourselves how long we shall live" (More; More et Vita-More 449). Consequently, several transhumanist movements argue that we must confront ageing and death, even if they are universal and inevitable. As the French transhumanist Didier Coeurnelle points out, a *universal* defect is still a defect; after all, the majority of people suffer from the flu during their lifetime, yet it is nonetheless considered a disease. In addition, if any defect without a cure were to be considered natural, Alzheimer's or AIDS would not be classified as diseases (Coeurnelle, 2014). Therefore, "Are ageing and death diseases?" is a relevant question in its medical meaning when related to 1) the defect of physical and mental functions and capacities and 2) the imminence of death.

For transhumanism, human enhancement through technological means could tackle the stakes of ageing and death. Human enhancement is broadly seen as what overtakes our allegedly fixed human condition and focuses not only on death but on any limitation, be it weakness, injury, disability, or ageing. We could argue that this definition of human enhancement considers "not finiteness as a condition of the bodies, but the body as a manifestation of finiteness, that in which and how it takes substance or form" ("Non la finitude comme qualité des corps, mais le corps comme manifestation de la finitude, ce en quoi et comme quoi elle prend consistance ou prend corps"; Milet 54). Yet, to consider disability as a disease seems not to carry the same philosophical weight as to see ageing or death as diseases, as this article will soon argue. Consequently, this article proposes that a philosophical approach is necessary to go beyond humanist dichotomies, in order to clarify how major notions such as health and enhancement are intertwined to shape our socio-political subjectivities. Given this context, we discuss the fact that medicine is traditionally *structured on a limit*: a narrow definition of health. This article shows how the current evolution of the medical framework paves the way for new debates; among them, the

transhumanist plea that envisions transcending the human condition, also *structured on limits*. Those limits are both biological (the reality of old age and death) and existential (the ontological openness to ageing and dying). This article debates how transhumanism tries to transcend both those structures: first, by considering ageing as a biological defect and asking for human morphological and biocultural freedom; second, by showing death as a fatal degeneration that could be overcome through biological amortality and informational immortality.

Enhancing the Medical Framework

Any medical framework is always changing to include new practices (plastic surgery, gene therapy, etc.) and the use of new tools (machine learning and AI, CRISPR-Cas9, etc.), or to define emerging diseases (COVID, etc.). Consequently, this section does not engage with that major discussion about the definition of medicine, as it is considered a truly plastic notion itself: Jeffrey Steinberg, for instance, whose fertility institutes allow parents to choose the sex of their children, "sees this practice as a continuation of plastic surgery and cosmetic medicine" (Guérin 71). However, we draw attention to the evolution of the notion of health and how it connects with changes in our society. It allows us to clarify how the idea of transcending the human being depends on human limitations and possible enhancements, in which ageing and immortality are very specific cases.

1.   **Limits and structures of the notion of health**

Our understanding of medicine has an undeniable impact on our conception of one's normal[iv] state and is inherently subordinated to the definition of health. Leriche once gave a famous definition of health, still in use among clinical practitioners (Reniers et al.; Goffette, *Humanité augmentée, anthropotechnie : Enjeux majeurs et perspectives humaines*): "life lived in the silence of the organs" ("La santé, c'est la vie dans le silence des organes"; Leriche, 1936).[v] Olivier Bézy specifies that Leriche did not intend to give a universal definition of health and that, as a surgeon, he knew perfectly well that "the silence of the organs" never excluded the presence of the disease (Bézy, 2009). But, here, health is considered a state of well-being, a point in space, or a moment in time, of unaltered corporeity. It is a state in which everything functions as it should; nothing hurts, nothing strains. It also covers the neutral state "in which the necessary functions are performed imperceptibly or with pleasure" ("La santé est l'état dans lequel les fonctions nécessaires s'accomplissent insensiblement ou avec plaisir"; Valéry 917).

Based on this definition of health, medicine has an apprehension of disease that it opposes with prevention, knowledge, and remediation. Therefore, it is structured within a limit: once health is restored and prevention is achieved, medicine supposedly no longer must act. This understanding of medicine advocates the respect of human finiteness and allows therapeutic interventions in accordance with an ideal of natural wisdom. For instance, it is common to operate on someone with near-sightedness, but still inconceivable to improve the sight of an ordinary sighted person; it is also common to use medication against disorders of concentration (ADHD) but theoretically illegal to use it in a competitive context. Therefore, as an unavoidable biological event, ageing is not traditionally considered a disease in itself, but the trigger for physical and mental defects that can lead to various symptomatic diseases. It does not fall within the scope of what medicine takes care of, except for its symptoms – for example, Alzheimer's.

2. **Human enhancement and the evolution of health**

Medicine depends on more complex considerations when the definition of health is broadened and loses its normativity. Indeed, this definition was reformulated by the World Health Organisation (WHO), as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (Grad, 2002). This definition does not mean that medicine cannot focus anymore on "neutral" health care, but it complicates its framework by linking it to the more subjective notion of "well-being". Even if this definition raised numerous objections, we postulate that the WHO definition does not impose a new definition of health, but merely describes an unprecedented paradigm. The WHO definition raises a concrete question, superseding a definition of health as a biological-based concept, as it includes it in a debate on what-life-should-be(-like). The restoration of health is considered as a radical form of care: "this WHO definition does not simply mean a fight against ill-being, but a victory for well-being, and even for complete well-being. Normality is here an unlimited ideal, a kind of infinite horizon" ("Cette définition de l'OMS ne signifie pas simplement une lutte contre le *mal*-être, mais une conquête d'un *bien*-être, et même d'un *complet* bien-être. Le normal est ici un idéal illimité, une sorte d'horizon infini"; Goffette, *Le problème du normal: entre détermination biologique et appréciation personnelle*, 35). But the WHO describes a broader situation, as the famous bioethics report "Beyond Therapy" (The President's Council on Bioethics, 2003) also considers separating medicine from the limit or structure of the aforementioned narrow definitions of health, providing it with a more transcendental objective: human happiness.

According to those new paradigmatic evolutions, we argue that ageing, by undermining physiological and social well-being, can be considered a disease. Moreover, we postulate that to consider ageing and death as diseases implies that any human enhancement advocating extended lifespan or a/immortality is in fact a therapeutic undertaking that opposes new biological issues. For transhumanist movements, this way of understanding those notions unveils major ontological and socio-political evolutions in our societies and, among them, a new fluidity between therapy and enhancement, and a new way to transcend human limitations.

The expression 'human enhancement', introduced by Daniel Druckman and John A. Swets (Druckman et Swets, 1988), became pivotal through the work of Erik Parens (1998). The European Parliament defines it as a "modification aimed at improving individual human performance and brought about by science-based or technology-based interventions in the human body" (Coenen et al. 6). This report defines two kinds of human enhancement: a therapeutic one, within the medical framework, and a non-therapeutic one. It exemplifies that, nowadays, the evolution of the definition of health blurs the boundaries between medicine and enhancement, bringing them closer enough to allow some researchers to include medicine in human enhancement (The President's Council on Bioethics, 2003) or to deny any demarcation between the two[vi].

Two aspects need to be first clarified to understand the concept of enhancement, widely used by transhumanist movements to consider the transcendence of human limitations through technological means. First, human enhancement covers many technologies and uses and cannot be condemned a priori as a whole. For instance, genome editing raises very different issues, whether it aims at preventing the onset of an inherited disease or choosing the future appearance of a child. The many different uses, means, and purposes of technological fields and objects "hide proximity, even when their legitimacy is no longer in question while others are controversial or even condemned" ("[Leur polymorphie] cache une proximité, même s'ils ne posent plus aucune question quant à leur légitimité tandis que d'autres sont controversés, voire condamnés"; Goffette, *De l'humain réparé à l'humain augmenté: naissance de l'anthropotechnie* 87). Moreover, human enhancement itself can include a wide range of therapeutic practices, i.e., medical actions aimed at improving a patient's condition as much as possible, and at increasing their chances of survival (e.g., genome engineering for therapeutic purposes, as mentioned above). This issue is raised in

Jérôme Goffette's work, for whom "anthropotechnics" could be an appropriate word to refer to human enhancement without therapeutic purposes[vii].

Avoiding Degeneration and Defeating Mortality

This section focuses on the transhumanist argument for new ways of transcending human limitations, based on biological, morphological, and evolutionist freedom. First of all, we must observe that the transhumanist assumption of an inherent ontological or biological quality within humans that requires one's enhancement or remediation is not new, per se, and finds root already in Aristotle's work. Indeed, Aristotle underlines that Epimethean neoteny[viii] is not a lack or a failure in the human constitution, but a quality (in the neutral sense, of a characteristic) that opens up new potentialities (Aristotle, 1994). Those potentialities are both anthropological, such as the performativity of hand gestures, the ability to stand, or the development of articulate language, and anthropotechnical, with the development of a dense social and technical network.

Though this is not the core of our article, the argument that something 'lacks' in the human being that prompts human enhancement is extensively discussed by several authors, such as Coyne in *An Unfit Future: Moral Enhancement and Technological Harm* (Coyne, 2018), which responds to Ingmar Persson and Julian Savulescu's work (Savulescu et Persson, 2014). In France, we can also recall the work of Jean-Michel Besnier, who develops the idea that transhumanists would in fact be tired of the human species (Besnier, 2010). In the examples cited, it is interesting to note that both Coyne and Besnier refer to the work of Hans Jonas. Besnier also mentions Günter Anders to denounce a tendency to lapse into "Promethean shame" (Anders 37). From a genealogical point of view, it seems to be mostly in these German authors that contemporary critics find authoritative arguments against transhumanism. More generally, we can sum up the transhumanist answer as follows: if there is a lack or a failure in the human constitution, it needs to be overcome; if it is a quality or property, there is no reason why it should not be extended and performed through technological enhancement. As such, as transhumanist movements consider ageing and death biological issues, they create a new therapeutic framework based on the theoretical openness of human enhancement.

1. **A morphological freedom**

Ageing is a complex process, constituted of independent defects with little to no causality. It is not the result of a genetic regulation that ensures it happens, but "an unregulated side effect of the failure of natural selection to maintain function at the later ages that few individuals reach in nature" (Partridge 148). As the human lifespan has been flexible throughout history (around 30 years old at the beginning of the nineteenth century, but 85 years nowadays), researchers debate if a biological and intrinsic limit to human life expectancy could in fact be expected (Wilmoth, 2000; Oeppen et Vaupel, 2002).

Nonetheless, if we examine biological old age as the final period of life, characterized by a slowdown in bodily functions, a decrease in physical strength, and a decline in mental faculties, transhumanist movements then consider it a disease and contest its necessity in human evolution.[ix] They consider ageing as the symptom of an illness to be cured, thanks to the development of new technological objects and the operability of human enhancement. For them, human enhancement is a "set" (Goffette, *Naissance de l'Anthropotechnie. De la médecine au modelage de l'humain* 95) of improvement (or optimization) tools, opposing all kinds of degenerations in themselves, including, by literal extension, ageing. From this perspective, fighting the biological symptoms of ageing amounts to rectifying human deficiencies through a number of technical means (current and foreseen). If ageing is indeed the biological degradation of bodily functions, then *any* means of human enhancement radically struggles against it.

In such a formulation, transhumanist movements make the fight against biological determinations a part of the human "morphological freedom" (Sandberg, 2013), i.e., the propriety of one's own lived form and the freedom to hybridize. Through the notion of "biocultural capital" (Miah, 2013), Andy Miah refers to technoscientific tools by arguing that their use should be decided by the individual, just like cultural resources (such as language and art) and external technologies (vehicles and high-tech products, among others). Biocultural capital underlines how human enhancement provides the tools through which people can adapt themselves to pursue their life goals in ways they deem appropriate. It is a means towards morphological freedom and body plasticity and it postulates that human transcendence is not discontinuous in our evolutionary process.[x] For Andy Clark, it is natural to consider the human as a plastic cyborg: "In this way, ours are *essentially* the brains of natural-born cyborgs, ever-eager to dovetail their activity to the increasingly complex

technological envelopes in which they develop, mature, and operate" (Clark 26). Defining ageing as a disease implies the possibility, even the responsibility, for authors like John Harris (*Enhancing Evolution*, 2007; *How to be Good*, 2016) to address it through technological solutions.

In this respect, transhumanism considers human enhancement as a neutral evolutionary movement. It is therefore seen as therapeutic, while ageing is a decaying process. Consequently, when transhumanism classifies ageing as a disease, not only does it confront the decay of health, but also the prospect of death. Indeed, the more fundamental expectation of morphological freedom that could be exerted on the human being would be the overcoming of our mortality. As there is a variety of transhumanist movements, there is no common ground on this question. However, we aim to discuss how a new understanding of immortality impacts the notion of the human condition and plasticity by modifying what we embody, what defines our identity, and how we represent ourselves. We will approach this question through two main discussions on technological enhancement: through biological modifications and informational enhancement.

2.   The superbiology approach

Through what the philosopher Jean-Yves Goffi calls a "superbiology" (Goffi 28) approach, some transhumanist movements advocate overcoming ageing and death by means of *amortality*. The subject may not die of old age but remains mortal (by accident or suicide). If in this case "anti-aging does not mean anti-death" (Mykytyn, 2009), it would transcend the human limit of being (by natural senescence) biologically mortal. For instance, the seven to nine hallmarks (López-Otín et al., 2013) that allegedly cause senescence are well-known to be the Trojan horse of Aubrey de Grey's fight against ageing, with his project Strategies for Engineered Negligible Senescence (SENS) (de Grey et Kope, 2009)[xi].

This superbiology approach is not entirely based on a fictional imaginary; it is also based on the emergence of new positive knowledge (such as epigenetics)[xii] and on the development of previously unseen technoscientific objects[xiii] such as gene-engineering tools, like the enzyme CRISPR-Cas9.[xiv] Along with those new tools, our increasing knowledge of genetics allows us to target new specific enzymes, which is crucial given that ageing is clearly apparent in organisms where growth is almost completed before reproduction begins, like insects, birds, and several mammals, including humans (Vaupel et al., 2004).

For this reason, the biology of ageing is a field of research developing rapidly, e.g., for the study of single-gene mutations extending the lifespan of animals in laboratories, such as telomerase activity. This enzyme adds a structure to the end of the chromosomes (the telomere) which helps to maintain their length. When, by successive divisions, the telomere becomes too short, the cell interprets its atrophy as DNA corruption and stops its growth. For humans, the number of times a cell population divides before cell division stops is called the Hayflick limit or Hayflick phenomenon. This cell death is responsible for many diseases, especially age-related ones. However, scientific experiments provide numerous potential applications in regenerative medicine (Jaskelioff et al., 2010) and teach us, more importantly, that "ageing is a much more plastic and modular phenomenon than we thought before undertaking this research" (Guarante, 2003).

That being said, clinical trials are seldom planned for humans, as genome editing always involves a risk of undesirable side effects (off target), even if the key question is to estimate it, as it may also be negligible (Atlan, 2011). Eventually, and even if we have already begun to understand that gene alterations, in general, are so complex that new tools like Cas9 have currently limited applications, bioethics committees object to germline alterations. A new technique of genome editing using a bacterial system, called CRISPR-Cas9, has recently been introduced, offering the possibility of inserting, removing, and correcting DNA with relative simplicity and efficiency, as yet unrivalled. As explained in §9, the application of this technology to the germline has raised serious concerns within the scientific community since its discovery (Comité International de Bioéthique, 2015)[xv]. Nonetheless, and while not all scientific approaches are feasible for ethical or practical reasons, ageing does not seem to be a phenomenon whose temporality is invariant. The superbiology approach tries to transcend ageing as a biological limitation, but still constitutes death as the human temporal horizon from a more existential stance.

3.   The computing-robotic approach

However, the transhumanist "computing-robotic" (Goffi 28) perspective entails a new form of *immortality*. It debates how to make the person forever incorruptible by theorizing an approach where one's substrates are either perennial or transmutable, making them eternal. This approach states that "the mind continues to depend on a substrate to exist and to operate, of course, but there are substrate choices" (Koene 146)[xvi]. While the superbiology branch wants to overtake the fact of *being mortal in the world*, the computing-robotic branch aims at

the negation of any limit inherent to *being in the world*. A major example is Hans Moravec's theory of mind-uploading. For him, the human body does not require any limited and vulnerable carnal envelope as we can consider the uploading of the "mind"[xvii] (Moravec, *Robot: Mere Machine to Transcendant Mind,* 1999) – or qualities of it, such as consciousness, memory, and personal identity – on digital or robotic platforms, which are resistant and efficient supports. Matter is therefore defined both as corruptible and corruption: it is the deprivation of another form. However, it is also what attempts to actualize itself and contains the potential of its transformation, i.e., the possible being.

On the contrary, the mind does not have the same potentiality and it is important to preserve. However, this perspective does not strictly fit into the framework of any body-soul dualism. Indeed, it discusses the uploading of the functional organization of the body in the same way as the uploading of consciousness: as a totality. Post-uploaded individuals would no longer possess objective, organic and localized bodies, but would still have their own body, understood as a receptive material immersed in their environment and melted with the mind. As such, it could be asked if there is any real possibility for a mind not to be embodied in any way, as phenomenology underlines: "The body is always present. In fact, it should rather be said: the constant presence makes the body and is the body, because this presence leads to weaving a unity around everything that is constantly here – weaving a unity: my body" ("Le corps est toujours présent. En fait, il faudrait plutôt dire : la présence constante fait le corps et est le corps, car c'est cette présence qui conduit à tisser une unité autour de tout ce qui peut être constamment présent – tisser une unité : mon corps"; Goffette, *Quelques pas théoriques vers une psychogenèse du corps* 363). As such, mind-uploading itself does not consider the loss of any substrate, even if this substrate only amounts to a computer code.

Indeed, Moravec considers two definitions of a person's identity: one by the body (body-identity), the other by the structure or information (pattern-identity). According to him, identity does not come from the body but from information. This transhumanist perspective implies that "any living or non-living form now tends to be perceived as an aggregate of information" ("Toute forme vivante ou non tend désormais à être perçue comme un agrégat d'information"; Le Breton 45). Our current scientific model tends to contribute to this perspective: the world is a compendium of the very same elements distributed differently (proteins, atoms, and molecules in general [Nelkin et Lindee, 1995]). For mind-uploading proponents, what becomes optional is not only the ageing body but the bodily substrate itself, as it is made up entirely of the information that constitutes its sole, unique value.

But, as for the very mind that performs the calculations and interacts with matter, the status is more nuanced: "The ability to copy it from one storage medium to another would give it an independence and an identity apart from the machinery that runs the program" (Moravec, *M.i.n.d Children* 119, 120). This theory of computing-robotic transhumanism thus debates immortality based on the persistence of one's personality through information, not on the persistence of the biological body. If a "superbiological" approach to amortality managed to repel the biological experience of death, "computing-robotic" immortality involves a being whose experience of death no longer matters, or only to the minor extent of the virtual or robotic substrate's durability that is inhabited.

This article has put into perspective the evolution of the definition of health, which leads to new debates regarding medicine and human enhancement, and it paves the way for increasing its socio-political stakes. By exploring those stakes through the question of ageing and death, transhumanist movements emerge as a vector for discussing the expression and shape that may be attained by enhancing the human body and mind. But, as such, they also anticipate the possibility and openness of new ontological deconstructions of the human condition, based on the horizon of our mortality. If it is precisely because of one's experience as an ageing, fragile, and mortal being that the human being is open to change and improvement, then debating the limits of our own plasticity has rarely been so crucial, as Gilbert Hottois has pointed out. "Aging and death are no longer considered as the necessary vectors for the fulfilment of a properly human existence – in the sense that, as Heidegger said, man is a being-for-death, […] a being whose life only makes sense and crystallizes in history because he is essentially, through nature and culture, dedicated to death" ("Vieillissement et mort ne sont plus considérés comme les vecteurs nécessaires de l'accomplissement d'une existence proprement humaine – au sens où, ainsi que le dit Heidegger, l'homme est un être-pour-la-mort, […] un être dont la vie ne prend sens et ne cristallise en histoire que parce qu'il est essentiellement, par la nature et la culture, voué à la mort"; Hottois 95).

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Notes

[i] This article differentiates between several transhumanist movements but does not seek to review all of them or distinguish them from other discourses such as humanism, posthumanism, or metahumanism.

[ii] While we consider the opponents to extended human lifespan who advocate that old age and death are natural stages of life, this article examines the opposite position. For an overview of bioconservative theories that claim that "slowing the aging process would be one of the most dramatic and momentous ways of enhancing human beings" (Juengst et al. 21), see the work of Leon Kass, Francis Fukuyama and Daniel Callahan in (Kass, 2004; Fukuyama, 2003; Callahan, 1995). Those authors are also put into perspective in Arthur Caplan's studies (*Death as an Unnatural Process. Why Is It Wrong to Seek a Cure for Aging?*; *How Can Aging Be Thought of as Anything Other Than a Disease?*).

[iii] Listed in the International Statistical Classification of Diseases and Related Health Problems (ICD) of the World Health Organization (WHO).

[iv] As opposed to pathological. The definition of normality is a wide subject; see (Canguilhem, 2013; Goffette, « Le problème du normal : entre détermination biologique et appréciation personnelle »; Giroux, *Après Canguilhem. Définir la santé et la maladie*). This question is more and more linked to new discoveries in genetics, because "the definition of normality is increasingly affected by the results of the Human Genome Program since this attempt (to study) molecular anatomy contributes to revealing the uniqueness of each person." (Testart, 1997) We will use the word *neutral* for a state, or a condition.

[v] To open the discussion with Christopher Boorse's famous claim about health being a theoretical and statistical concept (*Health as a Theoretical Concept*; *Concepts of Health and Disease*), see the commentaries of Thomas Schramme and Élodie Giroux (Giroux, « Définir objectivement la santé : une évaluation du concept bio statistique de Boorse à partir de l'épidémiologie moderne »; Schramme, 2014).

[vi] On this debate, see the work of Sheila and David Rothman (Rothman et Rothman). See also Lennart Nordenfelt's holistic notion of health enhancement, conceived as a general category covering

health therapy and health promotion (Nordenfelt, 1998), and his commentaries by Élodie Giroux (Giroux, « La théorie holistique de Lennart Nordenfelt »).

[vii] We find different but major uses of the word *anthropotechnics* in the works of Peter Sloterdijk (Sloterdijk, 1999) and Gilbert Hottois (Hottois et Missa, 1984).

[viii] The myth of Epimetheus is used by Aristotle and Plato to discuss the absence of biological specialization in the human being. Aristotle underlines that "much in error, then, are they who say that the construction of man is not only faulty, but inferior to that of all other animals; seeing that he is, as they point out, bare-footed, naked, and without weapon of which to avail himself" (Aristotle, Book IV, part 10). For him, Epimethean neoteny is not a weakness but the openness of a world of possibilities. It is precisely the architectural bareness of the human body that compels the anthropological evolution.

[ix] Against the anthropomorphism of the evolutionary principle, we quote: "Had Mother Nature been a real parent, she would have been in jail for child abuse and murder" (Bostrom, *In Defense of Posthuman Dignity*); and "Mother Nature, truly we are grateful for what you have made us. […] However, with all due respect, we must say that you have in many ways done a poor job with the human constitution." (More et Vita-More 449). See also the fable of the dragon-tyrant, with the dragon symbolizing ageing (Bostrom, *The Fable of the Dragon-Tyrant*).

[x] This idea is commonly grounded in debates around evolutionist philosophy and philosophy of technology; see (Simondon, 1989; Leroi-Gourhan, 1965; Sloterdijk, 1999; Stiegler, 2018; Guchet, 2005).

[xi] On the topics of extended lifespan and rejuvenating, see also David Wood or Gregory Fahy (Wood, 2016; Fahy et al., 2010).

[xii] Epigenetics is the science of natural mechanisms that can modify gene expression in a reversible, transmissible, and adaptive manner without changing the DNA sequence.

[xiii] On the ontological status of these objects, see (Lombard, 2023).

[xiv] CRISPR-Cas9 is to be classified in therapeutic medicine tools, and not only in human enhancement. For instance, there is therapeutic work on the editing of the MYBPC3 gene (whose mutation is frequently responsible for hypertrophic cardiomyopathy). As such, Cas9 has already been used on the genome of human embryos, including viable human embryos (Ma et al., 2018).

[xv] For this IBC report, see *Updating Its Reflection on the Human Genome and Human Rights, III.5. Emerging techniques for engineering gametes and editing the human genome, 102. Genome editing*. Paragraph 9 stipulates that genomic interventions may be undertaken only in exceptional cases and for preventive, diagnostic, or therapeutic ends if their purpose is not to initiate hereditary modifications.

[xvi] On Koene's theory about substrate-independent minds, see (More et Vita-More, 2013).

[xvii] On mind-uploading, see also the work of Marvin Minsky and Raymond Kurzweil (Minsky, 1991; Kurzweil, *The Age of Spiritual Machines: When Computers Exceed Human Intelligence*; Kurzweil, *The Singularity is Near*).