Towards an Ageless Society: Assessing a Transhumanist Programme

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1. Transhumanism: an Extreme Technological Vision

In recent days, a neglected factor in technological development came to the fore in the fields of Technology Assessment (TA) and Science and Technologies Studies (STS): visions as a medium to communicate uncertain technological futures (Grunwald 2009, 2012)[1]. Outside the scientific community there is also an increasing demand for orientation for technological futures. Many societal agents such as citizens, politicians and entrepreneurs are interested in foreseeing consequences of emerging technologies (Grunwald 2013). The high promises as much as the apocalyptic scenarios of emerging

1 | Though there have been a few studies on the functioning of "Leitbilder" and visions in shaping technologies in the early and middle nineties (Dierkes/Hoffmann/Marz 1992; van Lente 1993), TA became increasingly aware of those visions just since the beginning of the nineties. The cause for this awareness lies in the development of the societal discourse on the Convergence of Nano-, Bio-, Cogno- and Information Sciences (NBIC) to improve human capacities (Roco/Bainbridge 2003; Coenen 2009). Even though the Transhumanistic vision is much older than the NBIC debate (Heil 2010), it has its central reference to the potential of Nanotechnology for the improvement of the human condition as well as many similarities with the vision of NBIC. Besides this, personal overlapping between the two discourses binds these historical strings together (Coenen 2006). The above quoted William S. Bainbridge for instance, famous for his contribution in the NBIC debate, has recently published an article on the idea of „Transvatars" in the „Transhumanist Reader" (Bainbridge 2013).

technologies raise public attention, give reasons for hope, but also create anxiety and fear (Simakova/Coenen 2013). Uncertainties at the early stage of technological development create a demand for orientation and assessment of technological visions. Hence, stakeholders and politicians want to identify possible requirements for regulations (e.g. bio-safety), for chances of action (e.g. investing) or they just want to be informed about the likelihood of certain promises made in the field of emerging technologies (Grunwald 2013: 27). Technological visions do not only influence the general public as a passive recipient; they can be considered as narratives that also guide scientists and engineers in a certain direction of technological development. This guidance subsequently shapes the design of technologies: hence, visions are considered as an important parameter in technological development.

Transhumanism is an extreme technological vision, which clearly distinguishes itself from utopian narratives such as Thomas More's *Utopia*[2] in a few respects. In contrast to such classic utopian narratives, Transhumanism does not provide a general critique of the contemporary social and institutional order. Instead of criticizing the liberal market or the post-democratic political system for instance, Transhumanism accepts and seeks to sustain this system with its fostered values of efficiency and accomplishment (Saage 2006, 2007). The object of improvement is the individual and not the social system that may have developed the pressure on individuals that Transhumanists want to master. A further major difference between utopias and the vision "Transhumanism" is the fact that the envisioned change should be accomplished by technological means. Transhumanists consider technology as the appropriate means to deal with fundamental societal issues and to fulfil deep human desires. While former utopias considered a change of the reigning political and economic orders or education as promising means, Transhumanists prioritize technology as a fundament for improvement. The vision of Transhumanism appears in various forms, all of which have in common that they envision a future that brings about a decline of our physical and mental

2 | Thomas More's *Utopia* is seen as the prototype of a utopia and one of the constitutive literary documents of the modern age (Nipperdey 1975). The book contains a fictive dialogue in which criminal behaviour is discussed. One of the dialogue participants concludes that a fundamental change of the social order is necessary to overcome such behaviour. It is suggested that such a utopia is a possible and ideal world. Utopia is pictured as a universal rearrangement of the political, social and institutional order (Nipperdey 1975: 118).

boundaries as compared to today. The unpleasantness of all physical constraints – including diseases, senescence and death – should be overcome: Transhumanists seek to expand humanity into space. Transhumanist Max More summarizes these goals in his overview on the "Philosophy of Transhumanism":

> Becoming posthuman means exceeding the limitations that define the less desirable aspects of the 'human condition'. Posthuman beings would no longer suffer from disease, aging, and inevitable death (but they are likely to face other challenges). They would have vastly greater physical capability and freedom of form – often referred to as "morphological freedom" [...]. Posthumans would also have much greater cognitive capabilities, and more refined emotions (more joy, less anger, or whatever changes each individual prefers). Transhumanists typically look to expand the range of possible future environments for posthuman life, including space colonization and the creation of rich virtual worlds. (More 2013a: 4)

The *Transhumanist Declaration* also expresses these prophetic claims and the trust in the techno-scientific progress in a typically positive tone:

> Humanity stands to be profoundly affected by science and technology in the future. We envision the possibility of broadening human potential by overcoming aging, cognitive shortcomings, involuntary suffering, and our confinement to planet Earth. (Various 2013: 54)

While one could be inclined to regard Transhumanist visions as far-fetched speculations about uncertain futures and therefore neglect their significance and meaningfulness, it must be emphasised that visionary practices have a specific impact on the development of technologies in the present. Visionary narratives narrow the scope of possible paths in which we could develop new technologies. The Transhumanist vision regards technology as the fundament for future welfare: this leads to a distraction of the public discourse and neglects the opportunities of non-technological improvement of our society. Furthermore, the involvement of Transhumanists in concrete scientific and engineering enterprises shows that technological visions do not float in an empty space, but rather guide concrete contemporary business and engi-

neering activities[3]. Recently, Patrick McCray described the set of activities that many promoters of extreme technological visions are engaged in as "visioneering" practises (McCray 2013). Visioneering means the fostering of the visionary community, advocating for technological enterprises and the visionary agenda publicly, doing research to realise the vision, and allocating funding for these projects. Visioneers, such as Transhumanists, function as important actors in the social construction of technologies. The impact of their activities and the dangers emerging from it become obvious in the personal and conceptual connection between Transhumanism, biogerontology and anti-ageing medicine, which is manifested, for instance, in the person of Aubrey de Grey[4]. In the following section, we will discuss the advocates of the Transhumanist movement and deal with the Transhumanist vision of ageing and its technological claims.

2. Transhumanist Views on Ageing

Transhumanists claim that ageing leads to unnecessary suffering and death. Not without a reason, the Transhumanist Julian Huxley begun a list of desirable goals that could soon be achieved with a long and healthy life through scientific progress (Huxley 1931: 5–6). Just like Julian Huxley, Nick Bostrom assumes that almost everyone would choose a radically prolonged life as long as one could undergo this extended lifespan in an acceptable healthy condition (Bostrom 2013: 33). The claim of the Transhumanists is, therefore, not only to extend the lifespan but also to extend the productive years of life – the "healthspan", as Bostrom names it. He argues that this social desire is visible in many contemporary technologies such as the airbag. The development of these technologies is driven, as Bostrom says, by the wish to avoid unnecessary and premature deaths and injuries that subsequently lead to dying. The increase in the lifespan of the western civilization in the past century

3 | Since 2012 the leading Transhumanist Ray Kurzweil is director of engineering at *Google*. He is a good example of an active visioneer.

4 | Aubrey de Grey is a famous figure of the Transhumanist movement. He is a fellow of the Transhumanist Institute for Ethics and Emerging Technologies and Chief Science Officer of the SENS Research Foundation. The foundation is dedicated to the research on ageing and had a total income of 15 Million $ through personal donations of Aubrey de Grey in 2012 (SENS Foundation 2013).

gives us evidence for the efficiency of the technological mastering of ageing and dying. Bostrom has no doubt that further progresses in the intervention to the ageing process are likely and soon to appear if the right decisions are made nowadays. In his famous, original and lucid article, "The fable of the dragon", he attacks conservative bioethicists who deny the desirability of an eternal life and promote cautiousness about the side-effects of technologies that intervene into the process of ageing and dying (Bostrom 2005). The moral of the fable is that such a conservative attitude delays the mastering of the ageing process and subsequently costs unnecessary lives. Bostrom suggests that a more liberal research and technology agenda could save those lives. He pleas for a shift in the paradigm of technological development from the "precautionary" to the "proactionary principle" (More 2013b). The fable shows that the reign of the dragon, which stands for human mortality, is for Bostrom not a law of nature that cannot be influenced. The accusations that conservative bioethicists and other parties oppose the liberal development of technology, delay the progresses in life-prolongation, and are therefore responsible for unnecessary and premature death, are common in Transhumanism. In this debate, ageing is considered as the biological cause of diseases and premature death. The fight against ageing is therefore a fight against the cause for human mortality. The quest is to intervene in the ageing process in order to overcome it. Eric Drexler, the author of the "Engines of Creation", published in 1986, considered cell-repair machines based on nanotechnology as the appropriate tool to intervene in the ageing process. Drexler's promises with regard to Nanotechnology supported the strong expectations many Transhumanists associate with Nanotechnology. Drexler assumes that ageing is like other biological processes – natural, though not less undesirable:

> Aging is natural, but so were the smallpox and our efforts to prevent it. We have conquered smallpox, and it seems that we will conquer aging. […] Still, researchers have made progress toward understanding and slowing the aging process. They have identified some of its causes, such as uncontrolled cross-linking. They have devised partial treatments, such as antioxidants and free-radical inhibitors. [...] With cell repair machines, however, the potential for life extension becomes clear. They will be able to repair cells so long as their distinctive structures remain intact, and will be able to replace cells that have been destroyed. Either way, they will restore health. Aging is fundamentally no different from any other physical disorder; [...]. (Drexler 1986: 114–115)

This quote contains many aspects that are characteristic of the Transhumanist understanding of ageing, which reappears in many of their writings. A very typical characteristic of Drexler's way of reasoning in this quote, is that he considers ageing as a biological process; also typical in this quote is the claim that science has already made a huge progress in explaining these processes. Furthermore, his phrasing of ageing by using the military metaphor of "conquering ageing" suggests that society faces an opponent worth fighting, a truly evil enemy. Implied in this use of language is a personalisation of ageing as an entity that somehow has person-like attributes such as intentions or a will (to destroy humans): these metaphors reappear in many writings of Transhumanists and certainly develop an immense rhetoric power. He continues with another negatively phrased comparison: ageing as being similar to the unpleasantness of smallpox. Moreover, Drexler thinks that there are, or soon will be, technological ways to intervene in the ageing process and that we will and should apply these technologies: he envisioned the so called "Nanobots", based on Nanotechnology, to cure the cellular damage at its roots (Nerlich 2005). Finally, he considers ageing as a physical disorder, a phenomenon that does not only lead to diseases, but is a disease in itself.

Although Drexler's paradigmatic viewpoint on aging has many similarities with Transhumanism, it shows a difference to technological interventions that are currently summarized as anti-ageing technologies (Ehni 2014: 49). Transhumanists seek to completely reverse the ageing process: while anti-ageing medicine promises to undo the externally visible effects of ageing such as wrinkles, Transhumanists want to treat the roots of ageing, the biological process itself and not only its symptoms. However, the practises that are subsumed as anti-ageing medicine cover a wide range of scientific focuses and approaches (Everts Mykytyn 2010: 183). At first sight, it might seem that restoring health and fighting diseases is not a completely new claim: the example of Julian Huxley and the idea of the "Fountain of Youth" give evidence for a rather long tradition for this desire (Schade-Tholen/Franke 1998; Gruman 1966). The density and extent in which biomedical means are increasingly promoted as promising tools to intervene in the ageing process is, however, a historical novelty (Schermer/Pinxten 2013; Everts Mykytyn 2010). New is the way in which scientific progresses in the field are presented. Many proponents of ageing intervention technologies for instance prompt that the question is not "if", but rather "when" and "how" we will intervene. This suggests that we are dealing with a new quality of expectations (Achenbaum 2005; Everts Mykytyn 2010).

Besides Nick Bostrom and Eric Drexler, Aubrey de Grey is one of the most famous and criticized advocates of reversing the ageing process. In many publications he promotes society's war against ageing (Grey 2004): he co-founded the "Strategies for Engineered Negligible Senescence" (SENS) research foundation in 2009 and advertises it in many publications. By framing the SENS enterprise as an "engineered negligible senescence", this foundation seeks to distance itself from competing anti-ageing approaches such as face-lifting and other "surface interventions" in the ageing process. The metaphor of the bodily machine which is common in Transhumanism reappears in this framing: restoring the "normal" condition means repairing and this is usually done by engineers. De Grey's perspective on ageing has apparent similarities with Drexler's:

'In the context of discussing interventions, ageing can be defined as the lifelong accumulation of various intrinsic side effects of normal metabolic processes, which ultimately reach an abundance that disrupts metabolism and causes severe dysfunction of tissues and the whole organism. Some aspects of this dysfunction are classified as age-related diseases, and some less specifically as 'frailty', but their common cause is the accumulation of damaging metabolic side effects.' (Grey 2005: 49)

This quote shows that he regards ageing as the process of ongoing damage to the body. A strong normative wording describes the changes in the metabolic system and bodily functions of ageing people: the concepts 'dysfunction' and 'damaging' frame ageing negatively, as if the whole ageing body is a broken or dysfunctional machine. In his book "*Ending Aging: The Rejuvenation Breakthroughs That Could Reverse Human Aging in Our Lifetime"*, he writes that his research, and actually the whole enterprise of anti-ageing research, is about the abolishment of the unbearable suffering and pain that is caused by ageing (Grey/Rae/Burgermeister 2010: 16). In the book he argues that the development of age-reversing technologies is equally important to prior developments in medicine, like the development of penicillin. The fact that we regulate nicotine abuse by banning smokers from buildings and campaigning against smoking shows that society is interested in prolonging the lifespan in a healthy condition. Furthermore, the claims he makes rest mainly on findings in research on fruit flies and rodents (Rose 2004, 2013); in some laboratory experiments, caloric restriction has caused to slow down the ageing process in these animals. De Grey presents the assumption that responsible genetic components for the ageing process have already success-

fully been identified and manipulated (Grey 2005: 49). Aside philosophical doubts about the individual desirability of a radically prolonged live (Williams 1993; Ehni 2009) and concerns about the impact of a ubiquitous intervention into the ageing process with regard to global equality and possible generation conflicts (Fukuyama 2003: 57–71), many biogerontologists have also criticized de Grey's approach. The following chapter recaps the critique of the Transhumanist approach to ageing.

3. Some Remarks on the Reduction of Ageing and further Methodological Shortcomings

After having discussed how Transhumanists understand ageing, we will make four claims in this chapter: Firstly, in order to clarify the shortcomings of Transhumanist use of concepts related to ageing and health, some terminological remarks on the use of the concept "natural" and "disease" will be provided. Then we will come to the lack of scientific evidence for the claims of the Transhumanists: there are methodological doubts about the transferability from laboratory models to the human organism and a lack of verification of certain promoted interventions. Thirdly, we will explain why the concept of ageing cannot be understood solely as a biological process; it is necessary to describe ageing as a complex phenomenon that requires an interdisciplinary research approach to respond adequately to the challenges of an ageing population. The normative conclusions drawn on a one-dimensional approach to ageing are, therefore, inappropriate. We will end with arguing that the overwhelmingly positive picture of the development of future technologies is unjustified. Transhumanists neglect the fact that the technological progress is ambivalent, that is, that it contains positive and negative effects.

Conceptual Shortcomings

In the above quoted passages of Drexler and De Grey and in many other Transhumanist works, the concept of a "disease" describes an abnormal functioning of the body that is accompanied by shortcomings in well-being, ability, and productivity. As Anders Sandberg puts it with reference to Nanovisioneer Robert Freitas: "Disease is a failure of optimal functioning or desired functionality […]" (Sandberg 2013: 63). The question of what a disease is and whether dis-

eases are constructed or natural is too complex to be discussed here[5], but even if one would agree with the understanding of a disease as a malfunction, it seems that not all diseases lead to the same state of disability and lack of well-being. Ageing seems to lead to certain diseases; however, the identification of ageing with diseases is enriched with misunderstandings. If everything that leads to a certain state justifies the qualification of the cause as this state, then ageing could also be identified with dying. While one could skip the question of why one should draw such a conclusion[6], one may ask if this appropriately reflects the way we usually treat each other. Our conceptual pre-understanding of dying and ill persons is that such persons deserve special treatment and attention. An ill person has special needs and interests that we are obliged to take into account in our actions. A dying person appertains respect and consolation. If we age from the beginning of our lives, this ubiquitous attribution of disease does not represent the way we usually treat other people in our everyday lives, otherwise it would lead to the absurd accusation that all of us disobey the duties we actually have towards each other as ill people. Furthermore, from a pragmatic point of view we have to consider that this attribution makes dealing with diseases in regard to the law and, for instance, insurance practices unfeasible. A more or less clear demarcation between healthy and ill people is pragmatically necessary in various contexts. Finally, the distinction of age-caused and age-related diseases is substantive. The causes for many diseases that appear more frequently in old age are still unclear. It is reasonable to prioritize the term "age-related" or "age-associated disease" to the term "age-caused diseases" until there is more evidence for their source (Blumenthal 2003; Hayflick 2000).

Lack of Scientific Evidence

The presumed findings of Aubrey de Grey and his colleague Michael Rose are often criticized, also in the biogerontological community, as the quality of SENS research does apparently not fulfill scientific standards (Olshansky/Hayflick/Carnes 2002b). In their critique of the SENS approach, Hubert Warner and other gerontologists finally concluded their evaluation with a crushing statement:

5 | For an instructive overview see Murphy (2009).

6 | To illustrate this conflation of concept one may think about this analogous case: Is a storm the same as lightning just because it is almost always accompanied by lightning?

> In our opinion, however, the items of the SENS programme in which de Grey expresses such blithe confidence are not yet sufficiently well formulated or justified to serve as a useful framework for scientific debate, let alone research. (Warner et al. 2005: 1008)

Rose and de Grey present selective results from evolutionary biology, cell biology and molecular biology, which they crudely merge to a comprehensive theory of ageing (Rose 2013: 200). The greatest success for an intervention into the ageing process to which they refer over and over again is caloric restriction. Already in 1934, C.M. McCay and Mary Crowell published a paper in which they presented success in prolonging the lifespan of mice through caloric restriction (McCay/Crowell 1934): Michael Rose has also managed to double the lifespan of fruit flies in his laboratories through caloric restriction (Rose 2004: 25). These results may impress at first sight, although evidence for an extrapolation from lower mammals and insects to human organisms has never been provided. It is doubtful whether such an extrapolation is defendable without any concrete investigation into the relation the relation between caloric restriction and the lifespan of human organisms (Sierra/Hadley/Suzman/Hodes 2009; Olshansky/Carnes 2013). De Grey mentions various further methods of intervention: he proposes, for example, that we need to rely on stem cell therapy and genetic engineering to stop the ageing process. He further suggests that small molecule drugs and somatic gene therapy could support this aim and subsequently even reverse the ageing process (Grey 2003: 930). Unfortunately, he does not elaborate on these technologies, how to create and use them. Damien Broderick, also a promoter of Transhumanism, points out that in 1999 Cynthia Kenyon and Herbert Boyer from the University of California successfully identified a gene that is responsible for the cell metabolism in *Caenorhabditis elegans*, a nematode (Broderick 2001: 39–41). By just depriving the worm from the gene, the lifespan could be doubled. Broderick mentions that researchers at Emory University have been likewise successful by adding two synthetic enzymes, superoxide dismutase and catalase, which combat oxidative stress. This research has also been carried out with *C. elegans* worms. While this sort of laboratory experiment has particularly been successful in identifying some factors of ageing in these lower model organisms, the transferability of these results is highly questionable. The *C. elegans* worm consists of about 960 body cells; the human body, in contrast, contains about hundred trillion (10^{14}) cells. None of the presented approaches has ever been proved to be primarily responsible for the human ageing process and neither has one of

the technological interventions ever been tested in humans (Warner et al. 2005). Besides, the side-effects of these therapies for human organisms are unknown.

The Reductionist View on Ageing

Eric Drexler and de Grey assume that ageing is no different from any other physical disorder. One can wonder what this biological approach to ageing says about ageing in general. In the article "*The Problem of Theory in Gerontology Today*" from 2005, the authors argue that three main issues in contemporary gerontological research have been identified: biological and social processes of ageing, the aged themselves, and age as a dimension of structural and social organization (Bengtson/Putney/Johnson 2005). This list makes some relevant distinctions. It says that the process of ageing is biological *and* social, which is a crucial observation; furthermore, this approach points out that a precondition to investigate ageing is the notion of an aged person. Research in the psychology of ageing has shown that there is no measurable decline in the intelligence of elderly people, but rather an improvement of practical skills (Sternberg/Grigorenko 2005). Besides, there are several illustrative findings in the role of elderly persons of authority in the family bond, the age-related setting of new goals, and the effects of late career climaxes and retirement: these studies observe and investigate age-related social and psychological developments. Mental and social changes in late life are two of the numerous features that are part of the ageing process; if these sociological and psychological observations are to be taken into account to express a comprehensive theory of ageing, this requires an interdisciplinary approach from current gerontological research. The above mentioned gerontologists Bengtson, Putney and Johnson underline this requirement when they write:

> The field of gerontology itself is in need of integration, because so many more factors are now recognized to be involved in human ageing. For the mountains of data to yield significant new insights, an integrating framework is essential. But this cannot be done without theories and concepts that are broader and more general in scope. This lack of integration in theories of ageing is also an artifact of disciplinary specialization. (Bengtson/Putney/Johnson 2005: 6)

By referring to this quote, one does not need to assume that it will remain impossible to explain social and cultural phenomena through biological the-

ories, but this field of research is currently underdeveloped and does not do justice to the complex reality of human ageing. The Transhumanist 'biologisation of ageing' (Vincent 2013) is to be understood as a reduction of ageing. What does that mean? The conceptual question of what ageing is, is a metatheoretical one (Janich 2009). An answer to that question is, as mentioned above, a prerequisite in certain gerontological approaches. De Greys' analysis, for instance, starts with a preconception of ageing that is solely biological, and the research on fruit flies will not disclose any other social or cultural features of ageing. If the results of this research would suggest an answer to the question of what ageing is, the argumentation would be perfectly circular. So far, the biological concept of ageing thus fades out many relevant aspects of ageing that are observed by the humanities and the social sciences: it is therefore no wonder that Transhumanists conclusively value ageing negatively. An increase of well-being through a fulfillment of personal wishes, interests or an individual plan is also part of the ageing process, and the experiences we gather throughout our lives and the social contacts we foster partly constitute the value of our lives. This is the reason why we actually identify certain ages with specific features such as youthful carelessness[7].

Positive Picture of Technological Progress is Unjustified

Technological progress is ambivalent (Ropohl 1991; Lenk 1994): it is accompanied by many positive aspects such as an increasing mobility, for instance, but also with burdens for the environment and the climate. This seems to be a trivial observation yet it contrasts with the way Transhumanists present and frame our technological future. In Nick Bostrom's "Fable of the Dragon", for instance, one cannot find any remark that the accelerating 'wheel of invention' causes any negative effects, except that it costs money (Bostrom 2005: 276–277). The possibility that such progress harms the environment,

7 | In Lewis Carroll's "Alice in Wonderland" a poem illustrates the attribution of age-related features humorously. An astonished teenager asks his father how he gained all his impressive skills: "In my youth," said his father, "*I took to the law, and argued each case with my wife; And the muscular strength which it gave to my jaw, has lasted the rest of my life." "You are old," said the youth, "one would hardly suppose, that your eye was as steady as ever; Yet you balanced an eel on the end of your nose – What made you so awfully clever?"* (Carroll/Gardner/Tenniel 2000: 51)

persons or other beings that are involved in research trials, which may lead to even greater problems than in our current ageing society, is neglected. This shortcoming is part of a vision that is based on a naïve trust in the benefits of technological progress: therefore, we argue that the vision of Transhumanism is clearly only a one-sided view on technological interventions, lacking reasonable skepticism.

In the following concluding remarks we will come back to our point of departure: the Transhumanist vision and we will propose an alternative view concerning ageing and technological innovation.

4. Conclusions: Renovating the Vision of Anti-ageing

Transhumanists promote an extreme technological vision that receives increasing public attention. Charismatic characters such as Ray Kurzweil, Nick Bostrom and Aubrey de Grey – who have a scientific background and engage in the free economy, but also act with a high effect on the public – play a crucial role for the Transhumanist movement. A better understanding of their individual motivations and their role in technological development remains an ongoing challenge. Transhumanists aim at getting rid of the physical boundaries of humans, especially the ageing bodies and their permanent decline of functions. In the previous sections we have presented their vision and sketched a critique of their current content: we now want to come back to our perspective of vision assessment. Undoubtedly, the sort of vision Transhumanists present influences the shape of future technologies. This vision has an effect on the public perception of the technological innovation process, it attracts attention, it guides engineers and scientists, it fosters grants and funding and it drives the use of new and emerging technologies (Borup/Brown/Konrad/van Lente 2006). This is no different in the case of anti-ageing medicine. With certain resentment and followed by a warning, Olshanskhy and Leonard Hayflick wrote in the Scientific American in 2002:

"[…] the hawking of anti-aging "therapies" has taken a particularly troubling turn of late. Disturbingly large numbers of entrepreneurs are luring gullible and frequently desperate customers of all ages to "longevity" clinics, claiming a scientific basis for the anti-aging products they recommend and, often, sell. At the same time, the Internet

has enabled those who seek lucre from supposed anti-ageing products to reach new consumers with ease." (Olshansky/Hayflick/Carnes 2002a: 92)

Some authors have seen this as a case to attribute responsibility in the development of new and emerging technologies (Simakova/Coenen 2013). As we observed, the sort of anti-ageing intervention Aubrey de Grey is envisioning lacks scientific evidence and his promises are as much as his arguments largely based on rhetoric sleights of hands: De Grey uses strong metaphors that rise negative associations to ageing. Nevertheless, one could agree that ageing is for many people accompanied by painful diseases and physical decline and, furthermore, that our society is indeed obliged to help people who permanently live in states of dependency. An ageing population poses challenges and bears duties for societies. In this respect, one has to be aware that Transhumanists currently focus only on technological means to face these challenges, which are less successful and less "scientific" than they are presented.

Furthermore, transhumanists disregard non-technological means of managing these problems. The vision of overcoming the ageing process narrows our view on the possible alternatives to deal with the problem of the ageing population and the lack of well-being of (ageing) individuals. Furthermore, this vision neglects the social and psychological state of elderly people, which needs to be taken into account in care practices. The habits that elderly people have established during their lives, for instance, are allegedly harder to be shaped in late life. This is a strong indicator of the amount of novelties that are bearable for them. Increasing the knowledge about this sort of psychological facts in aged populations could support the creation of appropriate care settings and treatments. Psychological and sociological research that follows this motivation may have fruitful results in understanding ageing, but this sort of knowledge is not in the foreground of the Transhumanist agenda. The social and economic conditions in which people live contribute substantially to their longevity and health. In general, people in western countries are healthier and grow older than people in the global South. People in the global South suffer from malnutrition and premature death due to diseases that are curable or at least treatable in western countries. These differences between socio-economic groups are not only to be found when we compare countries to each other, but also within countries these differences in life-expectancy can be verified for certain social classes and gender (Overall 2005). When we compare, for example, poorer people to richer people in the UK,

we see that the average morbidity and mortality rate of the rich is clearly lower (Academy of Medical Sciences 2009). Another example is the population in Sardinia, which grows much older and sustains health until late life. Anthropological research has indicated that besides genetic and biological factors, the behavioural factors including life style, demographic behaviour, family support, and community characteristics may play an important role (Poulain/Pes/Salaris 2011).

These are complex phenomena, influential in the ageing process, which, as we have argued, Transhumanists do neglect in their argumentation. The pursuit to overcome physical barriers and preventing suffering are virtuous goals to aim at for policy makers, but they should be encountered in their complexity and balanced to the variety of technological and non-technological means to improve societal well-being. Besides Transhumanism there are other technological visions with other focuses that contest our values and shape our expectations. To develop reflective capacities to assess such visions and uncover their shortcomings could become increasingly useful.

Note

This article is largely based on the Master Thesis "Considerations on the Value of Ageing, Death and their Technological Mastering" of one of the authors, Martin Sand, written at the Institute of Technology Assessment and Systems Analysis in 2014.

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