A new framework for thinking about life extension

Pablo García-Barranquero

In the last two decades, the possibility of extending human lifespan has been a highly debated topic by both biomedical scientists (de Grey and Rae, 2007; Olshansky and Carnes, 2002) and philosophers (Agar, 2010; Overall, 2003). I propose an alternative framework to clarify different categories in the theoretical literature. This model builds upon the distinctions that Juengst and collaborators (2003), and Wareham (2016) make about the levels of human senescence and means to control it. In addition, I incorporate the classic perspective of Callahan (Stock and Callahan, 2004) as a different counterpoint. Besides this, I have to introduce some notions which are basic to understand my proposal.

Firstly, I compare these previous approaches with my own perspective:

Eric Juengst et al. (2003)	Daniel Callahan (2004)	Cristopher Wareham (2016)	**My own model**
Prolonged Senescence	X	X	**Prolonged Senescence**
Compression of Morbidity	The Natural Progress Model The Normalizing Model	X	**Compression of Morbidity**
Decelerated Aging	The Optimizing Model The Maximizing Model	Slowed Aging	**Decelerated Aging** **First Level of Negligible Senescence or SENS**
Arrested Aging (A)	X	SENS	**Arrested Aging (A) Second or Complete Level of SENS**
X	X	Arrested Aging (B) Cryopreservation	**X**
X	X	Reverse Aging	**Rejuvenation**
X	X	Escaping Aging Mind Uploading	**X**

This model comprises the following mix of conceptual categories:

a) **Prolonged Senescence:** involves the prolongation of life without attention to age-related diseases and pathologies or the health span.

b) **Compressed of Morbidity:** involves the prolongation of life without the burden of lifetime illness since it can be confined to a shorter period

before the time of death at the same time that the age of onset of the first chronic infirmity can be postponed a little later. The objective is not to delay aging but rather to extend the health span. It is applied to age-related diseases like Alzheimer or cancer, and age- associated pathologies like muscle-wasting. On Callahan's scheme, this model is represented by two categories. He describes The Natural Progress Model: "trying to understand the aging process in the same way that we are doing in current medicine. In favor of improving the quality of life of the elderly (...)" (Stock and Callahan, 2004, 56). Then, he offers another scenario, which he labeled as The Normalizing Model: "trying to reduce premature death and trying that more people reach the 85 years that Japanese women have maximum life expectancy" (Stock and Callahan, 2004, 556). I consider the two levels of Callahan at the same level as he focuses on improving the quality of life. Nevertheless, if we live healthier, we will extend our live expectancies a couple years (perhaps to the 85 year life expectancy of contemporary Japanese women).

c) **Decelerated Aging:** is what de Grey has labeled Strategies for Engineered Negligible Senescence or SENS (version 1.0 or beta phase): it involves the prolongation of life with less degradation of the cognitive and physical function of the organism due to the effects of aging. A decelerated aging clock would still move through all the normal phases of senescence, merely at a slower rate, extending life expectancy and health span. This is the same as de Grey (2004) is talking about when he describes the type of life extension that will be required to reach what he calls Longevity Escape Velocity (LEV). On his view, we only need to slow down aging long enough for science to mature enough to take us into the next model. De Grey claims that LEV will provide (SENS 1.0) 20 additional years from the increase of 30 % healthy life. On Callahan's scheme, this model is represented by two categories. He describes The Optimalizing Model as: "trying to get more people to reach the 122 years that Jeanne Calment lived. It is a realistic goal in so far as there have been super-centenarians over time" (Stock and Callahan, 2004, 556). Then, he offers a more hypothetical scenario, which he labeled as The Maximizing Model: "trying to extend the double of our life expectancy" (Stock and Callahan, 2004, 556). Obviously, The Optimizing Model seems more feasible. However, we could imagine a life of about 160 years without eliminating aging completely.

d) **Arrested Aging:** (A in Juengst's model and in my own model) or SENS (version 2.0 or ultimate phase): involves the complete control of the aging process. This is the same as de Grey (2004) postulated: LEV will improve the limits or errors until it is a definitive set of therapies against aging. On this category, a person born after the availability of arrested aging interventions might live 1,000 years without senescence, as long as they avoid other causes of death, such as dehydration, fatal disease, or starvation.

e) **Rejuvenation:** involves not only the complete elimination of the aging process but it is also capable of turning back our biological clock to early biological stages. We will enjoy a full cellular and molecular health and our aesthetic and physical appearance will be returned to what we look like at whatever age we choose, whether that is as a more robust and active

> elder, a mentally mature young adult, or a growing adolescent, or even an immature child. One could then turn on and off" one's aging process as one wished, or even return one's body to previous ages (to try some new lifestyle or somatic fashion).

Now, I present four reasons why my own model differs from the others that I have described in this section (Juengst et al., 2003; Wareham, 2016).

First, no one advocates more research in order to perpetuate a state of **Prolonged Senescence** that would merely extend the lives of the old without mitigating the degenerative effects of aging (Glannon, 2009). Thereupon, no one endorses the social consequences that would result from what Fukuyama calls the "national nursing home scenario", "in which people routinely live to be 150 but spend the last fifty years in a state of childlike dependence on caretakers" (2002, 69).

Second, unlike Wareham (2016), I also think that a comprehensive model of life extension should include **Compression of Morbidity**. The possibility of extending life can also be achieved if we are able to control (and even, eliminate) some or all of the age-related diseases. It is one thing to fight against aging and another is to try to counteract the virulence of Alzheimer or some types of cancer.

Third, unlike Juengst and collaborators (2003), I also think that a comprehensive model of life extension should include *Rejuvenation*. The possibility of eliminating aging and a maximizing health span are in the gerontological literature but a person may ask: if SENS arrives when I am older, who will I see when I look in the mirror?

At the other end of the taxonomy, I also ignore that a comprehensive model of life extension should include Arresting Aging (B in Wareham's model) and **Escaping Aging** (or Death) (Wareham, 2016) entirely, by achieving immortality or resurrection. For two reasons: (1) it is a utopia with almost no scientific basis that serves more for projecting philosophical speculations than other things; (2) the only way to achieve these goals would be to forego our physical bodies entirely, such as by integration (partial or complete) with the machine; for example, mind uploading in the last level. This differs from the nature of the other levels, and raises issues outside the scope of the debate over biomedical life extension.

Finally, the model that I am proposing in the table above builds on these categories, but improves upon Juengst and collaborators (2003) and Wareham (2016) models in several ways:

Flexibility: it is open to add or restructure categories with the evolving of gerontology. Its maxim is to focus on aging and senescence; therefore, there are not all the possibilities to live longer (or forever). **Overlap:** there is a continuity between each of the categories since there is no substantial gap between them. For example, between Compression of Morbidity and Decelerated Aging (we may think that we have delayed senescence but we have only slowed down the appearance of age-related diseases) or if de Grey (2004) develops his entire research project (from SENS 1.0 to SENS 2.0). **Levels of fantasy:** is intermingled with established science in this model. It spans medicine's current efforts to prevent late-life disease and the craziest ideas of charlatans in this field. Alt-

hough categories (a, b, and c) is, understandable in terms of the status quo and ongoing science, it takes a strong tolerance for fantasy to envision what is meant categories (d and e). The realistic aspiration does not consist of eliminating aging or reversing aging (Bostrom, 2005; de Grey and Rae, 2007; Harris, 2007; Kurzweil, 2005).

References

Agar, N. 2010. *Humanity's End: Why We Should Reject Radical Enhancement*. Cambridge, MA: MIT University Press.

Bostrom, N. 2005. The Fable of the Dragon Tyrant. *Journal of Medical Ethics*, 31(5):273–277.

de Grey, A. 2004. Escape Velocity: Why the Prospect of Extreme Human Life Extension Matters Now. *PLoS Biology*, 2(6):726–730.

de Grey, A. and M. Rae. 2007. *Ending Aging: The Rejuvenation Breakthroughs that Could Reverse Human Aging in Our Lifetime*. St. Martin's Press: London.

Fukuyama, F. 2002. *Our Posthuman Future: Consequences of the Biotechnology Revolution*. Baltimore: Johns Hopkins University Press.

Glannon, W. 2009. Decelerating and Arresting Human Aging. In: *Medical Enhancement and Posthumanity* (pp. 175–190). B. Gordijn and R. Chadwick (eds.). Dordrecht: Springer.

Harris, J. 2007. *Enhancing Evolution: The Ethical Case for Making Better People*. Princeton: Princeton University Press.

Juengst, E. T. R. H . Binstock, M. J. Mehlman, S. G. Post, and P, Whitehouse. 2003. Biogerontology, "Anti-aging Medicine," and the Challenges of Human Enhancement. *Hastings Center Report*, 33(4):21–30.

Kurzweil, R. 2005. *The Singularity is Near*. New York: Vikings.

Olshansky, S. J. and B. A. Carnes. 2002. *The Quest for Immortality*. New York: W. W. Norton & Company.

Overall, C. 2003. *Aging, Death, and Human Longevity: A Philosophical Inquiry*. Berkeley: University of California Press.

Stock, G. and D. Callahan. 2004. Debates: Point-Counterpoint: Would Doubling the Human Life Span Be a Net Positive or Negative for Us Either as Individuals or as a Society? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 59(6):554–559.

Wareham, C. 2016. The Transhumanist Prospect: Developing Technology to Extend the Human Lifespan. In *The Palgrave Handbook of the Philosophy of Aging* (pp. 517–538). G, Scarre (ed). London: Palgrave Macmillan.