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EVOLUTION, ENHANCEMENT AND IMMORTALITY

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Abstract: This article was initially presented by myself in 2010 during the congress "Beyond the body: Perspectives on enhancement" at the ISEI, University of Manchester. I discuss here what enhancement is and how "human nature" has changed throughout human history and I argue that it will continue changing in such a way that by the year 2400 people could expect to live to around 1000 years, and within 40.000 years humans will be able to live around 10.000 years, which in practical terms could be called "immortality". I also argue that all and any human enhancement, even the changing of our human nature transforming us into immortals, will only be a true enhancement if it came with the moral enhancement of humankind as a whole and each of us as individuals.

Keywords: Enhancement, evolution, immortality, moral enhancement

EVOLUÇÃO, MELHORAMENTO E IMORTALIDADE

Resumo: Este artigo foi inicialmente apresentado como conferência em 2010 durante o congresso "Beyond the body: Perspectives on enhancement" no ISEI, Uni-

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versidade de Manchester. Eu discuti aqui o que é "enhancement", como a natureza humana modificou-se ao longo da história humana e eu argumento então que ela continuará se transformando em um ritmo tal que por volta do ano 2400 as pessoas poderão esperar viver por aproximadamente mil (1000) anos e dentro de quarenta mil (40.000) anos os seres humanos serão capazes de viver por dez mil (10.000) anos o que em termos práticos poderá ser chamado de imortalidade. Também defendo aqui que todo e qualquer aprimoramento (enhancement) humano, mesmo a modificação da nossa natureza humana nos transformando em imortais somente será um verdadeiro aprimoramento se vier acompanhado do aprimoramento moral da humanidade como um todo e de cada um de nós como indivíduos.

Palavras-chave: Melhoramento, Evolução, Imortalidade, Melhoramento moral

What does enhancement mean? According to John Harris,[2] we do not need a new or more complex definition of the word "enhancement". In the context of interventions that have had an impact on human functioning, enhancement is clearly something that makes the difference, for the best. He also defines [3]enhancement in terms of human functioning as being, by definition, an improvement. If something is not good for you, it would not be an improvement.

Enhancement can be seen from many angles. Here it is possible to talk about physical enhancement, cognitive enhancement, emotional enhancement, moral enhancement. The idea of becoming better and improving our life conditions has always been present in the history of human evolution. Technological development, for example, is part of this history. In primitive times man discovered how to use fire, produce and transport and nowadays, to make fire is as simple as striking a match. From primitive man to the contemporary civilization, from the management of fire to the unrelenting persecution of the understanding of genes it is the history of a humankind that has developed by learning how to beat the hostile forces of nature and how to overcome natural limitations. Even what we call "human nature" has been changed throughout human history. We have much in common but there are also many differences between us and the Australopithecus, or even between the early Homo sapiens and us.

What does the future hold for us? Through radiometry studies we can calculate that the earth is aged approximately 4,5 billion years. The Australopithecus have lived between 1, 5 millions years to 4 million years. Studies by the British astronomer Robert Smith [4]predict that the earth will still keep going for approximately 7,

2. Harris, John, Enhancing Evolution, Princeton University Press,2007,p.36
3. Ibid, p. 9
4. According to Smith, Robert and Schroeder, K-P in Mon. Not. R. Astron. Soc. **386,** 155–163 (2008) (2008) , with the 10 per cent increase of solar luminosity over the next 1 Gyr it is clear that Earth will come to leave the HZ (habitable zone) already in about a billion years time, since the inner(hot side) boundary will then cross 1 au. By the time the Sun comes to leave the main sequence, around an age of 10 Gyr (Table 1), our simple model predicts that the HZ will have moved out to the range 1.29 to

6 billion of years, despite the fact that, according to him, in 1 billion years the temperature on the earth´s surface will reach hundreds of Celsius degrees, and given the suns expansion, all the water will evaporate[5], making life on earth impossible.

We Homo sapiens, however, have only appeared as a specie for two hundred thousand years (200.000 years) which in cosmological perspective is a very small amount of time. If we put things into perspective and take into consideration all the above numbers we will see that homo-sapiens still have a long time left to evolve. If the favourable conditions to the existence of life on our planet will still continue for another 1 billion years, what can still be done in terms of improvement to the life of each individual and improvement of the species is still unthinkable for us. Maybe one of the biggest improvements will be to reach immortality, and this would certainly provoke a substantial change in what we call "human nature". If there is one thing we can say that it is part of our human nature is that death is constitutive of our essence. Heidegger in his book "Being and Time" states that we are "beings toward death" (Sein zun Tode). If, then, we humans become immortal, the very essence of human beings would radically change.

To John Harris immortality is the Holy Grail of enhancement [6]. According to him:

1.86 au. The Sun will have lost very little mass by that time, so the Earth's orbital radius will still be about 1 au – left far behind by the HZ, which will instead be enveloping the orbit of Mars. (…) These effects are complex and uncertain (cf. Kasting 1988), and may increase or decrease the speed at which the HZ drifts outwards. But, none the less it seems clear that the HZ will move out past the Earth long before the Sun has expanded very much, even if the figure of one billion years is a rather rough estimate of how long we have before the Earth is uninhabitable.(…) Engulfment and loss of planet Earth will take place just before the Sun reaches the tip of the RGB, 7.59 Gyr (±0.05 Gyr) from now. According to our calculation, it occurs when the RGB Sun has still another 0.25 au to grow, about 500 000 yr before the tip-RGB. Of course, Mercury and Venus will already have suffered the same fate as Earth some time before – respectively, 3.8and 1.0 million years earlier.

5. According to Smith, Robert and Schroeder, K-P in Mon. Not. R. Astron. Soc. **386,** 155–163 (2008) (2008) , with the 10 per cent increase of solar luminosity over the next 1 Gyr it is clear that Earth will come to leave the HZ (habitable zone) already in about a billion years time, since the inner(hot side) boundary will then cross 1 au. By the time the Sun comes to leave the main sequence, around an age of 10 Gyr (Table 1), our simple model predicts that the HZ will have moved out to the range 1.29 to 1.86 au. The Sun will have lost very little mass by that time, so the Earth's orbital radius will still be about 1 au – left far behind by the HZ, which will instead be enveloping the orbit of Mars. (…) These effects are complex and uncertain (cf. Kasting 1988), and may increase or decrease the speed at which the HZ drifts outwards. But, none the less it seems clear that the HZ will move out past the Earth long before the Sun has expanded very much, even if the figure of one billion years is a rather rough estimate of how long we have before the Earth is uninhabitable.(…) Engulfment and loss of planet Earth will take place just before the Sun reaches the tip of the RGB, 7.59 Gyr (±0.05 Gyr) from now. According to our calculation, it occurs when the RGB Sun has still another 0.25 au to grow, about 500 000 yr before the tip-RGB. Of course, Mercury and Venus will already have suffered the same fate as Earth some time before – respectively, 3.8and 1.0 million years earlier.

6. Harris, Enhancing Evolution, p.59 -60

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> *"Life extending therapies and optimistic discussion of their promise and probable effects are on increasing dimension of serious scientific and philosophical discussion. If such therapies ever become reality and if our bodies could repair damage due to disease and ageing "from within", the effects not only on personal health and on survival but also on society and on our conceptions of ourselves and of the sort of creatures we are would be profound. If we could switch off the ageing process, we could then, in Lee Silver's words "write immortality into the genes of the human race". 7*

The extension of life expectancy of human beings is already a reality. To take Brazil as an example, the dates that comes from IBGE (Brazilian Institute of Statistics and Geography) shows that the average life-expectancy at the beginning of the XX century , more precisely 1910, was 34 years (33.4) [8], while these figures changed to 69.66 (69 years, 7 month and 29 days) (more than double) in 1998[9] and 72 years in 2004[10]. From the beginning to the end of the XX century life expectancy was doubled in Brazil. If it is possible to sustain these rates in the next 4 centuries, i.e., if life-expectancy is doubled each century in the next four centuries, the life-expectancy by the end of the XXI century would be 140 years, and by the end of the XXIV century it would be 1120 years, i.e., near to the year 2400 people could expect to live to around 1000 years. This is obviously an hypothetical reasoning and there is no indications that it is reasonable to expect that the rates that have been valid for the XX century will be the same for the next centuries, but even so it is reasonable to think that life expectancy will continue to increase, up to a point that, at the limit, we will approach immortality.

Nevertheless, would immortality be a good thing? More to the point, would human immortality be a good thing? Rational beings are the only ones who are conscious that they are perishable (that they will die one day), as Heidegger already pointed out in relation to humans and this makes them capable of suffering with the anticipation of death in a much more radical way than all the other non-rational beings. The intensity of this suffering should give to human beings some privileges, if we are to follow the utilitarian maxim of maximising happiness and minimising

7. In the article Immortality: The Ethics and Justice of Life Extending Therapies in Freeman, Michael Current Legal Problems, 2002(65-95) p.65-66 Harris explains what it would be to write immortality in the genes of the human race. He says, "Cloned human embryonic stem cells, appropriately reprogrammed, might be made to colonize particular tissue and organs triggering constant regeneration. Precise combination of growth factors injected directly into muscle or tissue might put the body into a state of constant renewal. If we can discover all the genes that trigger the ageing process and switch them off in the early embryo ,we could then ,in Lee Silver's words, write immortality into the genes of the human race"

8.Source http://www.braziltradelink.com/glance.htm and http://integracao.fgvsp.br/BancoPesquisa/pesquisas_n30_2003.htm (the life expectancy of men at birth was 33,4 and woman 34,6 in 1910 and they increased to 62,3 and 69,1 respectively in 1990).See also: IBGE :Estatisticas do seculo XX

9. Source: http://www.ibge.gov.br/english/presidencia/noticias/noticia_visualiza.php?id_noticia=1507&id_pagina=1

10. Source: http://www.ibge.gov.br/english/presidencia/noticias/noticia_visualiza.php?id_noticia=494&id_pagina=1

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suffering. If Mill is right in relation to the quality of pleasures when he says that a man is capable of pleasures that a pig would never imagine, we should say, by analogy, that humans are capable of suffering in a way that a pig would never be able to suffer. We would justify then in the case of humans (and all the others possible rational beings) the sovereign right of deciding about the continuity or not of our lives. When we mention here right to life, thus, what we have in mind is not only the right (negative right) that we have of not to be killed, but also the right (positive) to extending our lives[11]. This positive right comes as well from the fact that extending a life is nothing but to postpone death, but those who save lives are actually postponing death. Then, if saving a life is to postpone death and to postpone death is nothing else than to extend life, then saving a life is to extend it and so, as Harris said, life extending therapies are, and must always be, lifesaving therapies and must share whatever priority life saving has in our morality and our social values. However, if we extend life indefinitely we will reach immortality.

There are, however, some objections to immortality and life-extension. I will not be discussing all of them here; instead, I will be focusing on the objection a) that immortality would lead to overpopulation and b) the objection to the tediousness of immortality. Claim a) is based on the fact that, if the human population becomes immortal and even so people continue giving birth at the same rate that we do today, the life on earth would become a hell, as the planet would be overpopulated. The alternative then would be to stop reproduction to avoid overpopulation. Hans Jonas, alerts us about this problem[12]:

> *Now, obviously, just as mortality finds its compensation in natality, conversely natality gets its scope from mortality: dying of the old makes place for the young. The spectre of overpopulation casts its pall over the access of new life anyway: and the proportion of youth must shrink in a population forced to become static but increasing its average age by the successful fight against premature death .Should we then try to lengthen life further by tinkering with and outwitting the naturally ordained, biological time of our mortality – thus further narrowing the space of youth in our aging society? I think the common good of mankind bid us answer no (…) We should see in mortality a blessing and not a curse"*

I believe that Jonas is partly right in his analysis concerning the necessity of the existence of new human beings and their creative power. A world where there is no chance for new human beings to be born would be an unfair world, not

11. See Cutas , Daniela and Harris, John in The Ethics of Ageing, Immortality and Genetics, in Richards Aschcroft, Willey Even and others ,John MacMillan , Principles of Health Care Ethics 797-802, p799 it is said "Even If it was accepted that we do not have the right to be provided with the means to life extension ,forbidding life extension altogether, in principle, can very well be described as a violation of a negative right to life, the right to not being prevented from continuing one's life . Then, either as a negative or as a positive right, the right to life seems to support allowing (the negative version), if not providing when accomplishable (the positive version) access to life extending treatments".

12. Jonas ,Hans The burden and blessing of mortality in HAstings Center Rapport; JAn/Fev 92, Vol 22 Issue 1, p.39-40

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allowing the pleasures and blessings of human life to be given to more and more human beings. The flaw in his view, I think, is in his argument that immortality will necessarily generate overpopulation and that overpopulation implies the end of reproduction. Actually, the lost variable in his analysis is the technological advance that will be necessary to a population of immortals to emerge. If it becomes technologically possible to indefinitely prolong the lifetime of human beings, we have to think about the hypothesis that will be also possible to develop a technology that allows human beings to live and colonise other planets where there are propitious condition to life to develop.

According to Alan Boss, astronomer of the Washington Carnegie Institution of Science, there will probably be around 100 billion planets similar to earth in our galaxy[13], and if this calculation is correct we will have around 100 billion planets where we could inhabit and help to develop life. If so, it will be possible to conciliate immortality with generation insofar as we would continue reproducing ourselves and travelling throughout the universe in order to spread life and specifically intelligent life in the universe, and we would not be condemned to live a life of boredom that, Jonas reminds us very well, has been described by Jonathan Swift in the book "Gulliver's Adventures", when he arrives at the kingdom of the Luggnagg and it is described to him the saga of the Strullbrug (the immortals). Gulliver was initially impressed with their luck and the luck of a society that had such a source of experience and wisdom. But he soon realises they were a miserable group that people pitied and despised. Their endless lives were in the end more onerous than that of other mortals around and even the company of their fellows would be unbearable

What Jonas does not recognise, however, is that if it does become possible for us to become immortals, beating the illnesses that cause so much misery and suffering for the elderly nowadays, and as well as this, if we keep alive the ideal of preserving life on Earth and take it to the four corners of the Universe, we would have a destiny very different from the struldbrugs, that in Gulliver's description, even being told that he was a great traveller who had seen the all world did not had the curiosity of asking him even one question[14]. If it does became possible for us to extending our lives to a point that each of us could be considered immortal and to minimise suffering, probably it will be us the travellers who will populate

13. According to Alan Boss (The Crowded Universe,2009) " all the evidences gathered to date by over 10 years of planet hunting implies that earth-like planets should be common in our neighbourhood of the Milky-Way galaxy, and by inference, in other galaxies as well. But how common is common? Will essentially every nearby sun-like star have a habitable world, or only 1 in 10, or 1 in 100, or 1 in 1000? The theoretical and observational discoveries of the last several decades support the prediction that the frequency of habitable worlds is more likely to full in the upper end of this range that in the lower end"

14. Ibid p.197

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the universe and decipher its mysteries and not the hopeless spectators, bored and melancholic's of an eternal death that happens in life.

In the meantime, we should discuss a little bit more about the threat of overpopulation in a world where life expectancy of the population becomes bigger and bigger. The challenge here, I think, it is not to stop the inevitable, but to improve life's conditions for the elders and the whole population. This necessarily implies not only combating illness that attacks all the ages, such as cancer, but also the effective combating of illness that affects mainly the elderly such as the neurodegenerative illness, blindness, deafness and others. When we develop effective treatment for these illnesses, the elderly will live more and will live better in a way that the advance of therapeutic techniques leads to life-extension.

The expectancy of living more and better throughout the XXI century is real, given the advancement of scientific research and technology. However, while we are not able to travel to other worlds, the ghost of overpopulation will only be expelled through the modification of our mentality in relation to reproduction, making it not an obligation but a conscious decision, in a way that we realise that the act of "giving birth", the act of "creating life" is an act that demands total responsibility and caring for the generated being. Giving birth indiscriminately and without taking responsibility for the children it is a behaviour that should gradually give its space to the "conscious reproduction", already allowed by the advancement of reproductive technologies and reproduction control ,such as the contraceptive pill , where the important thing is not the number of kids generated but the parental caring for them, giving support ,love, education and moral education as well as the State caring, offering education for the siblings of poor families, security and peace. Increasing the life expectancy of population, allied to the "conscious reproduction" and the improvement of the quality of life of the population in general, and especially the elderly, we will be taking huge strides for the enhancement of humankind.

It seems to me however that all and any human enhancement, even the biggest of them all ,i.e., the changing of our human nature transforming us into immortals, will only be a true enhancement , a true improvement, if it came with the moral enhancement of humankind as a whole and each of us as individuals. We could not consider as being exactly an enhancement a population of immortals where everybody were Nazis', slave drivers or even corrupts. Thus, the moral practice, the adoption of moral principles such as the respect for others and their liberty, the principle of not causing harm to others, the respect to religious, social, sexual, gender and race differences, would be the biggest of all improvements, the biggest of all enhancements and maybe the necessary condition, whose non-existence could jeopardize any other human improvement.

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Here then it is necessary to discuss more profoundly the question of moral enhancement. It is widely known that moral improvements are obtained through education, and nobody would object to moral education. But what if this improvement came not from education but from biomedical sources? Douglas has pointed out already that it is plausible that biomedical moral enhancement technologies will become technically feasible in the medium term future. According to him (233)15 :

> *"Consider aversion to certain racial groups, and impulses towards violent aggression. Work in behavioural genetics and neuroscience has lead to an early but growing understanding of the biological underpinnings of both. There has long been evidence from adoption and twin studies of a genetic contribution to aggression (…) Race aversion has been less well studied. However, a series of recent functional magnetic resonance imaging studies suggest that the amygdala. Given this progress in neuroscience, it does not seem unreasonable to suppose that moral enhancement technologies which operate on relatively simple emotional drives could be developed in the medium term."*

Let us then suppose that we do develop a pill that reduces significantly the likelihood of people having unjustified outbursts of aggression, or that successfully and permanently affects people´s brains in a way that they will not react badly to different races in the way that they would have done before[16]. However, would be morally acceptable for people to enhance their moral capacities that way? I will answer this question by first putting forward the following example: imagine we are given the chance of going back in time and stopping Hitler of committing all the atrocities he did. Our time machine, however, would only allow us to be in contact with Hitler for twenty-four hours. During this time we could obviously exhibit all our best arguments trying to convince him that there is no such thing as a superior Aryan race, that the lives of Jews, blacks, gipsies or gays, are as valuable as the lives of a white Germans and that to construct and put people of other races in gas chambers is simply wrong, or alternatively we could slip in his glass of water a newly developed pill that we brought from the future that make people substantially improve their tolerance to race gender and sexual differences. Suppose now that we did our best in our trial of convincing and educating Hitler, but we are running out of time and he does not seem, in anyway, convinced of our arguments. Now, if we want to avoid the Holocaust and all the cruelties that were practiced during the 2nd

15. Douglas, Thomas Moral Enhancement, Journal of Applied Philosophy Vol 25, n3, 2008

16. According to Farah, Martha and Root Wolpe, Paul in the Hastings Center Reports (Monitoring and Manipulating Brain Function- New Neuroscience Technologies and Their Ethical Implications). In a now well-known study, Phelps and colleagues studied white subject's attitudes toward unfamiliar black faces, using both behavioural measures and fMRI. Using previously developed behavioural measures, they were able to estimate the degree of unconscious negative evaluation of unfamiliar black as opposed to white faces. They then measured brain response to unfamiliar black and white faces and found a moderately strong correlation between individuals' amygdala activation and the degree of negative evaluation of black faces. Racial group identity also has neural correlates that are roughly measurable with current brain imaging methods. In a study of black and white subjects viewing photographs of black and white faces, significant differences in response to in-group and out-group faces were found.18

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world war, the only way would be to sneakily manage to put the pill in his glass, enhancing Hitler's moral views and motivations, and return to our time knowing that, in doing so, Auschwitz would never happen in History. Would it be morally right for us to do that?

It seems to me that moral enhancement in this case would not only morally acceptable, but morally obligatory, for if you do not use the pill you would be putting yourself in the appalling situation of being co-responsible for Hitler´s crimes, as you had the opportunity of stopping them and you didn´t. If you can show that there is at least one case where biological enhancement would be not only permissible, but obligatory, then this would prove wrong the strong version of the bio conservative thesis, i.e., that it is not morally permissible to engage in any biomedical enhancements at all.

If biomedical moral enhancement is not in itself wrong, and could sometimes even be morally obligatory some times, we could then discuss a bit more the benefits that moral enhancement could bring for common people in real life. Kant establishes an interesting model to describe what to act morally is. In his model there are two strong sources of motivations operating over our will, pure reason and self-interest. Pure reason in its practical use gives to humans the categorical imperative, and if we do act motivated by the Categorical Imperative we will only practice acts that can be universalised, even if these acts are actually against our immediate self-interest. According to Kant everybody recognises and accepts the categorical imperative and the reason why we do not always act respecting its prescriptions is because our self-interest has a strong role to play in our will, interfering in our decisions. According to Kant "if we now attend to ourselves in any transgression of a duty, we find that we do not really will that our maxim should become a universal law, since that it is impossible for us, but that the opposite of our maxim should instead remain a universal law, only we take the liberty of making an exception to it for ourselves (or just for this once) to the advantage of our inclination"[17].

If Kant is right, and it seems that in relation to this point he is, inclination, self-interest and selfishness are in the core of the problematic of questions of immorality and unfairness, and if we could diminish the influence of inclinations and self-interest in some decisions we would act more morally (or at least less immorally) We do recognises and we do know what is the right thing to do. However, as humans we always want make an exception to the rule in our favour. It is actually, then, inclination and self-interest that, in general, impede that we act according to our judgements about what is right or wrong, fair or unfair. Curiously, recent studies in moral psychology and neuroscience seem to corroborate and shed light into

17. Groundwork of the Metaphysics of Morals (GM 4:424) , Cambrigde University Press, 2000, p 33

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the Kantian model. Knoch and others [18] present a study where they submit people to unfair offers and they show that disruption of the right, but not the left, dorsolateral prefrontal cortex (DLPFC) by low-frequency repetitive transcranial magnetic (rTMS) stimulation substantially reduces subjects' willingness to reject their partners' intentionally unfair offers, which suggests that subjects are less able to resist the economic temptation to accept these offers. At the centre of this experiment is the idea that the DLPFC plays a key role in overriding or weakening self-interested impulses and thus enables subjects to implement their fairness goals. The findings also show that disruption of the right DLPFC activity only affects fairness-related behaviours but not fairness judgments, because despite the fact of not accepting unfair offers, people still judge them as very unfair.

This opens a huge door for the studies of moral enhancement. If the right DLPFC has an important role overriding self-interested impulses, it could suggest that in the future it might be possible to stimulate right DLPFC activity in order to improve fairness behaviour. Considering then that the Kantian model of will establishes that one of the main reasons why people act immorally, namely, disrespecting the Categorical Imperative is because self-interest makes us not to do what we know is right, then the possibility of increasing fairness behaviour making us act more coherently with our moral judgements would be a huge achievement in terms of morality. If this kind of technology could be made available for people, would the world be better off with people engaging in such practices? The answer is certainly yes. The weakness of will (akrasia) where people recognise what they should do but end up not doing it, has been for centuries one of the main problems in morality. What probably make people to override some selfish impulses is a long process of learning and moral education. But if moral enhancement became possible through the developing of new technologies, why should we reject its use, considering that it would not replace moral education, but on the contrary, could be one more instrument to be used in this process? If to aim for a more moral world is a moral aim, we should use all the reasonable and non-immoral means available to reach this aim. Since we have shown that the thesis that it is always wrong to engage in any biomedical enhancements at all is false, the burden of proof that to engage in biomedical moral enhancement is wrong now lies in the hands of those who think so.

At the present stage of development of the specie homo sapiens it is impossible to take the humans hands from the wheel of our destiny. According to Harris, the progress of evolution is unlikely now to be achieved accidentally or by letting nature take its course. If illness and poverty are indeed to become rare misfortunes, this is unlikely to occur by chance, even with the thousands of centuries that Rus-

18. Knoch, Daria; PAscual-Leone, Alvaro; Meyer,KAspar; Treyer,Valery; Fehr,Ernst Diminishing Reciprocal Fairness by Disrupting The Right Prefrontal Cortex (Science vol 314 3 Nov 2006) p. 829- 832)

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sell envisages and evolution requires[19]. Harris is right. Actually, nature is and has always been indifferent to our destiny and if we succumb or if we are replaced for more adapted or less destructive species, Mother Nature does not care. The future of the human specie is in our hands, unless, of course, there is suddenly a natural catastrophe such as the fall of a gigantic meteorite on earth. We can either destroy the specie and even the whole of life on the planet in one of our wars where increasingly more and more destructive weapons are being used, or we can walk forward taking huge strides to build a time where to die will be part of a distant past that our descendents will look back with the same eyes that we today look at our ape ancestor.

Dawkins in an essay called "Gasps in the Mind"[20]proposed the following thought experience: he asks us to imagine a contemporary woman holding her mother's hand on the coast of Africa. Her mother holds the hand of her mother and so on. Each mum who enters in the chain keeps about a meter apart from the other. After only 300 miles, this imaginary chain would reach the ape ancestor. In another chain our ancestral ape, with her other hand, holds her daughters hand, which in turn holds the hand of her daughter and so on. In the end of this chain two contemporary females will be face to face and they will be a modern human and a modern chimpanzee, a human being and an animal.

Here I ask Dawkins permission to do imagine another thought experiment. Now let us imagine a contemporary mother holding in each one of hers hands two sisters, in a chain in direction to the future[21]. In one of the chain links ours descen-

19. Harris Op Cit Enhancing Evolution p.11

20. Dawkins, Richard Gaps n The Mind in Singer, Peter and CAvalieri, Paola, The Great Ape Project, New York, St Martin's Griffin, 1993 , p81-87 Let us imagine setting one up along the equator, across the width of our home continent of Africa. It is a special kind of chain, involving parents and children, and we will have to play tricks with time in order to imagine it. You stand on the shore of the Indian Ocean in southern Somalia, facing north, and in your left hand, you hold the right hand of your mother. In turn, she holds the hand of her mother, your grandmother. Your grandmother holds her mother's hand, and so on. The chain wends its way up the beach, into the arid scrubland and westwards on towards the Kenya border. How far do we have to go until we reach our common ancestor with the chimpanzees? It is a surprisingly short way. Allowing one yard per person, we arrive at the ancestor we share with chimpanzees in under 300 miles. We have hardly started to cross the continent; we are still not half way to the Great Rift Valley. The ancestor is standing well to the east of Mount Kenya, and holding in her hand an entire chain of her lineal descendants, culminating in you standing on the Somali beach. The daughter that she is holding in her right hand is the one from whom we are descended. Now the arch-ancestress turns eastward to face the coast, and with her left hand grasps her other daughter, the one from whom the chimpanzees are descended (or son, of course, but let's stick to females for convenience). The two sisters are facing one another, and each holding their mother by the hand. Now the second daughter, the chimpanzee ancestress, holds her daughter's hand, and a new chain is formed, proceeding back towards the coast. First cousin faces first cousin, second cousin faces second cousin, and so on. By the time the folded-back chain has reached the coast again, it consists of modern chimpanzees. You are face to face with your chimpanzee cousin, and you are joined to her by an unbroken chain of mothers holding hands with daughters.

21. The thought experiment is the following: Let us imagine a modern human giving birth to two daughters, at the same time, and dying at the moment she give birth. At each 50 years from this

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dents will continue to be as mortals as we are now. In the other link of the chain each daughter will live only five (5) years more that her mother has lived. If we agree in ending our chain in forty thousand years (40.000 years) from now - about five times less than the supposed time of the existence of Homo sapiens species up to now - at the end of the chain we will have a demigoddess who will live 10.050 years, facing a mortal as we are now. We hope that the moral enhancement will give to these "demigoddesses" or whatever we call them, the respect for the mortals that unfortunately today we do not have for our cousins, the chimpanzees.

day each one of the daughters, and then successively throughout the generations, will give birth to a female baby. While in line A the daughters will live approximately the same time that we live now, each daughter in line B will live 5 years more than her mother. If we establish the end of these chains in 40.000. years, in the end of the chain B we will have a mother who will live 10.050 (ten thousand years and fifty) giving birth to a baby that will live 10.055 years, while in the chain A we will have a mum who will live approximately 90 years giving birth to a baby who will live, probably, as much as her mother. For all the practical proposals, we will then have, standing face to face, a goddess and a mortal.

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