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## **Nanotechnology: beyond human nature?**

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## **\*Chapter 1\***

We give you no fixed place to live, no form that is peculiar to you, nor any function that is yours alone. According to your desires and judgment, you will have and possess whatever place to live, whatever form, and whatever functions you yourself choose. All other things have a limited and fixed nature prescribed and bounded by our laws. You, with no limit or no bound, may choose for yourself the limits and bounds of your nature. We have placed you at the world's center so that you may survey everything else in the world. We have made you neither of heavenly nor of earthly stuff, neither mortal nor immortal, so that with free choice and dignity, you may fashion yourself into whatever form you choose. To you is granted the power of degrading yourself into the lower forms of life, the beasts, and to you is granted the power, contained in your intellect and judgment, to be reborn into the higher forms, the divine.<sup>1</sup>

### **1.0 Introduction**

Nature is not static, and human nature is not the exception. Nature is rather changing, dynamic, and evolving. Through history human nature has changed, as a result of the way in which humankind has interacted with its environment, changing the way humankind perceives it and values it. This ever changing nature of humankind is enforced by social changes but also by technological and scientific developments. It is through science that we get a better understanding of our environment and with technology we develop the tools and devices that day by day help humankind to understand the nature of things.

However it is questionable whether with all this information, we have found the nature of humankind itself. If human nature is so dynamic, is there something that throughout history and time has defined all human beings as human beings?

With the introduction of new technologies we have come to a point where it is not only the nature of our environment we are manipulating but even our own nature. There is a lot of discussion of what it is that defines us as humans, and it does not seem clear why some people fear that new technologies would affect our core, while others consider using new technologies as part of our human nature itself. Is it possible that our technology defines our nature? Should there be a line that tells us when we are close to crossing a point of no return? Could a distinction between therapy and enhancement

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<sup>1</sup> This is a quote of God speaking to Adam in Pico della Mirandola's 1486 book, "Oration on the Dignity of Man" quoted on page 106. *Translated from Latin by Richard Hooker.*

help us to determine where to place that line? Is not part of our human nature trying to become better, in a way to enhance us?

## 1.1 Background

Evolution has followed an exponential accelerating rate;<sup>2</sup> so has our technology, as Ray Kurzweil states it.<sup>3</sup> As time goes by, the gaps between discoveries and inventions have become smaller and smaller; nowadays we might say they are *nanogaps*. Our wisdom might not be able to catch up with technology's incredible speed of development. The so called cutting-edge technologies that are growing at a seemingly boundless rate and which are also considered for human improvement are: Nanotechnology (manipulation of matter on the scale of nanometers), Biotechnology (manipulation of genes), Information technology (electronic management of information) and Cognitive technology (the exploration and manipulation of the mind) (NBIC).<sup>4</sup> Nanotechnology here plays an important role as it is central for the development of the others.

Scientists, engineers, researchers and students around the globe are taking part in this new technological revolution. We are developing the tools for understanding our environment and our own nature, in ways that we have only dreamt about before. Nevertheless, it is not just a matter of understanding, with technology comes the desire to manipulate nature and with it human nature as well.

One form of manipulation that seems controversial is using NBIC technologies for enhancing the human condition. This human desire can be traced long before we had developed any sophisticated technology. Take for instance Prometheus' myth, in which his desire to allow human beings to improve themselves was the reason for stealing Zeus' fire. Or Daedalos' myth in which he designed wings for him and his son, so they could fly as birds and escape from the Minotaur's maze. Daedalos knew nature had not provided us with wings, but he wanted to enhance his human condition to achieve his goals. And in his enterprise he suffered the death of his son Icarus, who did not find enough fulfillment with the mere fact of flying but instead wanted to fly higher and higher. Now the possibilities for the human condition to be enhanced come in pills, or creams, or surgeries and not so far from now, in *nanorobots* or implants. So athletes can

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<sup>2</sup> That is to say that the universe and life evolution changes during the first 2 billion years were almost nothing compared with the evolutionary changes that we have seen in the last million years.

<sup>3</sup> Stated in a TED talk. See: [www.ted.com/tedtalks](http://www.ted.com/tedtalks)

<sup>4</sup> ETC Group, 2003, p.6.

be stronger or faster, children can concentrate more, men and women can become slimmer, there is even a pill that helps us forget bad memories. And what the future technologies promise is the possibility of enhancing us to a point from where there might not be way of return.

The prospects of using different technologies for human enhancement has been the subject of considerable scientific research, and recently also of ethical debate. When considering what has been achieved and what could be achieved in the future, however, there are two things we must distinguish between: what is really at stake and what is only part of our inner fears. In the field of enhancement, nanotechnology can provide us with implants for seeing in the dark, hearing and perceiving beyond human limits, even increasing our mental capacity, which would allow us to perceive the world in ways that our human senses have not allowed us to do before. This could lead to the development of cyborgs – i.e., creatures that are partly humans, partly machines. This is not science fiction any longer, it is happening now, and as Kurzweil stated in his book *The Singularity is Near*, it is happening at an exponential speed rate:

Ultimately we will merge with our technology. . . . By the mid 2040s, the non-biological portion of our intelligence will be billions of times more capable than the biological portion.<sup>5</sup>

Therefore, with the possibility of enhancing human beings, perhaps beyond a point that defines our humanity (if there really is something as such), will take us to a new era that some have called “posthuman”.

Now we have come to the core problem: should there be a limit for improving the human condition or should we seek something beyond such a limit?

## **1.2 Statement of the Problem**

The problem to be tackled in this thesis is that nanotechnology as an emergent technology brings the possibility of enhancing the human condition. However, along with this possibility comes a threat to alter what defines us as humans. So with the possibility of altering “human nature”, what would be the ethical dilemmas and implications of going beyond all the limits we have had before? And what would the consequences be for ourselves as members of the human species in doing so, as we would merge with our technology?

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<sup>5</sup> Kurzweil, 2005, p.22.

The following questions could help us to understand the issue to be analyzed:

**a) Conceptual Questions.**

- What is nanotechnology?
- What is the difference between nanotechnology and other cutting edge technologies?
- What is therapy?
- What is human enhancement?
- Where should we draw the line (if possible) between therapy and enhancement?
- Is there something that could be called human nature?
- What is a cyborg?
- What does it mean to be posthuman?

**b) Factual Questions.**

- Is the distinction between therapy and enhancement absolute or relative? That is to say: is it possible that what is considered as therapy for some people is enhancement for others?
- Will nanotechnology applications be available in the near future?
- How would cyborgs and the development of implants be affected by nanotechnology?
- How could human nature be threatened by nanotechnology applications?

**c) Ethical Questions.**

- Is it morally right to do everything that nanotechnology allows us to do?
- What developments should be allowed within the field of human enhancement if any, and where should we draw the line between what is ethical and what is not?
- Is it ethical to pursue to overcome human nature?
- If to reach a posthuman stage means a threat to human nature, should we pursue such enterprise?

## **1.3 Aim**

The aim of this thesis is to analyze and take a stand on issues that have been latent for a long time in the field of biotechnology, and have been brought to the fore again with nanotechnology. Considering the potential impact of nanotechnology, the large amount of money available for research and development of nanotechnology and the dramatic increase of nanotechnology publications in recent years, there is still not a parallel increase in the number of publications that consider the ethical, legal and social implications that nanotechnology can give rise to.<sup>6</sup>

However, more and more has been taken into consideration, and both private organizations and some government initiatives are laying these aspects on the table. For

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<sup>6</sup> Singer, 2003, p.9

instance the National Nanotechnology Initiative which sets asides around 10% of its budget for social implications.<sup>7</sup> Reports covering some implications of nanotechnology have been released by the American National Science Foundation; the United Nations Educational, Scientific and Cultural Organization (UNESCO); and several non-governmental organizations (NGOs) such as the Canadian group on Erosion, Technology and Concentration (ETC) and the Foresight Institute. Furthermore, many universities around the world are also contributing a great deal.

Despite the fact of the several possible applications of nanotechnology, the focus in this thesis is mainly on implants and cyborgs, since I believe these applications could have an impact on human nature. Even though other technologies in the past have been considered dangerous in this area, there is still not so much research on nanotechnology implications since this is relatively such a new field.

It is also important to state the distinction between therapy and enhancement. Firstly, because the distinction has been under discussion for quite a long time; secondly, a better understanding of therapy and enhancement can make a difference in how to deal with nanotechnology applications regarding implants and cyborgs. This would also lead us to take real responsibility towards research in this field (whether for therapy or enhancement), in order to avoid unnecessary problems in regard to human nature. Therefore, my stand is to have a different approach on the distinction between therapy and enhancement, in order to handle nanotechnology-based human applications, mainly human implants and cyborgs, in a more responsible way.

## 1.4 Scope

The scope of the thesis is limited to analyze nanotechnology as a cutting edge technology for human applications that can be used for enhancing the human condition<sup>8</sup>, mainly human implants and cyborgs, as well as to define a line of usage of these applications. Although nanotechnology for certain scenarios described in this thesis are just theoretical and hypothetical, research is taking place in these fields as well. So the aim is not focused on the scientific or technological difficulties of nanotechnology, but

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<sup>7</sup> The fact that there are more funds on that subject does not necessarily imply they are properly spent.

<sup>8</sup> Here I am referring to the human condition as the result of our human nature (something that in certain degree all human beings share) and the individual biological, physiological and psychological features (which are not necessarily the same among individuals).

rather on the ethical dilemmas that arise in relation to its applications, in society and in the individual.

The methodology is not only to expose some of the arguments against and for human enhancement, but also to analyze them, in order to show the importance of where, as society and individuals, we should draw the line for the use of nanotechnology in this arena.

After this introductory chapter, chapter two analyzes what nanotechnology is. Even though this is done briefly, hopefully this would be enough to understand how nanotechnology is different from other cutting edge technologies. Then chapter three focuses on the nanotechnology applications for implants and the idea of cyborgs, analyzing their impact in society and in the individual.

Chapter four focuses on the therapy-enhancement distinction, analyzing the general problem when trying to make a distinction between therapy and enhancement, comparing different perspectives. It also analyzes if there is or should be a clear distinction between therapy and enhancement. In this chapter, future applications and existing ones of nanotechnology in both therapy and enhancement are discussed.

The fifth chapter mentions the endless discussion of human nature, and whether nanotechnology (when used for implants and cyborgs) could raise problems against the so called "human nature". Some of the problems that arise in this area concern how nanotechnology could change our ethical being or morality, and how that would affect the way we perceive our environment and therefore the way we learn from it. Underlying the discussion is the issue of what defines us as humans in the first place. In this chapter there would be a review of authors against enhancing the human condition, and authors that think it is the next step of evolution. (Most of the literature is the same as in biotechnology and genetics, but the examples and problems that are discussed here are the ones we found or could find in the future, and which are made or will be made possible by nanotechnology). This chapter also discusses the issue of a posthuman era.

Finally the last chapter addresses the issue of pursuing a different approach on the therapy enhancement distinction in order to deal better with those nanotechnology applications that might interfere with human nature. This chapter closes the analysis made in previous chapters.



## **\*Chapter 2\***

### **2.0 Converging Technologies**

Technology has been part of human history from the very beginning. Nonetheless, the way humankind approaches, perceives and uses technology has been dynamic through time. Technology has turned out to be more than the invention of techniques and tools for doing practical things, becoming the path to fulfill our deepest desires, conquer nature and gain a better understanding of our existence.<sup>9</sup>

Technology and science are rooted in each other. However, in such a global modern society as ours, the growth and direction of technology is not only determined by science, but also by the market, society, law and politics.

Another important feature of technology in the present is convergence. Firstly, convergence to the nanoscale, that is to say to the level of atoms and molecules, as part of a miniaturization trend; and secondly, convergence to the idea of using new technologies for improving human performance or enhancement, where:

Neurons could be re-engineered so that our minds “talk” directly to computers or to artificial limbs; viruses can be engineered to act as machines or, potentially, as weapons; computer networks can be merged with biological networks to develop artificial intelligence or surveillance systems.<sup>10</sup>

For Bill Joy, the Chief Scientist at Sun Microsystems in 2003, these converging technologies are GNR – Genetics, Nanotechnology and Robotics. For others it is GRAIN - Genetics, Robotics, Artificial Intelligence and Nanotechnology. References to BANG technologies can be found in the literature, since information technology uses **B**its, nanotechnology manipulates **A**toms, cognitive technology manipulates **N**eurons and genetics manipulates **G**enes (BANG).<sup>11</sup> The ETC Group called them in a report Atomtech, as the convergence is now to atoms, in which the bottom of the issue is not anymore manipulating genes but rather the blocks of which living and not-living matter is made of:

Atomtechnologies, which includes nanoparticles, nano-biotechnology, nanofabrication and molecular manufacture. It also describes the coming

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<sup>9</sup> Some people even ‘adore’ technology; that is to say that they consider technology as the savior of humankind. I myself do not embrace this view.

<sup>10</sup> ETC Group, 2005, p.8,

<sup>11</sup> ETC Group, 2005, p.8.

convergence of biotechnology, information technologies, and cognitive sciences with nano-scale manipulation of matter as the unifying force. Since nano-scale technologies will be applied in all sectors, no agency is taking the lead.<sup>12</sup>

In a report sponsored by the US National Science Foundation (NSF) in 2002, and edited by Mihail Roco and William Bainbridge, the concept of ‘converging technologies’ referred to what they named with the acronym ‘NBIC’. These are Nano science and nanotechnology; Biotechnology and biomedicine, including genetic engineering; Information technology, including advanced computing and communications; and Cognitive science, including cognitive neuroscience. The last area focuses on how human, animals and machines acquire, represent and manipulate knowledge which enables the exploration and manipulation of the mind, especially for cognitive enhancement.<sup>13</sup>

The core of this convergence is that scientific breakthroughs produce new paradigms, or perspectives linked to a set of practices, as Thomas Kuhn argued<sup>14</sup>. But are scientists, engineers and people in general able to understand the central features of this new paradigm? Can we really grasp all the implications and possibilities that it holds, and catch its pace even with the exponential growth is showing?

But above all, even though this convergence can help to improve our lives, reduce poverty, tackle pollution, and maybe even to understand some of the metaphysical question that have been haunting us for a long time, we cannot overlook the fact that, just as history has shown us, every technology and breakthrough also has side-effects.

## **2.1 What Is Nanotechnology?**

We hear of innovations using nanotechnology on a daily basis, governments spending millions in research funds for nanotechnology, specialized institutes and universities’ programs focusing on research and development of nanotechnology. We also have heard of the increasing amount of special reports, courses, conferences and academic journals addressing nanotechnology. We even have heard of nanotechnology in science fiction books or movies such as Spiderman or Minority Report. But what is nanotechnology?

Nanotechnology is not only a branch of engineering, as some might think; it is rather a multidisciplinary technology that involves different fields of science and engineering research. Within the groups that exchange findings, develop new techniques

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<sup>12</sup> ETC Group, 2003, p.7

<sup>13</sup> Bostrom, 2006, p.46

<sup>14</sup> Kuhn, 1970, pp38-39.

and engage problems under the nanotechnology subject are: physicists; chemists; biologists; theoretical and applied mathematicians; computer scientists; material scientists and electronic, mechanical, civil, chemical, biomedical engineers; and of course researchers from other specialized fields such as sociologists and ethicists.

Another important remark is that nanotechnology is a *nanoscale* technology, that is to say that in the case of “*biotechnology*” we knew that life (*bios*) was being manipulated, whereas *nano* only resembles the scale. The prefix *nano* indicates that the measure corresponds to a one billionth part of the unity, i.e. a *nanometer* (nm) is equal to one billionth of a meter. Having said this, nanotechnology could be understood as a suite of techniques for manipulating matter at the scale of atoms and molecules.<sup>15</sup> To have an idea of what we are talking about, the thickness of a human hair is around 80,000 nanometers, the diameters of individual atoms range from 0.1 to 0.5 nanometers, and a DNA molecule is about 2.5 nanometers wide. It is clear that everything on the nanoscale is invisible for the human eyes, and only with really powerful microscopes we are able to see what is going on in that scale. Nevertheless that does not mean we have not been aware of it. In the last 100 years chemists, physicists and biologists have come from debating the structure and composition to working with nanoscale objects.

Another definition for nanotechnology and the one considered in this thesis is the US National Nanotechnology Initiative definition:

Research and technology development at the atomic, molecular, or macromolecular levels, in the length scale of approximately 1 to 100 nm range, to provide a fundamental understanding of phenomena and materials at the nanoscale and to create and use structures, devices, and systems that have novel properties and functions because of their small and/or intermediate size.<sup>16</sup>

There is also a distinction made by the Royal Society of the UK between “nanoscience” which includes the “study and manipulation” of nanoscale particles and “nanotechnology” which includes the “design, characterization and production” of “structures, devices and systems” at the nanoscale.<sup>17</sup> In this work the term nanotechnology would be used for both nanoscience and nanotechnology.

Definitions of nanotechnology vary around the world, depending on national strengths and line of research. As a result, this could lead to confusion of the categories

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<sup>15</sup> ETC Group, 2005, p. 5

<sup>16</sup> National Science and Technology Council, NSTC, 2002

<sup>17</sup> UNESCO Report, 2006, p.7

of applied and pure research, and private and public research. On the other hand it also allows for a multidisciplinary scientific background set (government, and society also) to arise different concerns and ideas to bear on what nanotechnology will become.

Nanotechnology is not a young concept; the possibility was suggested originally in 1959 by the Nobel laureate Richard Feynman in his speech “There’s plenty of room in the bottom”:

The principles of physics, as far as I can see, do not speak against the possibility of maneuvering things atom by atom. It is not an attempt to violate any laws it is something, in principle, that can be done; but in practice it has not been done because we are too big<sup>18</sup>

In 1974 the word “nanotechnology” was first used by Norio Taniguchi of Tokyo Science University. By 1981 the human eye was able to see atoms for the first time with Gerd K. Binnig’s and Heinrich Rohrer’s invention of the scanning tunneling microscope (STM) at IBM’s Zurich Research Laboratory. In the same year Eric Drexler published the first technical paper on molecular nanotechnology and by 1986 the term was popularized in his book “Engines of creation”,<sup>19</sup> where he uses nanotechnology to describe his vision on molecular manufacturing. But it was not until 1996 that the US, and later on Japan and the European Union, considered seriously funding research under the label of nanotechnology.<sup>20</sup>

From then on the advance has been incredibly fast, nanotubes, nanocircuits, nanobots. Nonetheless, it is not clear yet where nanotechnology is heading to.

## 2.2 What Makes Nanotechnology Special?

Just as the British Industrial Revolution knocked hand spinners and handweavers out of business, nanotechnology will disrupt a slew of multi-billion dollar companies and industries.<sup>21</sup>

The progress of technology has always surprised humankind. Just as some people saw the computer era as a technological revolution, others see nanotechnology as the next one. One reason is due to the precision and specification that nanotechnology will put into human hands “to measure, manipulate, simulate, visualize and control

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<sup>18</sup> Feynman, “There is plenty of room in the bottom”, 1959.

<sup>19</sup> Drexler, 1986.

<sup>20</sup> UNESCO report, 2006, p.12.

<sup>21</sup> Lux Research, Inc. The Nanotech Report, 2004. Quoted in ETC group, 2005, p.4

matter”.<sup>22</sup> As part of the group of convergent technologies, nanotechnology has the lead as it permeates all the others. Another reason is the unique power and potential of nanotechnology. That is to say that size does matter, since size can change everything. At the nanoscale, the properties of elements and materials can change dramatically from the ones they feature on a larger scale. These changes are called “quantum effects”.<sup>23</sup> In other words, we can say that the properties we take for granted for certain substance at the micro and macro scale, with only a reduction in size, can change completely, showing different electrical, conductivity, colour, strength, elasticity, melting point and reactivity properties.<sup>24</sup>

Since nanotechnology works with the building blocks of living and non-living matter, nanotechnology processes and tools can be applied to virtually any manufactured good across all industry sectors. So nanotechnology will not only bring quality changes as the new properties and “bottom-up” assembly would mean “new platforms for industrial manufacturing that could make geography, raw materials, as well as labour, irrelevant”.<sup>25</sup> But it will also bring quantity changes as it allows “bottom-up” manufacturing.<sup>26</sup> That explains the range and reputation of public and private organizations spending tons of money on research. The US government spent in the year 2004 around \$1 billion, and for the year 2008 the funds request amounts \$1.5 billions.<sup>27</sup> The UK Royal Society reports that in 2006 the EU level of research was about €1 billion, and the United Kingdom roughly £45 million a year. In addition, Germany, Switzerland, Japan, France, Australia, South Korea, Israel and also countries under development such as China, the Islamic Republic of Iran, Brazil, Mexico, Taiwan, India, South Africa, and just recently Russia have all made clear that national research priorities in science and technology include research into nanotechnology.<sup>28</sup> And in the private sector the range of corporations investing heavily in nanotechnology involve companies like Xerox, Exxon Mobil, IBM, 3M, Johnson & Johnson, Lucent, Motorola, Eli Lilly, Toyota, Hitachi, Toshiba, DuPont, Siemens AG, General Electric,

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<sup>22</sup> Berne, 2005, p.42

<sup>23</sup> ETC group, 2005, p.4

<sup>24</sup> For instance, carbon in the form of graphite is soft and malleable whereas at the nanoscale can be stronger than steel. Nanoscale particles of aluminium oxide are used as explosives whereas at the large scale they are used to repair teeth by dentists.

<sup>25</sup> ETC group, 2005, p.4

<sup>26</sup> This was the vision of Drexler when he defined the assemblers and disassemblers in his book ‘Engines of creation’. Mankind capable to build anything since it will be able to manipulate the blocks that form matter itself.

<sup>27</sup> See [www.nano.gov](http://www.nano.gov).

<sup>28</sup> UNESCO report, 2006, p.12 and ETC group, 2003, p.60

Philips, L'Oreal, Bayers and Hewlett-Packard<sup>29</sup> A prediction by the US National Science Foundation is that nanotechnology will capture a \$1 trillion market by 2011 or 2012.<sup>30</sup> It also explains the incredible number of articles and reports on nanotechnology and the increasing number of nano-related patents.<sup>31</sup>

Nanotechnology has become more interesting and controversial than biotechnology, and will become the strategic platform for global control of food, health, manufacturing, energy, agriculture, computers and electronics, just to mention some fields.

## 2.3 Nanotechnology on the Market

Nanotechnology applications are really making its way out in the market. Nanotechnology is being used to make faster computers; smaller devices for storage; more efficient devices such as solar-panels, cell-specific drugs; monitoring sensors; stronger, lighter, more durable, smarter and more elastic materials.

Nano devices range from nanotube transistors, molecular transistors and switches, nanowires, biosensors, nanomachines, and nanoparticles for medical diagnosis and treatment.<sup>32</sup> Most of the development is being made within the military and medical sector, such as exoskeletons for soldiers;<sup>33</sup> implants that help paralyzed people to manipulate objects using their brains;<sup>34</sup> and more recently the first hybrid bionanodevice that electrically links nerve cells and photovoltaic nanoparticle films.<sup>35</sup>

The Project on Emerging Nanotechnologies keeps an inventory of products on the market that uses nanotechnology.<sup>36</sup> There is a wide variety of products, some of which are already available in the market. These include sunscreens, processors for electronic devices, waterproof and self-washable cloths, beauty and health creams, lotions, sports equipment (baseball bats, hockey sticks, tennis rackets, golf balls), adhesives, paintings and coatings among many others.<sup>37</sup> However some companies, in trying to keep with

<sup>29</sup> ETC group, 2003, p.60.

<sup>30</sup> Quoted in: ETC group, 2005, p.19. See also , [www.memset.org/news/1032299214-3](http://www.memset.org/news/1032299214-3)

<sup>31</sup> ETC group,2003, p.39

<sup>32</sup> Birt, 2006.

<sup>33</sup> Graham-Rowe,2004 .

<sup>34</sup> Technews, 2007.

<sup>35</sup> Nanotechweb , 2007.

<sup>36</sup> See: <http://www.nanotechproject.org/>

<sup>37</sup> It is important to mention that health and environmental risks that nanoparticles in particular, could introduce have not been largely researched, as stated by Andrew Maynard, chief science advisor for the project on Emerging Nanotechnologies in Washington DC. See Birt, 2006.

the trend, are misusing the “nano” label.<sup>38</sup> So there is not too much market regulation for products that uses the “nano” label, but is that the only problem?

## 2.4 Nanoethics

There is a saying that goes ‘with great power comes great responsibility’.<sup>39</sup> So it is not only about the potential benefits, but also the potential dangers, or side-effects that nanotechnology could bring along. That is why governments have created organizations to monitor and guide research and development in this field, such as the American National Nanotechnology Initiative (NNI). Last year the US government allocated \$11 million to research the potential side-effects of nanotechnology, but of course compared with the budget for research we might say that the potential benefits have made us overlook the downsides.

There are also some civil societies, universities around the globe and several NGO’s that are not only considering issues of socially responsible development in areas like justice, fairness, health, impact to the developing world, human rights, dignity, human enhancement, privacy, and environment; the ownership, intellectual property and control of technologies; but also monitoring the impact and educating people about new technologies such as nanotechnology. Some of these are the ETC Group; The Foresight Institute<sup>40</sup>; The International Center for Bioethics, Culture and Disability; The Institute of Science in Society (ISIS); The Science and Environmental Health Network (SEHN), the Center for Responsible Nanotechnology (CRN) and the UNESCO.<sup>41</sup>

The future direction of nanotechnology should be decided with the participation of all these different actors: scientists, researches, governments, NGO’s, universities, companies, and society in general. We cannot leave the responsibility only to those who are doing the research or the discoveries, or funding the projects. The direction that nanotechnology takes is also society’s responsibility.

Most of the nanotechnology applications are no longer a matter of if, but rather of when. Therefore in order to assess the ethical, legal and political aspects of

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<sup>38</sup> Birt, 2006.

<sup>39</sup> Quoted from Spiderman-2. Writers Stan Lee and Steve Ditto, 2002.

<sup>40</sup> Established by Eric Drexler, for a responsible development of nanotechnology.

<sup>41</sup> For instance in 1998 the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), an international committee of 18 experts advised the UNESCO on areas of applied ethics such as science ethics, environmental ethics and technology ethics. Last year the UNESCO published also a report on “The Ethics and Politics of Nanotechnology” and the UN also called for nanotechnology to help with the achievement of the Millennium Development Goals.

nanotechnology, it is important to separate real potentials from imponderable possibilities.

It is possible to find in the literature a call for ‘nanoethics’,<sup>42</sup> which considers the ethical implications of nanotechnology in particular. Considering all the money that is being invested and the speed of its development, we can see why it is better to address the ethical issues now, as nanotechnology is still in its ‘infancy’. Even though most of the ethical problems that nanotechnology arises are the same that other technologies before have brought along, nanotechnology will certainly bring different angles and perceptions. The fact that nanotechnology permeates so many different fields, also raises the questions of who should create and enforce policies regarding its research and development? Or what international laws should be made for it and who should or can enforce them?

Other areas of concern are fair distribution, privacy, patents, and the grey goo problem which is concerned with self-replicating nanomachines that would escape human control and would invade the world. And also the green goo problem which has to do with hybrid organisms and products, that result of the merging between living and non-living matter, which would not be easy to control and would behave in unpredictable manners.<sup>43</sup> But the problem I address in this thesis is the possible threat to human nature when using nanotechnology-based human applications aim to enhance the human condition. I believe that in the way to make us better, we might lose part of what make us human in the first place.

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<sup>42</sup> Weckert, 2004, p4. The term is not yet considered to be a separate field of inquiry according to Weckert.

<sup>43</sup>. See ETC Group, 2005, p.14.



## **\*Chapter 3\***

Imagination is the beginning of creation. You imagine what you desire, you will what you imagine and at last you create what you will.<sup>44</sup>

### **3.0 From sci-fiction to sci-real: Cyborgs and Implants**

What is science fiction if not a reflection of human fears and desires? As time goes by, we have witnessed how the gap between what is now considered science fiction and tomorrow's reality is not as big as it used to be. We have conquered in a way little by little our craziest dreams about the future,<sup>45</sup> crossing boundaries when the unknown and the unthinkable gets in our path, and finding ways to overcome and reach our desires, but from time to time also our worst nightmares.

Science fiction has been contributing to technological developments,<sup>46</sup> creating possible scenarios that we will most certainly, in the future, try to make them happen. That is why technology plays an enormous role in the way societies have evolved.

When analyzing the history of evolution, it is interesting to see that, even though our species is the only technology-creating species on earth today,<sup>47</sup> we were not the first technological species. Some groups of humanoids used technology.<sup>48</sup> Some people even argue that technology was the key to make a group become dominant over the other.<sup>49</sup> Consequently, with time only the group with the best technology survived. No wonder why some people acknowledge technology as the "human-sponsored variant of evolution".<sup>50</sup>

With the development of nanotechnology we are obtaining knowledge of our environment and ways to manipulate it in forms that have been only heard of in science

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<sup>44</sup> Quote from George Bernard Shaw. See [www.quotationspage.com](http://www.quotationspage.com)

<sup>45</sup> Not only writers have dreamt about fictional things, scientists and inventors have done it too.

<sup>46</sup> Arthur C. Clarke, a British science-fiction author, once stated the three laws of technology ... (1) When a scientist states that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong. (2) The only way of discovering the limits of the possible is to venture a little way past them into the impossible. (3) Any sufficiently advanced technology is indistinguishable from magic. With nanotechnology it seems as if the gap is about to be closed.

<sup>47</sup> There are studies that point out that there are monkeys able to use tools. However here I am emphasizing not only the fact of making tools but creating ways to preserve the knowledge of the new technology.

<sup>48</sup> About five million years ago emerged the Homo habilis who was capable to make and use tools. Then the Homo erectus domesticated fire and started using weapons.

<sup>49</sup> Kurzweil, 2000, p.15.

<sup>50</sup> Ibid, p.14.

fiction. Once we shaped our technology to control our environment, but now it seems like technology will shape us as it merges with us.

In 1993 Vernor Vinge introduced the idea of the singularity to describe an enormous but unpredictable social change driven by the curve of exponential change.<sup>51</sup> So if the exponential curve that Vinge suggested continues, computers will not only achieve the memory capacity and computing speed of the human brain by the year 2020 as Kurzweil predicts, but humankind will merge with machines.

Our bodies and brains will be surrounded by and merged with computer power which itself will become as, or more, powerful than our brains. As we merge machines into our minds we will indeed be deconstructed and put back together. We will use these technologies to redesign ourselves, our children and animals, into varieties of intelligent life impossible to predict.<sup>52</sup>

### 3.1 Implants

It is important to have a clear idea on the relation between implants and cyborgs, and the role of nanotechnology in the development of a new generation of human implants, mainly those used in the brain-machine interfaces.<sup>53</sup>

An implant is a prosthesis, if we understand a prosthesis as an artificial device used to restore bodily functions, replace missing biological structures and more recently to augment human functions.<sup>54</sup> Since an implant is a technological device itself,<sup>55</sup> it is understandable that with the rapid advances in technology a larger number of human functions are being restored or improved. We can find artificial limbs, joints, skin, bones, cervical implants, breast implants, dental implants, cochlear implants, cardiac pacemakers, implanted drug-delivery systems, electrodes implanted in the brain to control seizures or tremor, implanted chips to locate persons or to regulate devices in ‘‘intelligent environments’’, spinal neuroimplants and many more.<sup>56</sup> There is a long list

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<sup>51</sup> See Vernor Vinge in the coming technological singularity. How to survive in the post-human era.

Presented at the VISION-21 symposium sponsored by NASA.

<sup>52</sup> Hughes, 2004, p.140.

<sup>53</sup> Implants can also be used for animals, such as the case of Belle the telekinetic monkey sponsored by Defense Advanced Research Projects Agency (DARPA) or the robo-rat case. See Graham-Rowe, 2002.

<sup>54</sup> Implants do not necessarily need to be inside the body, they can also be outside the body.

<sup>55</sup> In a way every technological device and system enhances humans, whether it is our body, our performance or our environment. Or whether the enhancement is achieved in a symbiotic relation with the body or in an independent way.

<sup>56</sup> Some medical implants such as the cochlear one, are seen for some groups as ethnic cleansing and as a device that confronts the experience of being disabled. The debate for using enhancing implants will be even a more problematic one.

of implants that are in the experimental stage, plus another list that seems fictional, at least for the near future.

What is important here is that nanotechnology is helping a great deal to create new and more sophisticated implants, and improve the ones that are already available. Due to the fact that nanotechnology works on such a small scale, it allows fitting more devices in smaller areas, something that has been seen as a limit for a lot of new development in the past. This is one of the reasons for the boost in brain chips and neural prosthetics. In the U.S. for instance the Defense Advanced Research Projects Agency (DARPA) is funding the “Brain Machine Interfaces Program” which is basically aimed for achieving super soldiers. Nanotechnology is also helping in the creation of new materials that can coexist with neurons and can make into nanoscale electrodes. Brain implants are not a new issue but are one that with nanotechnology is going to have a tremendous improvement.

By establishing direct links between neuronal tissue and machines, these devices could significantly enhance our ability to use voluntary neuronal activity to directly control mechanical, electronic, and even virtual objects as if they were extensions of our own bodies.<sup>57</sup>

Recently at Brown University in Providence, Rhode Island, researchers built an implant using nanotechnology which helps paralyzed people manipulating objects, using their brains.<sup>58</sup> This new implant does not need the space and the not-easily manipulated cables that previous implants needed, thanks to the miniaturization of the electronics and new communication interfaces that nanotechnology allows.

Also in the Institute of Bionanotechnology in Medicine at Northwestern University, a group of researchers have demonstrated how paralyzed lab mice with spinal cord injuries can regain the ability to walk after been injected a purpose-designed nanomaterial. This work can have implications for diseases such as Parkinson's and Alzheimer's in which key brain cells stop working properly.<sup>59</sup>

Since research is under way, there are not yet many neural implants available that use nanotechnology, however research on neural implants with nanotechnology aims to

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<sup>57</sup> Ro co, 2002, p.252.

<sup>58</sup> Technews, 2007. The researchers tried first in primates successfully in 2002 and later on created a company called cyberkinetics where they developed the technology for humans. See also <http://www.cyberkineticsinc.com> and [http://www.brown.edu/Administration/News\\_Bureau/2001-02/01-098.html](http://www.brown.edu/Administration/News_Bureau/2001-02/01-098.html)

<sup>59</sup> Jaques, 2007.

enhance or restore sensory perception, memory, cognition,<sup>60</sup> behavior; to allow teleoperation of machines and also as computer interfaces.

It is really amazing what we will be able to achieve in the future. For instance, if Drexler is correct about his prediction regarding nanotechnology, then it will be possible to have “virus-sized molecular machines to study the structure and function of the brain, cell by cell and molecule by molecule where need be”.<sup>61</sup> And then after having learnt how the neural system works we will be able to design and build analogous devices based on nanoelectronics and nanomachines.

Just as the molecular machinery of a synapse responds to patterns of neural activity by modifying the synapse's structure, so the nano computers will respond to patterns of activity by directing the nanomachinery to modify the switch's structure. With the right programming and with communication among the nanocomputers to simulate chemical signals, such a device should behave almost exactly like a brain.<sup>62</sup>

We can think of nanorobots that distribute themselves through our brain, communicating with every neuron or even replacing them, augmenting the brain's function, feelings and thoughts. Some people think that these implants will make us think faster, multitask, record and play back thoughts, back up our minds (upload), dream feelings, interchange between sensory reality and virtual reality seamlessly, and even have new hardware additions.<sup>63</sup> Some researchers even suggest that by 2030 these devices could be perfected and available to the general public.<sup>64</sup>

After having analyzed the development of implants it is easy to see how they are so connected to the term cyborg, since implants are one of the paths to become one.

### 3.2 Cyborgs

The question then is if nano-implants will turn us into cyborgs? Or perhaps we are cyborgs already. In order to have a better perspective on this, it is important to have a conception of what a cyborg is. Before the term was applied to real humans it was used

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<sup>60</sup> These implants are targeted mainly to improve human memory, decision-making, creativity, and emotional response.

<sup>61</sup> Drexler, 1986.

<sup>62</sup> Ibid, chapter 5.

<sup>63</sup> Other futuristic idea with nanotech and implants is brainjacks that would allow us to think directly into a net and directly call up lyrics of songs, calendars, address books, maps, floor plans, lines of dialogue for a play or foreign language dictionaries or translators.

<sup>64</sup> Hughes, 2004, p.40.

in science fiction,<sup>65</sup> referring to hybrid organisms. In 1960 Manfred Clynes and Nathan Kline coined the term cyborgs to describe human bodies that had been altered and augmented with machines. For Kevin Warwick a cyborg is something that is partly animal, partly machine, and whose capabilities are extended, as a consequence, beyond normal limits.<sup>66</sup> Others, and the term that I incline myself towards, understand the term cyborg as the symbiotic relation between human and technology,<sup>67</sup> that is to say not only using technology but rather depending on it and even considering it as part of us. Then cyborgs would not only be people with implants but most humans nowadays.

If we take the narrow definition, we can say that the merging of humans with machines is occurring on a larger scale in our society as a result of the information revolution and technological advances such as biotechnology, information technology, cybernetics<sup>68</sup> and, more recently, nanotechnology. In the past the interfaces human-machine had an emphasis on a unidirectional channel from a machine to brain or brain to machine, with advances in nanotechnology<sup>69</sup> the interface human-machine is easier and faster now on a two-way direction, which makes even blurry the distinction when trying to define who is responding the human part or the machine part. Another important issue is that nanoscale manipulations will allow non-living nano-materials and living matter to become compatible and in some cases interchangeable,<sup>70</sup> making the possibilities of hybrids endless.

However, achievements in the human-machine interface have been taking place before using nanotechnology for a while in the medical and military area. For instance in 1998 the British cybernetics professor Kevin Warwick started his project for becoming a cyborg himself.<sup>71</sup> With his work he showed that signals from his brain could be transmitted around the world,<sup>72</sup> via internet to operate a piece of technology. So as cyborgs, our physical powers controlled directly from the brain are not restricted

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<sup>65</sup> For instance, in movies like Robo-cop, Terminator, Blade Runner, or in books like The Terminal Man by Michael Crichton and Mind Children by Hans Moravec.

<sup>66</sup> The problem when he refers to normal limits is that since we are talking of a hybrid, it does not seem clear whose normal limits we are talking about, the machine or the animal.

<sup>67</sup> This term I would refer to as the broad term, but in most of the paper I will be referring to the previous term human-machine (Clynes-Kline) that I consider as the narrow definition of cyborg.

<sup>68</sup> Cybernetics understood as the science of communication and control in animal and machine, and from which the term cyborgs is taken.

<sup>69</sup> Other convergent technologies are also helping considerably to these developments.

<sup>70</sup> See ETC 2005, p.56. This brings as a consequence that nonliving material will be performing biological functions, i.e. nanorobots performing as specific kind of cells.

<sup>71</sup> Even though other human implants have been carried around the same time too, he was the first in declaring that the purpose of it was that we wanted to become a cyborg.

<sup>72</sup> Warwick sent signals from Reading, across the internet into his nervous system in New York.

to our immediate body's capabilities. This leaves open the possibility for a paraplegic with a suitably-placed implant in his brain to be able to drive himself around, with the help of a wheel chair or even a robotic skeleton, merely by thinking about it. Nevertheless, when he started the project he had a lot of troubles with the size of the chips and the strength of the technology. That is why nanotechnology is playing a great role in this area, since it allows smaller, stronger and even bio-compatible implants. With the help of nanotechnology a "data cable" was recently made from stretched nerve cells, that would form better connections with human tissue than the metal electrodes currently used for prosthetics. This could in the future be used for connecting computers with the brain.<sup>73</sup> From the previous, it can be argued that with all these advantages becoming a cyborg in the future would be really easy and could also blur the differences between humans and cyborgs.<sup>74</sup> It can also be argued that becoming a cyborg might be the next fashion trend, not only because the amount of money in the market that is there to make it happen<sup>75</sup>, but also because people are losing their fear of gadgets, and as new generations come, it is more and more as if they were born already in symbiosis with technology.<sup>76</sup> Therefore the issue of being a cyborg is more an issue of whether society accepts it rather than if it is possible.

Among some of the more interesting ideas on future possibilities that lie ahead for cyborgs with the help of nanotechnology and human imagination are the areas of:

- Manipulation of emotions.<sup>77</sup>
- Cognition.<sup>78</sup>
- Increase life span.<sup>79</sup>
- Thought communication.<sup>80</sup>

<sup>73</sup> Simone, 2007. Tests have shown that electrical signals can be transmitted in both directions along the cord, what leads to think that in the future the cable can be use to connect an amputee's nerves to sophisticated prosthetics, connect artificial eyes or ears to the brain.

<sup>74</sup> The optimization of the human-machine interface has been taking seriously not only in the medical and military arena. That is why companies like Nokia, Motorola and other manufactures of wireless communications are investing so much in nanotechnology. See Hockenberry, 2001.

<sup>75</sup> The social pressure for being part of something has always played a great role in the development of our technological society and our personal identities.

<sup>76</sup> The past generations were afraid when the first cell phones or cameras appeared on the market, our parents' generation took a while to learn how to use the new features of cell-phones, and today's generation seem to know and use cell phones as if it was an extension of themselves.

<sup>77</sup> Mostly anger, shock and excitement. This is achieved by sending electronic signals into the nervous system to change the state of mind. We will achieve cyber-drugs and cyber-narcotics, ways to stop pain forever and even become immune to disease.

<sup>78</sup> Not only beings smarter or enhance other mental capacities, but also enhance our memory.

<sup>79</sup> Nanotechnology will help the body to stop or reverse the aging processes; it will also help us to control our metabolism. See Warwick, 2002, p.301.

### 3.3 The next evolutionary step?

The deep-rooted principles of evolutionary change will shape the development of nanotechnology, even as the distinction between hardware and life begins to blur. These principles show much about what we can and cannot hope to achieve, and they can help us focus our efforts to shape the future. They also tell us much about what we can and cannot foresee, because they guide the evolution not only of hardware, but of knowledge itself.<sup>81</sup>

If we take into consideration the intrinsic desire of humans to enhance themselves, it is plausible to say that most people would embrace becoming cyborgs. Among the supporters are the people in the transhumanism movement<sup>82</sup> or scientists like K. Warwick, who think becoming cyborgs is just the next evolutionary step for humankind. If that is the case, what is going to happen to those who do not want to become cyborgs? Would they be considered in the same way we consider chimpanzees now? Would humans as we know them today pass to be a sub-species? And what would the posthuman era be like? But above all and the reason why I do not agree with that statement is because it all seems to be about human desires. What gives us the right to master not only our environment but also play with nature? Just because we have the tools and the power to do something, it is not necessarily true that we should pursue that particular enterprise. Not even when we are tempted with endless knowledge, wealth and power. There are things in life that are far more valuable than that, things that give true meaning to our lives and make us happy and that do not give us mere pleasure.

Others that support the idea of becoming cyborgs consider them as a figure for disrupting essentialist presuppositions of modern thinking,<sup>83</sup> cutting through oppositions. That is to say that due to the fact of the hybrid nature of cyborgs, they could help to overcome the oppression of the weak, as Haraway states in her 'Manifesto

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<sup>80</sup> For some enthusiasts this could lead to a global brain connectivity which would allow more cooperation among nations. Some even argue that this is a clear connection with Gaia's hypothesis by James Lovelock and Lynn Margulis, in which the global ecosystem has homeostatic feedback mechanisms that keep it in balance, so after we have all been connected we will have a better understanding of this connection and will embrace our ecosystem in a different way. See Hughes, 2004, p.175

<sup>81</sup> Drexler, 1986, chapter 2.

<sup>82</sup> Something that caught my attention is that Sweden has been part of this movement with Anders Sandberg in 1994 who formed the Swedish transhumanist group *aleph*, and later on Nick Bostrom, currently a philosopher at Oxford University who co-founded the World Transhumanist Association.

<sup>83</sup> For instance black-and-white dichotomies of nature-culture, human-machine, natural-artificial, man-woman, physical-nonphysical, and fact-fiction. See Haraway, 1991, pp.149-181.

of cyborgs'.<sup>84</sup> Nevertheless, I believe this could also lead to exacerbate psychological and self-esteem problems, since substantial aspects of our identity will not be regarded anymore as important.<sup>85</sup> We also have the issue of how the individual understands the world, since it depends completely on how we sense it and what we sense. As cyborgs the ways and things we would be able to sense are far more than the ones the human race has been sensing since it appeared on Earth.

Another reason for becoming cyborgs is the one that Steven Hawking and all the people that believe that machines will take over humankind have:

We must develop as quickly as possible technologies that make possible a direct connection between brain and computer, so that artificial brains contribute to human intelligence rather than opposing it.<sup>86</sup>

So in order not to fear a future where the machines rule us, we better join them. I do not embrace this argument because it sounds to me just like an excuse for sustaining the research in these areas. Nevertheless humans are always in the run to develop new technology in order to overcome the side-effects of the previous, so in a way we would only be doing what we have been doing before. The problem is that for some it goes beyond overcoming the side-effects. Just as Warwick stated: "Once you've been upgraded you would not want to return to being a mere human again".<sup>87</sup>

It is also possible to see that even though we have not yet merged with machines, our dependency on machines is already taking a lot of our decisions away.<sup>88</sup> Some of the reasons of why humans are relying so much on machines are the simplicity to network machine intelligence and several ways of communication, the amount of information and memory that machines can handle, the variety of ways in which computers can sense the environment and the speed of computers.<sup>89</sup> Therefore the merging between humans and machines is seen by several as an enhancement of our "poor" features.

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<sup>84</sup> See Haraway, 1991, pp.149-181. According to Haraway the weak groups are women, black people and animals.

<sup>85</sup> Cyborg-people might have problems to interact with not-cyborg people, or will become more addicted to be plugged in the "virtual" world than in the "real" world, perhaps even problems of cyber-narcissism or having "ghosts" in our virtual memories.

<sup>86</sup> One of the most recognized theoretical scientist in the world. See Hawking's public lecture, "Life in the Universe," available on the Internet: [www.hawking.org.uk/lectures/life.html](http://www.hawking.org.uk/lectures/life.html)

<sup>87</sup> Warwick, 2002, p.140.

<sup>88</sup> I am not suggesting that humans in a conscious way are giving power to machines or that machines would become "conscious" and take power over us. However both remain possible scenarios.

<sup>89</sup> See Warwick, 2002, p.40.



But I do not think that the argument of becoming cyborgs in order to enhance ourselves is fully correct, because it overlooks the fact that persons would have to adjust to the information access and physiological control made possible through such devices,<sup>90</sup> a reconstruction of our conscious and unconscious cognitive processes will also have to occur, a reconfiguration of who we believe ourselves to be, of what it means to be sick, healthy, and the meaning of been alive in the “body”.<sup>91</sup> So even if the merging with machines could add new features to humans I believe that is not to say that something in what make us humans have been improved at all, since we might lose faculties we value, whether by accident or intentionally, such as our capacity to imagine and do ethical reflection. However, some people consider that becoming cyborgs will allow us to be more ethical and wiser human beings. I do not believe this argument holds, firstly because there is no possible way to prove that this new cyborg ethics will be indeed better. And secondly, I believe that part of being human is having *an ethos*, an ethical being. I also consider that this *ethos* has been eroded with the way we approach technology in the present, with the hunger for always more in the global market, and the fear of not fitting in society. Therefore, it can be argued that it is arrogant of us trying to redesign ourselves as ethical cyborgs, when obviously we are still struggling to managing and understanding our own ethics. It seems hard to understand why the more we want to be “better humans” the more we want to merge with machines.<sup>92</sup>

Another area of concern about becoming a cyborg is privacy and control. Some people consider using nanotechnology implants as an effective way for controlling others. This could sound as something that some parents, employers, dictators, military and terrorists are looking forward to, but not something that most of us would really embrace. Nanotechnology will allow implants that can be ingested or injected without the person noticing it, which can be used for medical purposes or other non-controversial issues. Nonetheless, the danger of misuse would always be latent. Viruses and hackers can also represent a problem. As the ETC group points out, how these nanotechnology-based applications will work in different cases is still matter for research, but what is clear to me is that with nanotechnology the invasion of privacy;

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<sup>90</sup> I am not arguing here that this is not possible, since disabled people are a good example of how human beings are quite good for adapting new features. Rather my point is that this human capability if done in such a speed that would not leave time for the mind to adapt and give meaning to all this new features, can have undesired consequences, risking our mental health.

<sup>91</sup> Identity, true experience and concept of the self, are more likely to face problems.

<sup>92</sup> Technology is good as a tool, for helping us to carry our lives, not as part of ourselves. The problem, as Garreau stated, is that machines have not only changed us, they have become us. See Garreau, 2004, p.65.

erosion of human rights, democratic dissent, and personhood;<sup>93</sup> as well as unjustified control of others will increase.<sup>94</sup>

Many questions arise with these new developments, until which point are my decisions and thoughts still my own? When is it just a product of the circuits inside me? Until which point can we keep replacing human parts and call that mesh of wires and nanomaterials a human being? How can we aspire to become partially-human, semi-human or super-human cyborgs if we have no hold on to what it means to be human? Therefore, before unleashing our desires to merge with machines, it would be wise to ask what are we really looking for and the reason for it.

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<sup>93</sup> With nanotechnology that allow us to disrupt memories and remove continuity, we are eroding our personhood, since we build our whole interpretation and understanding of the world based upon that experience or on the accuracy of our memories.

<sup>94</sup> ETC, 2003, p60

## \*Chapter 4\*

“Each misery has its own cry, but health remains silent.”<sup>95</sup>

### 4.0 Beyond Therapy?

With modern medicine and nanotechnology<sup>96</sup> we have achieved the potential not only to do better diagnostics, cure or prevent diseases, but also the possibility to use nanotechnology where there is no clear medical benefit, i.e. enhancement.

The debate on the distinction between therapy and enhancement is not a new one. Bioethical discussions have been held before on fields such as genetics, pharmacology or neuroscience, and just recently some debates have been centered on implant technology and other emergent technologies that aim to merge with the human body. It seems to me that the debate will continue, since the possible grounds against which either therapy or enhancement can be measured, such as a health standard or a conception of what is normal, are rather problematic. Therefore we can say that the debate itself started with the beginning of medical science itself and has become more complicated since it now involves more than only the medical area.

In order to understand why the debate on therapy-enhancement involves now more than the medical field, it is important to analyze the definition of health itself, which has an important role in the medical area. The definition of health is dynamic and open to add new features that other generations or different cultures did not acknowledge before. The Preamble of the Constitution of the World Health Organization (WHO) states:

The States parties to this Constitution declare, in conformity with the Charter of the United Nations, that the following principles are basic to the happiness, harmonious relations and security of all peoples: *Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.* [Emphasis added.] The enjoyment of the highest attainable standard of

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<sup>95</sup> Quote of the Swedish poet Erik Gustaf Geijer in “Odalbonden.”, the translation is: “Var plåga har sitt skri för sig, men hälsan tiger still”. Quoted in Bok, 2004, p.6.

<sup>96</sup> Of course other converging technologies are part of this too, but the focus on this paper is nanotechnology.

health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.<sup>97</sup>

More recently the definition of health added the ability to lead a “socially and economically productive life”. Among other definitions of health before the formation of the WHO, are for instance the one stated by Aristotle in the fourth century B.C., which sees health as a contributing factor to a state of thriving, flourishing or well-being. And the one stated in the Caraka Samhita<sup>98</sup> which says that “health is the supreme foundation of virtue, wealth, enjoyment, and salvation. Diseases are the destroyers of health, of the good of life, and even of life itself”.<sup>99</sup> Despite the fact that the WHO’s definition of health underline those ideas, it adds the claim that ‘complete well-being’ is indispensable to attain health.<sup>100</sup> This idea of ‘complete well-being’ is not new in human history; it was envisaged long ago when the Greek poet Hesiod spoke of a time “without evils, hard toil, and grievous disease” that came to an end after Pandora opened the box of miseries. Or in Thomas More’s book *Utopia*, where he wrote about the pleasure of “perfect” health saying that: “this alone makes the state of life easy and desirable”.<sup>101</sup> It can be argued from here that the use of the term ‘complete’ can be misleading in the therapy – enhancement distinction, since it seems to me dubious that any human being actually achieves such ‘complete’<sup>102</sup> state of well being during his or her live. If the WHO really pursues that state of completeness, it seems like no one will be able to reach the state of health, since health would be no more than an utopia. It can also be said that in pursuing this completeness, we can fall into the error of medicalizing all human experiences, since the ‘complete well-being’ is not only physical but also mental and social. However people supporting enhancement could argue, on the basis of this ‘complete’ statement, that enhancement should not be considered morally dubious since it is only helping us to achieve this ‘complete’ state that is needed for

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<sup>97</sup> See [Constitution of the World Health Organization](#), Geneva, 1946. Accessed March 18, 2007. Questions on how to interpret “the highest attainable standard of health” are raised, when considering the advances in nanotechnology and other converging technologies, along with efforts at health enhancement.

<sup>98</sup> The Caraka Samhita, contains the oldest known Ayurvedic writings of India written around the fourth century B.C.

<sup>99</sup> Caraka Samhita. 1949. Jamnaga, India:II, 4, 13. Cited by Temkin O. 1973, II: 397.

<sup>100</sup> Another important remark is that the WHO decided for the first time in history to take the task of promoting health on a global scale. For more on this see Bok, 2004.

<sup>101</sup> More, 1516, p.52. Here I emphasized the term perfect as the attainment of a complete well-being.

<sup>102</sup> Here I refer to the term complete as an all-or-nothing term. But even if we consider the term as one open to degrees, it will still have some conflicts in the absence of some agreed-upon conception of what complete well-being itself might be (physical, mental or social).

attaining health, and since health is a human right there would be nothing morally wrong with enhancement.

Other difficulties we can find with the previous health definitions are that due to the fact that they include subjective and abstract parameters such as mental well-being, the evaluation of health becomes subjective. Because of this, other definitions of health have appeared, such as Christopher Boorse's one, which defines health as "the absence of disease" as a state of "normal functioning, where the normality is statistical and the functions biological".<sup>103</sup> Or Norman Daniels' one, which modifies Boorse's one, coming up with: "health is the absence of disease, and diseases are deviations from the natural functional organization of a typical member of a species".<sup>104</sup> But even these more narrow definitions of health still have some problems. On the one hand a serious injury or a chronic disease might be a clear point of departure from the standard of health; however there are cases that defy classification. And on the other hand the concept of what 'normal' or 'natural' means in our current society seems to be, as Le Blanc points out, more and more transformable.<sup>105</sup> I find Le Blanc's claim plausible since there is no clear boundary anymore between what is normal and what is pathological, and what seems normal for a human of the 21<sup>st</sup> century, might have been something unthinkable for another human a couple of centuries ago. So it seems to be an ongoing process. Take for instance, the case of giving nanotechnology-based implants to help those who are near the lower end of the normal distribution curve, as they might be considered at a disadvantage to the normal, then "the average may equally regard themselves as disadvantaged with regard to the above average".<sup>106</sup> And as we brought those in the lower end up to average, the normal distribution curve will be shifted in an ongoing process. Therefore if our parameter is that therapy is when helping those below average, and enhancement when helping those that are already average, then the previous considerations provide an argument for saying that what might be an enhancement now for an individual could easily be a therapy in the future. That is to say that as the norm is shifted, the general standard of expectations in a society changes too. History has shown us that the desire for more, for the unlimited,

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<sup>103</sup> Boorse, 1977, p.542

<sup>104</sup> Daniels, 1985, p. 28.

<sup>105</sup> Le Blanc, 2002, p.160.

<sup>106</sup> Kass, 2001, p.16.

for better and for the different<sup>107</sup> is not satisfied with the average, nor takes its weight from the distinction between healthy and the better than healthy or the abnormal and normal. Nevertheless there is a need to draw a line, as it might be something more than our health or conception of normal that is at stake.

There is no contest to the moral good of tending to the health, care, and well-being of the body. But there is no grasping the moral meaning of progress when it challenges the relatively stable emotional and psychological comfort most humans generally have over being alive inside of the body.<sup>108</sup>

From the previous, I believe what is needed is a dynamic definition of health. One that includes the biologically given, the personally acquired and the social settings.

Health is a dynamic state of wellbeing characterized by a physical, mental and social potential, which satisfies the demands of a life commensurate with age, culture and personal responsibility.<sup>109</sup>

This definition allows a more open approach to health. On the one hand, it can embrace difficult cases of classification. On the other hand, it stresses the fact that health is also our responsibility. Finally, due to the fact that it is dependent in our social and natural environment, is not a static one. This definition is also in good agreement with “recent ideas proposed in social and preventive medicine, which emphasize the cumulative consequences of health determinants”.<sup>110</sup>

## 4.1 Therapy vs Enhancement

In order to have a better idea of why the debate has not been settled it is important to review some of the distinctions between therapy and enhancement that have been made in the literature. But also to have in mind that the distinction goes beyond the relation to medicine and its purposes, to the relation of human beings and their purposes.

### 4.1.1 Therapy

In the case that concerns us, therapy can be understood as using nanotechnology “to treat individuals with known diseases, disabilities, or impairments, in an attempt to

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<sup>107</sup> Tattoos and piercing are examples of how through time and cultures humankind has always searched for ways of differentiating from others.

<sup>108</sup> Berne, 2005, p.90.

<sup>109</sup> Bircher, 2005, p.335.

<sup>110</sup> Ibid, 2005, p.339.

restore them to a normal state of health and fitness”.<sup>111</sup> On the basis of medical ends, some argue that technology should only be used for this. Make the “patient” to be well. However there are examples where we use something not because of its therapeutic value but simply because it makes one feel “better than good”.<sup>112</sup> Inventions for weight loss, hair growth, birth control, wakefulness, sleep, have better memory, remove wrinkles or enlarge breasts are some “therapeutic”<sup>113</sup> uses of technology that are already available and people use. I believe it is plausible with these examples, to argue that some people consider therapy the same as enhancement. Thomas Murray argues that this is due to the fact that both are built upon the “intrinsic healing processes of the body and mind with the aim to restore the body to a natural, balanced state”.<sup>114</sup> At first glance his statement does not seem plausible; however he poses the idea of vaccines as a set of biomedical interventions, whose aim is to improve health. Vaccines work by enhancing the immune system so the body can resist infections; consequently, they are a clear form of enhancement. This seems to pursue medicine’s aims of preserving health and preventing disease. So is there really a substantial difference?

#### ***4.1.2 Enhancement***

Defining enhancement is not that simple, the term itself is a problematic one since it is abstract and imprecise. Does enhancing a human function mean making more of it or making it better? Or bringing a function or condition out more fully rather than altering it qualitatively? Augmenting or improving a function or condition? The definition I am inclined in this thesis is the one that refers to enhancement as interventions, in our case based on nanotechnology applications, to augment the capacities, characteristics and performances of the human body. That is why enhancement is considered by some people as going beyond the goals of traditional medicine,<sup>115</sup> since it takes us closer to

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<sup>111</sup> Kass, 2001.p.13. Although in the report “Beyond therapy” the emphasis is in biotechnology, it can be extended to the uses of nanotechnology.

<sup>112</sup> Fukuyama, 2002, p.46. We have the clear example of Ritaline or Viagra.

<sup>113</sup> I consider that the problem is the fact of being inserted in such a consumerist society, where people are driven by their desires of the so called “success”, which leads to the misunderstanding of the already controversial distinction between therapy and enhancement. And considering the amount of money that people invest in these so called therapeutical interventions is easy to see that techniques and powers make that desires where none existed before become necessities.

<sup>114</sup> Quoted in Harris, 2005.

<sup>115</sup> If we considered that the role of medicine is to sustain or restore good health. However, the role of medicine itself is not a settled matter, since for some it is to attain health, for others it is prevention of diseases, for others prevention of suffering. However I will not enter into more depth in this matter, but it is important to have in mind that this adds more things to consider to the already conflicting debate between therapy and enhancement.

“playing God”, or as a means to reach a posthuman future. Therefore some people are trying to ban its usage. But on what grounds is it morally right to forbid the usage of a technology or knowledge, which some people might use as therapy while others might use it as enhancement? There are areas with no controversy at all, where enhancement is not even perceived as such. For instance no one is making a big fuss because someone drinks coffee in the morning in order to improve his performance in the office.<sup>116</sup> However when talking of radical extension of live span, brain-machine interfaces<sup>117</sup> or cognitive ability, controversy seems to arise. It seems that we like moralizing about enhancement technologies except for the ones we ourselves use. And in a certain way human capacities have already been enhanced with the introduction of technology: cell phones, internet, and computers. And what might be different is that this enhancement was “somehow external to us, enabling us to accomplish our personal ends, but not altering that person or framing those ends”.<sup>118</sup> Another important point is that the difference between enhancement and improvement is overlooked. For instance the case of the vaccines definitely shows improvement but does enhancing our bodies to live almost double of what is considered average now, really improve something on the human condition? And there is also the problem of the boundaries of improvement itself. Should “improvement” be limited to eliminating sickness and suffering, or should it encompass the augmentation of other goods such as beauty, memory, strength, intelligence or happiness?

After all these considerations, I believe that therapy and enhancement are dynamic terms that overlap. And as in the case of vaccines, all successful therapies can be seen as enhancing.<sup>119</sup> However I believe that in order to be able to distinguish between the acceptable and the unacceptable uses of nanotechnology<sup>120</sup> we should pursue a more clear distinction between therapy and enhancement. Some have used the term “non-therapeutic enhancement”.<sup>121</sup> Nevertheless, I think using this term does not solve the problem, since the term is only focused in the medical field, and what I find disturbing about pursuing enhancement goes beyond the medical field, it is on the grounds of what

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<sup>116</sup> There are ways of enhancing without technological intervention, such as religion or meditation.

<sup>117</sup> Brain-machine interfaces, for instance, can have a therapeutic value, such as enabling blind people to see or the paraplegic to walk, but can also be used for enhancement, bridging neural and digital worlds, which would enable people to link with other people simply by thought.

<sup>118</sup> Rooco, 2002, p.270.

<sup>119</sup> That is not to say that all enhancements can become therapy.

<sup>120</sup> Some therapies are ethically dubious, while not all enhancement interventions are ethically dubious.

<sup>121</sup> Kass, 2001, p.15.



it means to be human, his integrity and dignity, about human freedom and human flourishing. It is the idea of wanting to go beyond of what make us humans. Of something that can either dehumanize or rather “superhumanize” us. It is the worry of pursuing the wrong goals in the wrong way, to improve ourselves at the cost of our full humanity<sup>122</sup> or that we no longer are fully being ourselves by becoming “better”. We might need to be careful with what we wish for. The *pro* enhancement side is more optimistic. Therefore, in order to come up with a different approach that handles in a better way human goals in the therapy-enhancement debate, it might be helpful to analyze some of the *for* and *against* enhancement arguments.

## 4.2 Enhancement: a two faced coin

In the future, nanotechnology will develop implants or nano-devices that would allow us to see the world in ways not ever seen before, like seeing in the dark or boost our cognitive abilities. However if we consider the case of the “respirocyte”, which is an artificial red blood cell that holds a reservoir of oxygen,<sup>123</sup> it is not the same if used for a victim of a heart attack than if used for a healthy athlete. But is the later morally dubious?

### 4.2.1 Pro Enhancement Arguments: towards superman.

In the literature we can find several arguments that support enhancement. I will analyze the most recurrent ones.

One argument is that there are pragmatic reasons for embracing enhancement, since “scientists cannot draw a clear line between healing and enhancing”.<sup>124</sup> The first reaction to this claim is that it is not reasonable to give different moral status to them, as long as no moral distinction can be made between them. If we recall the “The Paradox of the Heap”: given a heap of sand with N number of grains of sand, if we remove one grain of sand, we are still left with a heap of sand (that now only has N-1 grains of sand). If we remove one more grain, we are again left with a heap of sand (that now has N-2 grains). If we extend this line of reasoning and continue to remove grains of sand, we see that there is no clear point where we can definitely say that on side A, there is a heap of sand, but on the side B, there is less than a heap. But saying that there is no difference between them would be the wrong conclusion, so would the difference

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<sup>122</sup> Not all acts done by humans are *human* acts (acts arising from the roots of our humanity).

<sup>123</sup> Freitas, 1998, pp.411-430.

<sup>124</sup> Naam, 2005, p.5.

between therapy and enhancement. Therefore, even if the case is that there is no moral difference, this argument of there not being any clear defining line does not really hold. For some there are already sounded distinctions, such as the “quasi-statistical concepts of normality” of Norman Daniels, which he uses to argue that “any intervention designed to restore or preserve a species-typical level of functioning for an individual should count as [therapy]”.<sup>125</sup> Despite of this, I believe that even if we have not yet been able to delineate a clear and widely accepted boundary between enhancement and therapy, it does not follow that there is none, and therefore I argue that we should put limits on the kind of enhancement we want to pursue. This topic will be discussed later.

Another pragmatic reason for embracing enhancement is that “we cannot stop research into enhancing ourselves without also halting research focused on healing the sick and injured”.<sup>126</sup> I believe this argument is plausible, since in order to come up with the knowledge that will allow blind people to see with the help of nano-implants, research on the area has to be done, and that same knowledge can be used to enhance the healthy ones. Therefore, regulation is needed when pursuing enhancement, even if it is using the same knowledge and devices from a therapy perspective.

Another argument concerns precisely the grounds of regulation and states that regulation will not work anyway. A ban on enhancement will be like the “war on drugs”,<sup>127</sup> ineffective and with a lot of economical and safety issues, as most of the cases then would be done illegally. If we take the fact of science’s globalization and the rapid advances in nanotechnology, it seems as if restriction of enhancement will not hold for a long period, first of all since there are clear benefits for health and secondly due to the fact that we live immersed in a market that is hungry for its products. So if the consumer demand for enhancers continues as it has been in the past years, playing an important role in the emergence of a new global market, no government will be able to fully control it.<sup>128</sup> However I do not believe this argument is strong enough, due to the fact that even if we are not able to totally stop an activity, this does not mean that it

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<sup>125</sup> Daniels, 1992, pp.46-48.

<sup>126</sup> Naam, 2005, p.5.

<sup>127</sup> Naam, 2005, p.6.

<sup>128</sup> Based on studies at the Institute For Global Futures, global demand will be high and demand will drive research investment parameters. Just as the current markets for plastic surgery, mood altering drugs, and even beauty and fitness. There are significant factors that will drive the emergence of the human enhancement market making it robust, desirable and inevitable. See Canton 2003, pp-4-5.

is not worthy and morally right to prohibit or regulate that activity. If that was the case, we would not have laws at all.<sup>129</sup>

A third argument focuses on autonomy, so if human individuals really experience freedom, then we can ask whether it is the State or the individual itself the one that should have the right to alter its mind and body.<sup>130</sup> However this argument seems to hold only if we presuppose a liberal political thought. It is also hard to follow why some are trying to politicize a debate that does not need to be political in the first place.<sup>131</sup> Or why regulations are seen only as restrictions on individual autonomy rather than as a way of enhancing society's behavior, and the freedom of individuals inside a society.

One more argument is that the desire of enhancement is intrinsically human, so we should not try to ban it.<sup>132</sup> The argument seems plausible since people have been enhancing themselves and every time pursuing more and more sophisticated ways to do it. From the beginning we have looked for ways to be smarter, more beautiful, stronger, faster, fitter, and even live longer. Therefore the drive to alter and improve ourselves is not and should not be seen as unnatural. Some people might say that it is a quest for perfection, whereas for those who do not see perfection as something that humans can achieve, it would only be a quest for happiness, success, self-esteem and acceptance. Nevertheless, I believe the argument has certain problems, since neither all human desires are humane nor all natural is good. For instance diseases are natural things, and they do not seem that good to me. And secondly the argument takes a historical fact to arrive to a moral conclusion. But the gap between "is" and "ought" should not be underestimated. Just because something is a certain way does not mean it should be that way. The fact that we have supported slavery or intolerance in the past does not mean that we should continue supporting them. So even if humankind has pursued enhancement throughout history it does not mean it should continue to be that way. I am not arguing here for a ban, but rather for having a deeper understanding of what it is that we want to enhance and what are we willing to leave behind in doing so.

Finally, we have the case of those who consider enhancement merely as the next logical step in the ongoing process of improving ourselves. Scientists like K. Warwick<sup>133</sup> go even further, arguing that since the human condition might not be the best one,

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<sup>129</sup> The fact that we have laws against murder, speeding or illegal immigration does not fully stop those activities from happening.

<sup>130</sup> Hughes, 2004. and Naam, 2005, p.8.

<sup>131</sup> That is not to say that it would not have political repercussions.

<sup>132</sup> Naam, 2005, p.10. Also transhumanist writings hold this view.

<sup>133</sup> Warwick, 2001. Other scientist on these same lines is Kurzweil.

enhancement will take humankind into a better condition. Nonetheless, I do not consider that the decision of taking one more step up the evolution staircase should be in our hands.<sup>134</sup>

#### ***4.2.2 Contra-Enhancement Arguments: towards Frankenstein monster.***

The fact of such a diverse group of people on both *pro* and *contra*-enhancement sides makes the arguments so varied<sup>135</sup> We can find a confluence of medical, social, and environmentalists on the side of those who perceive enhancement as problematic. People like Leon Kass and Frances Fukuyama are among them, but also scientist like Bill Joy. As in the case of the *pro* arguments I will only analyze the *contra* arguments I found more recurrent on the literature.

For some people, the argument is based on a religious and holistic approach, since enhancement would reflect humankind's deep dissatisfaction with natural limits and discontent towards what "God" or nature has given us. As stated in the report "Beyond Therapy":

We are deforming also the character of human desire and aspiration, settling for externally gauged achievements that are less and less the fruits of our own individual striving and cultivated finite gifts.<sup>136</sup>

On this same line of thought lies the argument that since a supreme force creates life, we would be playing "God" in trying to change the nature of things. I believe this argument has a point given that, on the one hand, it prevents us from getting to a "Brave New World" scenario.<sup>137</sup> And on the other hand, it shows us how important it is to be fully aware and accept our finitude, since it might be the only condition that allows us to enjoy most of the human life, such as a taste of beauty, engagement and the quest for meaning. Nevertheless, I think it also has certain problems, since there are natural things that we have been trying to overcome, and are hard to see as morally dubious, such as the case when someone is born with bad sight and then has an implant that allows him to see. We should also consider that attempts to improve ourselves have been made

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<sup>134</sup> Not when the decision is only in the hands of a selected group of people, without a more open discussion.

<sup>135</sup> That is to say not only scientists and researchers are in one side and the religious people and ethicists on the other.

<sup>136</sup> Kass, 2001, p.150.

<sup>137</sup> If we lose sight of the difference between real and false excellence, the very ends we desire might become divorced from any idea of what is humanly superior, and therefore humanly worth seeking or admiring. And we would become a diminished society of spectators just as describe in Aldous Huxley's book, "Brave New World".

through other means, such as education, exercise, hard work, and so on. What would be then the difference if we use nanotechnology-based enhancement? Sometimes dissatisfaction can move us to improve ourselves. However, when the roots of dissatisfaction are based on something external to us, such as society's coercion or the market, then this "marketed" enhancement is rather dubious to be meaningful or to be doing any improvement at all.

Other concerns are about the "unnecessary" safety risks of using nanotechnology for enhancement.<sup>138</sup> For others is the issue of access and distribution,<sup>139</sup> since it might be the case that only a few are able to acquire enhancements, then problems of justice and authenticity of achievements would arise. However natural endowments are not equally distributed and it does not mean that because of that it is unfair that someone does not have Einstein's IQ. Some argue that excellence and accomplishments are measured relative to some standard, and that this standard is dynamic.<sup>140</sup> I believe this is correct, so enhancement should not be morally controversial just because it would augment performance, but then what follows is that we should be alert of what would have to be the new standards and try to realize that when there are two different standards we cannot compare them any longer. Or in doing so, we will be unfair to the comparison itself. Therefore human merit is only granted when it is based on our native capacities and the meaning of the accomplishment itself changes according to the path we took to achieve it.<sup>141</sup>

Autonomy and human nature, as authors like Habermas or Fukuyama have pointed out,<sup>142</sup> are also areas of great concern, since they could be deteriorated along with our identity. But this will be discussed in detail in next chapter.

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<sup>138</sup> Kass, 2001, p.47-51. The argument is on the basis of genetic enhancement, but I applied it to nanotech.

<sup>139</sup> Lindsay, 2005, pp.20-23. See also Buchanan et al, 2000, pp. 320-21. The argument is on the basis of genetic enhancement, but I applied it to nanotechnology. I believe this also can create a division far greater and more meaningful than the so called 'digital divide', for instance it can arouse feelings of discrimination not only between the enhanced side and the un-enhanced, but a division of 'generations'. Or if some can perceive the world in a way that others do not, it might create a 'communication division'. However it is out of the scope of this work to analyze with more detail these arguments.

<sup>140</sup> Allhof, 2005, p.46. He argues on the basis of genetic enhancement, but I applied it to nanotech.

<sup>141</sup> There are limits that our body is not capable of crossing without an external enhancement, and the merit is never the same when doing with than without. In this respect I am not arguing against enhancement that are more based in "our own human" efforts, such as studying harder or training harder.

<sup>142</sup> Habermas, 2003. Fukuyama, 2002.

## **\*Chapter 5\***

Man he is immortal not because he alone among creatures has an inexhaustible voice, but because he has a soul, a spirit capable of compassion and sacrifice and endurance.<sup>143</sup>

### **5.0 Are you really Human?**

Could a future paleontologist classify a person using all the technological devices we have nowadays into a different species? Is the human that merges with machines any different from the one we know now?

Individuals vary greatly, but in the end if we call ourselves humans there must be something that we all share. In this chapter the deeper question is whether nanotechnology could alter those basic properties of the human condition, if indeed there is something like that. Can nanotechnology change the way we shape love, truth, beauty, happiness, justice, and faith? But before analyzing this topic, it would be a good start to see the different approaches on human nature.

### **5.1 In the search for Human Nature**

For a long time now we have been trying to find something that defines us as humans, a 'human nature'. Christians and other religious groups see human nature as God's creation, so in this respect it is considered to be constant, unchangeable and divine. But this conception is not the only one. Other thinkers such as Karl Marx conceived human nature as the total sum of all our social interactions, therefore if we can alter those social relationships we can change human nature.<sup>144</sup> In this conception our nature is based on the fact that we are historical and social beings.

Jean Paul Sartre among other existentialists thought that human nature is not dependent on anyone or anything 'human nature' is based on our freedom, and that is why individuals are condemned to be free - to shape who they will become.

For other people it is our hunger for improvement, what defines our nature. The desire to acquire new capacities, expand the boundaries and overcome any possible

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<sup>143</sup> William Faulkner, Nobel Prize Acceptance Speech. Dec/10/1950. See [www.rjgeib.com/thoughts/faulkner/faulkner.html](http://www.rjgeib.com/thoughts/faulkner/faulkner.html)

<sup>144</sup> Rousseau also argued that human beings have the capability to alter their nature over time.

obstacles or limitations.<sup>145</sup> However, we can also say that it is our capacity of setting limits for ourselves that defines our nature. In more biological terms, human nature has been considered as the “product of evolution bounded by our own genetically determined species-specific pattern of behavior”,<sup>146</sup> as Edward O. Wilson states.

On cultural grounds, some people have stated that human nature is based on the capacity for learning and being able to pass that learning on to future generations in non-genetic ways.<sup>147</sup> For others it lies in being creative, intelligent, rational or even technological beings.<sup>148</sup> So it seems to me that we still have not agreed on any clear definition of what human nature really is. Despite this, I believe that human nature, if it is proper to speak of such a thing is common and exclusive to the creatures we recognize as humans and that it goes beyond any kind of trivial or temporary features of our physiologies, psychologies, biology, technology or our cultures that happen to be the result of a divine power, history, social interaction, our free choice or evolution. Therefore when referring to human nature in this thesis I would be considering it, as our ethical being, that part of ourselves that allows us to “potentially communicate with and enter into a relationship with every other human being”.<sup>149</sup> As ethical beings it is within our nature to struggle, to realize ourselves, to search for meaning and value of life.<sup>150</sup>

But the debate goes beyond what human nature is considered to be, it also touches the issue of whether human nature is fixed and immutable, once and forever, or whether it could evolve. More recently we have the argument of Justin Sage, a German sociologist, who thinks that human nature is a shifting combination changeable over time.<sup>151</sup> I believe that, given the ethical grounds of human nature, it is plausible to argue that human nature is not fixed but rather dynamic. It is always flowing questioning, struggling, deciding, creating, imagining and arguing.

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<sup>145</sup> I agree that human beings are always looking for improvement. However this desire is developed in each individual in different ways, for some it is the desire for more power or money, for others to acquire new capacities, and for others to become better humans ethically speaking. Therefore I think desire is in our nature; however it should be our freedom what shapes our desires and not the other way around.

<sup>146</sup> Wilson, 1978, pp. 3-4.

<sup>147</sup> Eisenberg, 1972, pp. 123-128.

<sup>148</sup> Some people even argue that our human nature as technological beings has taken us to a cyborg nature, where every new generation is so immersed with technology that it is part of ourselves already. See Clark, 2007.

<sup>149</sup> Fukuyama, 2002, p.9.

<sup>150</sup> I believe we all have an innate potential to become ethical beings, even though not all reach to become one. I also believe that unless we get in touch with our ethical being we cannot transcend the stage of being just another hominid, instead of a human being.

<sup>151</sup> Sage, 2000, pp. 25-46.

If our human nature is dynamic, what is wrong with allowing it to continue changing? I believe there is a difference when we say that human nature is not fixed but rather dynamic, whereas saying that we should actively try to change it. In this regard, nanotechnology-based enhancements could interfere with our free will to construct ourselves and give meaning to our lives.<sup>152</sup> Nonetheless, there are people who regard the modification to human nature as the stuff of science fiction, not technological possibility. However, considering that the gap between science fiction and reality is closing it can be argued that the possibility to alter in unknown ways human nature lies in our path now. Therefore, we have to be prepared, since soon the line between cyborgs and human beings will blur and we have to start questioning ourselves what criteria should be considered in order to distinguish between them. Or rather until which point cyborgs are more machine than human? Can we say that a cyborg is only an enhanced human and therefore it does not change anything in our human nature?

How much our nature has to change before our descendants cease to be human is a question we are not yet ready to answer. In this respect it resembles the question about when, in the course of evolution, our ancestors became human- which is also unanswerable at the present stage of our thinking and knowledge. That humans are uniquely rational, intellectual, spiritual, self-aware, creative, conscious, moral, or godlike seems to be a myth – an article of faith to which we cling in defiance of the evidence. But we need myths to make our irresolvable dilemmas bearable. And our claims for nature are more: not mere myths but also aspirations, still waiting to become true...for now, if we want to go on believing we are human, and justify the special status we accord ourselves – if, indeed, we want to stay human through the changes we face – we had better not discard the myth, but start trying to live up to it.<sup>153</sup>

Even if we are not ready to answer what human nature is, it does not follow that we are not able to start realizing what is so important about being a human being. Aristotle argued that human notions of right and wrong are ultimately based on human nature. Habermas for instance sees the importance of our human nature in that it “is crucial for our capacity to see ourselves as the authors of our own life histories and to recognize one another as autonomous persons”.<sup>154</sup> Human nature has a special role in defining

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<sup>152</sup> This free will has been considered the root of our dignity, that part of our human personality that demands that other people recognize one's worth, what Socrates, in Plato's Republic, labeled as *thymos*, a Greek word usually translated as “spiritedness”.

<sup>153</sup> Fernández-Armesto, 2004, pp.169-170. One of the best descriptions I have found of human nature.

<sup>154</sup> Habermas, 2003, p.25.



what is right and wrong, just and unjust, important and unimportant, and is fundamental to our notions of a good life and the concepts of existence and meaning. I believe the previous give us good reasons to realize why human nature is so important.

Hegel and Habermas have also argued that human nature is also important because it is the base of our dignity. However if we only consider dignity as the struggle for recognition as Hegel suggested, the argument has some troubles. Firstly, since other primates also experience the struggle for recognition. And secondly, because some people consider that dignity should not only be granted to humankind but to all living entities as well.

In spite of these arguments on the importance of human nature, I do not consider human beings as more worthy than any other creature;<sup>155</sup> rather it could be that with nanotechnology new challenges will come for those that hold long-standing ideas of human distinctiveness. The fear is not only that we are just another kind of animal, which was the main concern with Darwin's ideas when opposed to the idea of our divine origin. The fear now is that with us turning into cyborgs, we are just another kind of machine. I believe that technologies are not the path for confirming the boundary between the human and non-human domains, but rather they tend to erode the distinction.<sup>156</sup> However, there are people that believe that nanotechnology can help human beings to transcend human nature and enter into a posthuman era.

## **5.2 Transhumanism: the path to a Posthuman era**

When analyzing the debate of transcending our natural confines, we again find ourselves in the field of enhancement, since it can be argued that when we enhance ourselves what we are looking for most of the cases is to transcend those natural confines. Therefore, the quest for transcendence is as old as the quest for becoming better. And history has shown us that the pursuit is not without ambivalences.

Francis Bacon, in the Age of Enlightenment, proposed to use science as a mean to achieve mastery over nature and in doing so improve the human condition. With the Renaissance and rational humanism, man saw the possibility of using technology to

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<sup>155</sup> In other words even if we are distinct from other animals that is not to say that we are more worthy than them, just because of our possession of reason and consciousness, language and morality. Unfortunately, many currents of thought have fallen into anthropocentrism.

<sup>156</sup> Either human and animal, human and machine, human and the environment, or human with other humans.

improve the human organism.<sup>157</sup> But the character that is considered to have more influence in the movement for overcoming the known human condition is the German philosopher Friedrich Nietzsche with his doctrine of *der Übermensch* (“the overman”).

Man is a rope stretched between the animal and the Superman- a rope over an abyss. A dangerous crossing, a dangerous wayfaring, a dangerous looking-back, a dangerous trembling and halting. What is great in man is that he is a bridge and not a goal: what is lovable in man is that he is an over-going and a down-going.<sup>158</sup>

Nietzsche proposed that “man is something that shall be overcome”, however he was not exactly thinking of a technological transformation.<sup>159</sup>

So what is this reached stage after we have overcome our present limitations? Well, this stage is what is called posthuman and it is the main goal of the transhumanist movement. In the literature two kinds of posthumanism are found, the first one is the posthumanism of disembodiment, which wants liberation from the limitations of the physical realm. The second kind and the one of relevance for this work, is the posthumanism of embodiment,<sup>160</sup> which recognizes continuities between realms that might be considered as distinct and bounded.<sup>161</sup> Francis Fukuyama, in his book *Our Posthuman Future*, takes a posthuman to be a biotechnologically transformed creature that has a human shell but is already separated from its natural biological origins. The definition I will consider in this thesis is the one that refers to the posthumans as technological creatures, cyborgs, successors of what would become an obsolete biological human. This posthuman is seen as possessing extraordinary and even new physical, intellectual and psychological capacities. So let us examine one of the eager movements to reach this stage, the transhumanist movement.

### 5.2.1 Transhumanist vs Bioconservatives

The transhumanist movement emerged from the borders of cyberculture in the late 1980s. However the term “transhumanism” seems to have been first used by Julian Huxley, a distinguish biologist and Aldous Huxley’s brother:

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<sup>157</sup> If man is formed by the same matter that obeys the laws of physics, then it is possible to manipulate man as its environment.

<sup>158</sup> Nietzsche, 1891.

<sup>159</sup> He was thinking more along the lines of elevated personal growth and cultural refinement.

<sup>160</sup> See Pepperel, 2005.

<sup>161</sup> Could be mind and body or human and machine, but more broadly is the continuity between humans and everything else in the world.

The human species can, if it wishes, transcend itself – not just sporadically, an individual here in one way, an individual there in another way – but in its entirety, as humanity. We need a name for this new belief. Perhaps *transhumanism* will serve: man remaining man, but transcending himself, by realizing new possibilities of and for his human nature.<sup>162</sup>

Therefore we can say, transhumanism, as the short form of transitional human, someone who due to the use of technology, his cultural values and lifestyle, constitutes an evolutionary link to posthumanity. Due to the ‘trans’ prefix, it can also be understood as the movement for transformation or transcendence of the present human condition.

The movement promotes the view that human enhancement technologies, such as nanotechnology, should be made safe and widely available and that the individual should have morphological freedom.<sup>163</sup> Even though they long for posthumanity, they have a special emphasis on identification and avoidance of hazards,<sup>164</sup> encouraging the use of information, public debate, and education as means to make wiser choices, rather than having a global ban on a broad range of technologies with huge potential benefits. Inside the movement, some subchapters and other branches have been born, such as the “extropianism” movement proposed by Max More:

Extropy is a symbol for continued progress and reflects the extent of a living or organizational system’s intelligence, functional order, vitality, and capacity and drive for improvement. Extropy is an essential element of transhumanism.<sup>165</sup>

The movement embraces the principles of “self-transformation”, “intelligent technology”, “boundless expansion”, “open society” and “dynamic optimism”.

However, the biggest result of the movement was the formation of the World Transhumanist Association (WTA) in 1998,<sup>166</sup> which holds slogans such as “transhumanity to save humanity” or “for the ethical use of technology to extend human capabilities”. It was formed “to provide a general organizational basis for all transhumanist groups and interest, across the political spectrum”,<sup>167</sup> in this sense

<sup>162</sup> Huxley, 1927. Quoted from (Hughes, 2004).

<sup>163</sup> That is respect the individual right to decide which and how these technologies apply to themselves.

<sup>164</sup> Such as military or terrorist abuse, unwanted social and environmental side-effects, and accidents. The movement also has a strong emphasis in respect of human rights and individual choice.

<sup>165</sup> From the page of the Extropy Institute. Available at: <http://www.extropy.org> (accessed on May 19, 2007).

<sup>166</sup> It was founded by the Swedish philosopher Nick Bostrom and David Pearce. Activities range between internet discussion, development of documents, representation in the media, organizing the annual conference “Trans Vision” and publication of the online journal of Evolution and Technology. See <http://www.transhumanism.org>

<sup>167</sup> Bostrom, 2005b.

transhumanism have had also a strong political effect, as James Hughes shows in his book *Citizen Cyborg: Why Democratic Societies Must Respond to the Redesigned Human of the Future*.<sup>168</sup> Other aims of the WTA are to “develop a more mature and academically respectable form of transhumanism” and take into consideration certain concerns such as equalizing access to these technologies across classes and borders.

Even though the transhuman movement seems to take ethical considerations; there are some who do not share their goal, mainly people in the bioconservative group.<sup>169</sup> They believe that we should not use human enhancement technology, such as nanotechnology, since they present a threat to human nature. Nevertheless, bioconservatives and transhumanist have certain things in common. They agree that technology has the potentiality to transform the human condition, and therefore it is needed to think about its practical and ethical implications. Both agree on the great advances that can be achieved in medicine and at the same time are concerned with the possible side-effects. However, bioconservatives think we should not pursue goals beyond therapy, even though as discussed in chapter 4 there is no agreement on the term, whereas transhumanist seem to fall victims of a blind faith in human perfectibility. As George Annas<sup>170</sup> pointed out, “it is not transhumanism we should worry about, it is dehumanization”. From the previous, it seems to me that both groups can learn from each other and set an open dialogue for obtaining real advances on a debate that needs to be addressed quite carefully.

### 5.3 The threat to human nature

We appeal, as human beings, to human beings: remember your humanity and forget the rest. If you can do so, the way lies open for a new paradise; if you cannot, there lies before you the risk of universal death.<sup>171</sup>

As seen in the previous section there is a fear that the ethical core in our human condition would be lost if we use nanotechnology for enhancing human beings, i.e. as

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<sup>168</sup> Hughes is the executive director of the WTA, and he argues in his book that transhumanism is the way of the “Next Left”, what he considers as something in between a “biopolitical right” and people in favor of technological exploration.

<sup>169</sup> Ancient notions of taboo, a romantic view of nature, certain religious interpretations, technocracy, objections to the consumerism hunger, are some of the beliefs held by this group. People like Leon Kass, Francis Fukuyama, George Annas, Wesley Smith, Jeremy Rifkin, and Bill McKibben are leading this group. Francis Fukuyama, for instance, identified transhumanism as “the world’s most dangerous idea”.

<sup>170</sup> Director of the Program on Medicine, Technology and Society at the UCLA School of Medicine.

<sup>171</sup> The last sentence of the Russel-Einstein Manifesto “Nobel Peace Prize Acceptance Speech”.

cyborgs. Some of the moral questions that these interventions arise are beyond difficult since they are altogether of a different dimension than the ones we have had to deal with in the past. In this section the aim is to discuss whether or not there is a real threat to human nature.

The deepest fear of several bioconservatists, and mine, is as stated by Fukuyama:

[...]is not a utilitarian one at all. It is rather a fear that, in the end, biotechnology will cause us in some ways to lose our humanity – that is, some essential quality that has always underpinned our sense of who we are and where we are going, despite all the evident changes that have taken place on the human condition through the course of history. Worse yet, we might make this change without recognizing that we had lost something of great value. We might thus emerge on the other side of great divide between human and posthuman history and not even see that the watershed had been breached because we lost sight of what that essence was...there is an intimate connection between human nature and human notions of rights, justice and morality.<sup>172</sup>

Another reason why some groups, especially some religious groups, are against posthumanity, is that according to them the human being is “God’s” creation. Therefore, if we try to modify the human condition, that would mean that we are messing with God’s creation and challenging God himself. So as Fukuyama argues, it is not only about respecting nature in general but also our own human nature. Even if we left aside the argument that most of the defenders of this argument see humans as creatures with a divine origin, for the sake of the argument let us consider only that we should not pursue further modification since it is against what is natural. Given that our physical and biological features condition us, and allow us to give a specific meaning to our experiences. If we pursue to modify them, it would bring as a consequence, that we might not be able to give any meaning to our experiences since the modifications we impose to ourselves are not natural anymore. However, this argument has the same problems regarding the definition of natural, that we already discussed in the therapy debate.<sup>173</sup> It can also be argued that technology is also part of our human nature,<sup>174</sup> therefore the argument that technology threatens human distinctiveness does not hold,

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<sup>172</sup> Fukuyama, 2002, p.101.

<sup>173</sup> Here I must emphasize that natural, even in our own nature, does not imply it is good. At the same time nature has shown us the tendency of all living entities to pursue change as a means toward self improvement and not simply for survival

<sup>174</sup> Humankind has always been improving itself with new technology. And since technology helps to pass knowledge to other generations in non-genetical ways, it might be seen as part of our human nature. However, I am not implying that we are or should try to be natural born cyborgs.

given that technology is created by humans in the first place, it cannot change human nature since it is already a result of it. So technology per se is not the problem,<sup>175</sup> but rather our choices for how to use technology. So if we are not prepared to decide how to use our own creations, then we are doomed, denying ourselves to discover a ‘more primal truth’, as Heidegger pointed out.<sup>176</sup>

It also seems quite arrogant of man to believe it has a special role on Earth that justifies any direction of its actions towards its whole environment. As members of humankind we have certain responsibilities towards all the other members of humankind and our environment, therefore we can not just go around doing whatever we want. We have to ask what the purpose of our desires is and then take responsibility of our actions. And in this same way we can say that there is a distinction, even if not a clear one, between “being a body” and “having a body”.<sup>177</sup> To be oneself requires us to understand what our body and mind are, in spite of what we add to them. Otherwise we reject the responsibility and meaning of being the “authors” of our own lives”.<sup>178</sup>

This decisive line between chance and choice is the backbone of our morality...we are afraid of the prospect of human beings designing other human beings, because this option implies shifting the line between chance and choice which is the basis of our value system.<sup>179</sup>

From the previous analysis I do believe and agree, that not being aware of this distinction can “change our ethical self-understanding”<sup>180</sup> as members of the species, and the basis of our morality. Being part of such a highly technological society makes it difficult, but not impossible, to rediscover the meaning of human bodily awareness in a way that reinstates and affirms the sense of self in nature.

Another objection is that if we pursue becoming cyborgs, we would threaten our social beings feature, “in the forms of communication through which we reach an understanding with one another about something in the world and about ourselves”,<sup>181</sup> as Habermas argues. As human beings we occur in relation with our cultural, technological and historical environment, not only in our physical and biological structure. Nonetheless, I believe our so called social interactions in the present are not

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<sup>175</sup> Some features may be improved rather than threatened by technology.

<sup>176</sup> Heidegger, 1957, p.308.

<sup>177</sup> See Plessner, 1970, pp.27-32.

<sup>178</sup> Habermas, 2003, p.63.

<sup>179</sup> Dworkin, 2000, p.427.

<sup>180</sup> Habermas, 2003, p.23.

<sup>181</sup> *ibid*, p.10

looking for understanding anymore, but rather we are using them as an easy way of releasing our feelings of boredom, of “despair not to will to be oneself”,<sup>182</sup> or the anxiety of not fitting in.

Another worry is that we are threatening our dignity. The first thing is to question the existence of a so called human dignity, to which Fukuyama answered that:

Denial of the concept of human dignity – that is, of the idea that there is something unique about the human race that entitles every member of the species to a higher moral status than the rest of the natural world – leads us down a very perilous path.<sup>183</sup>

But then we have the problem of defining what human dignity is. According to some humanists it is a result of an evolutionary ontological leap, whereas for some religionist it is a gift from God. For others it is just a mere social construction to legitimise the exploitation of non-humans by humans. It seems to me that dignity is an abstract and subjective construction, given that there is no agreement and some even consider the concept of dignity itself as indefinable. The features that have been considered the base of human dignity, such as consciousness, or intelligence, have turned out to be not as unique, as we used to think. Take for instance that recently in Japan robots were entitled rights, so we can ask ourselves if that is to say that they were entitled with certain kind of ‘dignity’? Is the uniqueness of human dignity starting to fade away? According to Fukuyama that is false. He argues that “there remains some essential human quality underneath that is worth of a certain level of respect –call it Factor X”<sup>184</sup>, and that human dignity is the result of this Factor X. In this respect, I think Fukuyama is being too anthropocentric, since I believe that our natural environment as a whole also has a ‘factor X’, that is worthy of a certain level of respect. So we should not only treat humans as ends and not as means as Kant’s well-known conclusion, but in general nature.

People that see a threat to human dignity, consider that this comes from the fact that introducing enhanced persons into society would bring as a consequence that ‘ordinary’

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<sup>182</sup> Kierkegaard, 1980, p.52-53. “in despair not to will to be oneself. Or even lower: in despair not to will to be a self. Or lowest of all: in despair to will to be someone else.”

<sup>183</sup> Fukuyama, 2002. p.160.

<sup>184</sup> *ibid*, p.149. I agree that what defines dignity is not one single thing; it is rather a conglomeration of features. As Fukuyama describes its “factor X cannot be reduced to the possession of moral choice, or reason, or language, or sociability, or sentience, or emotions, or consciousness, or any other quality that has been put forward as a ground for human dignity. It is all of these qualities coming together in a *human whole* [my emphasis] that make up Factor X.” (p.171). Fukuyama uses this argument against genetic modifications but is applicable to any human enhancement technology.

humans lose some of that moral status that they currently possess, since equal dignity can no longer be achieved.<sup>185</sup> For some people, the posthuman stage is just the result of the extinction of the human one after having corrupted human dignity by technological means. However transhumanists do not see why once we reach the posthuman stage we would stop having dignity, since dignity consist in what we are and what we have the potential to become. And as Bostrom argues: “By defending posthuman dignity we promote a more inclusive and humane ethics, one that will embrace future technologically modified people as well as humans of the contemporary kind”.<sup>186</sup> Hughes, another transhumanist, argues that once we are enhanced we should talk about personhood so there would not be conflict with human dignity since we would grant this “respect” to all conscious beings, aware of themselves, with intents and purposes over time.<sup>187</sup> The problem with this concept is that infants, young children, elders and mentally infirm could then be excluded.

I believe that both enhanced and not enhanced humans have dignity, although it will not be based in the same features. A person that uses a cochlear implant does not have more worth than one that does not, however dignity can be threatened if we decided to use nanotechnology for certain applications. But here the distinction lies in our choices and not in the fact that some are enhanced and others not. The real threat to dignity comes from us not from nanotechnology itself.

Another concern is our identity. In this respect some bioconservatists have said that having an identity is to have limits. Nevertheless, it can be argued that we all change our identities over time. Given this, the problem is not that we change our identities, but rather that once we become cyborgs it would be difficult to see if the decision was made by the human part or by the machine part of me. We would also detach from our cultural identities and personal pursuits since we would be immersed in a global net of thoughts and connections. Consequently, in order to maintain our personal identity, even if it is a dynamic one, a network of legitimately regulated relations of mutual recognition and physical integrity is needed.<sup>188</sup>

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<sup>185</sup> Fukuyama in this respect considers that differences between enhanced and unenhanced would create problems of discrimination and possible social conflicts, such as posthumans harming ordinary humans or even planning to eliminate them.

<sup>186</sup> Bostrom, 2005a.

<sup>187</sup> Hughes, 2004, p.222

<sup>188</sup> See Habermas, 2003, p.34



Autonomy has also been a great worry on the posthuman debate. Since the instrumentalization of human nature can interfere with our ethical freedom of deciding for ourselves. Humans will no longer be governed by nature, as Habermas argues.<sup>189</sup>

However, as was discussed previously, to base the distinction on what is natural and unnatural does not take us anywhere. Habermas also believes that if reaching a posthuman stage we would reach an inhuman level of predestination, affecting our “autonomous conduct of life and moral understanding”,<sup>190</sup> excluding us from the “spontaneous self-perception”<sup>191</sup> of being the exclusive author of our lives, what Fukuyama calls the “subjective illusion of free will”.<sup>192</sup> So it seems that the real threat is not the possible reduction of autonomy and undermining of self-perception, but rather that we believe so as a consequence of a flawed self-perception. Maybe what Habermas is trying to do is protect the roots of autonomy and not only the results of it. Here we have to be careful, since in trying to protect our autonomy we could be denying ourselves the very thing we are trying to keep.

In general it can be said that when considering arguments that focus on the threat to human nature, it would be wise not to fall into “metaphysical fantasy, religious providence and assumptions of the superiority of human nature”.<sup>193</sup> It is also important to see that enhancing ourselves for reaching a posthuman stage is not necessarily incompatible with comprehension of the purpose and meaning of humankind and the universe, but rather that considerations of our limited abilities must help to define the path we take for reaching that comprehension.

So if we do not know enough about ourselves in our current state, how can we claim that the posthuman stage is the right step to take? However, how can we claim it is not? Therefore as I will argue in next chapter, it is not about banning efforts to reach the posthuman stage, but rather to take small steps when trying to reach it, so we can be more aware of its consequences and the reasons for pursuing those changes.

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<sup>189</sup> Habermas argues against genetic engineering, but I think is possible to apply his argument for neuroimplants, brain/computer interfaces, and some other human enhancement technologies, since they can affect our self-perception of autonomy.

<sup>190</sup> Habermas, 2003, p.52.

<sup>191</sup> *ibid*, p.63.

<sup>192</sup> Fukuyama, 2002, p. 151.

<sup>193</sup> Smith, 2005.

## **\*Chapter 6\***

### **6.0 A different Approach**

There emerges a radiance which elsewhere seldom appears: a glow of courage, of love, of insight, of selflessness, of faith. In that radiance we see best what humanity was meant to be. . . . In the valley of suffering, despair and bitterness are brewed. But there also character is made.<sup>194</sup>

In the previous chapters I have analyzed the promises that nanotechnology bears for human enhancement and with it the possibility of entering a new era, posthumanity, as cyborgs. I have also analyzed the possibility of altering our human nature by using nanotechnology for enhancing ourselves. Therefore if the stage of cyborgs would be reached as a result of enhancing ourselves through nanotechnology, then I believe that this is reason enough to handle and review the ambiguities of the distinction between therapy and enhancement and to have a better understanding of what can be achieved with nanotechnology and the possible side-effects it can bring such as the erosion of our ethical being. When using nanotechnology-based human applications I argue for a different approach on the therapy-enhancement distinction, one that does not polarize the terms. First of all, since new technologies, such as nanotechnology, make the distinction between therapy and enhancement go beyond the medical field. Second of all, since therapy and enhancement are not only dynamic terms, but also that they overlap. And finally, because by polarizing the debate on therapy-enhancement, we are losing the opportunity to build a better future.

From all the previous considerations, I consider that an approach for better handling the distinction between therapy and enhancement is one that considers an elastic border between them. With 'elastic' I mean that supports both therapy and enhancement, given that both can be relative and that the line between them is in continuous movement.<sup>195</sup> However that is not to say that because there is an elastic border all kinds of enhancement should be allowed or that there is no point in establishing a regulatory scheme for nanotechnology when used for these purposes. In order to reach a more open discussion, the approach has to place emphasis on what enhancement is considered to be, and then on the forms that enhancement should and should not take; rather than

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<sup>194</sup> Wolterstorff, 1987, pp. 96-97.

<sup>195</sup> Returning to the definition of health I support in this thesis, it is obvious why is then needed a dynamic line between therapy and enhancement.

putting a ban on nanotechnology when used for enhancement. A deeper understanding of the reasons to become better is also required; as well as of the meaning, purposes and reasons of the activities or features to be enhanced. When speculating about possible implications, we should be careful, since we might overestimate the fact that any future uses of nanotechnology is determined both by the goals and practices of an ever changing society, and by the technology itself. From the previous, it can be argued that science and technology need to be in balance with the market as well as with the ethics of society.

Before entering in detail into the suggested approach I would like to lay out a classification of the human enhancements in accordance with the place they have in the human body:<sup>196</sup>

- Outside the body and personal (mediators, like mobiles phones and other wearable tools and devices).
- Outside the body and environmental (transport for instance, all the enhancers that are part of the environment we live in, but do not form part of our personal objects such as products, agents, or even places).
- Inside the body and temporary (ingestible, like medicines or other food).
- Inside the body and permanent (implants, such as new organs or even new skills).

For some people when the enhancer (the medium that allows enhancement) is located outside the body, it does not represent any problem, or if it is inside the body but only temporarily. However does it really matter whether enhancers are worn outside our bodies as opposed to being implanted? What is the moral difference of carrying around a personal computer rather than having a computer implanted in our bodies? And besides, we already have implants such as pacemakers and cochlear implants. In addition, research is being done for nanorobots that monitor our vital stats (blood pressure, heart rate, cholesterol levels and so on) and communicate them to a hospital wirelessly. Why should these implants be morally dubious?

Since it is problematic to base the distinction only in a classification like this, I believe it is better to use it in conjunction with a classification that focuses mainly on the different usages of nanotechnology, whether to restore, augment, improve or prevent

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<sup>196</sup> Roco, 2002, p.7.

a condition on human skills, attributes or capabilities. Therefore, the following approach, I consider could be more suitable when us together with the previous one:<sup>197</sup>

- Therapeutics
- Augmentation.
- Evolutionary Change.

### **6.0.1. Therapeutics**

It refers to those nanotechnology-based applications directed to restore or provide “normal” human capabilities to the sick, disabled or dysfunctional. Therefore conditions resulting from birth defects, disease or accidents would fall within this category.<sup>198</sup> One of the more important nanotechnology applications within this field is Drexler’s idea of cell repair machines - “we will build (nano) machines able to enter cells and to sense and modify their structure”.<sup>199</sup> These nano-machines will help not only to repair, regenerate, control metabolism and aid healing, but also to recognize and destroy bacteria, cancer cells, viruses, worms, abnormal growths and deposits on arterial walls. Other examples of therapeutic usages are:

- Restoring sight.
- Restoring hearing.
- Prevention of disease.
- Prosthetics for limbs
- Depression management.
- Memory restoration (Alzheimer’s).
- Mobility restoration (Polio).
- Optimizing oxygenization of blood.<sup>200</sup>
- Drug and hormone delivery in the body (personalized medicine).

Due to the fact that most of us would agree on using nanotechnology for these purposes, I consider that it is more important to focus on the other more controversial usages of nanotechnology. For instance, certain nanotechnology development could allow people without good oxygenization of blood to reach a “normal” human standard, according to his or her age, gender and other features that determined these “normal” levels. Nonetheless, that same development can also be used for athletes to do better in a competition. Therefore, in practice all three classifications should be included in

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<sup>197</sup> See Canton 2003. The approach is based on Canton’s classification, however the emphasis made here is for using it with nanotechnology-base enhancers.

<sup>198</sup> Canton, 2003, p.5.

<sup>199</sup> Drexler, 1986, chapter 7.

<sup>200</sup> Only when metabolism is compromised in a critical medical situation.

national and hopefully in the future international nanotechnology regulatory schemes. Where open and constant debates are taken when analyzing the usages of nanotechnology for human applications, mainly those focuses on implants. But I will come back to this point later.

### **6.0.2. Augmentation**

It refers to those nanotechnology-based human applications directed to augment human levels of performance.<sup>201</sup>

Some examples within the augmentation field are or would be:

- Enhanced memory.
- Augmentation of sensorial capacities such as hearing or vision.
- Increasing intellectual capabilities
- Brain-machine communication (cyborgs).<sup>202</sup>
- Optimized immuno-defense.

Since anyone who is a candidate for therapeutic applications could want augmentation as well, a limit should be established. Therefore, I consider that a suitable approach, when referring to augmentation, is one that considers the augmentation of cognitive, physical or other capabilities to certain percentage above the average when the application is permanent and inside the body, for instance a brain implant. In this regard, given that what a 'normal' human feature is considered to be is not constant, there cannot be an absolute limit for what normal is. From the previous, I believe that the use of certain percentage would allow a more flexible view on the limits of 'normality'.

Human features can be represented in a Gaussian distribution curve (often known as normal distribution, see Fig.1). Where the mean, that is to say the average of the distribution curve of certain feature, moves depending on variables such as time, country, age, gender and so on (depending on the considered human feature). Considering this, it can be argued that a percentage<sup>203</sup> above the mean in a determined time can be seen as acceptable, but more than the allowed percentage should have restrictions. Take for example vision, if someone wants to see more than the mean at that specific time, and the allowed percentage for vision is 5%, then if someone within

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<sup>201</sup> Most of the augmentation applications are only theoretical now, but in a near future might be available. Cognitive and physical augmentation are within the areas where more research is being done.

<sup>202</sup> The cyborg case within certain special considerations can be considered only as augmentation.

<sup>203</sup> I must acknowledge Steven Savage, since the idea emerged as a result of a very enjoyable discussion on nanotechnology.

the average levels of vision wants to augment his or her vision by 10% more, then it should not be allowed. These percentages should be established by open debates where not only scientists or policy makers are involved, but also society in general.<sup>204</sup> The percentages also have to be chosen within each society, since the mean could differ for different human features in different societies or groups. Nevertheless, even if desirable, in most cases consensus for establishing the percentages values will not be possible to reach. Therefore, the approach should at least try to take into consideration different views and the ones that most people agree upon. In a national level, I believe using certain percentage above the mean as a limit, would allow that nanotechnology-based applications in the national level are better distributed among society, rather than remain concentrated in a small group. Consequently, only when most of the population has reached access to certain nanotechnology-based enhancement, then the percentage can be reviewed and then maybe changed. However, in an international scheme the limit for establishing a percentage should not be more than one standard deviation ( $\sigma$ ) of the international normal distribution of a specific human feature. The standard deviation is a measure of the spread of the values of certain multiset of values. I believe that using one standard deviation on an international scheme as a limit, on the one hand, could help to have a more elastic perspective in the therapy-enhancement debate. And on the other hand, one standard deviation would allow for changes in the human condition at a more smooth rate of change, so most people could actually think about the changes they are doing to themselves, and in doing so prevent that something valuable is altered on the human nature. Finally, one standard deviation would delineate the border between augmentation and evolutionary change.

The reason for considering one standard deviation and not two or three, is that it seems to me that one standard deviation would give us a reasonable percentage for limit, since it would include a set of values for certain feature among a group of people, society or humankind, that most member within that group share. So the idea is based on the precautionary principle, allowing changes but in small steps.

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<sup>204</sup> In this respect, the approach could also be helpful when taking into consideration justice issues of nanotechnology. However this will not be discussed in this paper.

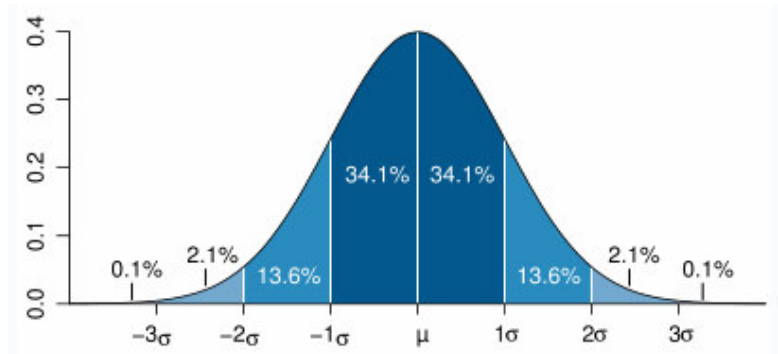


Fig.1. Standard deviation diagram

viewed 28 April 2007, <[http://en.wikipedia.org/wiki/Image:Standard\\_deviation\\_diagram.svg#file](http://en.wikipedia.org/wiki/Image:Standard_deviation_diagram.svg#file)>

### 6.0.3. Evolutionary change

It refers to those nanotechnology-based human applications directed to augment human levels of performance or physical attributes to levels above one standard deviation, so it would imply a change on a human feature beyond any other change throughout human history (for instance if the average of life span in developed countries is 72 years then it would not be allowed to increase it to 144 years, since it is a change that goes beyond one standard deviation in that point of time). I consider that nanotechnology-based human application above one standard deviation would imply re-designing our human limits, and therefore could be a possible threat to human nature. As a result, I argue that it should be considered as morally dubious. Examples of future applications are:

- Longevity enhancement.
- Infra-red night vision.
- Embedded wireless communications.
- Superior robotic limbs.
- Brain to brain communication.
- Expanding sensorial functions.
- Cyborgs.

## 6.1 Special Considerations

Firstly, the categories above should not be considered as absolute, rather dynamic and open to review, since individual and society needs (and features) change through time. Secondly, despite the fact that there are different views and approaches with the aim to handle better new technologies, the approach suggested above is focused on nanotechnology-based human applications.

As a reflection of the different problems, some have proposed that research and development in nanotechnology should be banned;<sup>205</sup> others that a non-government regulatory or advisory commission should be set up such as the International convention for the Evaluation of New Technologies that the ETC Group proposes;<sup>206</sup> while others suggest adopting design guidelines such as the ones proposed by the Foresight Institute or the ETC Group Laws for the Introduction of new technologies.

[]. Countries must regulate the development and use of technology politically, setting up institutions that will discriminate between those technological advances that promote human flourishing and those that pose a threat to human dignity and well-being. These regulatory institutions must first be empowered to enforce these discriminations on a national level, and must ultimately extend their reach internationally.<sup>207</sup>

Given that the introduction of nanotechnology is not inevitable and ethics is dynamic, I argue that the best option might be a non-government advisory council that helps formulating ethical guidelines and policies, that monitors and evaluates research, and that empowers society to participate in open, informed debates. We have to acknowledge that the path nanotechnology might take will also rely on all the 'stakeholders', that is to say scientists, researchers, politicians, legislators and society in general. For that reason, I consider important to have an ethical and regulatory parallel progress, as knowledge and new nanotechnology applications are being developed, since it is the only way to prevent non-desired consequences for humankind. We cannot wait until nanotechnology-based human applications are on the market; research and other actions have to be taken in the meantime. I also believe that the emphasis on the ethical and regulatory scheme should be done in the areas where they can have benefits for humankind before going into areas where self-satisfaction is the only driving force for using nanotechnology.<sup>208</sup> That is why in the suggested approach I firmly embrace therapeutic use of nanotechnology while I consider that we should be more careful when entering augmentation and restrict those that aim at evolutionary change.

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<sup>205</sup> Joy, 2000, See also Wæckert, 2004, p.5

<sup>206</sup> ETC Group, 2003, p.72.

<sup>207</sup> Fukuyama, 2002, p.182.

<sup>208</sup> I do not have any doubt that nanotechnology can help humankind, and I really think that a good example of this is how the United Nations Development Programme is using nanotechnology for helping to achieve the Millennium Development Goals.



Throughout history individuals have always found ways to break regulatory schemes, (take for instance moving research to other countries with different regulation schemes or pursuing it illegally). Given the previous, I argue that it is not a ban of nanotechnology that would prevent that it affects our ethical being or that we become cyborgs, but it is through reinforcement of our ethical being that better results and wiser choices can be made. A deeper understanding is also needed as society and individuals of our goals, desires and the meaning of our lives and bodies.

I consider dubious that reaching the state of cyborgs will provide us with answers to the fundamental and perpetual questions of humanity. Consequently becoming cyborgs cannot be the key to the pursuit of human excellence.<sup>209</sup> If we never felt the strong feelings or emotions of our own shortcomings and limitations, we would never aspire to become stronger, more compassionate, better or wiser. From the previous, I think it can be argued that the more we enhance certain human features, the more we erode the ones that in a way define our humanity, since we stop constructing ourselves, leaving our choices more and more in the ‘hands’ of machines. Such self-caused immaturity is not lack of intelligence, but rather “lack of determination and courage to use one’s own intelligence without being guided by another” as Kant once said it.<sup>210</sup>

## 6.2 Conclusion

Nanotechnology is playing and will continue to play an important role in the way we build our future. Nanotechnology can without any doubt help human kind to find good engineering solutions to material challenges and technical problems. On this thesis the focus is in nanotechnology-based human applications, i.e. implants, which are one of the areas that should be addressed really carefully, since they would help us to reach the stage of cyborgs, and with this posthumanity. Another reason for addressing carefully nanotechnology-based human applications is due to the fact that these developments have the potential to challenge held notions of what means to be human, of human equality and the capacity of moral choice. They might change our understanding of human personality and identity. They also could alter the nature of

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<sup>209</sup> Human excellence as the goal once we reach our ethical beings. It is also important to emphasize that technology is supposed to be designed to help us to make our lives easier and more comfortable, not to help us in our quest of meaning and human excellence. Every time humans have tried to use technology for such means, it has not turned out too good.

<sup>210</sup> Kant 1986, cited on Bostrom, 2005b.

global politics,<sup>211</sup> since they have the potential to control us and affect the rate of intellectual, material and political progress. But most worrisome, as I have argued in this thesis, they have the potential to alter in an undesired way human nature. Given that justice, morality and the good life are notions founded in our human nature, I consider then, that a better understanding of the direction and reason for nanotechnology-based human applications is needed.

Nonetheless, I have also argued that the consequences of nanotechnology-based human applications are not to be blamed on the technology itself, but rather on our never satisfied desire for enhancement. “Nanotechnology is not a force to be followed”.<sup>212</sup> We have to acknowledge that the future of nanotechnology is not independent of human will, but rather it is constructed through our actions, intentions, desires, and beliefs about how we want to live, who we are and what we aim to achieve. Since intentionality is involved in the development of nanotechnology, we cannot overlook that with it comes responsibility. So it is not the pursuit or worthiness of new knowledge that I question here, but rather humanity’s intellectual and ethical capacity to use it well, in light of the prospects of nanotechnology-based human applications.

We also have to bear in mind that it is very unlikely that a ban on nanotechnology-based human applications will achieve its purpose without taking away the benefits of research in nanotechnology. However, permitting everything is not an option either. Therefore, I have also argued for a different approach, one that is more dynamic and open compared to the polarized therapy-enhancement one, when addressing nanotechnology-based human applications. The suggested approach also emphasized the need to find a middle ground, where regulation, moral commitment of society in general and open debate would help us to build our future, instead of our voracious consumption or idealism of self-improvement through nanotechnological development.

Human progress is not only achieved through technological and economic measures, but also, and what I consider even more important, is that human progress can also be achieved through moral improvement. Consequently, I believe it is needed, firstly, to go through all the different ethical analyses of nanotechnology. Secondly, to analyze the kind of institutions and regulatory schemes required for nanotechnology development. Finally, to review the relationship we bear with technology, and with our own beliefs

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<sup>211</sup> Fukuyama, 2002, p. 82

<sup>212</sup> Berne, 2005, p.166.

and desires about it.<sup>213</sup> This last point is really important since every time our surroundings become more and more technology-dependant and technologically constructed, and also since we perceive technology as a way for addressing needs beyond the basic needs, such as longings for meaning and purpose.

Considering the rate of the changes we are seeing with nanotechnology, I hope ethical reflection does not stay on the bookshelf, but that society really grasps the importance of addressing the topics concerning human enhancement and nanotechnology-based human applications.

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<sup>213</sup> Berne, 2005, p.312.

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