

# TOWARDS A RADICAL RECONSTRUCTION OF THE HUMAN VISAGE: FROM NBIC CONVERGENCE TO SINGULARITY TALK

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The unprecedented advancements in science and technology in the last two decades gave rise to two major currents that undergird the transition from transhumanism to posthumanism. The first technological trend involves the convergence of technologies while the second trend projects the dawn of the Age of Singularity. The U.S. National Science Foundation used the phrase “convergent technologies” to refer to the synergistic combinations of (a) nanoscience and nanotechnology; (b) biotechnology and biomedicine, including genetic engineering; (c) information technology, including advanced computing and communications; and (d) cognitive science, including cognitive neuroscience. The complementarity of these technologies in the NBIC is summed up by Wallace in the following supposition: “If Cognitive Scientist can think it, the Nano people can build; the Bio people can implement it, and the IT people can control and monitor it.” This converged platform, with particular emphasis on the collusion of information and cognitive science, will have a profound impact on our concept of what it means to be human. As Kurzweil projects it, by 2040, human intelligence will be multiplied in a billion-fold. The further miniaturization of computers will make their integration with human bodies and brains highly plausible. Man will have the capacity to transcend the limits of human nature. In the light of these developments, how we would paraphrase the concept of the human person?

The paper will principally examine the emergent societal and ethical issues and concerns of the NBIC Convergence and the Age of Singularity. One of the areas which appear to be ethically problematic is

the blurring boundaries between nature and artifact. It will have significant repercussions on what it means to be truly human. The unbounded possibilities poised to introduce a rupture in understanding anthropology will engage us in serious reflection. How will man-machine interface affect our concept of the human person? How much nano-implants and nano-prostheses will make man non-human? How will neural implants impact our concept of freedom and autonomy? If these brain implants influence our capacities and functioning as human beings, do we assign a moral status to them? Can we hold them responsible for unethical and illegal human activities?

### **Introduction**

We have witnessed how technologies in the past have changed the way we think and live. These technological leaps and milestones were conveniently referred to as technological ages like the Industrial Age, Atomic Age, Space Age and Nuclear Age; and nowadays, we talk about the Digital or Information Age, Biotechnology Age and Nano Age. As previous technologies have transformed every fabric of human society in ways we have never thought possible, emerging technologies such as nanotechnology, biotechnology, and information technology are likely to have greater and more profound societal impacts and intergenerational implications. Modern technologies have not only become pervasive but more and more invasive as they are now integrated into our bodies, thus, blurring the fringes between the natural and artificial. Transhumanists are convinced that this will commence at much faster pace with the idea of interdisciplinary approaches and convergence of technologies towards the improvement of human performance and unparalleled increase in society's productivity. In Kurzweil's prognostics, Age of Singularity is drawing near.

In this paper I intend to discuss the meaning of convergent technologies based on the NBIC report, elaborate on the Kurzweilian idea of Singularity, extrapolate the concept of the ideal man in the NBIC Project and in Kurzweil's vision of singularity, demonstrate nanomedicine as a test case for developing potential applications of converging technologies and lastly, examine the broader societal and ethical implications of convergence and singularity.

## The Nano-Bio-Info-Cogno Convergence

It would appear that the idea of convergence was first used in the report entitled *Converging Technologies for Improving Human Performance: Nanotechnology, Biotechnology, Information Technology and Cognitive Science*. This was based on a conference co-sponsored by the National Science Foundation and Department of Commerce, held in 2001. It was edited by Mihail Roco and William Sims Bainbridge and was published in 2003. The report defines “convergent technologies” as the synergistic combination of (a) nanoscience and nanotechnology; (b) biotechnology and biomedicine, including genetic engineering; (c) information technology, including advanced computing and communications; and (d) cognitive science, including cognitive neuro-science.<sup>1</sup> Initially, it proclaims the dawn of a new age:

We stand at the threshold of a new re-nnaissance in science and technology, based on a comprehend-sive understanding of the structure and behavior of matter from the nanoscale up to the most complex system discovered in the human brain. Unification of science based on unity in nature and holistic investigation will lead to techno-logical convergence and a more efficient societal structure for reaching human goals.<sup>2</sup>

In the same report it was asserted that “sciences have reached a watershed at which they must combine in order to advance most rapidly.”<sup>3</sup> It also maintained that humanity will benefit from the convergence of technologies within 10 to 20 years. The task is metaphorically articulated as rekindling the spirit of the Renaissance, where holism reigns supreme

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<sup>1</sup>Mihail C. Roco and William Sims Bainbridge, ed. *Converging Technologies for Improving Human Performance - Nanotechnology, Biotechnology, Information Technology and Cognitive Science*, NSF/DOC-sponsored report, ed. National Science Foundation, (June 2002, Arlington, Virginia), 11; available from [www.wtec.org/ConvergingTechnologies/Report/NBIC\\_report.pdf](http://www.wtec.org/ConvergingTechnologies/Report/NBIC_report.pdf), 1; Internet; (cited hereafter as *Converging Technologies*).

<sup>2</sup>Ibid.

<sup>3</sup>Ibid.

over specialization and intellectual fragmentation, anchored in the fundamental unity of natural organization. The report likewise cited that the unification of science and technology is based on four major principles<sup>4</sup>:

1. *Material unity at the nanoscale and on technology integration from that scale.* This means that technology harnesses the use of natural processes to create new materials, products and devices from the nanoscale up
2. *NBIC transforming tools.* This emphasizes an inter-disciplinary nature where previously separated fields can now interface with one another using the same scientific instruments and methodologies
3. *Complex hierarchical systems.* This refers to understanding research problems as an integrated enterprise and allows for synergy with other areas
4. *Improvement of human performance.* The convergence aims to meet social, economic and political challenges by enhancing human mental, physical and social abilities.

In order to accomplish this gargantuan feat, strategies of transformation were formulated. These include focused research and development, increased technological synergy, developing interfaces among areas in science and technology and a holistic approach to monitor societal changes. Apart from these schemes, the report also emphasized the need for education and training in multidisciplinary research and development as well as addressing legal and moral concerns. Given these transforming tools, what are the possibilities that are poised to create an impact on the image of man? The NBIC report envisions the following possibilities:<sup>5</sup>

- The human body will be more durable, healthier, more energetic, easier to repair and more resistant to many kinds of stress, biological threats and aging processes
- A combination of technologies and treatments will compensate

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<sup>4</sup>Ibid.

<sup>5</sup>Ibid., 5-6.

for many physical and mental disabilities and will eradicate altogether some handicaps that have plagued the lives of millions of people

- National security will be greatly strengthened by light-weight, information rich war fighting systems, capable uninhabited combat vehicles, adaptable smart materials, etc.
- Instantaneous access to needed information, whether practical or scientific in nature
- The ability to control the genetics of humans, animals and agricultural plants

Based on these projections of human enhancement goal, the report prefigures and suggests the normative concept of the future visage or the image of the ideal human being and well as his desirable values. By looking at the research priorities identified by the workshop participants, we can delineate the ideal human beings as ‘technosapiens’, beings with expanded cognitions, with enhanced sensory capabilities, ready for brain-to-brain and brain-to-machine interfaces. The image is far removed from the creative, impassioned and self-motivated man of the Renaissance which it tries to reinvent. Schummer painted this image or model of man as possessing “an almost complete lack of emotional, moral, and political capacities, while social capacities are reduced to the exchange of information, obedience to a kind of totalitarian order, and the removal of disagreement by unified indoctrination.”<sup>6</sup> Further, he argued that the ideal human being is the paragon of the perfect soldier in combat and made reference to the summary of military workshop section of the same report to illustrate how convergence will operate:

*Applications of brain-machine interface.* The convergence of all four NBIC fields will give war fighters the ability to control complex entities by sending control actions prior to thoughts (cognition) being fully formed. The intent is to take brain signals (nanotechnology for augmented sensitivity and nonintrusive signal detection) and use them

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<sup>6</sup>Joachim Schummer, *From Nano-convergence to NBIC-Convergence*, 2008 [journal on-line]; available from [http://www.joachimschummer.net/papers/2008\\_Nano-NBIC-Convergence\\_Maasen-et-al.pdf](http://www.joachimschummer.net/papers/2008_Nano-NBIC-Convergence_Maasen-et-al.pdf); Internet; accessed 23 July 2010.

in a control strategy (information technology) and then impart back into the brain the sensation of feedback signals (biotechnology).<sup>7</sup>

### **Approaching the Age of Singularity**

Ray Kurzweil boldly proclaims that 2045 is the Age that man becomes immortal.<sup>8</sup> He is convinced that the exponential growth in computing technologies following Moore's Law is the key to the transition from our age to the Age of Singularity. And by that he meant that "the moment when technological change becomes so rapid and profound, it represents a rupture in the fabric of human history."<sup>9</sup> Like all other transhumanists, Kurzweil believed that technological singularity is man's destiny and in order to prepare for this inevitable future, he founded the Singularity University Training Center intended for corporate executives and government officials dedicated to "assemble, educate and inspire a cadre of leaders who strive to understand and facilitate the development of exponentially developing technologies, and apply, focus and guide these tools to address humanity's grand challenges."<sup>10</sup> When the time comes, man will transcend the limits of his nature by having smarter-than-human intelligence and faster-than-human-intelligence. This is essentially Kurzweil's prototype of the Transcendent Man.

While there is disparity of opinions between singularitarian and other transhumanist groups as to when and how Singularity will develop, there is a consensus among them regarding their unshakeable belief in the power of technology to shape the future of humanity which will allow us to overcome our feeble nature. This is the vision conjured by the National Science Foundation through the rhetoric of converged platform of technologies for the improvement of human performance. I

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<sup>7</sup>Roco & Bainbridge, *Converging Technologies*, 329.

<sup>8</sup>Lev Grossman, "2045 'The Year Man Becomes Immortal,'" *Time Magazine*, 21 February 2011.

<sup>9</sup>Ibid.

<sup>10</sup>See Singularity Institute for Artificial Intelligence, available at <http://singularity.org/>; accessed on 18 February 2012.

would like to believe that singularity, if it is going to happen at all, will be a sudden and abrupt phenomenon, but in order to make it happen, society must take a conscious and deliberate choice. One way of enabling the transition is by blurring the boundaries between the natural and the artificial. Human enhancement technologies will contribute greatly to the erosion of these boundaries. It will be impossible to tell when nature is artificialized or artifacts are naturalized.<sup>11</sup> Nanomedicine and nanomedical technologies will broaden the overlap between the natural and the artificial.

The exponential rate of increase in information technology, the remarkable progress in cognitive science, particularly in AI research and nanobiotechnology which is the subset of the converging technologies, blur the boundaries between human and non-human, between life and non-life. Based on the study of Lin and Alhoff, scientists have created and successfully mimicked nature through artificial noses with nano-sized sensors that can sniff out smells that are otherwise imperceptible to humans, artificial compound eyes and artificial skin to mimic the sensitivity of touch.<sup>12</sup>

Transhumanists placed their hopes on Genetics, Nanotechnology and Robotics (GNR technologies),<sup>13</sup> as catalysts of the new Age of Singularity. The potential for these technologies to extend life span by reversing aging and eliminating diseases and ultimately death has reinvigorated enhancement and therapy debate. What has been previously imagined as science fiction has established scientific grounds with the rapid advances in nanomedicine and medical nanotechnologies? The use of nanotechnology will enable site-specific treatments by packaging or encapsulating the active ingredients of

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<sup>11</sup>Xavier Guchet, "Nature and Artifact in Nanotechnologies," *HYLE* 15-1 (2009); [article on-line]; retrieved on 13 October 2009 from [www.hyle.org/journal/issues/15-1/guchet.pdf](http://www.hyle.org/journal/issues/15-1/guchet.pdf); Internet; accessed 2009.

<sup>12</sup>Fritz Allhoff and Patrick Lin eds., *Nanotechnology and Society Current and Emerging Ethical Issues*. (USA: Springer Science, 2009), XXV.

<sup>13</sup>GNR technologies were cited in the article of Bill Joy. See Bill Joy. *Why the Future Does Not Need Us*; [article on-line]; available from [www.aaas.org/spp/rd/ch3.pdf](http://www.aaas.org/spp/rd/ch3.pdf); Internet; retrieved 7 November 2009.

drugs to be delivered in the precise location where and when they are needed. Targeted drug delivery system will make treatment of diseases highly efficient and effective since nanoparticles remain undetected by the immune system and able to penetrate biological barriers without the risk of side-effects.<sup>14</sup> At the same time, findings in pharmacogenetics reveal that drug efficiency is affected by genetic factors. This opens up the possibility for tailored therapies or individualized medicine.<sup>15</sup> It is called tailored treatment since it is addressed at a specific disease process (like a person's genome) and customizes treatment based on the patient's response. The use of RFID devices or chips as human implants has been widely commercialized. An example of this is the VeriChip, a human implant, which is approximately the size of the grain of rice and is injected in the fatty tissue below the triceps.<sup>16</sup> It is designed primarily to access medical records in order to provide prompt quality care for patients in emergency cases.

### **The Broader Societal and Ethical Implications**

As technology becomes integrated into our human bodies, neural implants or computers chips in the human brain can become a reality. Human enhancement is not just a matter of personal choice. It will have intra-generational and inter-generational implications.<sup>17</sup> Modern societies have been used to pacemakers, implants and prostheses. We cannot relinquish these technologies. However, the basic question that we really need to address is how far should we go in enhancing ourselves?

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<sup>14</sup>See Fritz Allhoff, *The Coming Era of Nanomedicine*; [journal on-line]; available from [http://files.allhoff.org/research/Coming\\_Era\\_Nanomedicine.pdf](http://files.allhoff.org/research/Coming_Era_Nanomedicine.pdf). Accessed 6 August 2010. Also, see Harry Tibbals, *Medical Nanotechnology and Nanomedicine*, (New York: CRC Press, 2011), 110.

<sup>15</sup>Tibbals, *Medical Nanotechnology and Nanomedicine*, 476-79.

<sup>16</sup>Fritz Allhoff, et al, *What is Nanotechnology and Why Does It Matter? From Science to Ethics* (UK: John Wiley and Sons Ltd., 2010), 204.

<sup>17</sup>This means that our decisions about enhancement technologies will affect not only the present generation but will have far-reaching implications into the future. These concerns were addressed by the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) and argues strongly for the adoption of Precautionary Principle.



The blurring boundaries between the natural and the artificial are feared as the “conjurer” of eugenics by the backdoor.

Allhoff and Lin maintained that enhancement will broach certain issues concerning freedom, health and safety, fairness and equity, social disruption and human dignity.<sup>18</sup> Pro-enhancement advocates claimed that enhancing oneself is a matter of choice, an exercise of human freedom. However, this freedom is never absolute. Certain limits have to be defined to guard against conflict with the freedom of others. With neural implants and mood altering drugs, which may influence or interfere with our deliberative process, are we really acting as free agents? How will neural implants impact our concept of freedom and autonomy? If these brain implants influence our capacities and functioning as human beings, do we assign a moral status to them? Can we hold them responsible for unethical and illegal human activities?

Human enhancement technology appears to be risky and it is rather early to adjudicate that it cannot affect the germ line or that enhanced traits cannot be passed on to the next generation. Some of the effects may be indirect or may not even be visible in the short-term. Extending the life span of an individual may be good for that individual but an aggregate scale may create a problem to the society.

Likewise, enhancement technologies will widen the socio-economic disparity in the society. Only the wealthy can have access to enhancement technologies and can enjoy the benefits and advantages of being enhanced. This will create social and economic disruptions. High paying positions will be reserved only to those who have the powers of the enhanced. Hence, it is very likely that it will result into the “tyranny of the enhanced.” Lastly, the sternest resistance to human enhancement technologies is its impact on human dignity and the essence of being human. How much nano-implants and nano-prostheses will make man non-human? If morality and fallibility add a dimension of meaning

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<sup>18</sup>Patrick Lin and Fritz Allhoff, *Untangling the Debate: The Ethics of Human Enhancement*; [journal on-line]; available from [http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1004&context=phil\\_fac](http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1004&context=phil_fac); Internet; accessed 17 September 2010.

in human life, will we lose our humanity when we become immortal? Will omniscience and omnipotence affect human striving and will to meaning?

## CONCLUSION

Insofar, what we have done in this paper is to present the vision of National Science Foundation on improving individual performance and that of the society through converging technologies, then to juxtapose it with Kurzweil's vision of singularity. The assumptions and claims by Roco, Bainbridge and Kurzweil that were presented herein will have significant implications on redefining the idea of the human person. While the NBIC Report made no explicit mention of posthumanism, it reverberates on the same chorus sung by Kurzweil and other transhumanists. The attempt towards a radical reconstruction of the human visage, as we have demonstrated in this paper may be direct or overt as the Kurzweilian discourse publicly professed and propagate or it would be as subtle or covert as the vision of the National Science Foundation. Simply put, the convergence of nano-bio-info-cogno will hasten the transition to posthumanism or Kurzweil's Singularity Age. This subtle and encrypted rhetoric expressed in vision and goals will redefine our normative understanding of what it means to be human. Thus, the tenor of discourses in both projects focuses on man as feeble and faulty.

If and when Singularity occurs, it will broach ethical and societal concerns which we must consider seriously. This paper presented some of these moral quandaries. Modestly, we have barely touched the surface of highly complex and interdisciplinary issues and concerns. An earnest reflection and an active engagement of the society in the ethics of emerging technologies will be the initial step towards responsibly charting man's future.

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