

Ethics and artificial intelligence

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1. A commission's congress on converging technologies

In September 2005, the "Scientific and Technology Foresight Unit" of the Science Department of the European Commission organized a very interesting meeting on "converging technologies".

What is it about? With the spectacular advances of nanotechnologies¹ and also of the cognitive, biological, and informational sciences, one witnesses in the U.S., the European Union and the rest of the world a phenomenon of convergence of technologies and scientific approaches. In fact, when the scientist is working at the level of the very small—that is, at the nano-level, it is difficult to distinguish if one works with chemistry, biology, physics, informational sciences... or nano-sciences. In fact, they might well be working with all disciplines at once. Indeed, the traditional distinctions between the scientific disciplines, as we once knew them, are dissolving at the nano-level.

Science is rapidly changing, and some speak of a new scientific paradigm. At the technological and research level, a similar junction/fusion is occurring between biology, cognitive, informational and nanotechnologies.

This convergence between sciences and technologies at the "nanolevel" implies a different approach of all the educational systems, and of student preparation. From the first day, students will need to be educated in a transdisciplinary way and to be able to switch from one discipline to another, or even to navigate in a new one which may be a synthesis of a few traditionally separated disciplines.

All this also means that the nanosciences now have access to the building blocks that are the essence of life itself. As Dorothee Benoit Browaeys, journalist in Paris, and founder of the project "Living" observed², "If one can observe, manipulate, simulate the bricks of the living, one also can invent new structures. This is the field which has been opened namely by the nanotechnologies." We are emerging on possibilities that were unsuspected a few years ago, but which pose formidable questions.

At the beginning of the Conference, the European Commission mentioned the existence of an important report presented to the president of the U.S., George W. Bush in 2002. The Commission pointed out that the vision of the U.S. "raises questions" and suggested another approach to the "converging technologies."

¹ The nanotechnologies are technologies which work at the level of the cell size or the nanometre (one millionth of a millimetre or one meter divided by 1000 millions). One is attending at a new change of scientific paradigm, because, at the level of the cell, it is difficult to distinguish what relates to physics, biology or chemistry. This is another world where the classic distinctions between the modern sciences are relative.

² See <http://www.vivantinfo.com/index.php?id=121>

2. The US National Science Foundation Report

Let us review the U.S. National Science Foundation report³ and make clear the implicit concept of the science and the technology, which are at the basis of this report. This will be later very useful.

It is worthwhile at least to read the summary of the U.S. report. There is a quiet and serene description of the two scenarios we just mentioned—the progressive replacement of man by more and more intelligent machines, which reproduce themselves on their own and, on the other hand, the manipulation of the human brain modestly called “improvement of human performance.” Science is also mentioned in totally “modern” terms. I would even say in much more purely modern terms than European modernity. Following is this eloquent text⁴:

“Science must offer society new visions of what is possible to achieve. The society depends upon scientists for authoritative knowledge and professional judgment to maintain and gradually improve the well being of citizens, but scientists must also become visionaries who can imagine possibilities beyond anything currently experienced in the world. In science the intrinsic human need for intellectual advancement finds its most powerful expression. At times, scientists should take great intellectual risks, exploring unusual and even unreasonable ideas, because the scientific method for testing theories empirically can ultimately distinguish the good ideas from the bad ones. Across all of the sciences, individual scientists and teams should be supported in their quest for knowledge. Then interdisciplinary efforts can harvest discoveries across the boundaries of many fields, and engineers will harness them to accomplish technological progress.”

Thus, in this report, science itself becomes the altar of objectivity and truth. It is almost revered as divine, since its method distinguishes the true from the false (the “good” from the “bad”), and, thus, leads humankind toward the truth. The public can only “depend” on scientists and must be educated, because if it opposes the progress of science, it means that it is in the darkness of ignorance. In brief, it is a marvellous homage to science, corresponding to the “modern” vision of the 1800s in Europe.

3. U.S. critics and debate

As Jeremy Rifkin⁵ correctly says, the US for historic reasons has imported a “modern” vision of science, which became frozen in 1800. This vision of science did not change, because it was cemented in the American dream together with the protestant Puritanism. In addition, this gave birth to the powerful American dream that strongly believes in progress generated by science and technology but, at the same time, by the divine blessing which can manifest itself by the economic success of each citizen having the courage and the will to work hard and be honest. According to Rifkin, this vision of science has not changed in the U.S. precisely because it was sacralised in the American dream that no one dares to touch or decry. It has remained “deep frozen” since 1800.

This “modern/1800” vision of the U.S. Report about the convergent technologies brings up frightful questions. This “practically infallible vision of science” permits to totally short-change the ethical debate. So that the report clearly shows that the political and scientific leadership of the U.S. gave the green light, without inner thought, on the one hand, for the development of

³ *Converging Technologies for improving Human performance*, National Science Foundation, Arlington 2002, National Board of Commerce, USA. <http://www.technology.gov/reports/2002/NBIC/Part1.pdf>.

⁴ See *US report*, p. 40: “Motivation and outlook: Theme Summary of Panel by US representative of Governmental agencies.”

⁵ Jeremy RIFKIN, *The European Dream : when Europe's Vision of the Future is Quietly Eclipsing the American Dream*, Tarcher Penguin, 2004. See the brilliant chapter 15: “A second enlightenment”, pages 315-357.

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intelligent robots, capable to replace man, and, on the other hand, they do not hesitate to contemplate calmly the manipulation of the human brain to increase its potential.

I encourage the reader to go to the Internet to read at least the summary of the report, because I cannot go further in depth here.

But I shall here present two reactions of well-known scientists who sound the alarm.

The first is the very famous article by Bill Joy, the creator of the Java and other programs at Sun Microsystems⁶. Bill Joy wrote in 2000, in the fashionable technology magazine, *Wired*, an article that sounds the alarm and tries to launch a debate on the future of technology in the U.S. Here are significant extracts:

“First let us postulate that the computer scientists succeed in developing intelligent machines that can do all things better than human beings can do them. In that case presumably all work will be done by vast, highly organized systems of machines and no human effort will be necessary. Either of two cases might occur. The machines might be permitted to make all of their own decisions without human oversight, or else human control over the machines might be retained.”

If the machines are permitted to make all their own decisions, we can't make any conjectures as to the results, because it is impossible to guess how such machines might behave. We only point out that the fate of the human race would be at the mercy of the machines. It might be argued that the human race would never be foolish enough to hand over all the power to the machines. But we are suggesting neither that the human race would voluntarily turn power over to the machines nor that the machines would wilfully seize power. What we do suggest is that the human race might easily permit itself to drift into a position of such dependence on the machines that it would have no practical choice but to accept all of the machines' decisions. As society and the problems that face it become more and more complex and machines become more and more intelligent, people will let machines make more of their decisions for them, simply because machine-made decisions will bring better results than man-made ones. Eventually a stage may be reached at which the decisions necessary to keep the system running will be so complex that human beings will be incapable of making them intelligently. At that stage the machines will be in effective control. People won't be able to just turn the machines off, because they will be so dependent on them that turning them off would amount to suicide.

On the other hand it is possible that human control over the machines may be retained. In that case the average man may have control over certain private machines of his own, such as his car or his personal computer, but control over large systems of machines will be in the hands of a tiny elite—just as it is today, but with two differences. Due to improved techniques the elite will have greater control over the masses; and because human work will no longer be necessary the masses will be superfluous, a useless burden on the system. If the elite is ruthless it may simply decide to exterminate the mass of humanity. If they are humane they may use propaganda or other psychological or biological techniques to reduce the birth rate until the mass of humanity becomes extinct, leaving the world to the elite. Or, if the elite consists of soft-hearted liberals, it may decide to play the role of good shepherd to the rest of the human race. They will see to it that everyone's physical needs are satisfied, that all children are raised under psychologically hygienic conditions, that everyone has a wholesome hobby to keep him busy, and that anyone who may become dissatisfied undergoes "treatment" to cure his "problem." Of course, life will be so purposeless that people will have to be biologically or psychologically engineered either to remove their need for the power process or make them "sublimate" their drive for power into some harmless hobby.

⁶ Bill JOY: See his original article in "Wired" <http://www.wired.com/wired/archive/8.04/joy.html#1>. He quotes here a passage from Kurzweil who quotes from Kaczynski's Unabomber Manifesto...

These engineered human beings may be happy in such a society, but they will most certainly not be free. They will have been reduced to the status of domestic animals."

Following is another extract leading in the same direction.

"In a completely free marketplace, superior robots would surely affect humans as North American placentas affected South American marsupials (and as humans have affected countless species). Robotic industries would compete vigorously among themselves for matter, energy, and space, incidentally driving their price beyond human reach. Unable to afford the necessities of life, biological humans would be squeezed out of existence." There is probably some breathing room, because we do not live in a completely free marketplace. Government coerces nonmarket behaviour, especially by collecting taxes. Judiciously applied, governmental coercion could support human populations in high style on the fruits of robot labour, perhaps for a long while."⁷

It is most interesting to observe that the report of the U.S. National Science Foundation⁸ replies to Bill Joy on page 95, thus:

"Bill Joy has raised such issues with the public, presenting scenarios that imply that nanoscale science and engineering may bring a new form of life, and that their confluence with biotechnology and the information revolution could even place in danger the human species. In our opinion, raising this general issue is very important. But several of Joy's scenarios are speculative and contain unproven assumptions (see comments from Smalley 2000) and extrapolations. However, one has to treat these concerns responsibly. For this reason we have done studies and tasked coordinating offices at the national level to track and respond to unexpected developments, including public health and legal aspects. So far, we all agree that while all possible risks should be considered, the need for economic and technological progress must be counted in the balance. We underscore that the main aim of our national research initiatives is to develop the knowledge base and to create an institutional infrastructure to bring about broader benefits for society in the long term. To this end, it is essential to involve the entire community from the start, including social scientists, to maintain a broad and balanced vision."

We see that all the importance is given to "the need of economic and technological progress". We still are in the "modern/1800" paradigm, built and based on the concept of quantitative scientific economic and technological progress, which is not questioned. It is given a priority over ethical preoccupations (humankind's future) which must be "handled in a responsible way," but without giving them a decisive priority.

Engineering of the human brain? An example told in Brussels

Let us now consider the second way to treat humans in this "technological-industrial" vision. Either machines replace humans, or humans are manipulated to continue to adapt themselves to the logic of the machines which remain preponderant. Here one talks of "engineering of the human brain."

The National Science Foundation mentioned above suggests that this is only a matter of increasing the human potential, nothing more. Let us take an example that was called upon during the Brussels public meeting of 2004:

"We are in 2035. The school principal summons the parents and tells them, 'Your daughter is having difficulties in our school. The School proposes to give her a small injection, at school

⁷ Extract from the book of Hans MORAVEC: *Robot: Mere machines to transcend the human mind*, cited by Bill Joy.

⁸ *Converging Technologies for Improving Human performance*, June 2002, Arlington, USA.
<http://www.technology.gov/reports/2002/NBIC/Part1.pdf> See p. 95.

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expenses of course. This injection contains a mix of some billions of self-reproducing nanocomputers of the size of a cell. We have observed that often the children increase their intellectual performance and become quieter. Naturally you are totally free! However, if you do not accept, we regret to say that the school no longer can assume the responsibility of your child's education."

This is a possible scenario. Moreover, it indicates the second danger of the negative scenario of manipulation of human mind, beginning with the weak and defenceless.

Is this the direction in which we want to take our world civilization? Are we ready to subject our children or grandchildren to these types of "experimentations"? This certainly merits discussion. The public must be informed as best as possible to be able to fully participate in the debate.

After Bill Joy, let us go to one of the highest world authority in astronomy—Sir Martin Rees⁹, professor at the University of Cambridge. In 2003, he published a book that is a serious warning about the actual evolution of science and technology. He is much referred to by Jeremy Rifkin in the "European Dream" (p. 315). According to him, "the odds are no better than fifty-fifty that our present civilization on Earth will survive until the end of the present century." Rees warns against the construction of small nanorobots that replicate like viruses and that race out of control, devouring matter and turning the Earth' surface to a "gray goo"¹⁰. Rees worries also about similar threats posed by genetic engineering and computer technology—especially as technology in the high-tech field spreads rapidly.

According to Rees, it is urgent to organise a global discussion on scientific research. Many scientists reply that if the same warnings existed when man discovered the fire, we would have remained primitives. But Rees replies that the major difference is that the prior discoveries only had a limited and local impact, whereas the progress of the converging technologies may have a global and lasting impact.

There also is, in Washington D.C., the International Center for Technology Assessment <http://www.icta.org/nanotech/index.cfm> which is again very critical about some nanotechnology development. Here is a quote from Andrew Kimbrell¹¹, founder of this Center:

"Corporations, academics, and researchers came to realize, albeit slowly, that current technology is not compatible with life... To deal with this historic dilemma, the technotopians and their corporate sponsors outline a breathtaking initiative. This initiative was not to change technology so that it better fits the needs of the living things, as we were so eagerly advocating. No, they had and have a very different and stunningly self-serving approach. They decided to engineer life, indeed reality itself, so that it better fit the technological system. It is in this chilling context that the enormous significance of the current revolutions in technology can be fully appreciated. Here we have the key to the otherwise bewildering high-tech headlines and to much of our social malaise."

As I will show below, the difficulty is precisely the paradigm, the underlying vision. According to the vision of part of the North American establishment and its present government, they consider themselves "in the truth and objectivity" and are not ready to change, because there are no reasons to change if you are in The Truth. This is, fortunately, not the position of millions of U.S. intellectuals, who are totally conscious of the dangers of not shifting paradigm with this new tool of production.

⁹ Sir Martin REES: " *Our final century*" Random House 2003,UK, published in US with the title: *Our Final Hour*, Basic Books, 2003.

¹⁰ Sir Martin REES, *ibidem*, p.132.

¹¹ Andrew KIMBRELL, "Technotopia", in *YES, a journal of positive futures*, N°19, Fall 2001, p.14. Andrew Kimbrell is President of ICTA (International Centre for Technology Assessment), 666, Pennsylvania Avenue, S.E. Suite 302, Washington D.C. 20003. Phone: 202/ 547-9359. www.icta.org

So that Rifkin concludes (p. 320):

"The divergence in views on science and technology between Americans and Europeans is growing and is now coming to the fore in a myriad of public policy debates, threatening a schism as significant as the divide over our different sense of how best to pursue foreign policy and domestic security."

It is time now to go to the European position represented by the European Commission. This leads us into another atmosphere, another vision of the world, another scientific and technologic paradigm. We make a bound from 1800 to 2004.

4. Innovative position of the European Commission

One must acknowledge the European Commission and specifically Paraskevas Caracostas and his think tank on "Scientific and Technological Foresight" in the General Direction of Sciences, who initiated a high quality reflection on these crucial questions. They asked a group of experts to provide a report on the converging technologies. This intelligent and in-depth report¹² was published in September 2004 in Brussels. It includes the following items.

1. It clearly warns against any danger of manipulation of the human brain.

*"Some proponents of Converging Technologies advocate engineering of the mind and of the body. (The text has probably the U.S. National Science Foundation in mind, without to say it explicitly). Electronic implants and physical modifications are to enhance our current human capacities. The expert group proposes that Converging Technology research should focus on engineering **for** the mind and **for** the body. Changes to the cognitive environment or medical self-monitoring can improve decision-making and health. And the Commission warns against a real danger of surrendering our freedom to the machines: "Either way, humans may end up surrendering more and more of their freedom and responsibility to a mechanical world that acts for them."*

As we can see, the report proposes a strategy, which is very different from that of the U.S. Instead of engineering of human brain, they advocate engineering for the brain and for the body. We are in a completely different vision, in which, **the human person is in the centre now and not the machine.** We Europeans, feel much more at ease in this new vision and new paradigm.

2. Involvement of citizens since the first day as a new strategy.

The report details different aspects and challenges of these converging technologies, and it strongly advises to involve the European citizens by organizing centres of discussion, which they call "widening circles of convergence". It insists in the idea that, "Converging technologies (CT) converge toward a common goal. CTs always involve an element of agenda-setting. Because of this, converging technologies are particularly open to **the deliberate inclusion of public and policy concerns.** Deliberate agenda-setting for CTs can therefore be used to advance strategic objectives such as the Lisbon Agenda."

Moreover, the report advises that the political goal should be that of the Lisbon strategy which recommends that the Union become competitive in the knowledge economy, but in a sustainable and socially inclusive manner.

¹² "Nano-Bio-Cogno-Socio-Anthro-Philo. High Level European Group Foresighting the New Technology Wave: Converging Technologies – Shaping the Future European Societies. Brussels, European Commission 2004. <http://www.ntu.no/2020/final>.

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3. Ethics is completely integrated inside the creative development process, and scientists shall be educated in ethics.

The report indeed insists on ethics, philosophical reflection and human science's contribution¹³ "CTEKS agenda-setting is not top-down but integrated into the creative technology development process."

In everyday language, this means that usually everything is prepared and the decisions taken before "consulting the public" and politely asking it to accept a well prepared package. But the report says "no". The public must decide *with the scientists, and from the beginning* what these technologies will be used for. Toward which society are we going together? What is the real agenda? We are in a completely different vision of the role of science and scientists in society. And the text continues,

"Beginning with scientific interest and technological expertise it works from the inside out in close collaboration with the social and human sciences and multiple stakeholders through the proposed WiCC initiative ("Widening the Circles of Convergence"). For the same reason, ethical and social considerations are not external and purely reactive but through the proposed EuroSpecs process, bring awareness to CT research and development."

Thus, ethics is not an appendix that is added a posteriori without prior consultations. **No, ethics is at the heart of the process of the agenda creation.** It is at the heart of the reflection. And one also foresees a continued education of scientists in the field of ethics.

4. A new contract between society and science.

The end of the report mentions "*the new contract between society and science.*" The public is no longer an obstacle to the development of science, but it is an indispensable resource allowing society to choose between the scientific applications, which are positive for the future of humankind and those which are not.

We no longer are in the modern paradigm. The vision of science and society is transmodern. The paradigm is different.

5. **The vision of transhumanists and "singularity university"**

The Transhumanist Declaration

1. *Humanity stands to be profoundly affected by science and technology in the future. We envision the possibility of broadening human potential by overcoming aging, cognitive shortcomings, involuntary suffering, and our confinement to planet Earth.*
2. *We believe that humanity's potential is still mostly unrealized. There are possible scenarios that lead to wonderful and exceedingly worthwhile enhanced human conditions.*
3. *We recognize that humanity faces serious risks, especially from the misuse of new technologies. There are possible realistic scenarios that lead to the loss of most, or even all, of what we hold valuable. Some of these scenarios are drastic, others are subtle. Although all progress is change, not all change is progress.*
4. *Research effort needs to be invested into understanding these prospects. We need*

¹³ See the European Report, Page 4.

to carefully deliberate how best to reduce risks and expedite beneficial applications. We also need forums where people can constructively discuss what should be done, and a social order where responsible decisions can be implemented.

5. *Reduction of existential risks, and development of means for the preservation of life and health, the alleviation of grave suffering, and the improvement of human foresight and wisdom should be pursued as urgent priorities, and heavily funded.*

6. *Policy making ought to be guided by responsible and inclusive moral vision, taking seriously both opportunities and risks, respecting autonomy and individual rights, and showing solidarity with and concern for the interests and dignity of all people around the globe. We must also consider our moral responsibilities towards generations that will exist in the future.*

7. *We advocate the well-being of all sentience, including humans, non-human animals, and any future artificial intellects, modified life forms, or other intelligences to which technological and scientific advance may give rise.*

8. *We favour allowing individuals wide personal choice over how they enable their lives. This includes use of techniques that may be developed to assist memory, concentration, and mental energy; life extension therapies; reproductive choice technologies; cryonics procedures; and many other possible human modification and enhancement technologies.*

Ray Kurzweil's vision: Singularity is near (2034).

Ray Kurzweil is often presented of a visionary. He is the main founder and CEO of the World Transhumanist Association. He has also with a couple of friends created in Palo Alto the famous "Singularity University", which is a success. Here is a glimpse of what he presents in a recent book¹⁴ as a definition of this concept of "singularity", he has invented:

"Singularity.... is a future period during which the pace of technological change will be so rapid, its impact so deep, that human life will be irreversibly transformed. Although neither utopian nor dystopian, this epoch will transform the concepts that we rely on to give meaning to our lives, from our business models to the cycle of human life, including death itself. Understanding the Singularity will alter our perspective of the significance of our past and the ramifications for our future.... The key idea underlying the impending Singularity is that the pace of change of our human-created technology is accelerating and its powers are expanding at an exponential pace. (Page 7).

...Within several decades information-based technologies will encompass all human knowledge and proficiency, ultimately including the pattern-recognition powers, problem-solving skills, and emotional and moral intelligence of the human brain itself. (page 8).

...The Singularity will allow us to transcend these limitations of our biological bodies and brains. We will gain power over our fates. Our mortality will be in our hands. We will be able as long as we want (a subtly different statement from saying we will live forever). We will fully understand human thinking and will vastly extend and expand its reach. By the end of this century, the nonbiological portion of intelligence will be trillions of trillions of times more powerful than unaided human intelligence. (page 9).

...Once nonbiological intelligence gets a foothold in the human brain (this has already started with computerized neural implants), the machine intelligence in our brains will grow exponentially (as it has been doing all along), at least doubling in power each year. In contrast, biological intelligence is effectively of fixed capacity. Thus the nonbiological portion of our intelligence will ultimately predominate. (page 28).

¹⁴ Ray KURZWEIL, *The singularity is near: When humans transcend biology*, Penguin book, New York, 2005.

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...The human ability to understand and respond appropriately to emotion (so-called emotional intelligence) is one of the forms of human intelligence that will be understood and mastered by future machine intelligence. Some of our emotional responses are tuned to optimize our intelligence in the context of our limited and frail biological bodies. Future machine intelligence will also have "bodies" (for example virtual bodies, in virtual reality, or projections in real reality using foglets¹⁵) in order to interact with the world, but these nanoengineered bodies will be far more capable and durable than biological human bodies. Thus, some of the "emotional" responses of future machine intelligence will be redesigned to reflect their vastly enhanced physical capabilities. (page 29).

"As I see it, the purpose of the universe reflects the same purpose as our lives: to move towards greater intelligence and knowledge.... Having reached a tipping point, we will, within this century, be ready to infuse our solar system with our intelligence through self-replicating nonbiological intelligence. It will then spread out to the rest of the universe." (page 372.)

"My point is that we cannot safely dismiss the question of consciousness as merely a philosophical concern. It is at the core of society's legal and moral foundation. The debate will change when a machine –nonbiological intelligence- can persuasively argue on its own that it/he/she has feelings that need to be respected. Once it can do so with sense of humor – which is particularly important for convincing others of one's humaneness – it is likely that the debate will be won." (page 379).

In this book I underline 11 main ideas:

1. The ICT (information and communication technologies) are transforming our society.
2. The pace of change is geometric, which means extremely rapid.
3. The human brain is like a computer, but it is too slow.
4. Nanotechnology can multiply the power and the speed of our brains.
5. Science and technology are good and above any ethical debate. Their development is not ethically questionable.
6. The machine will be more important than humans.
7. We will be able to replace some human work by machines.
8. We will be able to enhance human potential in injecting nanobots in the human blood and putting implants in the brain.
9. Because of those ICT geometric growth and developments, Humanity will redesign and redefine the very meaning of our Human life, of suffering and of Human death. And Humanity will do this fundamental reflexion, only with the help of the machines and with the powerful help of our nonbiological, i.e. our future mechanistic brain.
10. Machine can produce and manifest consciousness.
11. The purpose of the universe is to move towards greater intelligence and knowledge.
12. Final goal is to abolish human death.

Why Kurzweil is wrong

My personal judgement rejoins the critics quoted above. I agree that we are confronted with a kind of "Future Shock" which corresponds to Alvin Toffler's vision¹⁶ of 1970. And I agree also with the geometric pace of this growth.

But my agreement stops here. The whole of Kurzweil's working hypothesis relies on

¹⁵ Foglets, "Nanobots called foglets can manipulate image and sound waves. They will bring the morphing qualities of virtual reality to the real world" (Page 28)

¹⁶ Alvin TOFFLER, *The Future Shock*, 1970.

a) A definition of the brain which is, in my opinion, obsolete and outdated.

There are important research and publications by David Bohm¹⁷, showing that the brain is like the door between two worlds, the Newtonian world and the Holographic world, which is out of space and time, and is the only real one. Karl Pribram, in Stanford University, has discovered that the brain is working like a Hologram. You can cut the hologram in pieces but in every piece you will find the whole picture. Sir John Eccles, thinks that "consciousness controls and directs the brain, which feeds it without to produce it". Neuropsychiatrist Peter Fenwick thinks that "the brain is like the entrance door to consciousness."

Actual research in quantum physics and neurobiology seem to indicate that the brain has many functions that we have not yet fully understood, like emitter and receiver of very feable light signals, but also indispensable link with the holographic world beyond space and time (Bohm). It is thus extremely dangerous to introduce nanobots inside the human blood and thus in our brain. The danger is that we could kill many subtle but extremely important functions we do not yet fully understand. Let us avoid to play Sorcerer's Apprentice.

b) *A M-1 definition of consciousness*

We refer here to another Silicon Valley genius, Willis Harman, who in 1998, announced that the great change of vision (Renaissance) at the beginning of the 21^o century would be the shift in Metaphysics. From Metaphysics 1, which pretends that matter (the brain) give rise to consciousness, towards Metaphysics 3, which affirms that Consciousness and Mind give rise to matter. Ray Kurzweil is an excellent and intelligent example of M1, which for the moment is still dominating, but will gradually become obsolete.

c) *An obsolete definition of science and technology*

As we have seen above many US intellectuals are like bounded to a too optimistic vision of science and technology. In Europe we consider that science and technology are ambiguous like every other human activity. Hiroshima is an example of this ambiguity of technoscience. And thus it is urgent that we reintroduce ethics and consultation with citizens since the first step of our nano-scientific research. This is also the European Commission's position.

6. Going deeper in this new vision of science

a) *Willis Harman and M3*

About consciousness allow me to quote Silicon Valley genius, Willis Harman¹⁸ (+1998), who announced that the real revolution of the 21^o century will be the transition from Metaphysics 1 to Metaphysics 3:

"Oversimplifying somewhat for clarity, let us think in terms of three basically different kinds of implicit metaphysics:

M-1. In the first of these, the basic stuff of the universe is matter-energy. We learn about reality from studying the measurable world. (The positivist assumption is that that is the only way we can learn.) Whatever consciousness is, it emerges out of matter (that is the brain) when the evolutionary process has progressed sufficiently far. Whatever we can learn about consciousness must ultimately be reconciled with the kind of knowledge we get from studying the physical

¹⁷ Massimo TEODORANI, *The Hyperspace of consciousness*, 2015. See also his *David Bohm: la physique de l'infini*, 2014. Teodorani is teaching theoretical physics in Bologna University.

¹⁸ Willis HARMAN, *Global Mind Change: the promise of the 21^o century*, 1998. Willis worked as senior scientist at the SRI (Stanford Research Institute), and was Director of IONS (Institute of Noetic Sciences).

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brain, for consciousness apart from a living physical organism is not only unknown, it is unconceivable.

...M-3: Yet a third metaphysics finds the ultimate stuff of the universe to be the consciousness. Mind (or consciousness, or spirit) is primary, and matter-energy arises in some sense out of mind. The physical world is to the greater mind as a dream image is for the individual mind. Ultimately the reality behind the phenomenal world is contacted, not through the physical senses, but through the deep intuition. Consciousness is not the end product of material evolution: rather, consciousness was here first!

... It is important to not misunderstand the M-3 position. It does not necessarily deny the "reality" of the material world. A dream is "real" for that matter; it's just that when you look at it from a different vantage point, you see another reality behind the dream. So the world studied by physicians is real enough; nevertheless from a different vantage point there appears to be a reality behind the physical world that modern science, in its present form, is in no position either to affirm, either to deny. (pp. 30-31).

This text was written 20 years ago. And unfortunately Willis has left us in January 1998. But after his death, I have the impression that the level of thinking in the Silicon Valley has gone down, despite their many brilliant successes, like Google, and others. After so many years, Willis' vision is not yet understood by the majority of the scientific community, neither in USA, neither in Europe and elsewhere. As it was not easy to understand Copernicus, at the beginning of Renaissance.

But the paradigm change is coming anyhow, probably from below, from the citizen and perhaps from a new generation of scientists coming up.

b) Prof Teodorani and David Bohm:

According to prof Teodorani¹⁹, Bohm has distinguished two orders. The first order is the newtonian order, he calls it the explicit order. While the second order is called implicit order. This order is in a hologram form. By definition in every part of the hologram you can find the picture of the whole. Even if you continue to cut smaller and smaller parts. This hologram is created maintained and amplified by consciousness and is well represented by light.

This means that consciousness is able to influence our cells. Lynn Mac Taggart²⁰ comes to the same conclusions. And thus prayer and presence have a REAL influence on our bodies and on our cells. This influence is not only psychological, is biological.

Now « in cauda venenum » (the worse poison is in the tail). The worse of the worse is that Bohm come to the conclusion that only the second order is real. This means that the whole of the newtonian order is an illusion. We are entering in a really new scientific paradigm, along the lines of Willis' vision.

Unfortunately only a small minority²¹ of the scientific community is grasping the importance of this paradigm shift. It seems that this minority has not anymore much influence today inside the « Silicon Valley ». And this is a pity.

¹⁹ Massimo TEODORANI, *David Bohm: la Physique de l'infini*, 2014.

²⁰ Lynn MAC TAGGART, *Physics of Intention*, 2007.

²¹ For example let us note the very interesting and active network called "Scientific and Medical Network" of many hundreds of scientist around the world. www.scimednet.org

Conclusion: the debate will happen in Europe

I will end this article with a quote of Jeremy Rifkin from his well-known book, *The European Dream*²².

"It is too early to say for sure whether Europe is leading the world into a second Enlightenment. Certainly its multilateral agreements, its internal treaties and directives, and its bold cutting-edge initiatives suggest a radical re-evaluation in the way science and technology are approached and executed. The increased reliance on the precautionary principle and systems thinking put Europe out in front of the United States and other countries in re-envisioning science and technology issues in a globally connected world. Still a word of caution is in order. The old power-driven Enlightenment science remains the dominant approach in the research, development, and market introduction of most new technologies, products, and services in Europe, America, and elsewhere in the world. Whether the EU government can effectively apply new-science thinking in its regulatory regime to old-science commercial applications in the marketplace remains to be seen. In the long run, a successful transition to a new scientific era will depend on whether industry itself can begin to internalise the precautionary principle and systems thinking into its R&D plans, creating new technologies, products, and services that are, from the get-go, ecologically sensitive and sustainable."

I agree with this vision and this question. Nothing is decided.

This article shows the urgent necessity for an intelligent and in depth debate on consciousness and reality, science and technology, and ethics.

My personal opinion is that if this debate occurs it will happen in Europe.

- Because the European public opinion seems more ready for an ethical debate on science and technology. More than other public opinions. For example public opinions in China, Russia, India or USA, seems less ready for a scientific paradigm shift.
- And we have already the superb job done by the Commission in 2005.
- We have also a lot of important European Foundations who could be interested.

This debate is urgent, very important, but not easy.

June 12, 2019

²² Jeremy RIFKIN, *The European Dream: When Europe's Vision of the Future is Quietly Eclipsing the American Dream*, Tarcher Penguin 2004, page 356-7.