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# Towards an Ethic of Technology? Nanotechnology and the Convergence of Applied Ethics

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Abstract: The hypothesis I develop involves that we have been witnessing, during the last ten years or so, an interpenetration in the area of applied ethics of certain concepts originally belonging to different areas of ethics, namely bioethics, environmental ethics, and also business ethics. Certain concepts such as "future generations," "consent," "precautionary principle," "intrinsic value," "global governance," "sustainable development," or "scientific uncertainty" are becoming "thick ethical concepts," in the terminology of metaethics; or in the terminology of American pragmatism: "living beliefs." They are now charged with strong moral contents that unfolds a new horizon of meaning at the heart of Western Modernity, a horizon largely defined by science and technical actions. Nevertheless, is this conceptual convergence in the area of applied ethics the sign of the coming of a new ethic of technique? I will discuss this topic taking as an example the case of nanotechnology.

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## 1. NANOTECHNOLOGY: THE CONVERGENCE OF SCIENTIFIC DISCIPLINES AND AN EFFICIENT SCIENTIFIC POLICY

Here are some key pieces of information concerning nanotechnology in order to better understand the phenomena of convergence of applied ethics that occur simultaneously.

If many definitions of nanotechnology are available, let us consider that they are generally defined according to the size of their object—the nanometer— and their main goal, which is to build machines from atoms; the construction of devices on the scale of molecules with superior (or completely new) capacities compared to the existing devices we know of. Consequently, the goal is to develop new technical abilities, a task more related to a very small scale engineering project than to the development of a new knowledge, although it is clear that new properties of matter can be discovered. Nanotechnology is oriented towards the creation of useful devices with implications in different fields of activity such as the military, economics, and biomedicine. We can affirm that nanotechnology's goal is more to create machines and devices in order to create more well-being in the context of a market economy, and much less to push forward scientific knowledge as an understanding and control of natural phenomena. Nevertheless, nanotechnologies are characterized by a key feature: they are a converging point of many classical disciplines—physics, chemistry, biology—also coupled with other technologies such as computer science and other techniques such as engineering. This convergence is the result of a multidisciplinary and interdisciplinary approach which is supported by very precise scientific policies.

The success in the development of nanotechnology is also the result of a variety of external factors. First, there is a real political will, initiated in the United States, to promote nanotechnology in order to launch a new economical and industrial revolution. Thus, since 2001, a colossal funding for scientific research has been put into place in the United States, quickly followed by the European Union and Japan, and then by Canada and Korea. In the United States, the coordination of the different federal agencies was started as early as in 1996, then followed in 2001 by the *National Nanotechnology Initiative* (NNI). The NNI developed an efficient political strategy which, on one side, funds the research, and on the other, promotes the organization of researchers into areas of expertise and the networking of researchers, universities, funding parties, and business organizations. Finally, the policies have also worked on the social acceptability of nanotechnology following different strategies: public education, the ideology of post-humanism, and the funding of social science research which, since 2004, was oriented towards risk assessment, social acceptability, and the public perception of nanotechnology.

Nevertheless, a political opposition has also emerged. Powerful and well established environmental NGOs took up a stand in the United States as well as in Europe. For example, in 2004, the *Berkeley Community Environmental Advisory Committee* protested against the construction of a laboratory facility capable of producing carbon nano-tubes. What was targeted there was not even the industry itself, but what preceded it—that is—the research facilities. NGOs like Greenpeace perceive nanotechnology as a direct threat to the ecosystems. *Canada's Action Group on Erosion, Technology, and Control* (ETC), an organization linked to an NGO well known for its stand against the use of GMOs (Raffi), called for a moratorium on the commercial production of nanoparticles (Preston 2005). In France, public consultations on nanotechnology in 2010 were stopped following the action by different groups, such as "Pièces et main d'oeuvre." For many, there is a similarity between the cases involving nanotechnology and GMOs (genetically modified organism), and the only way to prevent a widening of the gap (A. Mnyusiwalla, A. Daar, and P. Singer 2003) between the public opinion and nanotechnology is to initiate different strategies of ethical reflection. In its 2007 document, *The National Nanotechnology Initiative Strategic Plan*, the NNI calls for an ethics of nanotechnology based on responsibility, economical gains, State security and the increase of the citizen's quality of life.

## 2. A CALL FOR ETHICS AND THE CONVERGENCE OF APPLIED ETHICS

### 2.1 A Call for Ethics

This call for a wide ethical debate aims at overtaking the prophetical claims of the posthumanist movement that defined the early years of the discourse (*champ discursif*) on nanotechnology. This reflection, more complex and more specific to the present and future practical issues of nanotechnology, focuses on many ethical questions already well identified in the literature. The American context concerns six main ethical issues:

1) *The issue of equity:* how these techniques, or their production, are available to poor countries.

2) *The issue of privacy and security:* as much for the individual as for the State. Here the classic question arises again: what are the limits of the State's intrusion in one's private life. This question is viewed from two angles: security of the workplace and military usage.

3) *Environmental and public health issues* are more than ever identified as central to the problem of nanotechnology.

4) Philosophical issues, here the question of the *hybridization of humans and machines*, with the possibility of a co-evolution of the human specie with technology. What is at stake here is not only the social acceptability of

certain scenarios of enhancement devices put into place, but the specific problem of the definition of the normal and the pathological, the normal and the enhancement of human performances.

5) *Issues of economical development* are central in a very competitive globalization context that raises the problem of competition versus ethical behavior. Asian competition is considered as the main threat to the US economy as it relies on a fast development strategy sometimes lacks or simply ignores ethical and environmental issues.
6) *The issues of education and public participation* in the orientation and the choice of nanotechnology potentially beneficial to society.

In the light of these ethical issues, it is easy to see how, in the US, different branches of what is called applied ethics are summoned to answer to a position often considered as anti-science, anti-progress and anti-modern held by active environmental NGOs. In the last thirty years, applied ethics—bioethics, environmental ethics, business ethics and professional ethics—have developed in a sectional fashion in relation to the different activities or institutions of Western society. They adapted the American model to their reality. These applied ethics have held, and are still holding, a major role in the production of norms and in the social regulation in the face of multiple scientific and technological developments. In the biomedical field, bioethics, with its bioethics committees, its clinical ethicists and its biolaw, is probably the most accomplished western model of this normative regulation of techno-scientific progress.

In front of the six main ethical issues of nanotechnology, how do applied ethics answer? Is it possible to observe convergences or splits in the analysis and moral contents? In the literature, it is mainly in bioethics and in environmental ethics, although also somewhat in business ethics, that we find the analysis of these issues. My hypothesis is that this analysis is putting together an ethic of technique through the interpenetration of certain ethical concepts now "thick" or considered as "living beliefs." This is what I shall try to demonstrate briefly.

## 2.2 The Convergence of Applied Ethics and Nanotechnology

From a survey of the literature, I identified certain recurring ethical concepts in the fields of environmental ethics, bioethics, and business ethics which are presently used in the debate concerning the discourse (*champ discursif*) on nanotechnology.

### 2.2.1 Environmental Ethics and the Precautionary Principle

On account of environmental risks, environmental ethics are directly concerned in the debate on nanotechnology. These risks are a major societal issue. The current applications of nanotechnology are nanomaterials, and two main environmental risks are associated with them. The first would be a possible dissemination of nanoparticles in the environment which could interact with the atmosphere. The second risk consists of the absorption of nanoparticles by living organisms, includ-

ing humans, which could induce lethal modifications to the organisms, certain forms of cancer, and DNA modifications. This question is raised particularly in the field of novel foods where nanotechnologies are increasingly used without any international regulations (Centre for Technology Assessment, Switzerland 2009).

Nevertheless, nanotechnologies are interesting to the environmentalists because they could help to detect certain forms of pollution. They could also be useful to decontaminate certain sites and make a better use of energy. The environmentalists are all concerned by these risks as they are sensitive to their promises.

Environmental ethics includes a variety of theoretical positions, from a rational management of the environment to an almost absolute protection of Nature, a position held by some deep ecologists. But as explained by Brian Norton (1991), a certain unity exists in this intellectual movement. The core philosophical point of view is that Nature possesses an intrinsic value, independently of human beings. For this reason, Nature deserves moral consideration because of the biotic community which includes human beings (Aldo Leopold 1949). This biotic community results from a historical development over millions of years that generated a living system, both diversified and complex. This natural and historical process holds moral signification that is distinct from the production of human activities. There lies the moral intuition shared by environmentalists. The moral respect of this historical process needs not to be absolute, but it clearly questions, or blames, those who wish to modify the natural process or certain living organisms. The burden of the proof is on the shoulders of those who wants genetic transformations of living beings, for example. Nature is now seen as "vulnerable" to human technical intervention.

Concretely, because nanotechnologies claim to be able to create radically new materials, they should be the object of a serious risk assessment study. The environmentalists demand substantial studies on the risks involved by nanotechnology on health and ecological security. Many call upon the "precautionary principle" (European Commission 2007), exposing for example, certain American administrative decisions which promote an evaluation method of the risks of nanomaterials based on the methods used for standard macromaterials. Hence, nanotubes fall in the same category as graphite. Such an analogy is dangerous and illogical for it does not distinguish between the different types of materials. The environmentalists denounce the economical arguments hidden behind these decisions. Clearly, as it is now impossible to adopt the same behavior as was done concerning GMOs, a more responsible stand must be adopted in the face of possible consequences on environment and human health. Europe is given as an example in the way it applies the "precautionary principle": "no data, no market."

The "precautionary principle" brings into light a new method of risk management by introducing: (1) a responsibility of proof placed on the developers, (2) an effort of scientific knowledge concerning the global risks; (3) an introduction of temporality (long range risk assessment); (4) the knowledge of risks as a condition to the economic development for a given technology.

2.2.2 Bioethics and Human Dignity

In the field of bioethics, two topics of discussion can be identified as relevant in the case of nanotechnology. The first one concerns the ethical evaluation of nanotechnology, and in particular, nanomedicine. Many ethicists, inspired by the main American bioethical theory of Childress and Beauchamp (2009)—autonomy principle of the person, the principle of justice, and the principle of beneficence and non-malfeasance—consider that the tools for the ethical evaluation of research have been perfected enough over the last thirty years to answer the challenge that certain biomedical innovations might represent.

The second issue revolves around the problem of post-humanism, and therefore on the possible modification of the human being in terms of a reconstruction or an enhancement of human performances. It is the question of the hybridization of humans and machines, with the possibility of a co-evolution of the human species with technology, a radical modification of the natural evolutionary process of the living. The philosophical ground of this debate is far different from the ground of environmental ethics.

As a prophecy of hope, a utopia of the New Man, of transformation and mastering over matter, the post-humanist view flourishes with the arrival of nanotechnology, but this view was already discussed in the field of bioethics since the 1990s. These discussions were about the possibility, and the morality, of a modification of the human genome, no longer for therapeutic goals, but for the sake of personal enhancement. Let us remember that in 2003 the American *President's Council on Bioethics* published a document titled, *Beyond Therapy*, in which it is stated that the modification of the human genome is morally acceptable because it is legitimate to desire to have "healthier children, to be more efficient, to desire an ageless body, to have a healthier spirit."

Nanotechnologies are not the starting point of post-humanism, but they put into place oppositions between the proponents of the "hybridization of human and machines" (the cyborg), and the defenders of "human dignity." The latter, although they base human dignity on the autonomy principle or on rationality, share with the environmentalists the idea that the rules of evolution are not to be changed when it comes to living organisms. Jurgen Habermas's thesis in *L'avenir de la Nature humaine* (2002), is a good example of this position.

By introducing the issue of a transformation of the human being—both body and spirit—the discourse on nanotechnology radicalizes the debate on the normal and the pathological, and also on the criteria of therapy and enhancement. Ethical concepts such as "human dignity," "personal autonomy," and "consent," that built a certain definition of the human being, are imported from bioethics to the discussion field of nanotechnology.

2.2.3 Business Ethics and Global Governance

Business ethics has been actively developed in the US over the last fifteen years. The fast evolution and multiplication of professional activities related to the

phenomena of bureaucratization that is part of our societies has created complexity in the social structures and thus have made social interactions more difficult. Hence, a certain number of ethical questions specifically related to the different professions have crystallized into "professional ethics." For example: in business ethics, problems discussed are related to topics such as: the loyalty of the employee to its employer and, inversely, confidentiality and respect of the private life, business fraud, transparency of administrative decisions, and social responsibility of enterprises, etc. The concept of "global governance" became central in business ethics in the late 1990s. This ethical concept was imported into the discussion field of nanotechnology around the year 2004.

Governance is defined thus:

> Governance is the sum of traditions and institutions through which power is exercised in a given country for the common good. This includes procedures by which rulers are chosen, controlled and replaced (political aspect); the government's capacity to manage efficiently its resources and apply the right policies (economical aspect); and the respect of the national institutions by the citizenry and the State (institutional aspect). (Kaufmann 2005, 41)

This concept of governance does not limit itself to public administration, but also includes the private sector, civic organizations, NGOs, and international institutions. Governance aims at examining, in a wide fashion, the distribution of rights and obligations as well as power structures that define the specific structure of the organizations.[1] Global governance is interested in the conditions of the exercise of power.

In the discussion field of nanotechnology, global governance appears following three topics: the governance of risks, the social structures' adaptability, and the responsible development of nanotechnology.

Responsible development is directly referential to the notion of "sustainable development," including the issues of equity between the poor and the rich countries, the quality of life of human beings, and a care for the environment. This care is motivated by the risks involved by nanotechnology and obligates anticipation of issues concerning the environment, public health, and social consequences (Rocco 2008).

In the discussion field of nanotechnology, the concepts of global governance and sustainable development are treated through the field of business ethics, rather than from environmental ethics.

In the light of this exploration of the convergence of applied ethics in the field of nanotechnology, two issues are to be remembered. First, we can witness a selective appropriation of certain ethical concepts such as "the precaution principle" from environmental ethics, "human dignity" and "autonomy" from bioethics, "global governance" and "sustainable development" from business ethics, in the field of nanotechnology. Secondly, this ethics of nanotechnology which is appearing in the United-States, addresses, or will have to address one day, a core philosophical question—that is the progressive transformation of the human being and the environment by technology to the point where they will be co-evolutive to the phenomena

of the natural evolution of the living. Thus, I believe that nanotechnology forces us to think, in all its consequences, an ethic of technology to which moral content will possess a variable content.

## 3. TOWARDS THE CONSTRUCTION OF A NEW ETHIC OF TECHNIQUE?

My hypothesis is that, through the convergence of applied ethics, a movement initiated by American policies, an ethic of technique is developing. This ethic of technique has, it seems, two main features.

The first is that the core method of this ethic of technique, as it appears in the field of nanotechnology, is related to the philosophy of American pragmatism. What I tried to demonstrate through the convergence of applied ethics is the construction of a discursive field of nanotechnology which is structured from "living beliefs," according to pragmatists, or, as I call them, ethical concepts. These beliefs are, as I described, variably in competition or sticking together, but also ready to be evaluated through an experimentation of reality. This evaluation of facts (*épreuve des faits*) is linked as a retroactive cycle, to the technical development of nanotechnology, which will result in the creation, or not, of certain machines or techniques. Thus, "living beliefs" will be validated or invalidated by an analogical process, therefore a test through reality.

But these "living beliefs," in conformity to American pragmatism, possess specific characteristics. They are *pluralist*, therefore potentially in contradiction or competition with each other. They are *meliorative*, that means expressing the potential of a moral superiority in opposition to "dead beliefs." They are *contextualized* in function of a given culture, attached to common sense, and finally, compatible with present day *religious convictions*. It seems to me that this moral frame works perfectly well with technological development. Nanotechnology are linked with this proof by facts that allow a continual readjustment in the process of action. In this sense, is the American pragmatic moral philosophy an ethics of technique? A philosophical framework unaware of itself as it sticks to the movement of technological development?

My second point concerns what I believe to be one of the core moral problems of modernity, which is the transformation of the human being and its environment by technology to the point where it will be co-evolutive to the phenomena of the natural evolution of the living. The tension between artificialization and naturalization of the human being and the world is obvious, for biotechnologies and nanotechnology offer real and manifold opportunities of transformation.

As Heidegger clearly stated: "technique in itself is not what is dangerous" (Heidegger 1958, 37). As a technique it exercises its power on humanity or nature, forcing it to manifest itself under the exclusive mode of production that danger appears. Lyotard (1979) also commented in this sense, technique is "the spirit of generalized performativity." "Performativity is understood as the best input/output

account," it is also "efficiency, that is, the collection of the wanted effect." The result is an increase of power, not of what is true.

Is the potential co-evolution by technique the expression of the power of the modern Western world's dream of a world transformation? Is the ethics of technique being built through the American pragmatic framework simply applying furthermore this exclusive rule of performativity and enhancement? Or is it opened to other types of knowledge, thinking and existence in a plurality, inclusive of other cultures and civilizations?

These are the philosophical questions that are emerging through bioethics and environmental ethics and which responses engage future generations.

## NOTE

1. See Gilles Paquet, "Introduction" in Mémoires de la Societé royale du Canada, *La gouvernance au 21*ième *siècle*, sixième série, tome X, 1999, pp. 14–15.

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