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Techno-science and Ethics

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Abstract

The emergence of science-based industries after the Second World War, characterized by high technological intensity, created deep impacts on the economy, society, and on the scientific establishment itself. Science became a critical factor of competitiveness and economic growth and technology-driven research began to attract a majority of science-devoted funding. Mainstream science turned into techno-science and curiosity-driven research became the periphery of scientific endeavor. On the other hand, economic globalization nurtured a struggle between competing world orders implying the phasing out of the moral world of modernity. The resurgence of ethics is thus the other side of the new minted coin of globalization. Its aim is an impediment, rather than stimulation of new behavior, amenable to change and to create a sustainable new world.

"There are more things in heaven and earth, Horatio,
Than are dreamt of in our philosophy"

– W. Shakespeare, *Hamlet,* Act 1, Scene v.

New technologies have always emerged from existing artifacts and devices, tested and verified in the framework of prevailing technical cultures. It was in the course of everyday life that new ideas were conjectured and then tried through tinkering—a procedure that witnessed slow accumulation of expertise about the usage of the forces and substances of nature. This was true until the introduction of the railways and, to a certain extent, the telegraph.

However, in the course of the 20th century, the mechanism of technological creation was drastically transformed. Industrial research activities grew stronger with the development of new industries in the sectors of rubber, oil, glass, metallurgy, transportation and instrumentation; and science left the relative isolation in which it lived until then (in laboratories, academies and universities) but it was summoned during the Second World War to develop technologies with direct and immediate military application. The effort of post-War competition propelled national scientific and technological research budgets to embrace values which had never been attained before. With the birth of the first artificial satellites at the end of the 1950s, the public character of science and its technological applications were definitely established. (Caraça, 1999)

The emergence of industries of high technological intensity in the second half of the 20th century, such as nuclear power, aerospace, semiconductors, computers and

telecommunications, and, more recently, pharmaceutical and biotech-based industries, reveals the critical importance of scientific applications in the societies of the industrialized world. Business and societal practices now strongly depend on new ideas which have their origins in scientific effort, i.e., it does not derive from natural language or from common knowledge. This procedural change was not straightforward; it implied a thorough transformation and a deep institutional reorganization in the societies that assumed it.

""Mainstream science" became "techno-science", and curiosity-driven research was relegated to its margins."

It is of course necessary to change, but it is necessary to know what to change and how to change. This means that we should not attempt to change everything, because then everything would remain the same. And this is the central difficulty of innovation in the societies we live in. To change what, how, and by how much?

Advanced societies adopted structured processes of transformation where innovation was envisaged as the only answer to economic survival in the framework of fierce and omnipresent competition. This transformation had in the new science-based technological creation process a powerful driving force that no innovative effort could remain indifferent to.

The process of development that can be traced in the Western societies since the middle of the 20th century thus has a scientific base that prompted significant changes in the behavior of societal institutions and the way they were organized. New structures of economic activity were created by the assimilation of new innovative systems based on science. And the newly created wealth fueled the performance of this brave new world: its (diversified) success brought forward the concept of "globalization".

It is important to reflect on the changes that took place in the last seventy years. The first and foremost consequence of the new process of science-based technology was the emergence of new sectors in the manufacturing industry. These "hi-tech" or high technological intensity sectors were characterized by high added value associated with their operation. New enterprises were created in these sectors, which in turn generated powerful multinationals managing the surging new wealth in association with the financial sector. The world today would not be possible without its technologies: nuclear weapons, airplanes, missiles, satellites, space vehicles, computers, electronic networks, antennas, lasers, genetically modified products. And a long list of additional consequences can be added, ranging from the emergence of "technology management" to the issue of the "two cultures", from "digitalization" to "machine learning" and the comeback of "ethics".

Science, however, "suffered" the most dangerous impact. Having lost the seclusion of the walls of "academia", science experienced a tremendous pull from military and (later) business activities and markets. It became a critical factor of economic growth—a thrilling sensation at the beginning, which would and did become a stringent need to be fulfilled

later. With growing budgets allocated to the creation of new technologies, equipment and personnel, the research sector's main strategy became the invention of new technology—no longer the discovery of new laws of nature. "Mainstream science" became "techno-science", and curiosity-driven research was relegated to its margins. Science was no longer Queen, it drifted towards becoming Cinderella (Caraça et al., 2009).

"The "old" pyramid of knowledge, with science at its top (inherited from positivism), is no longer credible."

Today's world, born out of networks which create, diffuse, manage and support innovation and finance, is based on a group of formidable social, organizational and technological changes which were brought by the new process of producing technology from a scientific base. But these changes are societal, they are responses to the transformations experienced, involving all aspects of today's reality, concerning all networks of intense and enlarged communication that support our activity. They aided the emergence of a new way of living, intensive in information, knowledge and communication. Wild economic competition also selected its new "champions", eager to display their capabilities. A big turmoil in the classification of validation of true knowledge is also being observed.

We must understand that both knowledge and the languages devised for its expression and circulation evolve and are carried away with the times. Times of "fragmentation" of the existing social order—like the 16th and the 18th centuries, or the present—bring along the need to rethink our perception of how diverse fields and disciplines are structured, how they communicate and interact. The "old" pyramid of knowledge, with science at its top (inherited from positivism), is no longer credible (Caraça, 1999). The time has come for a system of knowledge that operates as a network, which does not postulate any common origin or hierarchy. Otherwise, how can we account for the critical value of marketing, design, software, management and finance, strategic foresight and cognitive sciences in the economy?

Clearly, the worldview of "globalization", which is based on a fuzzy and ill-defined notion of "knowledge", is at odds with the view of the world of modernity, which was derived from science. The new vision of knowledge and information favors the use of "governance" as a substitute for "government"; stresses "environmental" issues rather than an understanding of "nature"; promotes "global" contracts over "universal" rights.

In this vision, too, "techno-science" is no more than a factor of economic growth and innovation; and science and its universals are confined to the realm of "nature", and are recognized as the "theory of plausibility".

So we must not be surprised at the resurgence of ethics, now transfigured into the "theory of responsibility". Our moral world, made cohesive since the Middle Ages by religion and, throughout modernity by the idea of progress, has the tremendous challenge of reinventing a

new cohesive "glue". Otherwise, it risks dissolving into blocks—a sort of "moral apartheid", the final stage of the religious structuration of the world (Gauchet, 2002).

"No society will ever have a future by rejecting the kind of science that allows us to be reconciled with the universe."

The high visibility of ethical issues and ethics is associated with the rising complexity of contemporary society. As governance is the political conjugate of economic globalization, we may view the comeback of ethics at the local, institutional and sectoral levels, as a corollary of the underground struggle between competing world orders. Therefore, the emphasis on ethical aims appears as an unexpected partner of the triumph of techno-science (the science of science-based technology) that today pervades and supports the communication and physical infrastructure of the developed world.

Only the most naïve may envisage the unfolding of techno-science as being neutral in social terms. In fact, as François Gros deftly asserted more than a decade ago, the scientific enterprise is changing from the "exploitation of nature into a factory of life". (Gros, 1989) The culture of techno-science is aiming more and more at the direct control of human beings, by centering its aim and weight on the knowledge of physiological and psychological behavior, rather than through the longer path of understanding the forces of nature.

By acting on procreation, on embryo development, on birth, on sexuality, on aging, and on death, biological techno-science influences the very conditions of "individuation" of the citizens (Lecourt, 2003). Ethics thus is being used for all the wrong reasons: rather than being a stimulus to the improvement of new modes of conduct, we see ethics being applied essentially to the pure formulation of interdictions. It is interesting, here, to reflect on the passage of Bertrand Russell's *History of Western Philosophy* concerning the Atomists and classical Greece:

"Democritus (...) is the last of the Greek philosophers to be free from a certain fault which vitiated all later ancient and medieval thought. (...) From this point onwards, there are first certain seeds of decay, in spite of previously unmatched achievement, and then a gradual decadence. What is amiss, even in the best philosophy after Democritus, is an undue emphasis on man as compared with the universe. First comes skepticism, with the Sophists, leading to a study of how we know rather than to the attempt to acquire fresh knowledge. Then comes, with Socrates, the emphasis on ethics; with Plato, the rejection of the world of senses in favor of the self-created world of pure thought; with Aristotle, the belief in purpose as the fundamental concept in science. (...) After their time, there was a decay of vigor, and a gradual recrudescence of popular superstition." (Russell, 1945).

We probably have to redirect the present lively debates on, and over, ethics, by simply acknowledging the fact that there is no way through the 21st century without the illuminating presence of a strong basic science component and, especially, of first class fundamental

research. At the dawn of modernity, man traded his soul for his intellect (Forti, 2016). No society will ever have a future by rejecting the kind of science that allows us to be reconciled with the universe.

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Bibliography

1. Caraça, João., *Science et communication Presses* Universitaires de France, Paris 1999.
2. Caraça, João., B-A Lundvall, S Mendonça "The changing role of science in innovation" Tech. Forecast. Soc. Change 76 (2009) 861-867.
3. Forti, Augusto., Faust, *le diable et la science* Presses Universitaires de France, Paris 2017.
4. Gauchet, Marcel., *La religion dans la démocratie* Gallimard, Paris 2002.
5. Gros, Francois., *La civilisation du gène* Hachette, Paris 1989.
6. Lecourt, Dominique., *Humain, posthumain* Presses Universitaires de France, Paris 2003.
7. Russell, Bertrand., *A History of Western Philosophy* Simon and Schuster, New York 1945.