Are There, and Why Should There Be, Moral Limits to the Use of Scientific Advances and Technologies?

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Introduction

Modern social life is driven by the major developments in the fields of science and technology. As the sciences are constantly evolving and decoding the "secrets" of human and extra-human nature, they are equally feedbacking transformations in our self-understanding and praxeology. They touch the deep core of human existence, as they are transforming our self-understanding, directing us to rephrase the question of the right way to integrate ourselves in the world: *How should we live*?

We expect to learn a lot from the scientific achievements, especially in explaining our genetic origins, the workings of the brain, our relationship with the rest of the species on planet earth. Our expectations for the expansion of our knowledge are based on the findings of biosciences, computer science and artificial intelligence (AI), ethology, psychology – to name just a few cutting-edge scientific disciplines.

Expanding our knowledge of the molecular mechanisms forming the development of organisms, including the human one, opens up a vast range of unprecedented possibilities for intervention and genetic modification. Research findings on the brain function promise to offer secure explanations of the physiology of our cognitive life, to contribute to our understanding of the mechanism of brain damage, and to enhance

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various methods for the diagnosis, prognosis, and treatment of brain and neurological diseases. Developments in AI and robotics are attempting to redefine the human-machine relationship with important implications, including a new understanding of the interaction between mind and body, as well as between the artificial, digital and material reality in which we live.

The new cutting-edge technologies –or, as they are called, GRIN technologies: genetic, robotic, information and nano technologies– are unleashing a huge potential for human intervention in fields that were previously beyond human reach. They make it possible for us to genetically intervene in the very early stages of human reproduction and in the processes of embryonic development, to modify the evolution of physical and mental human functions, including the natural limit of death, by controlling the ageing process. Equally important are the possibilities of prolonging life with drugs and medical interventions, the replacement of vital organs by means of transplants or their maintenance by means of new mechanical support techniques.

Huge biomedical and biotechnological achievements have become reality due to the human genome's mapping [Human Genome Project (1986-2003)]. The development and exploitation of complex computational methods for the processing and modelling of huge amounts of biological data has unleashed great expectations in the fields of regenerative medicine, precision or personalized medicine, and synthetic biology, especially regarding the possibilities of molecular diagnosis and prognosis of diseases, and targeted medication/gene editing. With the development of bioinformatics and the construction of high-performance computing, the possibilities for data analysis, large-scale DNA sequencing, and bioinformatics analysis are expanding. These developments in biology, bioinformatics and new computational technologies have paved the way to the collection and analysis of large data sets, including health ones, on an unprecedented scale and with enormous predictive power. These achievements have clinical and medical uses, but also non-clinical applications – e.g., the creation of genetic profiles for use in forensics and judicial decisions (e.g. paternity identification).

The explosion in the development of the AI's science and technology is of crucial importance. The integration of their applications into social life substantially alters almost all aspects of individual and collective life – communication, work, economy, transport, education, law, administration, security, space exploration. The ways we interact with the environment and our mutual relationships are increasingly mediated by operating algorithms. Their applications are increasingly complex from the ethical point of view; they are linked to behaviors, practices and representations permeating our self-understanding and touching upon issues of personal identity, responsibility, and ultimately our humanness.

Science and technology indicate how we might achieve a goal, but they cannot tell us whether we should pursue that goal, that is, whether the goal is right or wrong; this can only be decided by ethics. As scientific achievements and technological innovations are constantly creating new praxeological possibilities, pressing questions have already arisen as to which of these should be excluded or developed, and under what conditions and safeguards. From the moment that alternative possibilities do exist, ethical-practical reflection becomes imperative.

Biosciences: Social Challenges, Moral Reflections

The social integration of biomedical sciences accomplishments represents a huge challenge. One of the most controversial ideas –from the ethical point of view– concerns the use of the theoretical knowledge and techniques produced to deliberately modify the biological nature of man, which is proving to be much more malleable than previous biological knowledge would have let us believe. Certain scholars claim that biosciences and biotechnology are directing us towards a transformatio ad optimum – the realization of an idea of the human species' "optimal self-transformation". It is a fact that ideals of self-perfection have run through human history, but –for some– we are nowadays much closer

to their realization: man is now taking, and must take[1], his evolution into his own hands and become self-evolved via technology.

Is there any moral limit to these pursuits? Interventions involving human subjects, whether they are related to the participation in scientific research or the exploitation of its applications, are limited by ethical considerations linked to the principle of respect for persons. This principle precludes the use of human beings as mere instruments for any purpose and requires clear boundaries to be defined about what is permissible or not in each specific case.

Practical reasoning, and, more particularly, morality presupposes acting subjects, who can reflect and decide what to do and thus are responsible, accountable and liable regarding their actions[2]. The capacity for principled accountability –a constituent part of moral freedom –, and its exercise are of such (sine qua non) value that its bearers (persons) cannot be sacrificed for anything that are less valuable. No person capable of rational action can be merely treated as means to any other end. Every human being is a unique person; therefore, it deserves and demands respect for the terms according to which it is able to act (freedom with accountability). The person's physical and psychological integrity must be protected in every possible way.

The person's moral freedom (autonomy), on which its dignity (his intrinsic value) is based, constitutes the normative basis of all obligations and all rights. This means that human beings, as autonomous beings with the moral attribute of freedom, who act and are accountable for their actions, should never be treated in a way that instrumentalizes and reduces them from a subject of social symbiosis to a mere object.

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1. See, for example, J. Savulescu, "Procreative Beneficence: Why We Should Select the Best Children, " *Bioethics* 15, no. 5/6 (2001); J. Savulescu, R. ter Muelen, and G. Kahane (eds.), *Enhancing Human Capacities*, Wiley-Blackwell, Chichester, West Sussex 2011; J. Harris, *Enhancing Evolution*, Princeton University Press, Princeton & Oxford 2007; J. Harris, *How to be Good*, Oxford University Press, 2016. For the relevant discussion, see J. Anomaly, *Creating Future People: The Ethics of Genetic Enhancement*, Routledge, New York and London 2020· A. Buchanan, *Beyond Humanity?*, Oxford University Press, Oxford, UK 2011.

2. See Stavroula Tsinorema, «Τὸ πρόσωπο καὶ ἡ ἀρχὴ τῆς προσωπικότητας στὴ νεότερη ἠθικὴ φιλοσοφία καὶ τὴ βιοηθική», in: Maria Kanellopoulou-Boti & Fereniki Panagopoulou-Koutnatzi (eds.), *Βιοηθικοὶ προβληματισμοὶ II, Τὸ πρόσωπο*, Papazisis Publications, Athens 2016, pp. 85-113.

Normative consequences are drawn from the principle of respect for persons, as to which actions cannot be morally supported. Invasive acts to the human body (clinical and therapeutic ones, or the use of medical and other information relating to a person and identifying him or her) are morally illicit if they are harmful, unjust, coercive, degrading to the recipient, if they constitute breaches of confidentiality or are products of deception. Unlawful interference with a person's body (or the illicit use of sensitive health data and identifying information) violates the deep core of its personality, may lead to the restriction of its freedoms and thus offend its human dignity.

Persons are morally treated when their will respected on the basis of principles, but also when they are protected from potential harm (*primum non-nocere*), especially in the form of protection of their life and health. Major ethical issues are particularly related to the safety of the methods used, with the important regulatory imperative of *avoiding premature application of scientific findings*. Equally important is the principle of beneficence, which stipulates that appropriate measures must be taken to ensure the well-being of persons, as far as this is feasible, whether they are patients or volunteers in scientific research projects.

The principle of justice has to do with those who are entitled to receive the benefits of research and its applications, and those who are obliged to bear the latter's costs. Injustice is committed when a person, without sufficient reason, is excluded from a benefit to which it is entitled or when it is unjustifiably subjected to costs which it does not deserve. Questions of justice arise in relation to decisions about which individuals have the right of access to the achievements of science (and technology) and why, as well as who acquires a right of access to personal data and why.

To our moral reflections, we should add the principles of social responsibility and social protection of health, which are also linked to a person's value. Scientific research, especially in the field of biomedicine, can lead to the development of preventive and treatment techniques for diseases, personalized treatment, etc. From this point of view, this research is of interest to society as a whole, since health is a social good and its protection is a universal value. Its development must therefore be protected.

But the moral primacy of the human being always prevails: "The interests and welfare of the human being shall prevail over the sole interest of society or science"[3].

Persons and Machines. Mind the Gap!

Huge new challenges arise from the development of information technologies, AI and robotics. The new "disruptive" technologies provide increasing opportunities for the multipurpose, extensive use of personal data, not only for scientific projects but also for practical applications of the accumulated knowledge and facilitating human life. Large volumes of data and information are collected; complex algorithms are used to analyze and process them. Challenges are raised by the AI enhanced potential mass surveillance, risks of discrimination in employment and insurance, greater risks of misinformation, dissemination of false news and defamatory content, new forms of threats to individuals' privacy, risks of manipulation of human emotions and control of behavior. Of great importance is who controls access to these technologies and under what conditions, and who decides on the funding of the research leading to their development.

Amidst so many great expectations and uncertainties, multivarious attitudes and representations of AI are emerging, ranging from over-enthusiastic narratives of a future "earthly paradise" to ominous, dystopian predictions of barbaric humanity. In both cases, the future of humanity is attributed to forces that are lying beyond man, resting on the power of algorithms and human artifacts, of "super-intelligent" machines, in the quest for a "General Artificial Intelligence".

First of all, it is necessary to distinguish between realistic future scenarios and simple science fiction. Our ethical reasoning must be sensitive to the time frame of practical issues and able to distinguish between questions

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3. Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine (Oviedo Convention), Article 2;· http://fst.aua.gr/sites/fst.aua.gr/files/oviedo_convention_gr.pdf [30.9.2023].

of immediate interest and those concerning predictions of a distant future.

Secondly, it is imperative to clarify the conceptual framework which are using to understand the functioning of AI systems. Much debate has arisen as to whether it is possible for us to attribute predicates to algorithmic systems and robots characterizing persons, such as "intelligence", "learning", "reasoning", "autonomy", "decision", so that we are referring to artificial persons and actors. There is a great leap from the literal to the metaphorical use of concepts, which can be a source of confusion both in terms of our relations with machines and amongst us. These systems are not literally autonomous; they neither decide nor learn. Consciousness or other mental contents that involve meaning and understanding cannot be attributed to them.

AI systems process information as a means of identifying patterns and relationships between symbols to solve problems, yet they don't understand what symbols look like in the real world. AI systems have no understanding of meaning, even when they convey linguistic content, such as OpenAI's recent language model, ChatGPT (Chat Generative Pretrained Transformer), which produces human-like text in dialogue form. They do not think, decide or reason like humans. Unlike the human mind, the ChatGPT language model synthesizes or matches rows of input, absorbing hundreds of terabytes of data, and extracts the most likely statistical answer to a question. It simulates human intelligence based on statistical probabilities, mimicking linguistic patterns.

Deep learning systems, the artificial neural networks, are being fed with extremely large volume and variety of information, from which they rapidly synthesize words for their answers. The learning performance of these systems can only have a heuristic meaning, not a literal one.

Again, they are not "autonomous" in the human sense. People are rational agents, possessing the moral attribute of freedom; responsibility and accountability derive from it. Technical AI systems, are neither responsible nor accountable for their actions, as it is typically proven by the cases of error or failure in their operation. The harmful consequences of malfunctions must be attributed to the human factor – the designer, the programmer, the manufacturer, the operator or the user.

The underestimation or disregard of the critical distinctions in understanding the characteristics of AI systems might seriously affected the human moral and emotional relationships. The serious challenge that people are facing with is to begin seeing each other in a way similar to that of the machines: as data nodes loaded into algorithms, and to model their relationships on the automated way in which machines react. With the development of AI tools, the prospect of replacing humans with machines in a range of activities, such as using robots to care for the elderly or to accompany young children, is becoming increasingly feasible. But if people are going to eventually hand over their most personal relationships to machines, it may be only a small step left to this mindset being integrated into their design and their further consolidation.

The weakening of the human factor, as far as decisions that are critically important for people are concerned, and the substitution of decision making by automatic techniques or statistical methodologies of algorithmic systems should make us very cautious, at least in some fields (cf., algorithmic suggestions for assessing the probability of recidivism, the release of prisoners on bail, the recruitment of officials, or, even more importantly, "autonomous" lethal weapon systems "selecting" human targets, etc.). The moral status of individuals is at stake when important dimensions of their lives and fate, including their own lives, are subjected to –or dependent on– the statistical indications of technical systems. Actions related to the subordination, evaluation or gradation of human life to such "suggestions" may threaten the core of our moral relations as free and equal persons[4].

Many ethical and social questions arise regarding the control, use and ownership of data; they are related to privacy and personal confidentiality, the prevention of unfair use, the avoidance of new forms of discrimination and inequalities.

The man-machine relationship needs to be thoughtfully planned, not having as its sole criterion the technical possibilities opened up by

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4. For a more thorough analysis, see Stavroula Tsinorema, "Τεχνητὴ νοημοσύνη μὲ ἀνθρώπινο πρόσωπο. Πρὸς μιὰ τεχνοηθικὴ τῆς εὐθύνης", in: *Στο σταυροδρόμι των ιδεών: Liber amicorum Ἰσμήνη Κριάρη*, Sideris Publications, Athens (in Print).

the development of AI systems and the expectation of their economic exploitation. Technological innovation is effective and beneficial when it clearly incorporates responsible standards related to failures and accountability for damages. The responsibility of scientists, designers, programmers, engineers, manufacturers, maintainers, operators, and users of the systems concerned must be clear and shared. The provision for the incorporation of safety and ethical standards as part of the quality of the technology produced is absolutely necessary from the very beginning. People must retain control and the ability to decide. Humans, not robots, are responsible agents, and they have to be held accountable.

We know very little today about how AI systems will affect the ways we think and make decisions. Uncertainty can be a source of concern and reflection but also a sign of opportunity and therefore individual and collective responsibility. The key issue is not the possible risk for those systems to be dominant, or for AI-enhanced machines to impose their will on us, leading our evolution into a "post-human" future, but the ways we will use or potentially misuse them. It is a matter of reflection on the direction and social orientation to be given to both research and planning of their development and their use.

Towards an Ethics of Responsibility for Science and Technology

Since our capacity for prediction is limited and some technology-enhanced processes activated by us may gain momentum beyond our control, we are obliged to seek as much knowledge as possible before proceeding to act, but also to design and use technology under the prism of our moral responsibility and socially beneficial goals.

At the same time, we should stress the importance of commitment to scientifically based evidence, even if the latter is always open to refutation. All young people should be educated to learn seeking out, respecting and critically exercising the scientific evidence, so as to become able to distinguish those who deceive and manipulate the evidence – intentionally or not. We need to learn how to use scientific evidence, to examine its origin and quality, with integrity and responsibility. We

need to learn to live with the truth (not "post-truth"), relying on the evidence, however supportable and correctable it may be.

Anything that is new, when incorporated into social practice, is not automatically beneficial or just. We need to make clear the morally legitimate goals, principles and values we are seeking to protect through the application of scientific advances, and of AI, before rushing to develop them, just because it is technologically feasible and achievable.

A renewed moral and social reflection needs to accompany the revolution in the sciences and technological innovations, a radical way of thinking, which will integrate the latter in a broader anthropological perspective and a practical social orientation that will include responsibility and care for all those affected, the distant "others" of the whole planet, in space but also in time, i.e. the future generations.