

The Social Responsibility of a Scientist: Philosophical Aspect of Contemporary Discussions

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Abstract

The article is devoted to the analysis of the modern state of ethics of science. The question is raised regarding the possibility and problems of the interference of ethics in scientific rationality. From a philosophical position, preliminary answers are given to the following questions: How is it possible to incorporate ethics into the scientific mind? Who is responsible for the destructive impact of scientific discoveries and technical inventions: a scientist or a consumer of technology? How to organize and establish ethical control over experimental science? What ethics can fruitfully interact with technological rationality? The necessity of the essential transformations of modern ethics of science is stated in connection with the global changes in the "social-natural" correlation, the effects of scientific discoveries and technologies on human nature. The solution to these problems in the philosophy of science of the past few decades is reviewed. The opposition of "interference - non-interference" ethical criteria in the goal-setting of scientific activity is analyzed. In addition to the well-known concepts of Kuhn, Lakatos, Feyerabend, the attention of the authors of the article dwells on the modern ideas of Hans Jonas, who argues that the responsibility of a man of science today becomes truly universal. Jonas justifies the need for a new ethic by the fact that humanity stands on the verge of death, being unable to control its own power over nature and its own nature. The ethics of science of Jonas is revealed in the categories of being and nothingness, of responsibility and fear, it implies first of all responsibility for the existence of humanity and the fear of its non-existence. A preliminary recommendation is given on the consolidation of the scientific community, commercial structures, and political forces, on the basis of which it is possible to form effective, modern, and existing ethical requirements for the responsibility of a scientist and science as such.

Keywords: *philosophy of science, ethics of science, ethos of science, social institute of science, responsibility of a scientist, ethics of responsibility.*

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Introduction

The catalytic impact of the natural sciences on the society became apparent due to their technological application in the 19th and 20th centuries. The influence of science goes far beyond the applied framework, affecting public thinking and behavior. The initial enthusiasm for scientific advances was replaced in the middle of the 20th century by a reassessment phase, which was expressed, among other things, in social concerns such as proliferation of nuclear weapons, the environmental crisis, the material needs of large areas of the planet, biotechnologies and their impact on the genetic fund. Any attempt to solve such complex problems should necessarily touch upon the issue of social responsibility of a scientist and the moral dimension of the natural sciences. From a philosophical point of view, the problem of the socio-ethical dimension of the natural sciences can be summarized in the following questions:

- how is it possible to incorporate ethics into the scientific mind?
- who is responsible for the destructive impact of scientific discoveries and technical inventions: a scientist or a consumer of technologies?
- how to organize and establish ethical control over experimental science?
- *what* ethics can fruitfully interact with technological rationality?

Theoretical background

From a socio-political point of view, the main question is whether it is appropriate and to what extent to take into account the factors of social life when determining the direction of scientific research. From a moral point of view, there is the problem of introducing ethical criteria into scientific research, what these criteria may be, as well as the sensitivity of an individual scientist and scientific community as a social group in relation to moral responsibility for the consequences of scientific discoveries and technical inventions (Lincényi, 2017; Thalassinos et al., 2011; Jankalová and Jankal, 2017; Dobrovolskienė et al., 2017; Lafer & Tarman, 2019; Radwan, 2018; Bombiak, 2019; Sabitova et al., 2018; Laužikas and Miliūtė, 2019).

The solution to the above-mentioned modern complex problems goes beyond the knowledge of any particular discipline, which means that it is given over to philosophy and should be based on dialogue and the exchange of information and arguments from various scientific and non-scientific points of view.

The modern philosophy of science, which analyzes and describes science in the form in which it is practiced, without prescribing norms and goals, considers the acquisition of true knowledge as the main engine of scientific activity. According to Popper (1989), the object of science is and should remain the search for truth (Popper, 1996). The decisions on how to apply scientific knowledge do not belong to scientific research as such, implying a clear distinction between science as a process of acquiring knowledge and technology as a means of its application. However, Kuhn in the historical study of science did not come to the conclusion that scientific progress approached some final object (for example, truth); the history of science reminds him more of a biological evolution: new theories are chosen because they provide the best way for future practice and the survival of science itself; and, although the adoption of new theories definitely means progress in solving problems, this does not mean that each new theory approaches a predetermined final goal (Kuhn, 1962).

In addition, the ethics of science was traditionally based on the professional ethos of scientific activity and, in particular, on the characteristic principles of the scientific methodology, such as the principle of objectivity, empirical control, measurement accuracy, etc. Scientific knowledge is also designed as autonomous and neutral one, since it is considered to be justified solely by empirical and logical criteria and, therefore, is effective for all social systems and useful for various purposes (Johnson & Hinton, 2019). The ambivalent attitude should also be noted towards the possibilities of scientific knowledge: the coexistence of opportunities and risks is inherent in the nature of scientific research. A part of the study may, despite initial intentions, have negative consequences, and vice versa. For example, the research on fungicides, whatever the original purpose, played a role in the development of poisonous gases, while studies, conducted to unleash biological warfare, can accumulate means of restoring ecological balance (Galtung, 1980).

Philosophy, with its purely logical analysis of science, ignores the social component of its character for a variety of reasons. In modern philosophy and sociology of science, it is stated that traditional analytical philosophy, which focuses on the analysis of final scientific statements, simplifies processes, such as evaluating and choosing alternative theories, or ignores social discourse. The opinion that the evaluation and choice of theories are based (exclusively) on unambiguous logical rules and empirical criteria is contested on the grounds that the development and selection of theories are held under the decisive influence of specific worldviews (for example, the mechanistic worldview). History-oriented philosophers and sociologists of science (for

example, Lakatos, 2008, Kuhn, 1962, Feyerabend, 2010; Ahtarieva et al., 2018; Ivygina et al., 2018) emphasize the impressive weight of personality-psychological and social factors and aspirations in the development, verification, and selection of scientific data.

More radical sociological approaches (for example, social constructivism) assert that scientific theories are entirely based on the personal interests and interaction of a scientist and the society, thus, are exclusively social constructions (Abikenov et al., 2019).

Within the framework of critical philosophy, it is also argued that science is mainly motivated not by striving for truth, but rather by a person's need to find patterns in nature and, therefore, in the safety while making decisions, achievements and leadership in managing things, not to mention greed, arrogance and desire for power. Other researchers believe that technological dominance over nature is the motivation for scientific research (Habermas, 1968) and that, in addition to searching for truth, the goal of scientific activity should be focused, for example, on preserving life and ecosystems and trying to ensure a decent quality of life for the members of the society.

Facts and Issues

The authors believe that the question of responsibility for the critical consequences of the development of science and technology for the environment, including the development of the so-called third world, concerns not only science but also philosophy, economics, politics, and the values of society (for example, consumption). The participation of the scientific community in explaining the risks of modern technological methods is inevitable today, but the decisions regarding the management of these risks require interdisciplinary discussion and interdisciplinary cooperation, despite the arguments, which often seem irreconcilable, put forward by various representatives of politics, economics, and sociology (Shatunova et al., 2019; Shamshudinova et al., 2019).

The complex problems of the era, such as, for example, the environmental crisis, the risks of powerful new technologies, etc., are not limited to one science. Their development goes beyond the competence of any particular discipline and requires the synthesis of various types of knowledge. This means that well-designed and viable proposals for solving complex problems should be based on dialogue and the exchange of information from various scientific and non-scientific approaches. However, such discussions, in addition to the inevitable conflicts arising from differences in the interests and aspirations of various parties, also reveal the fundamental

difficulties of communication, stemming from the peculiarities and means of thinking that are introduced by representatives of various scientific disciplines.

Already in 1959, Snow wrote about the two cultures that exist in the industrial societies of the West, about those who are engaged in science and technology, on the one hand, and about literature and the humanities, on the other hand, about the lack of understanding and cooperation between them, caused by their one-sided specialization and ignorance of other specializations. He also indicated the negative socio-political consequences of this discrepancy. Snow believed that only a well-designed educational reform can help to bridge the gap between the two cultures (Snow, 2008).

Böhler and Neuberth published a discussion between scientists, economists, and politicians about the principle of the responsibility of science for the future of human life and the environment. Economists referred to prevailing market principles, such as supply and demand, profit maximization and rapid economic success, which simply ignored the environment, as well as more reasonable behavior, including the willingness to pay environmental costs that are not part of the business calculation. Politicians noted the reaction of various lobbies with which they had to fight, and the importance of such dialogues, which, however, barely reached the door of state power. Scientists, for their part, discussed the ambivalence of research, the risks of technological applications and the tremendous difficulty of communicating with experts from other fields, philosophers, for instance, or sociologists, and even more with non-specialists, given the high level of specialized knowledge, required to understand the processing of natural problems from a point of view of physics, for example.

Socio-Political Intervention

The above-mentioned philosophical views concern the question of whether and to what degree a socio-political intervention in the field of scientific activity is desirable or feasible. Taking into account that scientific methodology itself is rather an endo-scientific issue, the authors believe that the possibility of social and political intervention may relate mainly to the orientation of research directions – the choice of the object of study.

Proponents of non-interference of social triggers in the scientific process saw the danger that science would develop depending on certain centers of power and would be used to serve various political and commercial goals within the framework of international competition. For example,

the position of Paul Feyerabend is considered quite radical in the philosophical community, since it assumes that philosophy can neither successfully describe science as a whole nor develop a method for separating scientific works from non-scientific entities, such as myths. It also suggests that the "general course" of science developed and recommended by philosophers should be rejected by scientists if it is necessary for further progress. At the same time, advocates of intervention fear that research may be conducted in science that is irrational or simply has no relation to social problems. One of the ideas that was put forward to reduce risks and avoid the use of scientific knowledge in destructive activities, as well as to advance the social orientation of research, was to create control mechanisms with a system of incentives and sanctions (Galtung, 1980). There are valid objections based on the opinion that these decisions will create other, equally undesirable problems and that the best guarantee of social orientation of science will not be the creation of additional control mechanisms, but the application of existing ones (state laws, the press and the media, civil initiatives, etc.).

Kuhn argues that the enormous progress of physics in relation to other sciences is associated, at least partly, with the fact that physics deals with problems dictated by science as such, and not by social requirements (such as in medicine). Despite this, there were stages in science when research, experiencing a lack of endo-scientific problems, was supported by the solution of external social problems. While the emergence of a new theory and its further development are based solely on accumulated and vital endo-scientific problems (for example, the problem of ether and the speed of light for the theory of relativity or atomic lines spectra, black-body radiation, photoelectric effect, etc. for quantum theory), these endo-scientific problems may not be sufficient to further expand the applications of the theory after it is substantiated. The examples of this are the evolution of organic chemistry to agricultural chemistry; partial transfer of molecular biology to medical research; quantum theory – to solid-state physics and semiconductor physics.

Although the question of social interference in the orientation of scientific research remains open at the philosophical and theoretical level, in practice the necessary funding for modern scientific research already indirectly influences the direction of the development of science (Korableva et al., 2019; Tarman, 2017). Scientific research today, on the one hand, is interconnected and interdependent with powerful new technologies, and on the other hand, solves more pressing social problems, such as finding clean, renewable energy sources, maintaining ecological balance, as well as the needs of a significantly increased population of the planet. Thus, the need to finance

high-tech research indirectly leads to a certain orientation of research priorities, since the state and other institutions provide financial support in order to be able to control specific areas of research. Traditionally, the ethics of science is regarded as an area limited by the characteristic principles of the scientific method. However, in addition to these operational principles, the ethics of science today needs to be transformed following the changes in the methods and means of experimental science (for example, negative environmental effects, experiments with animals) that science uses to conduct research. Hans Jonas rightly believes that the current unprecedented situation requires a revision of traditional ethical categories, the formation of a new ethics of science, a scientist's entry into a new scale of social responsibility: "No previous ethics will teach us the norms of good and evil, which would contain completely new modalities of power and its possible creations. The ground of collective praxis, which we are embarking on with high technology, is still no man's land for ethical theory" (Jonas, 1987). If in traditional ethics the zone of moral interaction and influence was limited to the sphere of communication between people, then the new ethics implies the responsibility of a person for the very existence of nature and its integrity. Jonas justifies the need for a new ethic by the fact that humanity stands on the verge of death, being unable to control its own power over nature and its own nature. The ethics of science of Jonas is revealed in the categories of being and nothingness, of responsibility and fear, it implies first of all responsibility for the existence of humanity and the fear of its non-existence.

In addition, having the power to arbitrarily change its own physical appearance and its essential properties, science must take responsibility for the inalterability of human nature and for the very existence of humanity.

What factors can enhance social responsibility and the ethical dimension of science? For example, it was proposed that the scientific methodology should include, in addition to the criteria for coordinating scientific theories and natural phenomena, a criterion determining the choice of means and objectives of the study and their compliance with social values, such as the right to save life and health, the right to satisfy basic material and spiritual needs, the right to preserve the ecosystem, etc. (Galtung, 1980). However, the proposals regarding external interventions in scientific methodology as such cannot be fully accepted by the scientific community.

One of the factors that are essential for strengthening the so-called "moral science" is the personal sense of responsibility of a scientist, which he or she acquired in the process of addressing moral issues, related to the choice of research subjects and the distribution of his or her knowledge for

practical application. Another equally important factor is the readiness of the scientific community as a social group to report cases of hazardous research, to raise awareness that society may have to pay for the risks associated with the use of technology. In response to this, undoubtedly, it can be argued that there are always productive and destructive aspects in research and that any attempt to completely separate them will most likely stop the dynamics of scientific research.

The questions and dilemmas related to the socio-ethical dimension of science reflect the insufficiency of clarification of the connection between science, technology, and society and, ultimately, between knowledge and action; more specifically, they reflect the conflict between the justified and legitimate right to freedom of research, on the one hand, and the need for external social and political interventions, on the other, arising from equally legitimate rights to protect the environment, life, and health from harmful or unforeseen consequences of modern technologies. Given its responsibility, for example, in relation to the development of society in connection with the ecological state of the planet, science must reconsider and redefine its attitude towards politics and publicity. This is not easy and painless, since the scientific spirit is traditionally defined as independent of socio-political norms and interventions (Carothers, 2018). The main issues that need to be clarified concern the ambiguous nature of the research (the coexistence of risks and opportunities) and, therefore, the management of risks associated with its technological application. The duality of research creates conflicts and dilemmas. Science is involved in solving the problems of experiments without the exact knowledge of their results (experiments, however, can be so large-scale that the changes they make can be irreversible, as, for example, in the case of nuclear testing or the use of genetic technologies in the natural environment).

There are no simple answers to the question about the social responsibility of science. Scientists' reflections on their social responsibility need feedback and information based on argumentation and analysis, conducted in other areas, such as philosophy or sociology. Traditionally, philosophy is committed to directing and orienting, or mediating in times of social crisis or difficulties. Philosophy reasonably asks the questions related to the widespread use of new technologies: for example, for the use of new substance in the wide dimensions of the natural environment, people rely on short-term forecasts based on its use in limited laboratory dimensions, or insist on long-term forecasts that attempt to evaluate cumulative effects during long periods of time. Scientists recognize that although the results of a limited experiment can be predicted with relative certainty, much more far-reaching predictions, such as, for example, the cumulative environmental impact

of applying new technology on dynamically open natural systems, are much more difficult and not subject to the limitations of precise and detailed scientific control. Another related question, posed by philosophy, is whether prudence and fear of future catastrophes should dictate a global ban on all dangerous technologies. As some scientists say, prudence and fear will impede the dynamics of scientific research or their acceptance only to the extent that, for example, with a certain degree of certainty, considerable damage to the biosphere could be excluded. Scientists say that they are asked to apply their knowledge to solve problems, for example, to find a cure for diseases. They are not ready to abandon genetic experiments and genetic technologies, although this is contrary to the principle of moral responsibility, because it can harm future generations. In such cases, philosophers recommend transparency of research and bringing the results to the public. Natural scientists acknowledge that the discussed problems are so complex that they themselves should now take some responsibility in respect of socio-scientific issues as practitioners, whereas traditionally ethics has always been the domain of philosophers and theologians (Böhler and Neuberth, 1992).

Discussion

Despite the conflicts and difficulties associated with communication, an understanding is formed regarding the need for such interdisciplinary discussions to solve complex planetary problems that would make it possible to realistically assess the level of scientific research, market principles, environmental awareness and the needs of a modern person. The society has already practiced such discussions: for example, at the United Nations Conference on Sustainable Development (also known as "Rio+20"), which took place from June, 20 to June 22, 2012, the development of science and environmental policy were jointly discussed.

As it was already stated, the problem of the social responsibility of science and technology comes down to a conflict between the right to freedom of research and the demand for external social and political control. This conflict arises because of the dual approach, which consists in the coexistence of opportunities and risks within the framework of scientific knowledge. Considering that the coexistence of opportunities and risks is inherent in the very nature of research, modern technologically advanced societies are obliged to decide how they are going to manage these risks and in the end what their priorities are. Such decisions go beyond the perspective and scientific

substantiation of the natural sciences and require interdisciplinary discussions and an exchange of views between science, politics, economics, and sociology.

It is hard to imagine that making decisions on complex social and scientific issues with ethical parameters could simply obey the list of unequivocal, transcendent and eternal rules. Even in the case of empirical sciences (despite the assumed advantage of empirical data), the philosophy of science does not consider that decisions about choosing a new postulate, theory or model are based on unambiguous logical rules that suggest regulating the relationship between experimental data and accepting or rejecting the theory, although a favorable combination of the experimental data can sometimes facilitate decision making. This decision is ultimately a matter of personal choice for a scientist, a matter of his or her own judgment and the mutual influence of his or her social environment, and, therefore, the subject of the science of cognitive sociopsychology. This epistemological change concerning the choice of scientific theory has raised the question of the criteria of truth and reasoning, for example, in the case of a conflict between scientific opinion and superstition or delusions regarding natural phenomena: how can any attempt to change the subject's understanding – often dictated by culture – beliefs or superstition be justified, if it is believed that truth is not determined on the basis of a reference to reality, but on the basis of what makes sense to people or through social consensus, as in constructivism. In the same way, subjective or relativistic ethical positions have made a positive contribution to the argument in favor of respect for personal beliefs or the development of cultural pluralism.

The question of decision-making criteria in controversial issues and those related to conflicts of values needs more attention. In sociology and ethics, there has been a shift in determining moral and responsible behavior from the level of personal moral judgment and its narrow interpersonal and short-term consequences and range to the level of broader social decisions, taking into account their prolongation for the future generation and ecosystems, as well as an accompanying search for rules of judgment and behavior based on moral thinking in the context of "immoral" conflicts of interest and self-affirmation, imposition and power of strategy. Natural science education should study and take into account the reflections of philosophy and ethics, if it considers that issues with socio-ethical parameters constitute the content of the teaching of natural science and not only the humanities (Yigit, 2018).

The essence of the question of the socio-ethical parameters of science lies in the ambivalence of research opportunities and their accompanying risks, as well as in the conflict between the legal

right to freedom of research and the requirement of external control to reduce the risk of research that may, for example, threaten the right to life, the quality of life or environmental preservation. The participation of the scientific community in explaining the risks of modern technologies is expected, but decisions regarding the management of these risks require interdisciplinary discussions and the exchange of information and arguments from various scientific and non-scientific approaches. Naturalists are indispensable when discussing the responsibilities associated with the future of the planet, due to the highly specialized and complex nature of scientific knowledge associated with modern technology. Natural scientists face significant difficulties in communicating with experts from other fields, as well as in transferring their knowledge to the public.

Interdisciplinarity should not replace special knowledge and basic skills, but the ethics and philosophy of science should be taught to future scientists in such a way as to promote awareness and overcome a specific, but limited point of view of each discipline, and thus provide a solid basis for interdisciplinary synthesis of knowledge and their effective use for understanding and solving the problems of the destructive impact of experimental science on the nature as such and the human nature.

Conclusion

In the interdisciplinary discussion that the authors mentioned earlier, attention should be paid, for example, to the problems arising from the intervention of non-specialists in increasingly complex research work and growing obstacles to the effective functioning of interdisciplinary committees for the approval of scientific and technological projects. When, for example, philosophers and sociologists understand how complex an ordinary problem in physics is and what knowledge is needed to discuss it, they come to the conclusion that such interdisciplinary discussions should be preceded by a physics course for the humanities. Otherwise, participants can quickly finish the discussion, as they speak different languages. Obviously, with regard to a case that sociologists consider catastrophic, an economist or a physicist may express other views or criticism that shed a completely different light on it. As the scientists noted, this means that communication between experts from different disciplines, as well as between experts and non-specialists, requires much more practice, which the majority of specialists are not ready for.

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