Synesis, v. 15, n.3, 2023, ISSN 1984-6754

THE IMAGE OF SCIENCE IN A SOCIALLY TURBULENT SOCIETY

A IMAGEM DA CIÊNCIA EM UMA SOCIEDADE SOCIALMENTE TURBULENTA

Oleh Kubalskyi
Dobrov Institute for Scientific and Technological Potential and Science History Studies of the NAS of Ukraine, Ukraine
kubalsky@nas.gov.ua

Received: 10 Mar 2023
Accepted: 30 May 2023
Published: 09 Jun 2023

Corresponding author:
kubalsky@nas.gov.ua

Abstract: The article is devoted to the analysis of the recent history of the philosophical justification of the public image of science in the philosophy of science – from the end of the 20th century to the current socially turbulent society. In this period, in various versions, scientists reflected on the epochal break in science: there were created the concepts of post-normal science, post-academic science, post-non-classical science, the concept of the triple spiral, the concept of technoscience, etc. This change of epoch was connected with the open exit of science into the public sphere and, in particular, into the sphere of politics as an active social and political actor. Along with preserving the priority importance of the role of natural science as a fundamental science, social sciences are increasingly coming to the forefront: they play an active role in promoting the interests of science in society. Three main models of active interaction between science and society are presented: the deficit model, the dialogue model, and the participation model. The important role of the media in shaping the public image of science, in the affirmation of ideas about scientific integrity and in the promoting the eradication of deformations of scientific knowledge is also emphasized – from highlighting the poor academic style to exposing the fabrication of scientific results. However, the definition of scientific integrity as one of the key characteristics of the public image of modern science should be carried out not by the media, not by the judicial system, not by political decisions, but by the expert assessment of the scientists themselves.

Keywords: Science, image of science, epochal break in science, models of active interaction of science with society, interaction of science and media.

Resumo: O artigo é dedicado à análise da história recente da justificação filosófica da imagem pública da ciência na filosofia da ciência – do final do século XX à atual sociedade socialmente turbulenta. Nesse período, em várias versões, os cientistas refletiram sobre a ruptura epocal da ciência: foram criados os conceitos de ciência pós-normal, ciência pós-acadêmica, ciência pós-não-clássica, o conceito de tripla espiral, o conceito de tecnociência, etc. Essa mudança de época estava ligada à saída aberta da ciência para a esfera pública e, em particular, para a esfera da política como um ator social e político ativo. Além de preservar a importância prioritária do papel das ciências naturais como ciência fundamental, as ciências sociais estão cada vez mais em primeiro plano: elas desempenham um papel ativo na promoção dos interesses da ciência na sociedade. São apresentados três modelos principais de interação ativa entre ciência e sociedade: o modelo de déficit, o modelo de diálogo e o modelo de participação. Ressalta-se também o importante papel da mídia na formação da imagem pública da ciência, na afirmação de ideias sobre integridade científica e na promoção da erradicação de deformações do conhecimento científico – desde o destaque do estilo acadêmico pobre até a exposição da fabricação de resultados científicos . No

entanto, a definição da integridade científica como uma das principais características da imagem pública da ciência moderna deve ser realizada não pela mídia, nem pelo sistema judicial, nem por decisões políticas, mas pela avaliação pericial dos próprios cientistas.

Palavras-chave: Ciência, imagem da ciência, quebra de época na ciência, modelos de interação ativa da ciência com a sociedade, interação da ciência e mídia.

1. Introduction

From the beginning of the 20th century to the present day, the world has been in a state of almost continuous turbulence, manifested most noticeably in wars, revolutions, economic and financial crises, and, more recently, global problems of humanity such as food, environmental, and other problems. All of this gives rise to new global, regional and local phenomena and processes, including social ones. Under such conditions, various spheres of public life and social institutions, including science, are undergoing dramatic changes. The peculiarities of modern transformations give some researchers grounds to even claim the emergence of a new type of science. However, in our opinion, these are somewhat hasty conclusions. So, based on the analysis of the current history of the philosophy of science – from the end of the 20th century to the current socially turbulent society – we will try to analyze how and why science is changing today, what role it plays in socially turbulent societies (they can be referred to as crisis-ridden, for simplicity), and how citizens perceive it. First of all, it should be noted that the final institutionalization of science, its establishment in its current form, takes place precisely at a time of social turbulence never before seen on the European continent – the period of the Reformation and Counter-Reformation (starting in the 16th and 17th centuries), which was accompanied, in particular, by the emergence of the first nation states. In other words, social turbulence, crisis is the "element" from which modern science (the science of the New Age) is "born" and with which the latter ultimately has to deal. The aim of the article is the analysis of the importance of actively promoting the public image of science in today's turbulent society.

2. Conceptions of "epochal break" in contemporary science

At the turn of the 20th and 21st centuries, concepts began to emerge that proclaimed an "epochal break" in science since the 1980s, the replacement of one type of science with another. Such concepts include, for example, the concepts of post-non-classical science, post-normal science, post-academic science, postmodern primacy of technology, second-order science, technoscience, triple helix, etc. Looking ahead, we note that a closer look at them, in our

opinion, proves that it is not so much the type of science that is changing as its image, the idea of science, its (self-)positioning, and (self-)representation. Globalization (internationalization), pragmatization, commercialization, and mediatization affect science mainly in its social dimension, i.e., as a social institution, a subsystem of society (along with other subsystems such as economics, politics, religion, culture, etc.), and as a professional community, rather than as an epistemological tool, i.e., a means of cognition of the world around us (including for the purpose of its further transformation). Nevertheless, let us consider these concepts in more detail to prove our point.

The authors of the concept of post-normal science emphasize (Schiemann, 2011) that large-scale, systemic changes are currently taking place in science as such, and not in individual fields and areas of research, as, for example, during a shift in scientific paradigms [Kuhn 1970]. In their opinion, the modern type of science – the so-called post-normal science – demonstrates a transition to new practices and new objects of knowledge production, given the newly emerging specific contexts of application of this knowledge.

The concept of post-academic science (Ziman, 2000) (and, as we will see later, not only it) describes the modern scientific sphere in a rather mundane, pragmatic way: science ceases to be (or at least ceases to be positioned as) a selfless activity and public good, turning into a more commissioned and expert business that is predominantly local rather than universal. According to this concept, fundamental research gives way to applied research (which means, therefore, the final rejection of the idea of "pure" science, knowledge for the sake of knowledge itself), and understanding the laws of the universe becomes rather a secondary consequence, a side effect of scientific research.

According to the concept of second-order science (Novotny et al., 2001), notable changes in modern societies, especially in civilized countries, include the partial blurring of boundaries between science and other subsystems of society, the transition of science from closed (authoritarian) to open (more democratic) nature, the loss of the scientific sphere's monopolistic right to knowledge production and pursuit of truth, the development of non-academic research, and the strengthening of transdisciplinarity/interdisciplinarity. At the same time, according to the authors of this approach, this transformation also concerns the epistemological core of science, which is increasingly influenced by human subjectivity and the socio-cultural context, including multiculturalism. The main message within the concept of second-order science is openness as the new face of science.

The concept of the triple helix (referring to new interactions between three social institutions – science (represented by universities), the economy, and government) (Schiemann, 2011) focuses on the dominance of the economic component in science and education, on the commercialization of scientific research and the increasing share of applied work performed on private orders and for economic growth, as well as on the convergence of educational (and, in fact, educational-scientific and scientific) institutions with business structures. Moreover, the main drivers of these processes, according to the authors of the concept, are economic globalization and the development of information technologies with the simultaneous formation of the so-called knowledge society (or knowledge-based society), in which the practical significance of knowledge is growing significantly. Moreover, market prospects, such as the competitiveness of knowledge-intensive products and their attractiveness to potential consumers, become perhaps the main criterion for the significance of research, based on the results of which such products are created.

Proponents of the concept of postmodern primacy of technology draw attention mainly to the transformation of the cultural context of science, in which the traditional priority of science over technology is being dramatically replaced by the predominance of technology over "pure" science.

The concept of technoscience (Nordmann, & Radder, 2011) identifies a new stage in the development of science (as opposed to classical science), characterized by close symbiosis and fundamental inseparability between science itself and the technologies it generates, given the ever-increasing dependence of research on practical needs and demands.

The concept of post-non-classical science synthesizes epistemological, social, and economic shifts in science, but most of all emphasizes the change in the place of science and scientists in society, which is most clearly seen in the mid-19th century. Adherents of this theory argue that since the formation of classical (17th-century) and non-classical (early 20th-century) natural science, scientific research has changed qualitatively. It has become the work of large research teams rather than truth-obsessed hermits, sometimes supported by private patrons (even if expeditions were sponsored by monarchs); isolation within highly specialized research has given way to complex interdisciplinary studies; information and communication technologies, in particular computerization, have significantly accelerated the exchange of research results and expanded the horizons of scientific research; finally, science has become a powerful productive force, a driver of rapid economic, social, cultural, and political progress, which, in turn, has attracted close attention of the society and led to intensification of applied,

i.e. practice-oriented research. In other words, knowledge has become a promising source of profit (and even power, not only in the figurative but also in the literal sense of the word – as the basis of the state's military power and promotion of national interests), scientific developments have become a commodity, and scientists have become ordinary employees whose activities have lost any idealistic, altruistic appeal. While describing the characteristics of modern science and the revolutionary changes in its societal position during the contemporary era, the authors of this concept do not fundamentally deny the enduring nature of the rationality that underlies the scientific method, worldview, and ethos. This rationality is characterized by objectivity, systematicity, substantiation, universality, general significance, value and political neutrality, a focus on the continuous accumulation of knowledge and its novelty, as well as academic integrity.

Thus, despite the transformation of research practice and organization, science is still primarily an activity of producing objectively (intersubjectively) true knowledge in accordance with clear criteria that researchers have been guided by to for centuries. Despite the actual non-scientific nature of the goals and sometimes standards of modern applied research, basic science is still essentially developing as classical natural science. And the demand for economically useful knowledge that can be used for profit (and not only) has existed since the modern era. In other words, we believe that in recent decades nothing substantially, qualitatively (rather than just quantitatively) new has actually happened that would warrant speaking about the changing type of science. However, this is not to say that there have not been transformations in the image of science. But before we consider them in more detail, let us focus on the peculiarities of contemporary interaction in the triangle "science-society-media" (some researchers add a fourth "corner" – power) that, in our opinion, have a significant impact on the formation of the image (or images) of science – the perceptions of it in the professional environment and beyond, the image of science as one of the most important social institutions (if not the most important).

3. Evolution of the interaction between science and society

The process of a kind of "socialization" of science, its entry into all spheres of social and private life has intensified and deepened so much that researchers of modern science consider it appropriate to analyze not so much the understanding and acceptance of science by society as the involvement of society in science in various formats. The evolution of the interaction between science and society is most often described by three models, which, however, are not

strictly chronological, but can be realized simultaneously, depending on the starting conditions and goals of communication. The first of these models is the so-called deficit model (Bodmer, et al., 1985), proposed in the UK in the mid-1980s (later it spread to the US and other countries) and implemented in the "Public Understanding of Science" program on both sides of the Atlantic. In short, the essence of this approach is, so to speak, enlightenment (or popularization) from above, based on the rather widespread stereotype of ordinary citizens as hostile to science but passive ignorant people who need to be "filled with knowledge", that is, informed as widely as possible about the achievements of science and its usefulness to the community. The initial hypothesis of the approach was that understanding leads to (or at least should lead to) acceptance and trust. However, awareness often leads to skepticism, and scientific illiteracy, paradoxically, is not necessarily obscurantist at first glance. However, some criticics like American researcher Dan Brian Short argues that: "This is not the public engaging with science; it is science attempting to engage with the public. Academics, politicians and educators all say they want to 'listen' to the public, but they are only 'listening' to responses to their own questions" (Short, 2013: 43).

The unidirectional, so to speak, monological nature of the deficit model, as well as public concern about the rapidity of scientific and technological progress, gave rise to other views on the relationship between science and society, namely the dialogue model and the participation model. The dialog model (Bauer, et al., 2007), proposed in the early 2000s, emphasizes not so much the educational and informational component as the social one, i. e. close cooperation with the public. An important feature of this model is that society is seen as one of the stakeholders and beneficiaries of the acquisition and application of new knowledge. At the same time, the full implementation of this model already requires institutionalization of the interaction between science and society. The participatory model (Science, 2002), proposed almost immediately after the first attempts to implement the dialog model, does not stop here and goes even further – towards a wider involvement of society in discussing scientific problems and decision-making in science (up to decisions on research goals and objectives). This model continues to be actively developed, with various experimental formats of public involvement in the scientific process being tested. Thus, the convergence of science and society is consistently turning into a bidirectional movement, an integral part of democratic science policy and a key issue of scientific communication, which abandons the principle of "distance lends enchantment" (Collins, 1985) and is intended, in particular, to convince society of the need to invest in education and science as a public good, which may not have an immediate practical effect, but does not lose its value

for the community (Nowotny, 2014). Such a convergence should, among other things, compensate for the "dramatic weakening of attention and respect" for expert opinion caused by the wide availability of information sources of varying quality and reliability (Anderson, 2012). At the same time, the involvement of society in science (and science in society) is viewed not as a state but as a process.

The tasks on the way to bridging the gap between science and society include not only identifying possible ethical contradictions regarding the potential impact of new technologies in "sensitive" areas (for example, in life sciences), but also creating a positive, attractive image of science, showcasing both its "high", cognitive purpose and its completely utilitarian results intended for everyday life (Clarke, 2012). Here, too, social and scientific communications cannot be imagined without the media, which act not so much as a source of information as a full-fledged agent and an important mediator (intermediary) between other parties to the interaction.

4. Science and media

Modern media, especially electronic media (while television and print media still maintain prominent positions in many countries, they also have their own electronic versions), have a significant impact on what the public knows about science and scientists, how they see them, and how they are perceived. And this, in turn, affects the level of trust in science, as well as its funding, both public and private. After the end of the Enlightenment, in the 19th century, the rapid professionalization and specialization of research created a gap between science and society, and it was the media that helped to bridge it (Dunwoody, 2014). The process was complicated by the fact that in the early 20th century, popularization activities were not approved by the scientific community itself, as they were considered unworthy of a true scientist, and some research organizations even explicitly forbade their employees to communicate with the press without prior approval (Goodell, 1977; Dunwoody, & Ryan, 1985). Under such conditions, journalists almost completely took over the function of popularizing science outside the academic environment.

Significant shifts in the relationship between science and the media occurred after the First and Second World Wars and during the Cold War between Western democracies and the countries of the socialist bloc. The press became interested in the potential of science for military victories, post-war reconstruction, and geopolitical leadership, but later also in the risks and dangers that the introduction of new technologies in the energy, defense, and security sectors

could bring. Certainly, this interest led to scientific institutions taking advantage of it, recognizing numerous benefits of openness, perhaps the most important of which is the public legitimization of science. According to some researchers (Lewenstein, 1992), having realized the "advertising" potential of the media, having become mediatized, science began to gain real social power. With the advent of social networks and blogging, the amount of scientifically loaded (in particular, popular scientific) content has sometimes increased by an order of magnitude or more. Thus, the media have become one of the largest channels (along with the educational sphere) for broadcasting and shaping the image of science as both an autonomous and open system, complex, unique, self-organized, changing according to its own laws and capable of progressive evolution, as well as science as a social value vital for the preservation of human civilization and the formation of a globalized society; and the idea of the scientific community as an embodied, institutionalized rationality. On the one hand, science is seen as a self-sufficient human value, satisfying a person's natural curiosity, and on the other hand, it is an effective means of realizing human needs and transforming the environment.

Irish researcher Declan Fahy insists that Goodell's concept of visible scientist is very helpful in our days too: "It classified a new type of public scientist, introduced a novel concept that explained how this new type of public scientist emerged and had impact, and identified how the mass media influenced the workings of the scientific enterprise" (Fahy, 2017: 1019).

Scince itself creates many possibilities to promote new brand, so it could be the brand of science too. Chinese economists Chao Sen Wu and Tien-Tze Chen have demonstrated that "brand image positively and significantly influences brand identification; brand personality positively and significantly influences brand identification; brand personality exhibits no mediating effect on the relationship between brand image and brand identification... brand image influences brand identification directly and not through brand personality" (Wu, & Chen, 2019: 309). So scientists should promote not themselves in science, but scientific achievements.

But does this generalized image of science have its own specifics in socially turbulent societies? And can we say that any particular representation of science prevails in times of crisis? We believe that both of these questions can be answered affirmatively. In socially turbulent societies undergoing crises and increasing demand for "simple solutions", science, first, often serves survival rather than development, and second, science itself must primarily survive (as history shows, it is surprisingly resilient, but not all countries that have endured it have had a fortunate experience of science survival). In such communities, the significance of science as a factor in building systems, states, and national identity is also heightened. Once lost, this factor

cannot be purchased from abroad, so it is necessary and advisable (even from an economic perspective) to nurture it on one's own basis.

It should also be taken into account the growing significance of visual culture in contemporary society and scientist should take care of visual support of their scientific results presentation. Spanish researcher Francisco López-Cantos notes: "Some of the latest cases are quite dramatic and have revealed more about fraudulent work and the publication of fake research articles… We must remember that as the body of analyzed data gets bigger, we introduce more biases to the process of capturing scientific pictures and create more problems in validating images" (López-Cantos, 2019: 49). The influx of information provokes formulaicity in the processing of scientific information, and therefore the groth of different kinds of deformation of scientific integrity – from academic poore style to the fabrication of scientific results.

But it could be also external factors of turbulence for science. In the context of, for example, a large-scale war of aggression that is accompanied by human, territorial, economic, and other losses (as is currently happening in Ukraine), scientific ambitions may not be among the national priorities of the victim of aggression for some time. The priority is not to improve the qualifications and publication activity of scientists, but to preserve the staff, logistics, and continuity of research. The primary functions of science in such societies are aimed at keeping the community and the state afloat, timely identifying risks, and minimizing losses. Science also aims to preserve logical and critical thinking and a scientific worldview within the community, to prevent degradation, irrationality, and societal decay. Additionally, it aims to continue studying the national physical and socio-cultural "landscape". These tasks may not typically interest the broader global scientific community. However, effective management of any community, for the sake of its security, well-being, and ultimately global security, requires research into its unique "face" or characteristics. The contradiction of the situation is that the scientific sphere of a socially turbulent society has to solve two opposite problems at once – to be mothballed, waiting for better times, and to become more active if necessary to respond to newly emerging challenges (and there is always such a need). Obviously, the way out of this predicament is to intensify international scientific cooperation, expand the range of applied research, and diversify sources of funding for the scientific sphere (including international donors). But this is a topic for a separate analysis.

Regarding the issue of the image of science, the philosophy of science still focuses on observing the internal criteria for demarcation of science from non-science and refraining from

involving external criteria for defining scientificity – political, legal, media, etc. Especially in such important matters as academic integrity, which is the core for the modern science.

5. Conclusion

There is no doubt that a modern state has no prospects without science. In order to win the war and rebuild in the post-war period, Ukraine will have to create and implement the latest technologies as widely as possible, based on advanced research. The image of science in a socially turbulent society like Ukraine in 2023 is that of a soothing presence for the troubled, a guiding light for the perplexed, and a lifeline for the drowning.

References

Anderson, L. (2012). Too much information? Political science, the university, and the public sphere. *Perspectives on politics, 10* (2), 385–396. https://doi.org/10.1017/S1537592712000722.

Bauer, M. W., Allum, N., & Miller, S. (2007). What can we learn from 25 years of PUS survey research? Liberating and Expanding the agenda. *Public Understanding of Science, 16* (1), 79–95. https://doi.org/10.1177/0963662506071287.

Bodmer, W. F., et al. (1985). *Public Understanding of Science. Report of a Royal Society ad hoc Group endoursed by the Council of the Royal Society*. London: The Royal Society.

Clarke, L., et al. (2012). *A synthetic biology roadmap for the UK. Synthetic biology roadmap coordination group*. Technology strategy board. https://www.academia.edu/90176709/A_Synthetic_Biology_Roadmap_for_the_UK.

Collins, H. M. (1985). *Changing Order: Replication and Induction in Scientific Practice*. London, Beverly Hills, and New Delhi: Sage Publications.

Dunwoody, S. (2014). Science Journalism: Prospects in the Digital Age. Bucchi, M., & Trench, B. (eds.). *Handbook of the public communication of science and technology* (pp. 27–39). London: Routledge.

Dunwoody, S., & Ryan, M. (1985). Scientific barriers to the popularization of science in the mass media. *Journal of Communication, 35* (1), 26–42. https://doi.org/10.1111/j.1460-2466.1985.tb01882.x.

Fahy, D. (2017). Historical moments in public understanding of science: 1977, The Visible Scientists identifies a new scientist for the mass media age. *Public Understanding of Science, 26*, 1019-1024. https://doi.org/10.1177/0963662517732909.

Goodell, R. (1977). The Visible Scientists. *The Sciences*, 17 (1), 6–9. https://doi.org/10.1002/j.2326-1951.1977.tb01494.x.

Kuhn, T. (1970). *The structure of scientific revolutions*. Second Edition, enlarged. Chicago, London: University of Chicago Press Ltd.

Lewenstein, B. V. (1992). The meaning of `public understanding of science' in the United States after World War II. *Public Understanding of Science, 1* (1), 45–68. https://doi.org/10.1088/0963-6625/1/1/009.

Nordmann A., Radder H., & Schiemann, G. (eds.). (2011). *Science transformed? Debating claims of an epochal break*. Pittsburgh: University of Pittsburgh Press.

Novotny, H., Scott, P., & Gibbons, M. (2001). *Rethinking science: knowledge and the public in an age of uncertainty*. Cambridge: Polity.

Nowotny, H. (2014). Engaging with the political imaginaries of science: Near misses and future targets. *Public understanding of science, 23* (1), 16–20. https://doi.org/10.1177/0963662513476220.

Schiemann, G. (2011). An epoch-making change in the development of science? A critique of the "Epochal-Break-Thesis". Carrier, M. Nordmann, A. *Science in the Context of Application*. Boston Studies in the Philosophy of Science 274 (pp. 431–453). Dordrecht, Springer. https://doi.org/10.1007/978-90-481-9051-5_25.

Science (*2002*). *From PUS to PEST*. *Science*, *298*(*5591*), 49.

Short, D. (2013). The public understanding of science: 30 years of the Bodmer report. *School Science Review, 95* (350), 39-44.

Wu, C. S., & Chen, T.-T. (2019). Building brand's value: Research on brand image, personality and identification. *International Journal of Management, Economics and Social Sciences, 8* (4), 299-318. https://doi.org/10.32327/IJMESS/8.4.2019.19.

Ziman, J. (2000). *Real science: what it is, and what it means*. Cambridge, New York: Cambridge University Press.