INFO-117 UDK: 001.31:316.774:004.738.5
Received: 2017-02-05 Original Scientific Paper /Izvorni znanstveni rad

SCIENCE IN POST-TRUTH SOCIETY: NEW MEDIA AND SOCIAL PERCEPTION OF SCIENCE

Željko Pavić, Antun Šundalić

Department of Cultural Studies, Faculty of Economics, Josip Juraj Strossmayer University, Osijek, Croatia

Abstract

The public has always had an ambivalent attitude towards science. Science has brought new knowledge and has made life easier, but the power of knowledge has always provoked doubts about ethics of scientific endeavours. Among other factors that might be attributed to contemporary postmodern society, various characteristics of media production lead to the communication errors and negative public attitudes towards science. However, the advent of the new media has exacerbated such issues within the relationship between science and the media, taking into account that non-selective information sources on the Internet destroy the role of "gate-keeping" residing in traditional mass media and journalists. Although at first sight such a process implies potential for information demokratization, it also entails possibilities of presenting completely false and unfounded opinions, especially those concerning science. In this paper, the authors show a detailed analysis of the socio-cultural changes and media production characteristics that cause misunderstandings, but they also indicate useful principles that could lead to the more successful communication and social understanding of science. The role of scientists as communicators of science is indispensable in this respect, but there is also a need to abandon the traditional and idealized concepts of science as an isolated and self-sufficient human endeavor.

Keywords

science, media, Internet, postmodern society, popularization of science

Introduction

Public attitudes towards science are quite ambivalent, and so has been throughout the entire history of science. Since the beginning of its development, science has started to face doubts about the possibility of its misuse. Examples of such fears and concerns can be found already in 19th century literature among the classic novels such as *Frankenstein* (Mary Shelley) and *Dr. Jekyll and Mr. Hyde* (Robert Louis Stevenson). One of the most persistent criticisms of science has started from the beginnings of the industrial revolution and the value and social changes that it has brought. Critics of science accused it of distorting the image of the world as an "impersonal machine that can best be understood by its constituent parts and measurable sizes such as mass and velocity" **/1/**. As a consequence, the mechanistic worldview deprives the world of humanity, desacralizes and banalizes it. The idea of the meaning of knowledge related only to its application („knowledge is power“) leads to the loss of morality and cynical disposition of both nature and people. Scientific worldview without human meaning robs people of morality and imagination, making them cold collectors of knowledge used for selfish purposes. Although this criticism of science is intensified with the industrial revolution and the linking of science and technology to a single complex, it may be said that it is not new, i.e. that it represents a common view of human knowledge prevalent in almost entire human history. For example, in ancient Greece, an emphasis is placed on ethics and politics, in medieval period on theology, whereas natural sciences were considered to be less valuable because they do not speak much about

the man himself, the meaning of his existence, and his place in the world. This cultural criticism of science can also be seen as an expression of constant tension between rationalism and romanticism, between reason and intuition /**2**/. Each time the advancement of science and rationalism is intensified, artists and intellectuals appear to criticize abstraction and advocate for the re-affirmation of emotion and intuition. Hence, although the roots of the above-mentioned ambivalence can be found in fears of change, or in, generally speaking, human nature that rejects excessive rationalism and reaches for human meaning, the ambivalence and skepticism are intensified in the modern age with the emergence of media. For example, media portrayal of disagreeing scientists, or the numerous fake media experts talking about science in the media, can certainly increase the level of public skepticism /**3**/. With the appearance of the new media, especially social networking sites (SNS's), media influences on attitudes towards science might even be rising. Having this in mind, in this paper we focus on the development of the Internet/new media and deep changes that they bring in the field of trust in science, as well as social definition of scientific truth, and even truth in general. Therefore, the aim of this paper is to show the features of media production that add to public skepticism and misunderstandings, but also to emphasize some rules that can lead to better communication and a more successful public understanding of science.

Contemporary public perception of science

Contemporary research shows that, in contrast to the former view of scientists as heroic individuals seeking truth in order to achieve the common good, today there are quite a few negative characteristics attributed to science and scientists in the public, such as questionable ethics, connections to corporate interests, ecological and other negative consequences of science and technology, and conducting expensive research without clear goal and purpose /**4**/. Within this conceptual framework, it is especially important to determine the extent to which it is possible to speak of insufficient knowledge and information, or the "spirit of time", i.e. postmodern value system resulting from structural contradictions embedded in (post)modern society /**5**/. For example, the rejection of scientific medicine and the acceptance of alternative and complementary medicine is, as a rule, related to higher levels of education and can not be attributed to ignorance and lacking knowledge regarding modern medical methods and theories /**6**/.

According to the Eurobarometer research, science and technology are one of the areas where European citizens feel least informed. Thus, only 11% of European citizens consider themselves very well-informed about this area, and the share of Croatian citizens considered to be very well-informed is the same, i.e. at the European average. The same share of citizens are well-informed when it comes to culture and art, and when it comes to other areas (sport, politics, and the environment) the number of the well-informed is even higher. It may also be noted that there is a disagreement between high interest about science and somewhat lower level of information about it /**7**/. However, in spite of the high level of trust in science in general, there is a high level of skepticism in relation to certain aspects of the scientists' work. Thus, 58% of citizens agree that scientists can no longer be trusted on the controversial subjects in the field of science and technology because they depend on the corporate money, while 50% completely agree that private funding of science and technology hinders a more complete understanding of the subject matter in various areas. It is also interesting to note that Croatian citizens belong to the most sceptical ones in this regard /**8**/. Responses to other questions may also reveal a certain ambivalence towards science. For example, 66% of citizens agree that science and technology make our lives healthier, easier and more comfortable, while another 61% agree that science makes our lives more interesting. However, 58% of citizens believe that the changes that science introduces into our lives are too fast, and 53% of citizens agree that scientists have considerable power due to their knowledge, which makes them dangerous /**9**/. Again, this ambivalence is particularly pronounced in the Croatian case, since Croatian citizens are inclined to believe that science has the power to make positive changes in our lives, but they are also very skeptical, as we have seen earlier, when it comes to the scientists' hidden motives, the power given to them by the scientific knowledge, and the impact of private funding on their work.

Bauer /**10**/ analyzed longitudinal trends in the EU-12 countries and concludes that scientific

literacy has increased in the period from 1989 to 2005, while attitudes towards science remained roughly the same (relatively positive), and the interest in science has declined somewhat. Cohort analysis confirms these conclusions, as the younger generational cohorts are more scientifically literate and have a somewhat more positive attitude towards science. Specifically, they are less concerned about accelerated changes brought by science and more often than older cohorts believe that science and technology change human life for the better. When it comes to education and gender, it can be inferred that more educated individuals are more scientifically literate, have a more positive attitude towards science, and are more interested in it, despite the fact that there are certain interaction effects when it comes to age cohorts. Additionally, women get lower scores on all of these variables when compared to men. In other words, they are less familiar with science, show less interest in it, and are more skeptical about its effects /**11**/. Similar results can be found in a special Eurobarometer report dedicated to the public perception of science and technology. Namely, men and more educated individuals show greater interest in science and are better informed about it /**12**/.

Interestingly, Bauer's analysis does not corroborate the accuracy of the so-called post-industrial hypothesis which posits that increased knowledge of science in post-industrial societies leads to skepticism towards it, at least not at the individual level of analysis. Namely, according to this hypothesis, the relationship between scientific literacy and attitude towards science is not linear, but curvilinear. This relationship is more critical in less industrialized countries, wherein the criticism arises from the lack of knowledge about science and technology. However, in post-industrial societies, the attitudes towards science also become more critical, but due to different reasons related to greater familiarity with science and the ability to estimate its potential negative consequences /**13**/. Bauer's analysis also shows that the correlation between knowledge and attitudes is positive for all generational cohorts, even though not too large (from 0.11 to 0.20), which confirms the so-called deficit model wherein more extensive knowledge about science leads to more positive attitudes. But at the same time it can be seen that the correlation between scientific literacy and interest in science is greater among older generations. Similar results are obtained in the Eurobarometer survey. Thus, there is a positive correlation between information on science and technology and positive attitudes towards them. For example, citizens who are better informed about science and technology are more likely to think that science improves our living conditions, and less likely to agree that scientific knowledge gives power that can be dangerous or that science changes our lives too fast /**14**/.

Science and postmodern society

In our view, the aforementioned skepticism and doubt in scientists and certain aspects of science as an institution can be explained by the three-fold combination of (1) postmodern individualization and doubt in all kinds of social institutions and authorities, (2) lack of knowledge and information partially based in evolutionary developed cognitive deficiencies, and (3) rising media influence.

As for the first component in this combination, data from the World Values Survey /**15**/ show that economic changes and rising economic well-being lead to cultural changes in favor if increasing individual autonomy and individual choice and smaller focus on group identities and authorities. Therefore, skepticism towards scientific authority can be observed as an integral part of the skepticism towards any group authority, notwithstanding the fact that modernization theory assumed that social development would lead to increasing levels of individual rationality. However, this was based on a false assumption that an individual can understand science in its full scope, when in fact science can only be accepted as a social institution that must be trusted on account of its collective rationality embedded in the scientific community that uses scientific method to advance knowledge in a never-ending process of self-correction. Moreover, as Giddens /**16**/ argues, modern reflexivity leads to the loss of everyday social routines and to the anxiety about the future, which is principally open towards all kinds of alternative scenarios. In other words, regained freedom and humanism carry a burden of responsibility and all kinds of man-manufactured risks that need to be dealt with. Science and technology are a premium source of both benefits and risks, they also become one of the premium

targets of doubt and organized or semi-organized skepticism in the „risk-society“ /**17**/.

Besides the banal fact that lack of knowledge and information about science is correlated with the attitudes towards science, at least to a degree as the above mentioned Eurobarometer data indicate, some of the appeal of the *Post-Truth* thinking (as explained later in the paper) could be explained by the cognitive mechanisms that could lead to mistrust towards scientific modes of thinking and conspiracy theories about science and scientists. For example, it can be assumed that intuitive modes of thinking are a part of our evolutionary past, i.e. that they resulted in adaptive behaviour. Namely, essentialism, teleological way of thinking, and detecting agency and intentionality probably have strong roots in human evolution /**18**/. As noted by Blancke and De Smedt, essentialism can strengthen our belief in causal structure of the world, thus not having to explore the world from the beginning every day. Teleological mode of thinking allowed our ancestors to better understand causes and effects, while intentionality enabled a better understanding of other persons' motives and thus enabled our ancestors to adapt their behaviour in order to achieve evolutionary advantages (survival and reproduction). The idea of the evolutionary roots of intuitive thinking can also be supported by the fact that it appears earlier in the cognitive development of children /**19**/. As a consequence, more abstract and evidence-based modes of thinking are something that should be developed by learning and education.

Since postmodern society is arguably dominated with mediatization/media-constructed reality /**20**/ and simulation /**21**/, it can be inferred that the media should have a rising influence on the perceptions of science and scientific truth, as well as on attitudes towards science. Even though this influence probably existed ever since the two phenomena began to historically coincide, it is our contention that the Internet and new media lead to the more stronger influence and new dilemmas regarding the public understanding of science.

Media and science news framing

The media represent only one, and by no means the only way of public communication of science. According to the model proposed by Sánchez-Mor /**22**/, public communication of science can be understood by means of the types that arise through combining the informal learning mode that is happening in such communication ("playful" or "meaningful") and the way of directing the audience (mass or individualized audience). According to this typology, media presentation of science would be directed towards mass audience and meaningful informal learning. Therefore, its goal is to make science interesting. However, the penetration of the Internet into communication technology enables the media/Internet to attain other goals of public communication of science, especially the one that concerns the incorporation of science as a part of personal identity. Namely, this type of public communication of science is individualized and focused on meaningful learning, with quality educational materials that can be found on the Internet being typical examples. The Internet also partially provides the third type of public communication science aimed at entertaining the individual by offering demo materials or workshops where, although without too much depth and understanding, science can be perceiveed as a fun activity and thus perhaps part of one's own future career (most often in the case of younger persons).

Within the most important goal of public communication of science, namely information, Brajdić Vuković and Šuljok /**23**/ determine two basic journalistic approaches to science: (1) scientific popularization - a picture of science as a progressive activity that addresses problems and is useful to society and humanity, and (2) science as the news - it also points to the negative consequences of science, its lack of ethics, the alignment with corporate and political interests, etc. Using Nisbet's /**24**/ conceptualization of the scientific news framing, Šuljok /**25**/ identified the most commonly used frames in the most widely read Croatian print media, as well as the changes that occurred in relation to the period of late socialism (the late 1980s). It is interesting that both in the first and in the second period, the dominant framing of science pertains to the science as a driver of progress, innovation and better life. Moreover, this frame becomes even more prominent in the post-socialist era (almost 77% of all news belong to this frame). As Šuljok points out, this finding challenges the growing concern about skepticism and criticism directed to science, although the results can also be interpreted partly as uncritical reporting stemming from the

superficial engagement with science by the Croatian journalists. In addition, the results of this research do not confirm the growth of *sciencetainment*, or the reporting on science that consists of the presentation of fun or bizarre facts. Namely, only about 7% of all news in both studied periods falls into this category/framework. Nearly the same shares are to be found with regard to the frame that relates to the view of science consisting of scientific controversies, inexplicable and contradictory findings or epistemological conflicts between various groups of scientists. As Šuljok emphasizes, this finding does not corroborate the thesis on the mediatization of science, since highlighting conflicts is one of the most prominent features of media production and news selection.

Daily presentation of scientific information in the media is often considered inadequate, and this opinion is especially expressed in the scientific circles. Along with a number of other factors, the features of the media production are often considered as an obstacle to the quality transfer of scientific discoveries to the general public. Salleh /**26**/ lists several features of media production that may affect the distortion of media coverage of scientific results, wherein the most important ones are: (1) emphasis on clear headlines - newspaper articles are usually written in form of the so-called inverted pyramid, wherein the title and the first few sentences carry the bulk of the message, (2) use of common narratives - for example, scientists are portrayed either as selfless idealists that help humanity or as unscrupulous and immoral individuals who are servants of corporations or politics, (3) emphasis on conflict - media coverage usually emphasizes conflict between opposing views even when it is not present in order to dramatize the story and make it more interesting, and (4) personalization – journalists tend to use personale stories that can distort the reality. On the other hand, as common errors in the media presentation of science, Fjæstad /**27**/ lists: (1) inadequate coverage of scientific progress, (2) sensationalism and negativism in the choice of topics and (3) presentation mode, (4) incorrect reference to the facts, and (5) reluctance to follow the story and correct inaccuracies. As Fjæstad emphasizes, a part of these errors stems from one of the most important media roles, which is a critical stance to various social and political actors and the protection of the public interest. Therefore, journalists will often question the meaningfulness, usefulness and ethics of the scientists and scientific institutions, even when that does not correspond to the reality. Therefore, media coverage of science can be occupied with criticism and negativity because they attract a greater number of audiences, thus enabling financial stability and independence from the centers of political and economic power.

Numerous studies have justified doubts regarding the selective representation of science in the media. For example, Saguy and Almeling /**28**/ show that media reports on obesity as a public health issue are much more dramatized (e.g. through the use of words like "epidemics" or "declaring war to obesity"), and that such dramatization is achieved by a combination of selective choice of scientific studies that are dramatically intoned themselves with their own additional dramatization. Likewise, the problem of obesity is often phrased as a moral issue, emphasizing individual responsibility for its emergence as well as for its resolution (exercise, better nutrition, calories limitation, etc.). Therefore, the results of this study show that the already existing tendency to dramatize the presentation of one's own work and its results by scientists themselves, probably due to the need to attract attention to their own work and obtain funding for its continuation, is further intensified in the media reporting. Such conclusion is confirmed by the findings of a study conducted by Woloshin et al. /**29**/ on a sample of 20 medical academic institutions by analyzing their press releases, which journalists often take as raw material for their reports. Namely, it is apparent that even press releases point to the studies with weaker research designs, do not produce technical details such as sample size or even quantify results, and often bring unpublished results (although this should be completely avoided). Selvaraj, Borkar, and Prasad /**30**/ show that media more often report on medical papers that have somewhat weaker methodological framework, such as the use of cross-sectional research designs versus randomized clinical studies, i.e. experimental research. In our view, this finding can be explained by the fact that journalists themselves are more equipped to understand research with less rigorous methodological framework. For example, it is easier to understand that the two phenomena are related than it is to understand the concepts of

statistical/experimental control, dilemmas about valid determination of causality, internal and external validity of research, etc. It also might be assumed that studies of weaker methodological quality more often reveal "sensational" results, i.e. results that differ from most other studies and from the current scientific consensus. Despite the testing of statistical significance in correlation/observation studies, some correlations may appear to be coincidental and reach the media if they are potentially interesting to the wider public, or have some of the characteristics of the newsworthiness. Furthermore, Rosenhouse and Branch /**31**/ point out that the American media devote equally time to advocates of the theory of evolution and the theory of intelligent design, thus setting a solid distinction between the theory of intelligent design and "classic" creationism. In this way, as Rosenhouse and Branch emphasize, intelligent design is framed as a legitimate science without questioning the credibility of inteligent design proponents, i.e. the number of their published scientific papers in top-level biology scientific journals. In a similar manner, McBride et al. /**32**/ show that journalists often dedicate the same amount of space to conflicting opinions in the area of sexuality research, even when there is a clear consensus built around a research question. Moreover, these authors have found that sexuality researchers themselves feel that there is a conflict of interest between journalists looking for controversial subjects and the results of research and researchers who may have problems with displaying their work in such way and consequently losing their funding sources. Lewis and Speers /**33**/ also emphasize this moment of "balancing" in media reporting on the MMR controversy in Britain. Namely, government's efforts to convince the public of vaccine safety had been contrasted with Andrew Wakefield's views on the association of vaccine and autism, although the vast majority of other scientific research had not established the existence of this link.

New media and Post-Truth

Bearing in mind the shift from the mass media to the new Internet-based media, it can be assumed that above mentioned communication errors are even more intensified and that such a process could lead to further increase of skepticism directed to science, although these effects still can not be confirmed due to their novelty. Namely, „old media" (televison, radio, and print media) contained the mechanisms of selection and filtering of information through professional and ethical standards that still exist to some extent. At the very least, in the traditional media news are written and information is provided by professional journalists. Since the Internet is increasingly taking up the place of the traditional media in obtaining information about science, such professional selection and filtering mechanisms are surely available to a far lesser extent. In addition, the media framing of science completely neglects a framework that is certainly important to the public perception of science, and that is the question of truth, or the question of the epistemological power of science in relation to its "rival" discourses and worldviews. This is, in our opinion, a problem not just arising in this research area, but also in public opinion surveys that study the attitudes towards science. To be precise, it is not surprising that most people will be willing to admit that science has brought useful insights and made life easier, because it is very difficult to deny it completely given the growing standard of living, health and longevity in developed countries. However, the key question is how individuals will respond when placed in situations where there is a denial of established scientific theories (e.g., theory of evolution), when exposed to ideas that are contrary to the currently accepted research findings (for example, the conviction that the combined vaccine causes autism), or have no foundation in science (alternative medicine, conspiracy theories, astrology, etc.). To put it another way, the question is to what extent individuals accept scientific methodology as the only legitimate method of objective research of the empirical phenomena that surround us, and to what extent are they willing to believe in validity of well-established scientific theories. In a nutshell, this is a matter of faith in science vis-à-vis competing anti-scientific ideas.

Albeit the Internet changes the communication paradigm from "broadcasting" to "narrowcasting", i.e. enables individualization of media messages and pluralization of information sources, we should not be hasty to conclude that such processes lead to the emergence of a new virtual public sphere, "teledemocracy", "digital democracy" that is superior to the classical communication paradigm dominated by mass media, primarily television. Namely, although

decentralization and pluralization make somewhat less likely the communication isolation and imposition of opinions, this does not mean that the dominant opinions that crystallize in the internet space can be considered correct. There are several reasons that point us to such a conclusion. First of all, the non-selectivity of information sources on the internet ruins the role of classical mass media and journalists as "gate-keepers". Although such a process at first glance implies democratization potentials, it also entails the possibility of expressing downright factual errors and unfounded opinions, especially when science is concerned. Namely, science itself is a democratic and self-correcting mechanism, but the credibility of the information provider is crucial in the process of endorsing scientific knowledge. Namely, it is necessary that the source of information is a person who obtained the knowledge through standard and proven scientific methods, i.e. by applying certain protocols that are part of scientific methodology. Most of the science information that we receive is mediated, and this applies even to professional scientists who, beyond their competence fields, also depend on the mediated knowledge provided by competent scientists or other communicators of science (most often media reporters). In this respect, it is important that the source of scientific information is credible, which is not always the case in the domain of Internet communication. To put it another way, it can be deduced that our acceptance of information on science is, as a rule, a result of faith, but this faith can be founded or unfounded, depending on the credibility of the information source. That is, it is crucial to ascertain whether the corpus of knowledge is derived by applying suitable scientific methodology. Though it is not reasonable to completely underestimate the power that traditional media subjects (journalists and media corporations) still have in the field of Internet communication, the non-selectivity of information sources can lead to processes that distort the perception of reality and thus the perception of the relevant information on science. The altered nature of media communication does not imply that classical communication theories have ceased to exist and that the world of Internet communication can be ideally understood as the area of free communication in which the open discussion lead to the truth. Indeed, the term "Post-Truth", which is being increasingly used as a comprehensive expression that attempts to explain new mediatized reality. Namely, this expression denotes the reality in which what we consider to be true relates to our intuitions, interests and emotions, i.e. what we would like it to be true. Such situation might arise as a result of conscious or unconscious manipulations for which the Internet creates a particularly fertile ground. Thus, the Internet creates a suitable space for spreading cynicism and conspiracy theories, that is to say, the emergence of so-called Mean-World Syndrome and other perceptional distortions explained by the cultivation theory /**34**/ /**35**/. In the context of attitudes towards science, this particularly pertains to the general skepticism towards science, and the framing of scientists as greedy servants of large corporations that distort the truth in search of their own interests and corporate profits. This certainly does not imply that the ethics of scientists and scientific research need not be considered and questioned, but that the Internet communication can completely derogate the mechanism of obtaining scientific knowledge, and the scientific community as such. Similarly, the dominance of certain opinions on the Internet can lead to the emergence of a "spiral of silence" /**36**/ wherein aggressive minority opinions are transformed into majority ones through the progressive autocensory action guided by the misguided perception that our opinion is a minor one. For example, in a climate of aggressive campaigns against vaccination of children as a form of infectious disease prevention, the majority opinion on the usefulness of vaccination can become a minority opinion through the mechanism of the spiral of silence.

Such problems instigated by the Internet communication, especially by the Internet social networking sites, are also increasingly recognized by the people who actually co-created this global network. For instance, Tim Berners Lee, inventor of the World Wide Web, in an article in the British Guardian /**37**/ emphasized precisely easy dissemination of disinformation as one of the three issues that need to be repaired in order to be able to "save" the World Wide Web. He sees a particular danger in the data science algorithms that allow disinformation or even outright lies to be directed to those who can be assumed to be particularly receptive according to the previously available information (e.g., from web-search history). Similarly, the founder of Facebook Mark

Zuckerberg, prompted by the events around the 2016 US presidential elections, announced a stronger fight against false news on Facebook /**38**/. He announced the introduction of automatic detection methods that would rely on assessments of organizations dealing with authentication or on projects initiated by scientific organizations /**39**/.

Thus, the internet brings new opportunities, but also the dangers concerning public communication about science. Namely, the ease of communication and the availability of scientific information are probably at the highest level in the entire human history. People have many options available, regardless of whether the goal is only to have fun, or to inform or learn more in-depth about science. On the other hand, the inaccessibility and decentralization of the Internet often lead to a multitude of unselected information and possible misunderstandings, and can even be conducive to accepting non-scientific or pseudo-scientific beliefs. However, there is the flip side of the Internet coin. For example, Trench /**40**/ nevertheless thinks that the Internet, if properly used, can lead to better public communication of science. Namely, he thinks that Internet science communication should use the contextualization opportunities that are unique to the Internet. For example, articles about science can be associated with hyperlinks to other web sites with information about authors, original articles, or other proven sources of information on a particular topic. In addition to the ability to use multimedia materials (photos, video materials, etc.), a particular material can be presented in many different ways and levels, enabling reading of different depths, thus approaching various targeted audience segments. Although a multitude of hyperlinks can sometimes lead to fluidity and losing focus by the readers, their proper selection, filtering, and categorization by source and relevance can provide greater transparency with regard to additional and reliable information on the sources of scientific information and thus greater confidence in science and scientists /**41**/.

Conclusion

In contrast to the former mass media who homogenized attitudes and values with their omnipresence, or led to a kind of *mainstreaming* process in which the media could overpower the individual, social and cultural factors that led to diversity /**42**/, new Internet-based media lead to disintermediated selection process that strengthens confirmation bias and group polarization /**43**/. This process further endangers the very notion of scientific objectivity and scientific truth, which has already been put into question by the postmodern relativization and individualization. Even though the Internet offers a rich source of data and information on science, scientific community, policy makers and the general public shall have to find the ways of enabling a communicative consensus over controversial scientific question and science in general to be reached. This process can not be retrograde, or envisaged to re-establish science as an indisputable authority that must not be criticized, but must establish new criteria for selection of scientific news and information that can restore reasonable faith to the process of reaching the scientific truth and restore its credibility. Due to the abovementioned arguments, it is extremely important that scientists themselves, in various ways, actively engage in communication about science, including the mass media and Internet communication. Apart from covering science as a topic, journalists often use scientists as sources when writing about a more or less scientific subject matter that is perceived as socially important. In this way, their own articles are strengthened by the citation credibility of the proven scientific authorities. Therefore, the relationship between journalists and scientists should be a symbiotic relationship based on mutual benefits. Therefore, journalists gain added credibility and deepen the subject matter, while scientists gain greater visibility of their own work or themselves as persons engaded in scientific pursuits, which can be used to increase scientific prestige and provide funding for new projects and research. Naturally, accessibility, concise and effective modes of expression, and the personal and institutional credibility are of the outmost importance /**44**/. Namely, scientists who are willing and quick to respond to the offered collaboration, scientists who can formulate succinct answers to the posed questions, and formulate phrases that can serve as good headlines, soundbites or introductory themes, scientists who are affiliated with renowned institutions or have high scientific credibility, are preferably selected as sources.

Notes

/1/ Brown, H. (1986). The Wisdom of Science: Its Relevance to Culture and Religion, Cambridge University Press, Cambridge, p.104.
/2/ Brown, Hanbury, op. cit., p. 106.
/3/ Bultitude, K. (2011). The Why and How of Science Communication. In: Rosulek, P. (ed.), Science Communication, European Commission, Pilsen.
/4/ Sardar, Z., Van Loon, B. (2005). Znanost za početnike, Jesenski i Turk, Zagreb, pp. 6-10.
/5/ Pavić, Ž. (2013). Science and Pseudoscience in Postmodern Societies. Informatologia, 46(2), 145-153.
/6/ For the Croatian case, see Pavić, Ž., Milanović, G. (2014). Komplementarna i alternativna medicina u Hrvatskoj: testiranje triju hipoteza. Socijalna ekologija, 23(2), 95-119.
/7/European Commision (2010). Special Eurobarometer 340/ Wave 73.1–TNS Opinion & Social. Bruxelles: Directorate---General for Communication. p.13.
/8/ European Commision, op. cit., pp. 19-27.
/9/ European Commision, op. cit., p.29.
/10/ Bauer, M. W. (2012). The Changing Culture of Science across Old Europe. 1989 to 2005. In: Bauer, M.V, Shukla, R., Allum, N. (eds.), The Culture of Science. How the Public Relates to Science Across the Globe, Routledge, New York, pp. 92-109.
/11/ Bauer, M. W. (2012), op. cit., pp. 101-102.
/12/ European Commision, op. cit., pp. 11-16.
/13/ Pardo, R., Calvo, F. (2002). Attitudes toward science among the European public: a methodological analysis. Public Understanding of Science, 11. p.138.
/14/ European Commision, op. cit., pp. 34-47.
/15/ For example, Inglehart, R., Welzel, C. (2005). Modernization, Cultural Change, and Democracy. The Human Development Sequence, Cambridge University Press, Cambrodge.
/16/ Giddens, A. (1991). Modernity and Self-Identity: Self and Society in the Late Modern Age, Stanford University Press, Stanford.
/17/ Beck, U. (1992). Risk Society: Towards a New Modernity, Sage, New Delhi.
/18/ Blancke, S., De Smedt, J. (2013). Evolved To Be Irrational? Evolutionary and Cognitive Foundations of Pseudosciences. In: Pigliucci, M., Boudry, M. (eds.), Philosophy of Pseudoscience: Reconsidering the Demarcation Problem. The University of Chicago Press, Chicago, pp. 305-320.
/19/ Evans, E. M. (2000). Beyond Scopes: Why Creationism is Here to Stay. In: Rosengren, K; Johnson, C; Harris, P. (eds.), Imagining the impossible: Magical, scientific and religious thinking in children. Cambridge University Press, Cambridge, pp. 305-331.
/20/ Strinati, D. (1995). An Introduction to Theories of Popular Culture, Routledge, London.
/21/ Baudrillard, J. (1994). Simulacra and Simulation, The University of Michigan Press, Ann Arbor.
/22/ Sánchez-Mora, M. (2016). Towards a taxonomy for public communication of science activities. Journal of Science Communication, 15(2), 1-8.
/23/ Brajdić Vuković, M., Šuljok A. (2008). Slika znanosti u dnevnom tisku: popularizacija ili marginalizacija. In: Prpić, K. (ed.). Elite znanja u društvu (ne)znanja. Institut za društvena istraživanja u Zagrebu, Zagreb.
/24/ Nisbet, M.C. (2009). Framing Science: A New Paradigm in Public Engagement. In: Kahlor, L., Stout, P. (eds.). Understanding Science: New Agendas in Science Communication. Taylor and Francis, New York.
/25/ Šuljok, A. (2015). Changes in media selection and framing of science news in Croatian daily press. Journal of Science Communication, 14(1), 1-20.
/26/ Salleh, A. (2001). Science in the media: the good, the bad and the ugly. Australian Science Teachers Journal, 47(4), 28-37.
/27/ Fjæstad, B. (2007).Why journalists report science as they do? In: Bauer, M.W., Bucchi, M. (eds.). Journalism, Science and society. Science Communication between News and Public Relations. Routledge., New York, pp. 123-131.
/28/ Saguy, A.C., Almeling, R. (2008). Fat in the Fire? Science, the News Media, and the ''Obesity Epidemic''. Sociological Forum, 23(1), 53-83. doi: 10.1111/j.1573-7861.2007.00046.x
/29/ Woloshin, S., Schwartz, L.M., Casella, S.L., Kennedy, A.T., Larson, R. J. (2009). Press Releases by Academic Medical Centers: Not So Academic?. Annals of Internal Medicine, 150(9), 613-618.
/30/ Selvaraj S., Borkar, D.S., Prasad V. (2014). Media Coverage of Medical Journals: Do the Best Articles Make the News? PLoS ONE 9(1): e85355. doi:10.1371/journal.pone.0085355
/31/ Rosenhouse, J., Branch, G. (2006). Media Coverage of „Intelligent Design". BioScience, 56 (3), 247-252. doi: https://doi.org/10.1641/0006-3568(2006)056[0247:MCOID]2.0.CO;2
/32/ McBride, K., Sanders, S. A.; Janssen, E., Grabe, M.A., Bass, J., Sparks, J.V., Brown, T.R., Heiman, J. R. (2007). Turning Sexual Science Into News: Sex Research and the Media. Journal of Sex Research, 44(4), 347-358.
/33/ Lewis, J., Speers, T. (2003). Misleading media reporting? The MMR story. Natural Review of Immunology, 3(11), 913-918. doi: 10.1038/nri1228
/34/ Gerbner, G., Gross, L., Morgan, M., Signorielli, N. (1980a). The 'Mainstreaming' of America: Violence Profile No. 11. Journal of Communication, 30(3),10-29.
/35/ Gerbner, G., Gross, L., Signorielli, N., Morgan, M. (1980b). Aging with Television: Images on Television Drama and Conceptions of Social Reality. Journal of Communication, 30(1), 37-47.
/36/ Noelle-Neumann, E. (1984). The Spiral of Silence: Public Opinion - Our Social Skin, University of Chicago, Chicago.

/37/https://www.theguardian.com/technology/2017/mar /11/tim-berners-lee-web-inventor-save-internet, accessed on 13.3.2017.

/38/ http://fortune.com/2016/11/19/zuckerberg-fake-news-facebook/, accessed on 13.3.2017.

/39/ For example, FactCheck.org is a project of the Annenberg Public Policy Center of the University of Pennsylvania.

/40/ Trench, B. (2007). How the Internet changed science journalism. In: In: Bauer, M.W., Bucchi, M. (eds.). Journalism, Science and society. Science Communication between News and Public Relations. Routledge., New York, pp. 133-141.

/41/ Trench, B. (2007), op. cit., pp.138.

/42/ Gerbner, G., Gross, L., Signorielli, N., Morgan, M. (1980b). Aging with Television: Images on Television Drama and Conceptions of Social Reality. Journal of Communication, 30(1), 37-47.

/43/ Bessi A., Zollo F., Del Vicario M., Puliga, M., Scala, A., Caldarelli, G., Uzzi, B., Quattrociocchi, W. (2016). Users Polarization on Facebook and Youtube. PLoS ONE 11(8):e0159641. doi:10.1371/journal.pone.0159641

/44/ Allgaier, J. (2011). Who is having a voice? Journalists' selection of sources in a creationism controversy in the UK press. Cultural Studies of Science Education, 6, 445-467.

Literature

1. Allgaier, J. (2011). Who is having a voice? Journalists' selection of sources in a creationism controversy in the UK press. Cultural Studies of Science Education, 6, 445-467.
2. Baudrillard, J. (1994). Simulacra and Simulation, The University of Michigan Press, Ann Arbor.
3. Bauer, M. W. (2012). The Changing Culture of Science across Old Europe. 1989 to 2005. In: Bauer, M.V, Shukla, R., Allum, N. (eds.), The Culture of Science. How the Public Relates to Science Across the Globe, Routledge, New York, pp. 92-109.
4. Beck, U. (1992). Risk Society: Towards a New Modernity, Sage, New Delhi.
5. Bessi A., Zollo F., Del Vicario M., Puliga, M., Scala, A., Caldarelli, G., Uzzi, B., Quattrociocchi, W. (2016). Users Polarization on Facebook and Youtube. PLoS ONE 11(8):e0159641. doi:10.1371/journal.pone.0159641
6. Blancke, S., De Smedt, J. (2013). Evolved To Be Irrational? Evolutionary and Cognitive Foundations of Pseudosciences. In: Pigliucci, M., Boudry, M. (eds.), Philosophy of Pseudoscience: Reconsidering the Demarcation Problem. The University of Chicago Press, Chicago, pp. 305-320.
7. Brajdić Vuković, M., Šuljok A. (2005). Slika znanosti u dnevnom tisku: popularizacija ili marginalizacija. In: Prpić, K. (ed.). Elite znanja u društvu (ne)znanja. Institut za društvena istraživanja u Zagrebu, Zagreb, pp. 291-322.
8. Brown, H. (1986). The Wisdom of Science: Its Relevance to Culture and Religion, Cambridge University Press, Cambridge.
9. Bultitude, K. (2011). The Why and How of Science Communication. In: Rosulek, P. (ed.), Science Communication, European Commission, Pilsen.
10. European Commision (2010). Special Eurobarometer 340/ Wave 73.1–TNS Opinion & Social. Bruxelles: Directorate---General for Communication.
11. Evans, E. M. (2000). Beyond Scopes: Why Creationism is Here to Stay. In: Rosengren, K; Johnson, C; Harris, P. (eds.), Imagining the impossible: Magical, scientific and religious thinking in children. Cambridge University Press, Cambridge, pp. 305-331.
12. Fjæstad, B. (2007).Why journalists report science as they do? In: Bauer, M.W., Bucchi, M. (eds.). Journalism, Science and society. Science Communication between News and Public Relations. Routledge., New York, pp. 123-131.
13. Gerbner, G., Gross, L., Morgan, M., Signorielli, N. (1980a). The 'Mainstreaming' of America: Violence Profile No. 11. Journal of Communication, 30(3),10-29.
14. Gerbner, G., Gross, L., Signorielli, N., Morgan, M. (1980b). Aging with Television: Images on Television Drama and Conceptions of Social Reality. Journal of Communication, 30(1), 37-47.
15. Giddens, A. (1991). Modernity and Self-Identity: Self and Society in the Late Modern Age, Stanford University Press, Stanford.
16. Inglehart, R., Welzel, C. (2005). Modernization, Cultural Change, and Democracy. The Human Development Sequence, Cambridge University Press, Cambrodge.
17. Lewis, J., Speers, T. (2003). Misleading media reporting? The MMR story. Natural Review of Immunology, 3(11), 913-918. doi: 10.1038/nri1228
18. McBride, K., Sanders, S. A.; Janssen, E., Grabe, M.A., Bass, J., Sparks, J.V., Brown, T.R., Heiman, J. R. (2007). Turning Sexual Science Into News: Sex Research and the Media. Journal of Sex Research, 44(4), 347-358.
19. Nisbet, M.C. (2009). Framing Science: A New Paradigm in Public Engagement. In: Kahlor, L., Stout, P. (eds.). Understanding Science: New Agendas in Science Communication. Taylor and Francis, New York.
20. Noelle-Neumann, E. (1984). The Spiral of Silence: Public Opinion - Our Social Skin, University of Chicago, Chicago.
21. Pardo, R., Calvo, F. (2002). Attitudes toward science among the European public: a methodological analysis. Public Understanding of Science, 11, 155-195.
22. Pavić, Ž. (2013). Science and Pseudoscience in Postmodern Societies. Informatologia, 46(2), 145-153.

23. Pavić, Ž., Milanović, G. (2014). Komplementarna i alternativna medicina u Hrvatskoj: testiranje triju hipoteza. Socijalna ekologija, 23(2), 95-119.
24. Petersen, Alan; Anderson, Alison; Allan, Stuart (2005). Science fiction/science fact: medical genetics in news stories. New Genetics and Society, 24(3): 337-353. doi: 10.1080/14636770500350088.
25. Rosenhouse, J., Branch, G. (2006). Media Coverage of „Intelligent Design". BioScience, 56 (3), 247-252. doi: https://doi.org/10.1641/0006-3568(2006)056[0247:MCOID]2.0.CO;2
26. Saguy, A.C., Almeling, R. (2008). Fat in the Fire? Science, the News Media, and the ''Obesity Epidemic''. Sociological Forum, 23(1), 53-83. doi: 10.1111/j.1573-7861.2007.00046.x
27. Salleh, A. (2001). Science in the media: the good, the bad and the ugly. Australian Science Teachers Journal, 47(4), 28-37.
28. Sánchez-Mora, M. (2016). Towards a taxonomy for public communication of science activities. Journal of Science Communication, 15(2), 1-8.
29. Sardar, Z., Van Loon, B. (2005). Znanost za početnike, Jesenski i Turk, Zagreb, pp. 6-10.
30. Selvaraj S., Borkar, D.S., Prasad V. (2014). Media Coverage of Medical Journals: Do the Best Articles Make the News? PLoS ONE 9(1): e85355. doi:10.1371/journal.pone.0085355
31. Strinati, D. (1995). An Introduction to Theories of Popular Culture, Routledge, London.
32. Šuljok, A. (2015). Changes in media selection and framing of science news in Croatian daily press. Journal of Science Communication, 14(1), 1-20.
33. Trench, B. (2007). How the Internet changed science journalism. In: In: Bauer, M.W., Bucchi, M. (eds.). Journalism, Science and society. Science Communication between News and Public Relations. Routledge., New York, pp. 133-141.
34. Woloshin, S., Schwartz, L.M., Casella, S.L., Kennedy, A.T., Larson, R. J. (2009). Press Releases by Academic Medical Centers: Not So Academic?. Annals of Internal Medicine, 150(9), 613-618.

ZNANOST U DRUŠTVU „POST-ISTINE“: NOVI MEDIJI I DRUŠTVENA PERCEPCIJA ZNANOSTI

Željko Pavić, Antun Šundalić

Odjel za kulturologiju, Ekonomski fakultet, Sveučilište Josipa Jurja Strossmayera, Osijek, Hrvatska

Sažetak

Odnos javnosti prema znanosti uvijek je bio ambivalentan. Znanost je donosila nove spoznaje i olakšavala život, no moć koju spoznaja nosi sa sobom izazivala je i dvojbe u pogledu etičnosti znanosti i rada znanstvenika. Uz druge čimbenike vezane za obilježja postmodernog društva, razne zakonitosti medijske produkcije dovode do šumova u komunikaciji i negativnih stavova javnosti. Međutim, s pojavom novih medija dolazi do posve promijenjenog odnosa znanosti i medija, s obzirom na to da neselektivnost izvora informacija na internetu ruši funkciju klasičnih masovnih medija i novinara kao „gate-keepera“. Iako takav proces na prvi pogled implicira demokratizacijske potencijale, on za sobom povlači i mogućnosti iznošenja posve pogrešnih i neutemeljenih mišljenja, osobito kada je znanost u pitanju. U ovome se radu detaljno prikazuju sociokulturne promjene i obilježja medijske produkcije koja pridonose skepsi i nesporazumima, ali i izlažu korisna načela koja mogu dovesti do bolje komunikacije i uspješnijeg javnog razumijevanja znanosti. U tom se pogledu osobito ističe uloga znanstvenika kao komunikatora znanosti, ali i potreba da se napuste tradicionalna i pretjerano idealizirana poimanja znanosti kao izolirane i samodostatne ljudske djelatnosti, odnosno da se komunikacija o znanosti odredi kao dvosmjerni process.

Ključne riječi

znanost, mediji, internet, postmoderno društvo, popularizacija znanosti