Problems of science popularization exemplified by modern Russian practice

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Abstract. Science popularization is a specific public activity of scientists, the purpose of which is education and self-realization. The article emphasizes the fact that this activity is self-organized in Russia, and the key role in its development is played by technical and technological improvement and the Internet. Media development contributes to the uncontrollable spread of pseudoscientific and unscientific theories as well as their criticism. The study is focused on the showization of science, which is presented to the public in the form of spectacle and entertainment. The forms of popularization of science in sociocultural practice begin to fulfill the function of intellectual leisure for the public. Popularization in the context of media development enables scientific knowledge to become public knowledge by means of publishing popular science literature, organizing online and offline lecture halls, web portals with scientific and educational content, which is evidence of the democratization of science in general and the activities of the scientist in particular. The activities of popularizers in modern Russia are consolidating, traditions are being developed, shaped by stable rituals, and recognizable authoritative "stars" are appearing. Thus, the popularization of science seems to be an ambiguous phenomenon of modern Russian culture, which reveals the features of a centralizing sociocultural institution.

1. Introduction

Popularization as a form of representing scientific knowledge to a wide audience has formed into an independent sphere and field of activity over the past 10 years in the domestic culture. This activity involves both scientists who are ready to bring scientific knowledge in a popular format, adapting the content of scientific problems to the level of understanding of the general public, as well as scientific journalists and PR specialists creating media projects, writing books and speaking to the public. Science has gone beyond the boundaries of scientific institutions and academic communities and has become a kind of intellectual leisure activity, which, as it turned out, is in great demand today, especially among young people. In the 21st century, along with the global visual-medial turn, the permanent reform of the education system in general, and higher education in particular, the democratization of academic research institutions and the general availability of information, the popularization of scientific knowledge has become one of the trends in modern Russian society. P. Burke, who pointed out the intensification of interest in culture and cultural research starting from the middle of the twentieth century, noted: “We are on the way to the cultural history of everything in the world: dreams, food, emotions, travel, memory, gestures, humor, exams, etc.” [1]. By analogy with
this expression, it is possible to say that we are on the path of popularizing everything: popularizing science (both individual sciences, such as anthropology, history, astronomy, and scientific knowledge itself), art, individual practices, such as reading, traveling, education, etc. In this regard, there are fewer and fewer closed professional areas: knowledge, initially targeted at professionals and often in demand among those specializing in a particular field, finds its audience, listeners, readers among non-specialists. The dissemination of this kind of knowledge is provided by modern technologies, including the digitization and systematization of existing intellectual baggage [2], as well as the creation of new content [3].

The main goal of popularization is based on the idea of enlightenment, firstly, technical and technological and later humanitarian and ideological [4, p.67]. The value of enlightenment is enormous and it requires the observance of certain rules and norms, besides it is also a moral responsibility. According to I. Kant: “...the public use of one's reason must be free at all times, and this alone can bring enlightenment to mankind. On the other hand, the private use of reason may frequently be narrowly restricted without especially hindering the progress of enlightenment. By "public use of one's reason" I mean that use which a man, as scholar, makes of it before the reading public. I call "private use" that use which a man makes of his reason in a civic post that has been entrusted to him.” [5]. Free use of reason is an absolute value and good. However, in the context of norms and ethics of the teaching profession and the status of a scientist, the freedom to express one’s view on a particular problem faces the requirements of maximum objectivity established by scientific universe. The average person is not always able to distinguish unscientific and pseudo-scientific content or to separate the private point of view of a scientist from scientific knowledge per se. The dominant role of the Internet, which for the majority of those interested in science, is the only and last source of information, is alarming, since a huge number of non-verifiable documents are publicly available there: “It takes above-average internet literacy to distinguish these different types of information and informant from each other” [2, p.193]. There is a fact-checking system, evidence base, the logic of scientific analysis and criticism inside academic science, whereas online publications do not have such powerful and strict support. Moreover, there is often no certainty on some important issues within science itself, since science is primarily an uninterrupted process of cognition, the results of which are constantly reviewed and refined. The role and place of the state and official academic institutions in the review of public scientific information and strategies for popularizing activities are posing a problem now. In the Soviet Union culture, science popularization was one of the state tasks. In modern Russian reality, science popularization, which has started to intensify at the beginning of the 2010s, has been and is partly spontaneous, despite the fact that in 1998, the Commission of Pseudoscience and Falsification of Scientific Research, which today is the main official body for identifying pseudo-scientific theories in Russian science, was established in the Russian Academy of Sciences on the initiative of Academician V.L. Ginzburg. The Ministry of Science and Higher Education, with the support of Moscow State University and the Russian Academy of Sciences, has established the award For Fidelity to Science, which has been awarded since 2015 for achievements in the field of popularizing science to scientists, journalists, photographers and business representatives. But the first serious step of interest in this area from the academic world was the legislative expansion of the powers of the Russian Academy of Sciences (RAS) and the meeting of the Presidium of the RAS on September 18, 2018, which discussed the tasks of the RAS in the field of science popularization and promotion [6]. The main report on this issue made by Academician A. R. Khokhlov, Vice-President of the Russian Academy of Sciences, enumerated the tasks of the RAS in the promotion of science [7]. The first attempt to find a common line for the development of the above mentioned activity and to establish a dialogue between the initiative popularizers of science and the official scientific coordinator of the country, the RAS, was made on June 6, 2018, when the Academy of Sciences held a meeting of the popularizers with A. Sergeev, the President of the Russian Academy of Sciences [8].

Popularization satisfies the need for self-realization of a scientist or a journalist who wants to understand scientific issues in detail. For a scientist, popularization can be a form of creativity, an opportunity to make a text or a speech on familiar topics that will be in demand among the audience.
In addition, such activities, requiring great effort and additional time from the scientist, increase the role of the field of science which this scientist is engaged in, and affect his personal status and recognition both in the intradisciplinary and interdisciplinary fields. The latter may be ambivalent. There is a likelihood that the results of the work of a scientist conducting an active popularizing activity will be taken less seriously in the academic environment, and the scientist himself will receive a negative reaction from his colleagues and management. This phenomenon is called the Sagan Effect (in honor of the popularizing scientist Karl Sagan). In the Western academic world, serious career consequences are possible for scientists actively interacting with the media, therefore young scientists are not as active in the field of science popularization as those who have already confirmed their status with academic merit: “<...> science dissemination may be incompatible with a successful academic career, particularly if the scientist is a junior or pretenure investigator. <...> science dissemination is performed by productive and competitive scientists, who receive no career recognition for their outreach efforts” [9, p.2081]. As the analysis of the achievements of famous scientists shows, popularizing activity does not reduce their scientific significance, moreover, their activity and efficiency increase [9, pp.2077-2078]. Although scientists, as a rule, do not bear official sanctions for their public activities and even get some benefits, the Sagan Effect has not been overcome and bias against active communicators from science often makes itself felt in an implicit form. The question that arises here is the responsibility of the scientist involved in popularization, as well as the career advantages and disadvantages that they receive by actively contacting the media, publishing their works in media, designed for mass reading, participating in popular projects.

The purpose of the given study is to describe the phenomenon of science popularization and the main problem areas associated with this activity, as well as to identify the main peculiarities of Russian practice of popularizing scientific knowledge in modern culture. In order to achieve the previously mentioned aim, it is necessary to do the following: 1) to analyze the phenomenon of popularization of scientific knowledge in general as well as science popularization in the Russian culture of the last decade in the context of the development of new media and the Internet; 2) to designate the most prominent scientific and educational projects and regular events implemented both on the Internet and in sociocultural reality; 3) to characterize the intensification of science popularizing activities in Russia and to identify the features of communication and interaction between the academic world and the popularizing community; 4) to problematize the formats and ways of representing scientific knowledge in the context of modern popular culture.

2. Methods
Methodologically the work is based on a cultural and philosophical analysis of research literature and sociocultural phenomena. This approach allows us to analyze the essence of the science popularization phenomenon in modern Russian reality from the philosophical perspective, to determine what social changes can give rise to this phenomenon, and what effect this phenomenon has on society as a whole and individual communities, such as youth, the scientific community, academic science, popular culture, etc. A culturological approach allows us to see the phenomenon in the context of modern trends in the development of culture, such as mediation, democratization of closed social institutions, etc.

The study of the phenomenon of science and scientific knowledge popularization in the domestic scientific tradition often focuses on the development of the popular science genre. The reasons for its appearance are described as well as the stages of its formation from the publication of popular scientific books, articles, magazines, television programs to modern forms, such as the Internet and related media content [10, 11, 12, 13]. As for the Russian history of popular science, the pre-Soviet and Soviet periods are described in detail, with great emphasis on the role of “Physics for Entertainment” by Ya. I. Perelman [10, 14]. After the success of this publication, later, in 1926, the publication of a whole series of books “Science for Entertainment” began in various scientific fields of knowledge, the circulation of which in a short time exceeded 2 million copies [10]. A significant number of publications are devoted to the activities of the society “Znanie”, which was organized in
Soviet Russia in 1947 (originally called the All-Union Society for the Dissemination of Political and Scientific Knowledge, later renamed) and has become a leader in the publication of popular science journalism in the country [11]. Another part of the studies of the phenomenon of popularization is aimed at studying conceptual approaches to the phenomenon of popular science and its problematization [16, 17]. Using a philosophical and cultural approach, we propose to see the popularization of science as a dynamic phenomenon of modern culture, which is in the process of recovery with unpredictable consequences for society and science.

3. Results and Discussion

The aim of the study was to describe the phenomenon of science popularization as such, and the main problem areas associated with this activity, as well as to identify the features of domestic (Russian) practice of popularizing scientific knowledge in modern culture.

Starting from the 19th century, when the growth of scientific knowledge, mostly associated with technological breakthroughs and the change in the goals of science towards practical orientation, was combined with the development of publishing and the demand for the press and journalism, the interest in popularizing scientific knowledge and science as a whole was also intensified. The 17th century, which is considered to be the time of birth of experimental science, can be treated as the beginning of science popularization [16, 18, 19]. Around this time, the scientist left the “ivory tower” and turned to the world beyond, trying to translate the language of science into the language of common people. The scientist’s “appearance in front of the audience” was accompanied by a translation of scientific knowledge into an accessible language, writing books that present the results of scientific research in a popular form. Both Western and Soviet scientists were engaged in this activity. So, among the unconditional authorities and “stars” in the field of scientific knowledge popularization are Isaac Asimov (biology, chemistry, physics, mathematics, geography, astronomy), Brian Green (physics, astronomy), Stephen Hawking (physics, cosmology), Jacques-Yves Cousteau (geography, biology), Michio Kaku (physics, astronomy), Richard Dawkins (biology), Karl Sagan (astronomy), Jacob Perelman (mathematics, physics), Joseph Shklovsky (astronomy, astrophysics), S.P. Kapitsa (physicist, the editor-in-chief of the journal V mire nauki (In the world of science), the host of the television program Ochevidnoye-Neveroyatnoye (Obvious is incredible) and others.

The fact that science popularization is far from being limited to the framework of literature and book journalism was already pointed out in 1939 by Ya. I. Perelman: “An entertaining science has not only a book existence; in recent years, it has been embodied in the exhibits of a new educational institution, the House of Entertaining Science in Leningrad. An attempt of transferring the principles of this trend to the screen has also been made (Film “Physics for Entertainment”)” [20]. Currently in St. Petersburg there is an interactive museum of entertaining science LabyrinthUm, which organizes programs of “scientific shows” for schoolchildren. There is the museum of entertaining sciences Experimentarium in Moscow, besides, there is an interactive scientific center for children and adults the House of Entertaining Science and Technology in Kazan. These museums are based on the model of the House of Entertaining Science, initiated by J. I. Perelman in Leningrad in 1935. From the point of view of Ya. I. Perelman, entertaining science, unlike other trends in the popularization of knowledge, is aimed, first of all, not at the actual in science and technology, but at the fundamental basis, and serves to fill the gaps in school education [20].

In modern culture, which is characterized by free access to information and flexible and diverse conditions for obtaining education, based on personal needs and opportunities (for example, distance education and online education [21, 22]), scientific knowledge presented in accessible language by specialists in their field turned out to be in demand. The tools for disseminating and obtaining scientific knowledge in a popular form are media, popular science lectures, popular science literature and the Internet (including LiveJournal and social networks), as well as science museums and science festivals [14, p. 18-19]. These are the formats that make scientific knowledge easy to grasp. At the same time, the accuracy of such information can be trusted due to the fact that it is supported by the
authority of the scientific community, the majority of the representatives of which are science popularize [15].

Modern popularization in Russia takes on the forms of an already existing sociocultural phenomenon with its own institutional forms and hierarchy (for example, prominent activists of the educational movement, who can be attributed to its vanguard, such as Vladimir Surdin, Asya Kazantseva, Alexander Panchin, Sergey Popov, Stanislav Drobyshovsky have been invited to meet with A. Sergeyev, the President of the Russian Academy of Sciences), rituals, its information resources and well-established internal connections and communication flows. Science popularization started in Russia as a fairly self-organizing process in the early 2010s, as the result of efforts of individual scientists and scientific journalists and their interest in popularizing the achievements of science. Today this phenomenon is demonstrating an ever-increasing institutionalization and obvious centralization. In 2002, at the initiative of D. Zimin, the non-profit Dynasty Foundation, which supported scientific research, was established. Its successor after the closure in 2015 was the Evolution Education Trust. In 2008, the Enlightener Prize was established, which is awarded for the best literary non-fiction works. Besides, under the auspices of the Evolution Foundation, non-fiction books are published and lectures have been organized in the regions of Russia since 2016. The Foundation organizes Lecture Schools, where you can get the necessary skills for presenting material in a popular scientific form and become a part of the team. On the fund’s website, educational materials for organizing educational events are available. The Foundation holds “Meetings of Enlighteners”, at which professional science popularizers can discuss pressing issues and share successes and initiatives.

In 2010, the scientific and educational portal Antropogenesis.ru was launched, which today has become one of the central social and media active projects. Under the auspices of the portal, scientific and educational forums “Scientists Against Myths” are regularly held in Moscow and St. Petersburg, where scientists debunk various speculations around relevant topics requiring scientific professional analysis in a modern format of a short presentation. Thanks to modern technology, you can watch the online broadcast of the event after pre-registration, or become a direct participant.

In 2016, the Antropogenesis.ru portal and the Evolution Foundation set up an (anti)award for contributing to pseudoscience, called VRAL (VRunic Academy of Pseudoscience), which is presented once a year in October at the Scientists Against Myths forum. According to the creators of the award: “Trofim Denisovich Lysenko (posthumously), Djuna (posthumously) and Ambrose Ambrauzovich Vybegallo (virtually) became the first full members of VRAL” [23]. The selection of candidates takes place in three stages on social networks, the winner is awarded a diploma of the Honorary Academic of VRAL and the statuette of a sad reptiloid. As a rule, winners and finalists do not come to the award, and the presentation of the award takes place in the form of an entertainment show.

Significant projects in the Russian media space, combining the functions of popularizing science and education, include Post-Nauka project, which started in 2012. Here you can find materials in both text format and short (10-20-minute) video lectures recorded by scholars who are experts in their fields of knowledge today. The project itself states that the priority is presentation of fundamental scientific knowledge.

The new forms of presenting scientific content include Internet publications focused on current popular science information for subscribers (Science and Technology, Science), online magazines, online newspapers and online publications that provide up-to-date information from the world of science, and tell about the history of science in an attractive format (Naked Science, Troitsky variant – Nauka). Also Science Slam and Science Bar Hopping (a scientific stand-up with a 10-minute presentation), FUNK (a contemporary science film festival) are in demand in modern culture. More traditional formats of work are the activities of cultural and educational centers (e.g. “ARHE”) and lecture halls (in universities, museums, libraries, and public institutions), etc. Thus, the speeches of scientists representing a particular area of scientific knowledge and topic are in demand on TV and radio, in public lectures, in the “new media” and on the Internet. Due to the growing interest in science and the increase in the number of various events and media resources in the field of scientific
knowledge, VseNauka project aims at orienting the user, who is interested in science, in great amount of popular scientific and educational information. Information and service resources include “Indicator”, “Theory & Practice” (information about educational opportunities), “4science” (a platform for combining science and business), etc.

Innovations related to the development of media environment have also affected education. Along with the interest in scientific knowledge presented in accessible language, the need for accessible education has grown. Both in case of scientific knowledge and in case of education, the most powerful catalyst is media development and digitalization of culture. Such portals as Arzamas, Open Education, and the SciOne provide the opportunity to listen to lectures created taking into consideration pedagogical design. So, thanks to on-line courses, you can study (not study, but be studying, because it is necessary to emphasize the processuality of this practice) the Chinese language, master the brief history of Ancient Greece “in 18 minutes”, learn the history of formation, for example, of the Russian language or learn the basics of astrophysics. In the context of digitalization and mediatization, a kind of interpenetration and hybridization of the public and private, professional and amateur spheres take place. Besides, there is the desire to know everything about everything, to solve the scientific mysteries that are most closed and difficult for the average person to understand, and to make the academic world equal (equivalent) to everyday experience. This leads to a kind of scientific and educational boom, embedding science and education in the field of hedonistic consumption. For example, the edutainment learning technology, which includes entertaining content both in the traditional learning process and in non-traditional places, such as cafes, parks, offices, galleries, etc., or the creation of specialized gaming educational spaces, has long been widely used in the West, and is being used now in domestic practice [24].

The development of media systems has changed the forms and methods of communication within and outside the scientific community [2, p. 185-186]. Possibilities of quick access to updated information on one’s own or related scientific field, publications and books, various databases, quick receipt of information about ongoing scientific events, as well as grants and competitions, facilitation of interpersonal communication are the undoubted advantages of the development of new digital technologies [25, p. 382]. But at the same time, the Internet has opened wide access for both authors setting forth their views on a particular topical issue from a scientific (or pseudoscientific) angle, and for public discussion of these topics, and therefore, to a free interpretation of scientific facts, uncontrolled by rigorous framework of academic science, and their possible distortion. Open online platforms provide an opportunity to implement commercial and advertising projects labeling them as scientific ones and manipulating public consciousness (for example, advertising and production of bioadditives, advertising and sale of books on history and culture, which have a dubious “scientific” evidence base but are supported by the media). The accessibility of information can make people believe in their personal competence on issues related to everyday life, but with scientific justification (for example, vaccination issues, attitude to homeopathy and treatment of diseases, GMOs, etc.). For collective consciousness, the publication of scientific (or science-like) information in printed media, its appearance in the field of public communication gives it the status of a proven fact: “The communicative path from specialist to popular science can thus be illustrated as a funnel that removes subtleties and shades of meaning from the knowledge that passes through it, reducing it to simple facts attributed with certainty and incontrovertibility” [26, p. 62]. But then the fixed undoubted knowledge begins to affect specialists themselves, which leads to a change in the concept in the professional sphere, and sometimes it even reaches decision-making authorities.

In the Western scientific tradition, there is a rather large research body of literature devoted to the popularization phenomenon from a wide variety of points of view, both in historical retrospective and in the context of modern trends, connected with the increasing role of modern media in the work of scientists, scientific communication and communication with society and conceptual understanding of problems and prospects of this type of activity [27, 28]. The scientist’s participation in the dialogue with society in an understandable language on issues of science and scientific knowledge is a modern component of image and authority, creating an additional “surplus value” in the form of fame and
recognition both inside and outside the narrow academic circle. One of the researchers on the topic of popularization of scientific knowledge, Massimiano Bucchi, the editor of the Public Understanding of Science journal, who himself is an active user of modern social networks (in particular, Twitter) for popularizing science and informing the public about his scientific achievements, in an article written in the mode “a talk with a father”, says: “Opportunities to directly engage with the public are now potentially available to anyone in the field of research. <...> Unfortunately there is still a widespread belief that science communication is easy and straightforward, and can be improvised by anyone who knows some specific content, without bothering to understand the other terms of the equation, for example, the media and the public – or if you wish, society ” [26, p. 516]. That is, it is necessary to have not only scientific degrees and academic training, but also the skill of communication with society. The popularization of scientific ideas is an actual resource for the development of scientific journalism, and the scientific communicator today is a sought-after specialist, especially in journalism. Also, a modern scientist who wants to participate in the process of popularizing the scientific data of his field must necessarily have additional competence, which is the ability to form discourse in the language of mass communication. As a rule, active popularizers from the field of academic science have active accounts on social networks, depending on preferences (Facebook, Twitter). Domestic popularizers often have their VK page, which is oriented more specifically to individual professional activities, and also maintain their blogs and create personal pages on the Internet.

Among the problem areas of this type of activity, one can single out the fact that the line between the scientist and the showman, between science and the spectacle or entertainment, is being erased. It can happen in the minds of a wide audience, for which science is turning into a series of exciting tricks and interesting events. As one of the authors notes, in the context of the development of a media environment the public is longing for something new and interesting, thus public is not interested in science, but in science-like knowledge, and popularization becomes a form of amusement: “If you look closely at the surrounding social reality, you can notice an even more subtle nuance: increasing interest to popular science (Popular Science 2.0), but not to science itself. Popular Science 2.0 created a simulacrum of “scientific” knowledge (an exact copy of a non-existent original), which is being discussed in modern society” [4, p. 72]. By becoming a part of popular culture, science risks being replaced by pseudoscience. Examples of such science showmen are the Bogdanov twins (Igor and Grichka Bogdanoff / Bogdanov, of French descent), who are famous as hosts of scientific television shows. They wrote dissertations and published scientific articles that caused a scandal in connection with their “unscientific” character. The Bogdanov twins publish books, e. g. in 1991 the book “God and Science” (“Dieu et La Science”) was released. The book was pseudoscientific, but became a bestseller. The preface to their first book “Keys to Science Fiction” (Clefs pour la science-fiction, 1976) was written by Roland Barth, which is symptomatic in itself. Despite the fact that their books are recognized as unscientific, the Bogdanov twins continue their activities.

Another problem is the transformation of popularization into new forms that require analysis. The popularization of science can be considered a sphere of leisure, part of the industry of popular culture, specific communicative practice, the form of existence of science and scientific knowledge. The popularizer of science is not the creator of new knowledge (although he can simultaneously produce scientific knowledge in his “laboratory”), his function is to transpose information into the field of profane (everyday) using accessible language suitable for the entertainment sector (with visuals, video and audio, with interesting examples and facts using humor and simple words). With the development of media, scientists become pop stars, which has never happened before. Scientist and showman are two functions that merge into a successful public science popularizer. An experiment was conducted at the School of Medicine of University of California, during which Dr. Miron L. Fox from Albert Einstein College of Medicine, authority on the application of mathematics to human behavior, made a presentation on “The mathematical theory of games used to train doctors” at a conference in front of psychiatrists and psychologists (doctors and students). The presentation style of the speaker was scientific, special terminology was used, the presentation itself was emotional and bright. However, "Dr. Miron Fox" was actually an actor who, during the experiment, managed to convince specialists of
his scientific competence [29]. In modern realities, it is quite difficult to differentiate between true and false knowledge, false scientist from a professional, since professional activity no longer has clear boundaries. A scientist who speaks the language of popular culture and a pseudoscientist who speaks the language of science are two types of representations of scientific knowledge that require observation and analysis.

4. Conclusions

Popular science, of course, cannot be the main form of representing scientific knowledge and is not a substitute for traditional education, despite the fact that it is currently in great demand. This activity must be controlled by the academic community and the state. Some researchers believe that communication with the audience via media or “new media” is a part of the role of the scientist in society, and not just his individual decision or moral duty [30]. Having scientific degrees and extensive knowledge in the scientists’ research field is not yet a guarantee of the success of such public activities. The content and presentation of this content are two important components of the popularization of science. They are determined by the modern transformation of the education system and pedagogical activity, the growth of information flows, the “ruinization” of the classical university [31] and the introduction of new requirements for the academic profession, which leads to an epistemic revolution.

The system of rituals in the scientific world carries an important mission of symbolic community unification. Such rituals include the ceremony of defense of dissertations, the form of conferences, congresses and meetings, the organization of discussions and open lectures, etc. [32, p. 54]. A hierarchy is defined by a system of scientific degrees and titles, positions, and scientometric indicators. For scientists popularization also has an unmistakable profit, especially today, when high scientometric indicators are required. Public visibility makes the scientist recognizable not only among the general public, but also among the academic community, which increases the readability of his purely scientific publications among specialists in related fields of scientific knowledge and the citation of his works [26, p. 60, 9, p. 2081]. Thus, through popularization, using modern media, scientists have the opportunity to form their common identity, exchanging the results of their scientific research and making the borders of narrow-profile sciences, scientific topics and problems more transparent.

1. The development of media and the Internet is bringing about changes in the forms and methods of representing scientific knowledge. There are more and more media projects the purpose of which is science and scientific knowledge popularization, the so-called “fight against myths” (the danger of GMOs, vaccination issues, etc.). Besides, educational media projects are in great demand nowadays. The media format of representation of such content contributes to analyzing, developing and testing new methods used for presenting and visualizing knowledge.

However, the democratization of media, the development of modern media and the Internet have contributed to the spread of unscientific and pseudoscientific knowledge, as well as the creation of commercial and advertising products under the label of science. One of the main missions of Russian science popularizers is fighting against the previously mentioned state of affairs, which is especially relevant due to lack of control of pseudo-scientific (media) content by the academic community and the state.

2. The development of science popularization in modern Russia in the last decade, initiated by philanthropists, individual scientists and scientific journalists, is somewhat spontaneous. The media projects created during this time (Arzamas, PostNauka, Anthropology.ru and others) turned out to be incredibly popular among the broad masses. The academic, scientific and educational community has remained somewhat aloof from activities aimed at popularizing scientific knowledge and innovations associated with the emergence of new media. Recently, however, there has been an interest in dialogue and the exchange of experience on the part of the Russian Academy of Sciences (RAS) with the already established domestic community of science popularizers. Besides, the RAS has developed its own action plan in this area.
3. Science popularization in Russia is an industry aimed at disseminating scientific knowledge. On the one hand, it is fully-developed, on the other hand, it is still in its infancy. Another feature of it is that previously mentioned industry is being formed outside the world of academic science. Originally this activity was based mainly on personal initiative. Today it can be stated that popularization has developed into a separate social institution with its own organizational core, activity programs and methods, media resources, traditional events and symbols. Although this phenomenon was a complex of separate projects and initiatives at the start, it reveals considerable centralization and structurization now.

4. Another feature of science popularization in Russia is that intellectual content takes entertaining forms, becomes a form of leisure and is accompanied by elements of popular culture. Some scientists become “stars” of science, combining the features of academic scientists and media people, actively mastering the tools of media and popular culture. In our opinion, such a symbiosis of a popular format and academic science is ambivalent in nature, since the boundaries between the scientist and the showman, science and entertainment are blurred. On the one hand, this makes scientific knowledge more accessible and easily perceived, on the other hand, for ordinary minds such blurring of boundaries can lead to discrediting science and scientific knowledge, i.e., cause the opposite effect.

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