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Open Access to Scientific Knowledge. Who receives dividends?

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Abstract—Open access to scientific knowledge is considered as a new neo-liberal project in the globalized world. The advantages and disadvantages that members of the open access obtain are described. Open access greatly facilitates monitoring, analysis, and control of scientific research by global institutions and transnational corporations, and enables them to identify promising branches of knowledge on the periphery of the global science system that are obtained outside of the "mainstream" and use them for their interests. The link between open access to scientific knowledge and knowledge feudalism is developed.

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INTRODUCTION

In this project, we consider open access to scientific knowledge as another major neo-liberal project in a globalized world. However, despite the excellent objectives set forth in the project, namely, to allow free and open access to research results, and thereby dramatically accelerate the turnover of scientific knowledge, in our opinion, the true, although veiled, aim of this project is the derivation of the most significant and cutting-edge scientific knowledge from full trade and its commercialization and introduction into open but total trade turnover in terms of TRIPS. This second and higher goal could not, of course, arise in the world's institutes and transnational corporations. The fact that the Open Society Institute stands behind this project with its Budapest initiative to open the access to scientific knowledge speaks volumes. In this article we will try to prove our hypothesis.

It is obvious that the essence of the open movement to scientific knowledge was inherent to science from the beginning. Scientists have always tried share their scientific results with the others, without this we would not have advances in science [1]. The development of the Internet 20 years ago fundamentally accelerated this process, but after 10 years influential political and academic forces decided to introduce the spontaneous process of "connectedness" of research results in a controlled direction. They took strong initiatives (Budapest), declarations (Berlin), statements, and mandates recommending or even requiring open access to research results, primarily basic ones, that were carried out thanks to public funds. Powerful networks of electronic archives and online open access journals with global registers, e.g., ROAR, DOAR, and DOAJ developed the institutional and interinstitutional policies for the majority of participants in the open access process (scientists, research institutions and universities, publishers, and funding agencies) [2].

Now each interesting scientific work that is published in a small turnover and largely inaccessible journal instantly reaches its readers, after self-archiving in the open access electronic archive.

It is also important to note that the open access movement emerged among scholars and librarians in response to the escalating prices of magazine subscriptions from commercial publishers.

All the participants in open access receive its unconditional benefits: scientists increase the visibility of their publications, and, consequently, their citations; universities and research centers increase the demand for their research results and, consequently, their ratings; magazines increase their impact factors; and countries as a whole improve their overall publishing activity and the level of quotation of their scientists, and, consequently, the rating of the country. However, in cases of weak involvement in OA (open access) the movement sharply increases the competitiveness of entities that are well integrated into this movement. This leads to strong stratification of the scientific arena.

Let us give one example. Through the establishment of an electronic archive with open access at Belgorod State University (BSU) with 76 full-text documents (this was the third electronic open access archive among Russian universities) in May 2009, its January web metric rating, as calculated by the Spanish cyber-metric laboratory, increased in the beginning of July 2009 by 1597 positions. Of course, for megaversities with established science schools and traditions, whose scientists actively publish in recognized international journals, such a sudden change is impossible, but for Belgorod State University, which started from nothing, became more recognized because its electronic archive (dspace.bsu.edu.ru) promoted an improvement in the visibility of the other bibliographic resources of the university, which previously were not seen on the Google Scholar search engine (for example, pdf-files of projects from the bibliography of the Belgorod State University Research Library at elibrary.bsu.edu.ru).

Despite the fact that all the active members of the international movement for open access to scientific knowledge obtain benefits from it, on a global scale the total long-term dividends, as well as those from all the other processes of globalization (free products, services, capital, labor strength, and the intellectual property movement), go to a greater extent to developed countries. These countries have more opportunities through strong monitoring and analytics "to digest" everything that is produced by the scientists of developing countries. The scientists of these countries try to publish the results of their competitive investigations in English but most scientists and science managers from developing countries don't speak English. Therefore, the most ambitious countries should establish monitoring and analysis centers to process the huge flow of scientific information provided by the open access movement in order to extract the maximum benefit from it. Moreover, this flow will grow dramatically, as shown by the fact that currently only 15% of the worldwide scientific output (published annually in the 25 000 scientific journals) is presented with open online access [3].

Our observation of electronic archives (in the case ROAR) and open access online journals (in this case DOAJ) shows significant increases in their numbers (number of archives: May 11, 2006, 658; March 25, 2010, 1658 and number of journals, January 15, 2008, 3095; March 25, 2010, 4842).

Let us cite several outstanding examples of monitoring organization and data collection and analysis of scientific–technical information, as well as the use of the scientific and technological capabilities of other parties.

1. During the Soviet–American confrontation the Americans compared the development of the All-Union Institute of Scientific and Technical Information in Moscow with such events as the launching of the first satellite, and claimed that translation of Soviet refereed journals into the English language could solve many problems in the organization of their own monitoring and the processing of scientific and technical information [4]. The policy of the United States Institute for Scientific Information, which has the same information flow (about 1 million sources per year) as the All-Union Institute of Scientific and Technical Information, does not provide for its meaningful substantive analysis, where qualified and experienced advisors (academics in relevant fields) pore over all recently released publications and describe their substance in intensive lectures, which are more useful than author's annotations. Only the All-Union Institute of Scientific and Technical Information of the Russian Academy of Sciences could organize such a grand-scale work. I want to emphasize that at the preliminary stage it was not information and library workers who treated this huge information flow, but scientists who were interested in receiving the latest research findings and using them in their work, not to mention the fact that they received fees for this work. We would also like to mention that after the breakup of the Soviet Union, of course, the quality of abstracting journals deteriorated and attracting strong scientists to collaborate with the All-Union Institute of Scientific and Technical Information became difficult because of the low fees and easy access to online journal databases; magazines became very expensive and the new generation of scientists couldn't imagine them. Our 10 years of experience in the economic departments of the Kharkov National University (1999–2005) and Belgorod State University (since 2006) shows that virtually all economists (and not just graduate students) do not suspect the existence of such abstract journals as *Industrial Economics* and *Management Organization* of the All-Union Institute of Scientific and Technical Information (they are not available in the collections of the academic libraries of these universities), as well as the abstract journals and bibliographies of *Economics* of the Institute for Scientific Information on Social Sciences, (Moscow), although the libraries of these universities take the latter ones at an affordable price. This explains the level of our economic research.

2. The well-known example of the Japanese monitoring, data collection, analysis, and use of nonproprietary amateur Soviet inventions and knowledge that is widely published in the scientific journals *Techniques of Youth*, *Knowledge is Power*, and *Science and Life*.

3. The unique range of free and freely available in the printed and electronic types of magazines in the CORDIS focus, which is published by the General Directorate of the European Commission for Research has been transformed into three publication since 2008: Research eu: a magazine on European research (published ten times each year with a turnover of 126 000 copies in four European languages), the Research eu. results supplement (in English), and Research eu. focus (in three European languages). Compared with the previous series of journals, their circulation and the number of languages into which they are translated has decreased, but their quality and presentation has improved.

A large number of scientific journalists and interpreters work on the first journal; they prepare special reports on specific topics and a series of stories within the priorities of the 7th Framework Program of the European Community for Research and Advanced Development and they give reports on outstanding scientists under the title "Portraits." The second magazine is actually the abstract journal for the major results of the projects of the 5th Framework Program of the European Community for Research and Advanced Development, which are covered in five sections: biology and medicine; energy; the environment; information technologies and telecommunications; and industrial technologies. A sixth category, "Events," provides information about upcoming con-

ferences, seminars, schools, etc. The third journal describes the successful history of European research and innovative practices. In general, it is a unique set of magazines with an excellent design, which provides performance monitoring of the Framework Program of European Community for Research and Advanced Development, as well as an overview of the developments in the European Research Area. It is important to note that research teams from all over the world, including Russia, have participated and participate in the network consortia of the above programs. In this connection, it should be stressed that the European Commission orders and pays for the work, so the main commercialized results of the applied research Framework Program belongs to it [5]. Russia could raise its scientific image if it would to publish Russian-language versions of these magazines with the support of the European Commission. This would be a publishing project under the All-Union Institute of Scientific and Technical Information (refereed journals) and it would address the post-Soviet scientific community, which is generally not fluent in English.

4. The International Science Foundation (the Soros Foundation) grant program for emergency support of all ex-Soviet scientists who have joint publications in internationally recognized magazines, which is in the amount of 500 US dollars, and selection of the best of them, with grant support of over $10000 for the further involvement of many of them in work abroad [6]. This was organized after the collapse of the Soviet Union.

It should be noted that even now in an era of unprecedented development of the Internet, when intellectual property can go anywhere in the world with a single keystroke of a computer, knowledge, which is inseparable from its carriers, has played and will play a huge role, especially in the basic training of the next generation of scientists and skilled specialists. Therefore, developed countries will never abandon the search and recruitment process for "brains" around the world, primarily within the least developed and postsocialist countries, where they are often not needed and therefore are inexpensive.

Russia as a Great Power should integrate into the international movement for open access as soon as possible and develop a dignified scientific and technical potential in a powerful network of digital archives (currently on the ROAR register there are only 27 such archives in academic institutions of the Department of Social Sciences of the Russian Academy of Sciences and 3 in the classical universities of Ekaterinburg, Krasnoyarsk, and Belgorod, while in the USA there are 303, in Great Britain there are 164, and in Germany there are 108 archives) and open access online magazines (out of 4842 such journals in the DOAJ register there are not more than two dozen Russian ones), as well as developing a system for the monitoring and analysis of scientific open access information. The opinion that those who first fully integrate into this movement will have much greater dividends from it is well known. The potential advantages and disadvantages for participants in the open access movement are summarized in the table.

In the context of this analysis, it is important to note that the production, distribution, and use of global scientific knowledge is controlled and regulated by the institutions and corporations of developed countries [7, 8]. For example, the awarding of the Nobel Prize in economics is under the control of Wall Street and the Bank of Sweden. The corporatization and privatization of knowledge have become a reality of the corporatized economy, in which there is only corporate power instead of competition in the market [9].

Any research that is done outside of the so-called "mainstream" is considered marginal; its results are ignored and not referred to and it is impossible to attract attention to them. The results of studies that promise benefits upon commercialization in the future are derived from the open scientific revolution. This is so-called "knowledge encapsulation" [8], which also refers to the results of research that is conducted outside the mainstream. Belonging to the mainstream means publication in journals that are included in the database of the Institute of Scientific Information, USA, which have recently become part of the transnational Thomson–Reuters media holding, which owns two-thirds of the global media market.

In each area of research it is important to understand which institutions control it, forming scientific fronts and clusters of publications, which is the corresponding mainstream; otherwise, it is impossible to build a strategy for entering them. By institutions we mean research centers and universities, scientific journals, and other entities, as well as the granting organizations that are behind them (foundations and corporations). For example, many biomedical research scientific foundations create the multinational pharmaceutical, biotechnology, and genetic engineering companies that contribute to the hypertrophic growth of research, which is not related to their social significance.

The same issues apply to the areas that are related to nanotechnology and information and communication technologies, whose development is fueled by vested interests.

If the results of fundamental and applied research that are published in scientific journals freely circulate in the scientific community facilitated by the movement of the open access, so in commercialized knowledge "information or knowledge feudalism" dominates [10, 11]. For example, in [11] shedding light on such issues is proposed:

(1) Schools in villages are unable to provide computer education to their children because licenses for the Windows operating system are too expensive.

Open Access to the scientific knowledge

Open Access members	Advantages	Disadvantages
1	2	3
Scientists	Raise the visibility of their publications and index of their quotation and, consequently, their competitiveness	Weak involvement in the Open Access movement increases relative disadvantage to competitors
Universities and research organizations	Improve the relevance of their research results, and, consequently, their competitiveness (their institutional rating)	Weak involvement in the Open Access movement increases relative disadvantage to competitors
Publishers of Science Periodicals	Improve the impact factors of their journals	Subscriptions to the traditional (paper) versions of journals are reduced. Weak involvement in the Open Access movement increases relative disadvantage to competitors
Research and promotion agencies	Criteria and selection methods of grant applicants become more transparent. The return to science research supported by the requirements of the Open Access policies of the funding agencies increases*	
Countries	Raise the overall competitiveness of local scientists and institutional participants, and, consequently, their countries rating	Weak involvement in the Open Access movement increases relative disadvantage to competitors
Developed countries in general and transnational corporations	Have overall advantages over developing countries due to powerful control facilities and analysis of all the Open Access to research results. Advantages of the English language	
Developing countries in general		Have a total loss before developed countries and transnational corporations due to the lack of powerful control facilities and analysis of all Open Access research results. Noncompetitiveness of national languages

* For example, placement in the public domain of not only conventional articles and monographs, but also primary (raw) data [2].

(2). Millions of people die from hunger, while improvement technologies (patents) for agricultural production are protected.

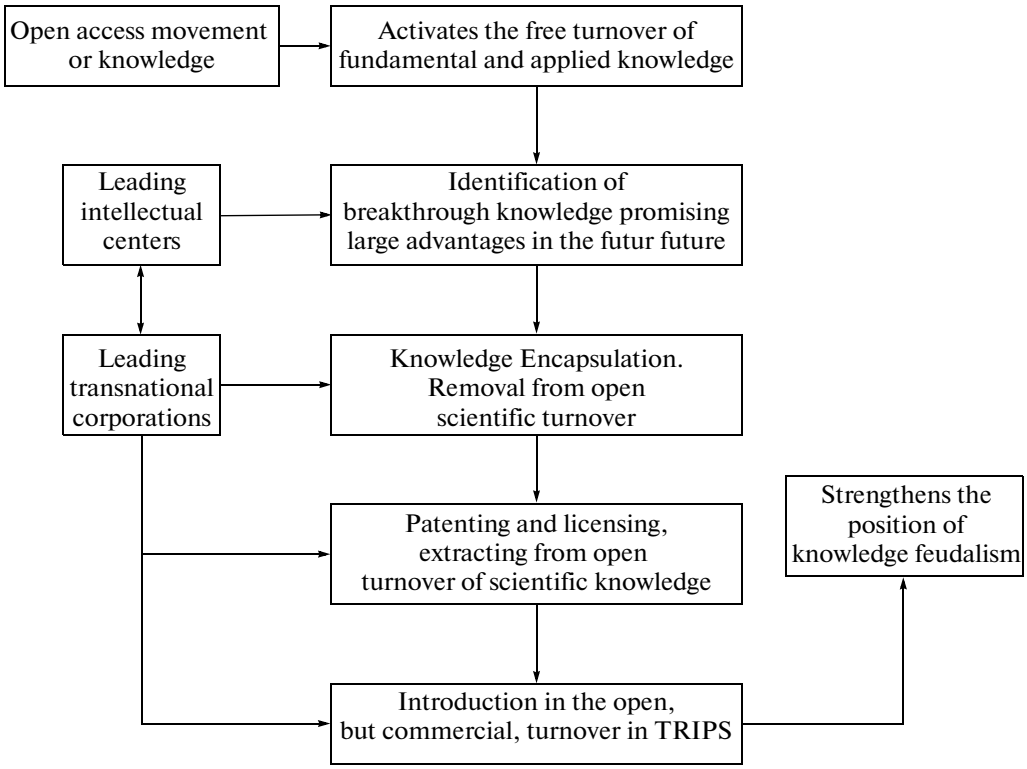
(3) Large companies developed the technologies for desalination and water purification, but still millions of poor people struggle to obtain clean drinking water.

(4) In Africa people are dying from AIDS, while companies that produce cheap generic medicines prevent the production of essential drugs that are patented by transnational corporations.

(5) Effective means of production are available, but small and medium-sized enterprises are deprived of the use of such proprietary processes and business methods.

The above analysis allows us to understand the relationship between open access to scientific knowledge and knowledge feudalism. We have presented this relationship in the figure. Thus, freely circulating socially significant knowledge is introduced into the open after removing it from the scientific revolution and commercialization, but trading and turnover in the TRIPS strengthens the position of knowledge feudalism.

Global peace can be found in the constant race to invent new products and technological processes to overcome the existing patents on old ones that fabulously raise the prices of end products. Moreover, this is treated as an advantage and as an innovative method of development. Thanks to this type of policy, many Americans no longer can afford their own medicine and they go to Mexico for cheaper generic drugs. In [10] it was noted that the total cost of brand-name



The connection between open access to knowledge and knowledge feudalism.

drugs in the USA tripled from 1990 to 2000, from 40.3 to 121.8 billion dollars.

The result of our proposed scheme (see the figure) consists of the following idea. Socially significant knowledge obtained through public funding at the expense of taxpayers should remain after its commercialization as a public good. A huge role in this process is played by autonomous communities of universities that do not have to give business most of the rights to their research developments and, therefore, are obliged to monitor their commercialization and distribution. This would be possible only under conditions of the development of powerful university networks, as individual universities in a globalized world cannot generate finite knowledge for the new technological regime. University communities should be no less powerful than commercial ones and transnational corporations; they should foresee promising and cutting-edge knowledge that emerges from their own basic and applied research and build centers for science and technology foresight of their own. Again, this is possible only if university networks exist.

In conclusion, we emphasize that the international open access movement to scientific knowledge greatly facilitates its monitoring, analysis, and control for the global institutions and transnational corporations that are behind this movement, allowing them to more quickly identify the seeds of promising scientific knowledge at the periphery of the global scientific system that have been obtained outside the "mainstream" and use it.

Countries, universities, research centers, institutes, research teams, and individual scientists have a tough choice: remain on the fringes of global scientific knowledge or try to enter the mainstream using the unique possibilities of open access.

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