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## Sociology of Science & Technology

Санкт-Петербург

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им. С. И. ВАВИЛОВА

ИЗДАТЕЛЬСТВО «НЕСТОР-ИСТОРИЯ»

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# РОССИЙСКО-КИТАЙСКИЙ СЕМИНАР ПО ИСТОРИИ НАУКИ
# Russian-Chinese Seminar on History of Science

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## Introduction

Since the 17th century, the number of people participating in scientific activities has risen increasingly. Such scientific institutions and societies, as Accademia del Lincei founded in Roma in 1603 and Académie Royale des Sciences supported by the French government, came into being. In 1724, Russia established the Royal Academy of Science (Императорская Академия наук и художеств) in St Petersburg, which substantiated the Academy a more scientific research institution. Over more than four hundred years, this kind of scientific system has been changing with the development of science and technology, and has been developed under different cultural environment and countries. Therefore, it formed different structures and development models, which is of vital importance to the innovation and application of knowledge as well as cultural prosperity in history.

Both Russian Academy of Sciences and the Chinese Academy of Sciences have established professional research institutions for the history of science and technology, namely the Vavilov Institute for the History of Science and Technology (Moscow and St Petersburg) and the Institute for the History of Natural Sciences (Beijing). The two institutes took the lead in realizing national institutionalization of research on the history of science and technology in the respective countries and professionalization of historians of science and technology. The two institutions started Sino-Russian academic communication ever since the 1950s, after the 80s, the exchanges continued to deepen. In April 2007, St. Petersburg branch of the Vavilov Institute for the History of Science and Technology, Institute for the History of Natural Sciences, and Shandong Education Press made an agreement to cooperate in translating and publishing some volumes of the book series on the history of science

and technology in modern China into Russian, which has been supported by the General Administration of Press and Publication of the People's Republic of China.

In recent two years, exchanges and cooperation between Chinese Academy of Sciences and the Russian Academy of Sciences in the history of science and technology have further deepened. The two Russian directors, prof. Eduard Kolchinsky and prof. Yury Baturin, have paid visits to Beijing successively, the partnership between the VIHST and IHNS has been established in the form of an agreement, various forms of cooperation, including Bilateral conferences, symposiums, workshops, joint postgraduate training, etc. have been initiated. In 2010 July, the IHNS and the St Petersburg branch of the VIHST, signed a cooperation agreements, which determined that the theme of exchanges and cooperation include comparative studies of the development of science and technology and the transmission of knowledge between China and Russia, and so on. In March 2011, the IHNS and the VIHST signed a cooperation agreement, which aimed to promote the bilateral academic exchanges between the two institutes, to carry out scientific research projects, exchange of scientific researchers and graduate students, etc.

The comparative study helps us identify the nature of things. Both Russian Academy of Sciences and the Chinese Academy of Sciences are typical national research institutions, which played leading roles in their countries. Furthermore, these two Academies have gone through wide communication and cooperation in the past. They are ideal cases to the comparative study, to which great importance has been attached by both Chinese and Russian scholars. In order to implement the bilateral cooperation agreements, the director, prof. Eduard Kolchinsky, visited Beijing with five experts in October 2011, during which, in October 12–15, they carried out "Conference on Comparative Studies of Chinese Academy of Sciences and Russian Academy of Sciences" in collaboration with the IHNS. In this conference, historians from both institutes discussed the history of two academies and their cooperation in the past, which helps us have a deep understanding of the development and reform of scientific institutions that keep pace with the times. We will publish the papers, which contribute to the conference, in *Sociology of Science Technology*, in order that more scholars and readers, who are interested in the issue, may conveniently share Sino-Russian scholars.'

I would like to extend my sincere appreciation to scholars from both countries who contributed papers for this conference and the journal. They are Nadia Asheulova (Ащеулова Н. А.), Tatiana Feklova (Феклова Т. Ю.), Valentina Lomovitskaya (Ломовицкая В. М.), Anna Samokish (Самокиш А. В.), Anastasia Fedotova (Федотова А. А.), Yangzong Wang, Li Zhang, Jiuchen Zhang, Jinhai Guo and Lina Wang. I would also like to extend my heartfelt thanks to those scholars edited these papers. I'm looking forward to obtaining more fruitful achievements through cooperation and to contributing more new knowledge to the international colleagues.

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# Foreword

Due to their geographical neighborhood Russia and China have long-standing ties rooted in their mutual history. They have been studied thoroughly enough in many aspects by both Russian and Chinese historians. The last twenty years have seen growing attention to the issues of relationship between two countries which is caused by a dramatic change in the geopolitical situation and the nature of international links including those between Russia and China. Their main imperative is desire of friendly neighborhood and cooperation in various fields.

At this background it looks strange that until quite recently the history of scientific contacts and cooperation between the two countries has been ignored or treated in Russian books as the Soviet Union's unselfish aid to the young People's Republic of China in the 1950s to early 1960s. China saw a different situation when starting from the mid 1980s scientific works were published devoted to the results of the policy "learn from the USSR" and its significance for Chinese science. Conclusions and assessment made by Chinese colleagues differed sometimes greatly from the dominant views in the Russian scientific community. From the start of the new millennium the situation began to change and today various scientific links have been established. Several shared projects on the history and sociology of science have been completed.

In his foreword, director of the Institute for the History of Natural Science, Chinese Academy of Sciences, Professor Baichun Zhang looks in detail at the events in recent years from a perspective of cooperation between his Institute and the Institute for the History of Science and Technology, Russian Academy of Sciences. I would like to note that the origin of this close cooperation dates back to the first years of the XXI century when the exchange of visits took place between heads of our institutions: Liu Dun and Baichun Zhang from the Chinese side and V. M. Orel and E. I. Kolchinsky from the Russian side. We established friendly relationship from the very beginning which helped to quickly build further fruitful cooperation. At first it was reports and papers that introduced work of their foreign colleagues to scholars in the both countries. Historians, philosophers and sociologists from the Center for Science, Technology and Society of Tsinghua University took an active part in these efforts. In 2005, in Beijing the International Congress of History of Science was held, as well as the international forum *Reforms of Science in China and Russia: Theory and Practice* which raised our relationship to a higher level and enabled us to launch long-term mutual projects. One of them was publication of books — both in Chinese and Russian — dealing with various aspects of science reorganization in the two countries over the last decades. It became clear, thanks to that project, that it was time Russia learned from China how to reform science in order to get positive rather than negative results, and instead of destruction of Russia's scientific potential to increase it quickly and integrate closely into the world scientific community.


Participants of the international forum "Reforms of Science and Technology in China and Russia: Theory and Practice", 2005, Beijing

So, all this led the two institutes — the Institute for the History of Natural Science, CAS, and the St Petersburg Branch of the Institute for the History of Science and Technology, RAS, to take obligation of assistance in translating books — into Russian and publishing in Russia — on the history of Chinese science produced by the Shandong Education Press.

At that time we published in Russian the collection of papers "Reforms of Science and Technology in Russia and China: Results and Perspectives" as well as a book by Baichun Zhang, Fang Yao, Juchun Zhang, Long Jiang "Technology Transfer from the Soviet Union to China in 1949–1966". The latter one, based on archive materials, reveals, honestly and without prejudice, complicated but really brotherly relations between two giants of the socialist bloc in the 1950s.

By 2010 the Russian-Chinese cooperation in history and sociology of science had become quite various and differentiated. Numerous visits were paid by Chinese scholars to Moscow and St Petersburg, as well as by Russian scholars to Beijing, Shanghai, Nanking, Changsha, and so on.


Reforms of Science and Technology in Russia and China: Results and Perspectives / eds. N. Asheulova, O. Bao, E.Kolchinsky. St Petersburg: Nestor-History, 2009

Formal signature of agreement on science cooperation (2010), Baichun Zhang, Eduard Kolchinsky

In 2010, while E. I. Kolchinsky and T. I. Yusupova took part in the 12th International Conference on History of Science in China held by the Chinese Society for the History of Science and Technology, agreements were concluded on cooperation between the Institute for the History of Science and Technology, St Petersburg Branch, Russian Academy of Sciences and the Institute for the History of Natural Sciences, Chinese Academy of Sciences, as well as the Center for Science, Technology and Society, Tsinghua University.

I think it was a unique experience of this multifaceted cooperation when Professor Baichun Zhang organized a Chinese-Russian meeting in Beijing, in October, 2011 at the Institute for the History of Natural Sciences, Chinese Academy of Sciences. Thanks to a thoroughly

Participants of the Chinese-Russian meeting at the Institute for the History of Natural Science, Chinese Academy of Sciences, Beijing, 2011

thought-over program it was possible during three days to look closely at the issues like Soviet experts in the Chinese Academy of Sciences; Sino-Soviet cooperation in natural resources surveys; distinctive features of academic mobility in today's Russia; pharmaceutical hunger and medicinal plants: mobilization of the botanists during Word War One; the Russian Academy of Sciences' expedition and exploration of China in the first half of the XIX century, and so on.

The following contributors — among others — were of outmost importance for Russian participants: Jiuchen Zhang, Wang Yangzong, Zhang Li, Guo Jinhai, Wang Lina, and Professor Shu Miao as interpreter helped a lot to discuss in detail each paper in lengthy debates. No doubt that not only did that meeting strengthen our cooperation but also raised it to a new level. Thanks to hospitality of the conference organizers, and first of all Professor Baichun Zhang, Russian historians and sociologists of science were able to familiarize themselves with a unique culture, to appreciate generosity and friendliness of the Chinese hosts. But the main thing was that once again we saw that the Chinese case of science reforms, which enabled China to become one of the leading scientific powers in a very short time, could be invaluable for Russia.

In conclusion, I would like to express my sincere gratitude to Professor Baichun Zhang, his wonderful staff, especially Wang Fang who took care of us in Beijing and helped us solve various problems. We will do our best to make the conference *Traditions and Innovations* planned for October, 2013 fruitful and useful as well.

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# The History and Institutional Characteristics of the Chinese Academy of Sciences: a Sketchy Account

The Chinese Academy of Sciences (CAS) was founded on November 1, 1949. Over the past six decades, CAS, as China's most important scientific research center, has embarked on a unique road of development with distinctive features. Its history and system are rarely seen in the world history of science and technology.

***Keywords:*** The Chinese Academy of Sciences(CAS), historical sketch institutional features, unit system.

## I. A Brief Introduction to the History of CAS

The development course of CAS falls into the following six stages.

The first one, from 1949 to 1955, is a pioneering stage. In 1950, CAS set up its first research institutions on the basis of former institutes of Academia Sinica, the former National Academy of Peiping and other research institutions in China's mainland. After

consolidations, the first 15 CAS research institutes and preparatory offices for three other institutions were inaugurated. In addition, some brand-new laboratories were established in line with the needs of national reconstruction through the recruitment of outstanding overseas S&T professionals. By 1955, the number of CAS research institutes went up to 47. In the mean time, in light of experience of the USSR Academy of Sciences and the China's S&T development, CAS established the Academic Divisions (CASAD) comprising four divisions: physics, mathematics and chemistry; biology and earth sciences; technological sciences; and philosophy and social sciences. It put in place a system whereby different Academic Divisions supervised various research institutes, laying a foundation for the academic leadership at CAS.

The second stage, from 1956 to 1966, witnessed a rapid growth of CAS. In early 1956, the Central Committee of the Communist Party of China (CPC) called for a "march toward science." On behalf of the CPC Central Committee, Premier Zhou Enlai set the keynote for the accelerated advancement of CAS by advocating: "pooling the most outstanding scientific workers and college students to conduct scientific research, strengthening CAS with enormous efforts, and building it into the locomotive of the nation's scientific research and education." The formulation and implementation of the National 12-year Long-term Plan for S&T Development ushered in a phase of amazing development for CAS. To address the needs of national defense and industrial reconstruction, a batch of new institutes for advanced technologies were founded. Furthermore, to enforce the planning for academic disciplinary development, some CAS institutes for basic and applied sciences were inaugurated. In addition, a system of postgraduate education was introduced to CAS in 1956. During the economic and social campaign of "the Great Leap Forward" from 1958 to 1961, CAS branches and their research institutes mushroomed across the country, bringing the total number of CAS institutes up to a record 242. Later, during the shake-up of national institutions from 1961 to 1962, the central authorities abolished all the provincial branches of CAS and colleagues run by institutes, and many research institutes were abolished or consolidated. By 1962, the number of CAS institutes was reduced to about 100, forming the geological and academic landscape of CAS in the later stage. Meanwhile, with the launch of "the third line" construction campaign, considerations were made to relocate CAS institutes from big cities such as Beijing and Shanghai, into inland places, and site selection was soon started in Shannxi, Shanxi, Hubei and Sichuan. However, most of the attempts were abandoned during the Cultural Revolution starting from 1966. Nevertheless, because of the move, some CAS institutes came into being in the northwest and southwest China.

During this period, the CPC Leading Group at CAS proposed to conduct research into three key tasks (later known as the "three grips"), namely cutting-edge science and technologies, major S&T issues concerning national economy, and basic scientific questions. Centering on nuclear weapons (A-bombs, satellites and missiles), CAS researchers made outstanding contributions to China's cutting-edge science and technology development. At the same time, they scored large numbers of applied research results for the development of national major research projects for agricultural and industrial development and natural resources surveys. In addition, breakthroughs such as synthesis of bovine insulin were made in basic research.

In the third stage, from 1966 to 1976, CAS was badly disrupted in the political upheaval of the "Cultural Revolution:" some major CAS leaders (such as Zhang Jinfu, Pei Lisheng and Du Runsheng) were toppled; a large number of scientists suffered greatly; and many key departments were controlled by activists. In addition, many research institutes for national

defense were put under other administrative systems. Later, under the incorrect guideline of "open-door scientific research," which encouraged researchers' intensive and direct participation in political movements and productive labor, a host of CAS institutes were transferred to other departments or local governments, and some were even dismantled. For a time, only 10 research institutes of natural sciences remained directly under CAS. The sound research foundation built up over the previous 10 years or so was almost destroyed completely.

In 1972, under the personal intervention of Zhou Enlai, basic research in China was somewhat revived. In 1975, Hu Yaobang and Li Chang carried out a short-lived rectification campaign in the Academy. Although the two were soon criticized, what they had done to restore research order, to readjust the policies on the intelligentsia, and to improve work conditions for researchers, laid an important foundation for promoting the advent of the "Spring of Science."

The fourth stage, from 1977 to 1980, saw a revival of CAS. At the end of May 1977, Mr. Hua Guofeng, then General-Secretary of CPC Central Committee, decided to convene the National Science Conference. CAS did a great amount of preparatory work for this convention, which ushered in the "Spring of Science." After resuming his leadership position in June 1977, Mr. Deng Xiaoping took the initiative to take charge of national S&T development with great attention on CAS. Entrusted by him, in early August, CAS and the Ministry of Education jointly held a symposium on education and science. In March 1978, the National Science Conference took place. In this way, CAS not only led restoration of the normal S&T order in Chinese S&T community, but also played an important promotional role in bringing order out of chaos and implementing the policies on the intelligentsia throughout the country.

This period also saw rapid restoration of research order at CAS. A large number of S&T bodies were either reorganized or renewed. In October 1977, China's first graduate school system was established at CAS. In early 1979, CASAD resumed its academic activities. A total of 12 CAS branches were also established or renewed across the country in such places as Shanghai, Chengdu, Xinjiang, Lanzhou, Hefei, Guangzhou, Shenyang, Changchun, Wuhan, Xi'an and Kunming. By 1980, the total number of CAS research institutions hit 117, and that of its employees reached a record 84,000.

The fifth stage, from 1981 to 1997, is a period of reform and exploration for CAS. In line with the advancement of the national S&T system reform, CAS continuously adjusted its administrative guidelines and orientations. A series of reforms were attempted in terms of science administration, funding and personnel systems. On the basis of the CASAD system, an academician system was set up. In spite of a spell of severe financial difficulties, CAS led the national S&T system reform by introducing such measures as setting up open laboratories and a science fund open to the whole country; and introducing a contract system of employment for all staff, a director responsibility system at institute level, and the Hundred Talents Program, a cross-century scheme to recruit qualified personnel. At this period, technological development became an important task of CAS. Several hundred high-tech spinoffs were started at CAS. However, few of them were as successful as today's Lenovo Group, and most were later closed or left the Academy.

This period witnessed the launch of a host of big-science projects at CAS, including the Beijing Electron-Positron Collider, the Lanzhou heavy-ion accelerator, the National Synchrotron Radiation Laboratory, which has promoted basic research of CAS. From the 1980s to the 1990s, CAS established a large number of national key laboratories, accelerating the academic disciplinary development and scientific research. In terms of basic science, CAS scored a batch of outstanding research achievements, including the development of a symplectic geometric

algorithm of Hamiltonian Systems; breakthroughs in superconductivity, precise measurement of τ lepton mass, synthesis of new nuclides; the development of a solar multi-channel telescope and an astronomical telescope with aperture of 1.56 m; and the construction of a high-resolution physical map of the rice genome for the first time in the world. In addition, many research achievements were scored in the fields of environment, resources, information technology, materials and space science and technology.

The CAS post-graduate education made rapid progress in this period. A large number of graduate students were trained to become the main research forces of the Academy. The Hundred Talents Program, which was started in the 1990s, recruited and fostered many outstanding young researchers, laying a solid foundation for filling in the generation gap of CAS S&T personnel.

The sixth stage, from 1988 to today, is a period for implementing the Knowledge Innovation Program (KIP) and the Innovation 2020. CAS conducted research into China's strategy for S&T development in 1997 and at the end of the year, presented to the central authorities a report entitled *Building the National Innovation System to Usher in the Knowledge Economy Era*. On February 4, 1998, the General Secretary of CPC Central Committee Jiang Zemin made an important instruction on this report. In June 1998, at the first session of the National Leading Group for S&T Development, the Academy was given the green light to spearhead KIP. One month later, a launch meeting for this Program was held at CAS. The KIP pilot program falls into three phases: launch period (1998–2000), overall implementation period (2001–2005), innovation and overlapping period (2006–2010). Over the 10 years or so, CAS adopted a series of measures, including crystallizing S&T objectives, adjusting S&T layout, reforming management system, improving research conditions, expanding cooperation through opening to the outside world, and fostering innovation culture. CAS was downsized as the number of its autonomous research institutes went down from 123 in 1997 to 100 in 2009. Many big science facilities were also launched, including Large Sky Area Multi-Object Fibre Spectroscopy Telescope, Shanghai Synchrotron Radiation Facility, the Daya Bay Neutrino Laboratory, and China Germplasm Bank of Wild Species. Renovation was made to Beijing Electron-Positron Collider and the Lanzhou Heavy-ion Accelerator. CAS has dramatically improved its research and education conditions and environment, and remarkably upgraded its innovation capacity. Outstanding research findings were made in basic science, strategic high-tech development and sustainable development studies with rapid increase of the numbers of research papers and patents. Over the past decade, CAS has played a leading and demonstrative role in building the national innovation system, giving impetus for China's S&T reform to enter a new stage focusing on developing a national innovation system with Chinese characteristics. At the same time, it promoted the increase of social innovation awareness, and improved CAS position in the international S&T community.

## II. Features of the CAS System

### 1. Orientation of CAS

In its early years, in addition to serving as the national center for scientific research, CAS was a governmental department under the Commission of Culture and Education of the State Council, which is conducive to its rapid development. Nevertheless, due to its own

limitations, it was difficult for CAS to fulfill its role as a government organ. In the *Organic Law of the State Council* adopted at the First Plenary Session of the First National People's Congress in September 1954, it is clarified that CAS would no longer serve as a component of the State Council, but it would still be subject to the direction of the State Council. Thereafter, the role of CAS has changed from a government administration to an institution directly under the State Council.

The Academy's role as the national center for scientific research was beyond doubt at first. In fact, the establishment of CASAD in 1955 was a major step toward this goal. However, in the "march toward science" campaign, scientific research received increasing attention from universities and research institutes under industrial departments, which intensified their competition with CAS in terms of S&T personnel and other resources, and led to the doubt over the central role of CAS. The dispute was only mediated by the intervention of top state leaders such as Mao Zedong and Zhou Enlai. It was then that China's S&T system and the role of CAS were officially clarified. Premier Zhou Enlai made it clear in his government report in June 1957 that "China's system of scientific research is made up of four components: CAS, universities, research institutes under industrial departments, and those under local governments. CAS is the academic leader and key research center of the system while universities and research institutes (including laboratories of factories and mines) under industrial departments and local governments are extensive bases for China's scientific research. It is the organizational principle of China's S&T forces. Leaders of various departments should promote partnership in the spirit of coordination and to overcome the unhealthy undertaking of departmentalism."

In March 1956, the State Council formed a Commission for Science Planning. Although an *ad hoc* agency for blueprinting the 12-year Long-term Science and Technology Development, the commission remained functional after the formulation of the planning. In May 1956, the State Council set up a National Commission for Technology as a permanent agency. On basis of the two commissions, in November 1958, the State Science and Technology Commission (SSTC) was established. Later, local governments followed the suit to set up its own S&T committees, thus forming a unified S&T management system from the central authorities to local governments.

While the administrative role of CAS in the S&T community was further weakened after the establishment of SSTC, its function as the national center for scientific research never changes. To minimize the setback suffered by S&T research during the Cultural Revolution, Zhou Enlai said that China has to rely on CAS for S&T research. In 1970, SSCT was merged into CAS, which reinstated CAS's formal role as both the science center and an administration for China's science enterprise. The situation changed in September 1977 when SSTC was resumed.

In its early years, CAS was a comprehensive academic institution engaged in natural sciences, applied technology and social sciences. To strengthen the ideological leadership over institutions for social science, after the Anti-Rightist Movement starting in 1957, the CPC Central Committee Propaganda Department took over the academic guidance of the 10-odd research institutes under the Academic Division of Philosophy and Social Sciences, leading to a gradual independence of the Division and its institutes. In May 1977, the Academic Division of Philosophy and Social Sciences was renamed as the Chinese Academy of Social Sciences, thus becoming fully independent of CAS. Since then, CAS has been defined as the national comprehensive research center for natural sciences. In January 1981, CAS proposed to the Central Committee of CPC to build the Academy

into the nation's highest academic body and a multi-disciplinary research center for natural sciences. This was further confirmed in its *Tentative Constitution* adopted by CAS later this year. In the same year, however, the central government set the guideline for S&T development, stating national economic development must rely on science and technology, science and technology must serve national economic development. This made the newly-defined CAS mission and guiding philosophy seemingly behind the current requirements of the central authorities. Although CAS adjusted the guiding principle for running the Academy in 1983, its mission remained unclear in a rather long period of time.

In January 1994, during the annual conference of CAS, Jiang Zeming sent his congratulatory message, saying that CAS should strive to blossom into a scientific research base up to the international advanced level, a training base for high-caliber S&T professionals, and a base for promoting China's high-tech development, making further contributions to China's modernization. The line was reiterated in Jiang's greetings to mark the 45th anniversary of CAS later on, further clarifying the objectives and role of CAS.

*The Constitution of the Chinese Academy of Sciences*, which was adopted on December 28, 2005, stipulates that CAS is composed of CASAD and various subordinate establishments. It is China's highest academic institution in natural sciences, the top S&T advisory body in this country, and the national comprehensive research and development center in natural sciences and high technologies. Its development objective is: Striving to build itself into a center of excellence in scientific research, high-caliber S&T personnel training and high-technology development noted for first-class attainments in scientific research, benefits, management and talents. This newly defined vision and objectives embody the development experience of CAS over the past decades. However, they have yet to be endorsed by the government in the form of law.

**2. Major Tasks and Administrative Guidelines**

The fundamental differences between CAS and former Academic Sinica are not only in their orientations, but also their major tasks and administrative guidelines. Since its establishment, CAS has emphasized its services to the people and the national reconstruction. In 1950, it specified, in the Directive of CAS President Guo Moruo, that the cardinal principle to reform the previous S&T institutions should be based on the culture and education policies prescribed in the Fifth Article of the *Common Program of CPPCC* (the Chinese People's Political Consultative Conference), so as to train talents for science development, and enable scientific research serve the national undertakings in industry, agriculture, healthcare and national defense. Accordingly, the major tasks of CAS included the following.

(1) Establishment of Scientific Research Directions:

• Holding the viewpoint that scientific research should serve the people and integrate with practice so as to shake off the old style of being divorced from practice or doing whatever one likes;

• Conducting theoretical and experimental research in a planned way in line with modern scientific development trends and by learning international experience in science so as to catch up with the world advanced level; and,

• Stressing planning and collectiveness in scientific research so as to strengthen the organic relationship between various disciplines.

(2) Training and Rational Distribution of S&T Professionals:

• Promoting political studies among S&T workers so as to enable them to master the viewpoints of Marxism and Leninism;

• Making an overall planning for talent training by strengthening cooperation with universities and other training organizations;

• Making a nationwide survey on S&T talents so as to distribute and replenish them in a planned way; and,

• Encouraging and assisting overseas scholars to return to their motherland.

(3) Adjustment and Augmentation of Scientific Research Institutions:

• Consolidating similar institutes and strengthening them step by step by centering on institutes in the fields of natural sciences and based on the existing organizations for the time being;

• Consulting governmental departments in charge of national economic and finance development, and setting up close links with them so as to set priorities in line with the current national reconstruction demand and pooling forces to address practical issues; and,

• Making plans for the steady development of scientific research in the fields that is still a virgin territory in China but urgently needed by the country.

This cardinal task laid a good foundation and showed the way for the initial development of CAS. In early 1954, the Central Committee of CPC made instructions on a report of the Academy, stating that as the national center for scientific research... CAS is to address the theoretical questions of basic science and key science issues with important bearings on national economic development. Scientific research institutions under various production departments should focus on technological issues in productive practice. Universities could carry out studies on either basic science theories or science issues from production practice in line with their conditions." This statement was later reiterated by the central authorities in the *Instructions on Current Work of Natural Science Research Institutions* (also known as the 14 Articles): "CAS institutes should mainly conduct research into basic science theories and key S&T issues with important bearings on national economic development and defense. Research institutes under industrial departments should focus on S&T issues concerning the production in their own sectors, application and development of new technologies, and necessary theoretical studies. On the basis of this division of labor, each institute should have its own priorities, and give full play to their own advantages. They should also have close relationship and cooperate with each other."

However, in the first 30 years of its development, due to the affection of political campaigns and changes of its central work, CAS made frequent changes in its major tasks and research directions, proposing such different policies as "promoting theoretical studies through problem-solving research tasks", "attaching great importance to research in three aspects: cutting-edge science and technology, major S&T issues concerning national economy, and basic scientific questions", "catering to factories, countryside and schools", and "open-door scientific research". Due to a lack of stable administrative guideline, research tasks and directions of CAS often changed with various political situations and nation's central work, posing severe negative impact on its stable and sustainable development.

At an expanded Executive Meeting of CAS held in October and November 1979, consensus was reached regarding the directions and tasks of CAS: "They should be kept stable... In line with the division of labor in China's science enterprise, CAS should stick to the principle of placing importance on basic science and scientific excellence and serving the national economic development and defense. At the same time, it should help industrial departments in solving major and comprehensive S&T problems. Thereafter, "placing importance on fundamental research and capability improvement with an objective of serving economic reconstruction and national defense" was specified as the guiding principle of

CAS in a report to the Central Committee of the CPC on January 29, 1981. However, the principle was questioned by then Premier Zhao Ziyang. In 1983, the Secretariat of the Central Committee of CPC pointed out that CAS "should greatly strengthen applied research and active participation in selected aspects of technology development with a sustained emphasis on fundamental research". In fact, this instruction vetoed the administrative guideline proposed early by CAS. In that case, CAS had to take this order from the central authorities as its "guideline' in the new period.

In early 1987, facing the situation of reform and open-up and gearing scientific research toward economic development, then CAS President Zhou Guangzhao called for mobilizing the main S&T forces of CAS into the drive for national economic reconstruction while maintaining a picked team to conduct fundamental research and follow-up studies of high-technology. The next year, the Academy put forward the policy of "one Academy, two operational mechanisms" to promote synergy between the system of scientific research and the system of technology commercialization both under CAS by introducing different operational mechanisms, management measures and evaluation criteria for the two systems.

The policy of "one Academy, two operational mechanisms" was implemented for more than 10 years. In January 2002, at the CAS annual conference, then CAS President Lu Yongxiang proposed a new administrative guideline to meet the needs of S&T development in the 21st century and the national strategy of Invigorating China through Science and Education. This new guiding principle for running the Academy, which is still being implemented today, states: Catering to the national strategic demands and aiming at the frontiers of world science, efforts will be made to promote indigenous innovation in scientific research and the innovation and integration of key technologies, so as to scale the heights of world science and technology, and make fundamental, strategic and forward-looking contributions to China's economic growth, national security and sustainable development. It is stipulated at *the Constitution of the Chinese Academy of Sciences* which was promulgated in 2005 with only a slight change in wording.

**3. CASAD and Academician System**

In its early years, CAS abolished the institutions of the former Academia Sinica such as its council and academician systems. Instead, a special committee composed of more than 200 experts was set up to execute academic leadership over the Academy, which turned out to be unsuccessful. A visit to the Soviet Union in 1953 opened up a new prospect for CAS. Drawing on the experience of the USSR Academy of Sciences and in light of China's reality, CAS established CASAD in June 1955. The first 233 CASAD Members were selected into four divisions under CASAD: physics, mathematics and chemistry; biology and earth sciences; technological sciences; and philosophy and social sciences. They exercised academic leadership over the whole country as well as the Academy. Meanwhile, a system was built up to bring different research institutes under the academic administration of different divisions. At the same time, preparations were made to set up a system of CASAD Members. However, due to the unspecified functions and powers of these Members, especially after the political movements such as "Great Leap Forward" and "Anti-Rightists," the CASAD Member system existed in name only. As an establishment to contact and manage research institutes, however, CASAD kept functioning and played an important role until it was abolished during the Cultural Revolution. In 1979, CASAD resumed its activities, and in 1987 its offices were changed into different academic bureaus of CAS.

CASAD expanded its membership in a small scale in 1957. In 1980, it held its first large-scale democratic election. The Fourth CAS General Assembly held in May 1981 gave the top decision-making power of CAS to its General Assembly or the Presidium when the Assembly was not in session. This conference also elected the First CAS Presidium, which chose its executive chairman, CAS president and vice presidents, and appointed CAS secretary-general. Each CASAD division elected its standing committee, which chose its director and vice directors. As a result, CAS erected a new system whereby S&T experts exercise the leadership over the whole Academy. However, the system was effective less than three years.

The function of CASAD was changed dramatically at the Fifth CAS General Assembly held in January 1984. It was made clear that the General Assembly was the highest national consultative organization in science and technology, and that CASAD Membership is the highest honorary academic title. The main mission of CASAD would be academic evaluation and consultation, and CAS should institute a presidential responsibility system. Thereafter, CAS president will no longer be elected by the presidium, but nominated by the State's premier, and then approved and instated by the National People's Congress (NPC) or its Standing Committee. In 1985, CAS introduced an institute director responsibility system throughout the Academy. The implementation of the presidential and director responsibility systems, a basic institution still being enforced at CAS today, completed power structuring at both Academy and institute levels. To safeguard the fundamental rights of researchers and staff members, meanwhile, there is still much room for improvement. In addition, the designed role of CASAD as "consultation" has largely reduced its academic leadership over CAS as an "academic committee", "science committee", or "council" which are often seen in research institutions across the world. This institutional problem might accelerate the unhealthy development of the already-existed official-rank-oriented system.

In 1990, the State Council endorsed the CAS proposal on CASAD Member elections. In 1991, after 10-year suspension, 210 new CASAD members were elected. Since then the election was held every two years. In October 1993, it was decided at the 11$^{th}$ Executive Meeting of State Council to change the title of CASAD Member to CAS Member. Also at this conference, decision was made to set up the Chinese Academy of Engineering.

As early as in 1955 when CASAD was established and in 1980 when new CASAD members were elected, CAS conducted studies on the establishment of an academician system. As the academic level of the possible academicians is expected to be fairly high, the number was anticipated to be less than half of the existing CASAD Members. However, the practice of renaming all CASAD Members "CAS Members" has lowered academic levels of academicians. In addition, its institutional faults further diverted this honorary title to an official rank. In recent years, with the improvement of the CAS Member elections, and the implementation of Senior CAS Members, the role and function of both CASAD and CAS Members improved steadily in China's S&T undertakings.

**4. The Unit System**

CAS and its subordinates are institutions directly under the State Council. Over the past two decades or so, the pace of reform in State institutions is rather slow. Even though CAS has made many reform explorations in personnel and institute management, the "unit" feature of CAS and its subordinates has never changed.

The "unite system" with Chinese characteristics is the fundamental basis of China's research institution system, making CAS unique in the world S&T community. First, it is a big and all-inclusive enterprise, from research institutes, branches, canteens, guest houses,

clinics to kindergartens, elementary and high schools (currently the schools have been separated from CAS), to universities, graduate schools and CPC party schools. Benefits distribution is mainly made within the unit, forming a very close but intense personnel relationship and unit culture. Second, there are many undertakings with multi-objectives and constantly changing demands and situations. Although it may help CAS to implement the guidelines and policies of the central authorities in an efficient and rapid way, making contributions to the country's economic growth, national defense and social development, it could weaken the autonomy of CAS and its subordinates, and making it difficult for a national science academy to pursue its goal of science excellence. Third, the way of running CAS as a government organ, irrational distribution of resources and official status in personnel system lead to the development of an "official rank standard" at the Academy. To address the problem, CAS's own efforts are not enough, and, more importantly, it depends on the national institutional reform in various aspects and the progress of entire society.

## III. Concluding Remarks

Over the past more than 60 years, CAS has contributed greatly to China's S&T development. Since its establishment, it has strived to serve national strategic needs and socioeconomic development by conducting scientific research in line with China's modernization demands and producing many innovative S&T results and laying a good foundation for the development of major academic disciplines in China. By independently developing a series of high-tech fields with strategic importance, it has formed a scientific research system with Chinese features, giving impetus to the development of China industrial technology system, the S&T system for national defense, and the regional innovation system.

CAS is also an important base for China's graduate education. As early as in 1955, CAS took the lead in setting up China first formal graduate system. It established the University of Science and Technology of China in 1958 and China's first graduate school in 1977, introducing systems of academic degrees and postdoc research. Since the start of Knowledge Innovation Program, CAS stepped up its efforts to develop a large scale and high-level graduate education system. Shaping an education system with USTC and Graduate University of CAS as the core and covering all CAS institutes, the two-stage model for graduate education has constantly upgraded its graduate education.

Over the past more than six decades, CAS has pooled and trained a large number of scientists who have greatly contributed to China's S&T undertakings, including many prestigious scientists who founded major S&T disciplines in China and honored with China's top S&T awards. Since the start of KIP, CAS has fostered nearly one thousand S&T leaders and top scientists and technicians, forming a high-caliber innovation taskforce, including 600 chief scientists or principal investigators in national major S&T tasks, nearly 700 winners of the National Science Fund for Distinguished Young Scholars, 53 Creative Research Groups supported by the National Natural Science Foundation of China (NSFC). A total of 900 CAS scientists are currently holding important posts in international science organizations. At present, CAS houses 12 branches, 100 research institutes, more than 100 national key laboratories or engineering centers, and a network of field observation making up of nearly 1,000 stations. It currently has about 50,000 full-time S&T workers.

From 1956, when the national S&T awards were set up, to 2009, CAS have been recognized by more than 1,000 national S&T prizes as a lead performer of research activities with outstanding research findings, including 390 prizes from the State Award for Natural Sciences (accounting for 42 % of the national total), in which 19 were first-class prizes (making up 59 % of the national total); 181 prizes from the National Award for Technological Innovation, in which 4 were first-class prizes; 536 prizes from the National S&T Progress Award, in which 39 were special or first-class prizes. Regarding the number of the awards, it is no doubt that CAS is the top research institution in China S&T community. However, in terms of international S&T awards and world-renowned scientists, both CAS and the Chinese S&T community have a long way to go. In this regard, CAS shoulders heavy responsibility in the years to come.

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# Soviet Experts in Chinese Academy of Sciences: Historical review of cooperation and exchange between Chinese and Soviet Academy of Sciences in the 1950s

After the establishment of The People's Republic of China in 1949, to learn from Soviet Union was the most realistic fast way to build a new country. Under the advocacy of Chairman Mao Zedong, the whole China was fired with the zeal of learning from Soviet.

As a whole, in the scientific and technological exchange and cooperation between Chinese and Soviet Academy of Sciences during 1952–1966, there were three most distinctive and representative points. Since 1954, dozens of Soviet advisors and experts came to China in succession to help Chinese Academy of Sciences draw up the plan, establish new research institutes and disciplines, and launch numerous highly effective research activities. Since the signing at the end of 1957, the cooperation agreement between Chinese and Soviet Academy of Sciences had lasted for nearly 10 years and now still plays an active role in the academic progress of Chinese Academy of Sciences. Numerous Chinese students studying in Soviet Union are now the research backbone in each discipline after their return to China, and exert great influence so far. This article will narrate and assess the work of Soviet experts in Chinese Academy of Sciences during this period.

***Keywords:*** Soviet expert in China, planning and organization of the national scientific research, the plan of scientific and technological development, the Chinese Academy of Sciences.

## I. From the Soviet Advisors for President of CAS to experts in different disciplines

Chinese Academy of Sciences started to receive Soviet experts since October 1954 At that time, CAS invited Ковда Виктор Абрамович (a pedologist and a communication academician of Soviet Academy of Sciences, 1904–1991) as the Advisor to President. Over the more than a decade later, dozens of Soviet experts in different fields were successively employed to work in China.

In April 1953, as instructed by Premier Zhou Enlai, the Culture & Education Commission of Government Administration Council planned to employ 279 Soviet experts in addition to the 140 Soviet experts to train up senior officials for every relevant department. Every department under Culture & Education Commission proposed a list, including 8 Soviet experts to be employed by the CAS as chief advisor and advisors in applied physics, high polymer, petroleum, metallurgy, plant ecology, soil and earthquake. However, in August, 1954, the plan was adjusted to employ only 3 advisors, i. e. 1 chief counselor, 1 advisor in geology/metallurgy, and 1 advisor in polymer chemistry.

On October 13, 1954, Ковда as the advisor to President of CAS arrived in Beijing and welcomed by Guo Moruo, the President of CAS. В. А. Ковда contributed greatly to the development of CAS and China's science. After numerous visits to the research institutes of CAS in Beijing, East China and South China and the reading of numerous materials, in January 1955 Ковда proposed Chinese government to draw up a national plan for scientific research and "Fifteen-Year scientific development plan". Under his proposal, China drew up the first long-term scientific technological development plan in 1956, i. e. "*National Long-Term Plan of Scientific Technological Development*". His wife also came to China, but later returned to Soviet Union in April 1955 for medical treatment on her worsening heart disease. Out of work, Ковда did not accompany his wife to return to Soviet Union. On June 26, his wife died of illness in Moscow. On the next day, Ковда returned to Soviet Union and ended his tenure as the Advisor to President all in a sudden.

Besides В. А. Ковда (Advisor of President), the other two Soviet advisors, С. Р. Рафиков (polymer chemistry) and Г. П. Сердюченко (linguistics, 1904–1965). Soon came to China in end-1954 to take up their posts.

By the first half of 1955, many Soviet experts in different disciplines worked in CAS, but only the above served as the Advisors to CAS. Apparently, this cannot meet the need of fast development of CAS. In the beginning of 1955, CAS planned to employ 7 Soviet advisors, which has been approved by the Vice-Premier Chen Yi. However, А. Ф. Мальцев, the Culture & Science Counselor and Deputy Chief Advisor of Soviet Union in China, thought that emphasis should give Soviet experts full play to their talent instead of employing more Soviet experts. Finally, CAS decided to reduce the number of Soviet experts. At the end of April 1955, CAS employed 4 Soviet advisors in geology, steel metallurgy, useful mineral selection, and artificial petroleum.

After В. А. Ковда returned to Soviet Union in June 1955, Soviet Academy of Sciences recommended Лазаренко Борис Романович (1910–1979) to take over the work of Ковда as the chief advisor to CAS. On December 25, 1955, Б. Р. Лазаренко arrived in Beijing. During his stay in China, Б. Р. Лазаренко participated in the drafting of Fifteen-Year development plan for CAS and China's Twelve-Year scientific development plan in 1956 from the beginning to end. Б. Р. Лазаренко spelled out the mission of Task 43 —

electrical processing and electric new application. In February 1958, Б. Р. Лазаренко completed his task and returned to Soviet Union.

Here, it is necessary to briefly describe the difference between Soviet advisors and experts during this period. In view of the actual conditions of CAS, Soviet advisors were generally senior scientists of very high position and academic level. In China, they served as the Advisor to President of CAS or the advisors in a certain discipline to help solve major problems and provide consultancy, including organization set-up, rules/regulations, management system and general plan. Soviet experts were all professional researchers, and employed under the contractual requirements of aid projects. They generally worked in research institutes/stations or expedition teams to solve the actual issues. CAS applied to Foreign Experts Bureau for Soviet advisors and experts, and employed them only after the review and approval of the State Council. In China, especially in low-level unit, the titles of advisor and expert were often mixed at that time, until uniformly used expert after 1957.

In fact, around 1956, Chinese leaders began to change the viewpoint on Soviet Union. Soviet advisors enjoying large power caused great conflict in some Chinese administrative and military departments. China and Soviet Union then started to adjust the policy of sending and inviting the Soviet advisors/experts. In July 1955, State Council required that "any expert for solving purely technological problems should be employed as technical-aid experts, not to be included into the list of advisors". New rule stated that "only advisors for urgent work and necessary for starting work can be employed, Otherwise, suspend or no employment". By the end of 1957, State Council announced a circular that all Soviet experts were uniformly called as "Soviet expert" thereafter.

After Б. Р. Лазаренко, CAS did not employ Advisor to President but Soviet experts for guiding and participating in the research of different disciplines for some time. In December 1955, State Council approved CAS to employ Soviet experts for the year 1956. In February 1957, as requested by different and research institutes in drawing up the national scientific plan, CAS applied to Foreign Experts Bureau for 19 Soviet experts in 1957 (including 5 experts for long-term (1-year) and 14 experts for short-term. The application was then approved by State Council.

From the end of 1957 to the beginning of 1958, China and Soviet Union signed the Scientific Technological Cooperation Agreement for "122" projects. Chinese and Soviet Academy of Sciences also signed the scientific cooperation agreement. As one of main terms of these agreements, the scientists of China and Soviet Union should engage short-term academic visits, a big change from the long-term employment of numerous Soviet experts in China during the 1st Five-year Plan. Later, Soviet experts were employed according to the cooperation plan between Chinese and Soviet Academy of Sciences, not employed by the Chinese government. Then, more and more Soviet experts worked in CAS. The number of Soviet experts working in China in 1958 was more than 3 times of that in 1957. Moreover, Soviet experts substantially changed their job nature and scope, from guidance, planning and management of research and organization work in CAS to mutual cooperation in research and expedition projects.

According to statistical data, by 1960, CAS had received 780 Soviet experts (person-times), among them, there were 68 Soviet academicians and many others at the level of associate PhD or higher. They greatly helped the development and research of CAS. Before 1957, the Soviet advisors/experts employed by Chinese government worked in China for long time. Later, the majority of Soviet experts taught, guided and researched for short time. Among these Soviet experts, most of them engaged in natural science as technical-aid experts. Few Soviet experts

engaged in social science, they came to China to collect materials, exchange experience or further study. Meanwhile, Soviet experts came to China mainly through the temporary assignment or, invitation between the academies of sciences of the two countries.

## II. Withdrawal of Soviet experts and its influence

On July 16, 1960, Soviet government suddenly informed Chinese government to unilaterally withdraw Soviet experts. Up till this time, 44 Soviet experts and students (further study) worked in CAS, (including 41 natural scientists and technological experts and 3 social scientists) and 4 wives and 3 children of the Soviet experts.

Under the arrangement of Soviet embassy, Soviet experts began to leave China. Among Soviet experts working in CAS, 13 experts left China by July 30, and 41 experts left China by August 29, including 22 experts completed their tasks and 19 experts not yet completed their tasks but left early They left China starting from August 2 in different batches. By September 14, the final two Soviet experts left China. Till then, all Soviet experts working in CAS were withdrawn.

The withdrawal of these Soviet experts affected the research work of CAS in different degrees according to their discipline and job nature. Accurate and unbiased assessment can only through in-depth analysis. Among 19 Soviet experts leaving China latest, 9 experts worked as technical-aid experts in China under the Scientific Technological Cooperation Agreement for "122" projects, 1 expert working in China for 2 years (came to China three times), 2 experts working in China for 1 year and 3 experts working in China for 6 months. The other 3 experts working in China for 10 months, 9 months or 3 months. The rest of 10 experts were employed for 3 months to 1 year according to the cooperation agreement between Chinese and Soviet Academy of Sciences. Most of them came to China during March-June 1960. Few of them had completed the tasks when they left China in August.

After the early withdrawal of Soviet experts, the cooperation in expedition suffered from a certain loss. Both field and office work of expedition teams were temporarily suspended, only some repair and arrangement work.

The withdrawal of Soviet experts affected more the disciplines requiring concrete guidance of Soviet experts in terms of organization, academic and technological. In the 1950s, China did not engage any research on the precious metal and platinum. The withdrawal of Soviet experts left many problems and difficulties to Chinese researchers who were completely lack of research experience.

Since Soviet Union withdrew their experts in 1960, CAS did not invite any Soviet experts to give lecture or aid in China and stop inviting in the mid-1960s (1964 and 1965). This marked the end of scientific and technological exchange and cooperation between Chinese and Soviet Academy of Sciences for more than a decade.

## III. Role and historical function of Soviet experts in the early development of CAS

As mentioned above, due to the complexity in employing Soviet experts to work in China — how they came to China, their job identity, time, disciple and nature, it is difficult to accurately summarize the number of Soviet experts who worked in CAS. However, the role

and function of Soviet experts in CAS could still be classified into two types according to the cooperation and exchange between Chinese and Soviet Academy of Sciences from the establishment of CAS to the beginning of the Great Cultural Revolution in 1966.

First, the two advisors to president (В. А. Ковда and Б. Р. Лазаренко). For sudden reason, Ковда, the first Soviet chief council in CAS, worked in China for only 8 months, but his *Proposals for Planning and Organizing the Nationwide Scientific Research Work in the People's Republic of China*, had contributed to the formulation of China's first national scientific development plan and CAS' whole set of systems, including regulations on postgraduate and ordinance on academic committee of research institutes. Лазаренко, the second Advisor to President of CAS, worked in China for 26 months. Despite the limitation, Лазаренко participated in the formulation of Fifteen-Year development plan of CAS and China's twelve-year scientific development plan. He played an active role in the establishment of electric processing and electric new application disciplines in China. In addition, just like the above two advisors to president, С. Р. Рафиков as a polymer chemist and Г. П. Сердюченко as a linguistics were outstanding Soviet scientists before they came to China. They acted as the advisor to decision-making and designer of China's science activities during their job in CAS. They contributed to the establishment and rapid development of some blank disciplines.

Secondly, when compared with the few Soviet advisors who planned, guided and engaged in the every research work of CAS, it was the large number of Soviet experts who worked in every research institute and experimental station of CAS. Most of them were associate PhD or above working in China for different periods. They closely cooperated with Chinese scientists in the research and expedition activity. In fact, they were the special important research force in CAS, and the main body of Soviet experts working in CAS.

Actually, among being regarded as "Soviet experts", some were doing further study in China. Their main task to come to China was to understand China situation, collect materials and receive further study, especially in the social science and natural science where China has obvious advantage, e. g. geology and marine organisms. They obviously did not have the mission and qualification to provide technical aid to China, but were still called as "Soviet experts", which could be interpreted as the friendship and respect of Chinese people to Soviet Union.

In a word, during more than 10 years in the middle of 20$^{th}$ century, Soviet experts working in CAS gradually weakened their job nature, job scope and role, from the guidance, planning and management of research and organization work of CAS in early period to the mutual cooperation in scientific research and expedition projects. The assistance from Soviet experts played a critical role in building the mechanism, system and talent team of CAS in early establishment, accelerating its scientific research, and setting up of blank urgent scientific fields. They contributed greatly to the development of CAS.

The role and job nature of Soviet experts in CAS varied with the ideology of China and Soviet Union at different stages and the adjustment of Chinese Leaders in Soviet policies. This was completely consistent with the conditions of other Chinese industries and fields at that time, and highly coincided with the diplomatic policies of the Communist Party of China. Before the marching from Yan'an to Beijing, the Communist Party of China was not experienced in organizing and leading the modern scientific programs. Therefore, after the complete elimination of "imperialism harmful influence", it was necessary to rely on Soviet

experts and learn from Soviet model in designing the organization and system and engagement in the research activities.

However, due to the foundation established during the Republic of China, Chinese and Soviet Academy of Sciences shared experience in a unique way. As mentioned in the beginning of this article, CAS was based on several national research institutes during the Republic of China. Although the People's Republic of China did not accept old scientific system based on the model of the western developed countries, the 20-year scientific engagement during the Republic of China left an intangible valuable wealth for the People's Republic of China, especially in some fields such as geology, plant taxonomy, archaeology, philosophy and mathematics. This complicated the relation between Chinese and Soviet Academy of Sciences in the 1950s. Soviet experts working in CAS not only contributed unilaterally, but gathered more and more data and materials for research through Chinese unique natural resources or existing scientific achievements. In this sense, Soviet experts were fully paid off from the technical aid to China.

The large-scale employment and dispatch of Soviet experts were a unique phenomenon in the socialist block under the world political pattern in the mid-20$^{th}$ century. In the context of political and diplomatic, this means antagonism through alliance and common development, and inevitably affected by various factors among countries inside the same bloc (interest conflict, military contest and power/status struggle). By the late 1950s, such fields as semiconductor and computer technology had been considered as confidential projects by Soviet Union, and titanium alloy was even regarded as top secret. Therefore, the request of CAS for experts was delayed, reduced, or even refused completely. In some fields, Soviet experts working in China could not perform their duty as expert or impart the knowledge and technology to Chinese, according to relevant regulations of Soviet government. The science is of no national boundary, but the scientists and scientific application are of national boundary.

On other hand, the political atmosphere and national ideology of China in the 1950s also dominated the scope and direction of scientific and technological exchange between Chinese and Soviet Academy of Sciences. This results in mistakes of different degrees in core issues (how to consider the role of Soviet experts and how to launch the cooperation on a mutual and fair basis). Chinese government blindly believed Soviet experts and emphasized the political significance. For example, in some fields with better research foundation, China needed to just employ several Soviet experts of higher level, but actually invited numerous expert teams (even including some experts of low level), which played a limited role in the expedition/research and wasted the human and material resources. In 1957, regarding the Soviet participation in the joint expedition team of Heilongjiang basin, Gu Zhun, then Deputy Director of General Expedition Commission of CAS, strictly condemned Soviet Leaders' great chauvinism and irresponsibility, and sharply criticized some Chinese partners for the thought that the cooperation with Soviet Union could improve their value and the extravagance in receiving Soviet experts. However, the anti-rightist movement started soon, and Gu Zhun was regarded as rightist due to his anti-Soviet idea.

Today, global science, technology and economy tend to integrate. From the historic review of exchange and cooperation between Chinese and Soviet Academy of Sciences half a century ago, most of the Soviet experts working in CAS might pass away. Their experience and story faded as they left us. However, the research and recognition would still continue and deepen in the history during this period.

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Examples drawn from the cooperative projects between Chinese and Soviet Academy of Sciences in 1960, in biological field, 37 Soviet experts came to China (excluding those in paleontology), among which 27 experts (73 %) were proposed by Soviet Academy of Sciences and only 10 experts were proposed by Chinese Academy of Sciences. Archive of Chinese Academy of Sciences: 60-4-43.

Another typical example. On August 18, 1956, Chinese and Soviet government signed the "Agreement on the Joint Scientific Research for Surveying the Natural Resources and Productivity Development Prospect at Heilongjiang Basins and the Exploration Design for Overall Utilization Plan in Argun River and Heilongjiang Upstream". This agreement was signed mainly according to the urgent Soviet's need of development far-east region and the advocacy of Soviet Union. It was a major scientific and technological cooperation project between China and Soviet Union led by Chinese Academy of Sciences.

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# Sino-Soviet Cooperation in Natural Resources Surveys: Interactions between the Two Academies

The Chinese Academy of Sciences (CAS) started the natural resources surveys during the heyday of "Learning from the Soviet Union" campaign in China in the 1950s. Therefore, the CAS entered into extensive collaborations with its Soviet counterpart, the Soviet Academy of Sciences (SAS), in the planning and organizing of these surveys. This paper aims to illustrate the role of Soviet scientists in China and the impact of Sino-Soviet scientific cooperation in this period through a detailed examination of the joint natural resources surveys undertaken by the two academies in 1950s.

***Keywords:*** Natural Resources Surveys, the Academy of Sciences, Sino-Soviet Cooperation.

## 1. "Learning from the Soviets" and Sino-Soviet Cooperation in Natural Resources Surveys

### 1.1. The Origins of the Cooperation between the Two Academies

The policy of "Learning from the Soviet Union" was established soon after the People's Republic of China was founded. During this movement, the USSR's experiences in organizing scientific research became the model in China. Chinese scientists thought that learning from the Soviet Union could avoid the roundabout course in their research.[1]

Following the model of the USSR, the Chinese government established the Chinese Academy of Sciences in 1949. In 1953, CAS sent its first delegation to the USSR to learn how to organize and lead the research work.[2] In 1955, a delegation of the Soviet Academy of Sciences visited China, which played an important role in promoting the cooperation between the two academies. From then on, exchange visits and cooperative research increased markedly.

A major part of the cooperation between two academies was outright Soviet scientific and technological assistance to China. For example, in the Sino-Soviet scientific cooperation agreement for1958 to 1962 signed in 1958, there were 92 collaborative projects, and 50 of them were in the nature of Soviet assistance, which covered some new scientific and technological areas urgently needed in China, such as the research on semiconductors, computing technology, organic compounds, rare elements and petrochemistry. The other 42 items were either suggested by Soviet scientists, such as projects in the areas of philosophy, economy, history, ethnology, and literature, or based on mutual benefits, which covered astronomy, chemistry, biology, geo-science, and natural resources surveys.

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[1] Zhongguo kexueyuan guanyu fangsu daibiaotuan de gongzuo baogao (The report of a delegation of the Chinese Academy of Sciences to the Soviet Union) // Xuexi Sulian de xianjin kexue (learning advanced science from the Soviet Union) (Beijing: Science Press, 1954). P 1–8.

[2] *Guo Muoruo*. Preface // Xuexi Sulian de xianjin kexue. P. 1–4.

**1.2. General Situation on the Cooperation in Natural Resources Surveys**

As the People's Republic of China launched large-scale economic construction in the early 1950s, it became very important to find out as soon as possible the distribution of natural resources for agriculture in the country. Therefore, the Chinese government began to organize natural resources surveys even though there was a severe shortage of technical manpower and material resources for such undertakings.

One of the first tasks the Chinese scholars faced in starting these surveys was to look for a model on how to conduct them. For this they naturally looked to the Soviet experiences. In general, Chinese scholars thought that scientific planning, tight organizing, and collectivist spirit were the foundation of successful of large scale surveys in the Soviet Union. On the other hand, some researchers hoped that collaboration with Soviet scientists would bring additional benefits, such as the possibility of an expansion of research activities and enhanced prestige of the projects being undertaken.[3] Therefore, Soviet scientists were welcomed in most of survey teams.

Soviet scientists played different roles as the progress and the contents of the survey varied. For example, Soviet geologists, agronomists, and geomorphologists were interested in loess survey as Chinese Loess Altiplano is the typical integrated loess in the world. But when they joined in 1957 in the survey team on water conservancy and soil erosion prevention in the middle reach of the Yellow River, the Chinese scientists had already finished their fieldwork. To meet the needs of the Soviet scientists, the CAS then arranged for 60 Chinese scientists to accompany 6 Soviet counterparts to do the same fieldwork.[4] This kind of cooperation had helped Soviet scientists to collect scientific data, but it's useless for Chinese scientific research. Another example is the survey on tropic biological resources. As Soviet scientists were not familiar with the research of tropic biological resources, "they did not play a very active role in the survey"[5] as Chinese scholar concluded. In contrast, in research fields where Soviet scientists had done the research, such as the integrated survey in Xinjiang, integrated survey on harnessing the desert, and integrated survey in Heilongjiang River valley, Soviet scientists were able to provide a great deal of assistance to their Chinese counterparts.

From 1956 to 1960, each large survey team of the CAS invited Soviet scientists to take part in the fieldwork and some of them were conducted as formal cooperative projects of the two academies (table 1). Generally speaking, the cooperation of the two academies was on a mutually beneficial basis.

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[3] *Gu Zhun Zishu*. Gu Zhun's memoirs. Beijing: Chinese Youth Press, 2000. P. 236.

[4] *Zhou Hang*. Zhongsu kexuejia hezuo kaocha Huanghe zhongyou shuitubaochi gongzuo (cooperation on the survey of water conservancy and prevention of soil erosion in the middle reach of the Yellow River) // Kexue Tongbao (science bulletin). 1957. № 17. September, 12. P. 540.

[5] *Zhu Kezhen*. Zhongguo kexueyuan zonghe kaocha gongzuo de xianzhuang ji jidai jiejue de wenti (the current status of and the urgent problems facing the integrated surveys of the Chinese Academy of Sciences) // Zhongguo kexueyuan nianbao. 1957. Annual bulletin of the Chinese Academy of Sciences for 1957. Beijing: Chinese Academy of Sciences, 1958. P. 197–200; reprinted in Zhu Kezhen // Zhu Kezhen quanji (the completed works of Coching Chu). Vol. 3. Shanghai: Shanghai Scientific and Technological Education Press, 2004. (hereafter Zhu Kezhen quanji). P. 360–363.

Table 1

Subjects and person-time of Soviet scientists in China in 1958[6]

| The name of the team | Total | Land layout | Physical geography | Physiognomy | Geobotany | Hydrogeology | Agrology | Geology | Hydrology | Forestry | Irrigation works | Chemistry | Glaciology | Biology | Distribution of productive forces |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Yellow River Team | 6 | 1 | 1 | 1 | | 1 | 1 | | | | 1 | | | | |
| Xinjiang Team | 11 | | 1 | 1 | 1 | 2 | 3 | 1 | 1 | | 1 | | | | |
| Heilongjiang Team | 60? | | | | | | | | | | | | | | |
| Yunnan Team | 4 | | | 1 | 1 | | 1 | | | | | | | 1 | |
| Gansu-Qing-hai Team | 5–6 | | 1 | | | | | 1–2 | | 1 | | | 1 | | 1 |
| Qaidam Basin Team | 3 | | | | | 1 | | | | | | 2 | | | |

## 2. Three Kinds of Cooperation

### 2.1. Integrated Survey of Tropic Biological Resources

In the early 1950s, southern China was the only large tropical areas in the socialist world. Therefore, there was not only the economic value but also strategic/political value in exploiting its tropical biological resources. In fact, it was in response to a special request from the Soviet requirement that the Chinese government initiated a large-scale project on the utilization of tropical resources in southern China, including integrated surveys on tropical biological resources conducted by the CAS with participation of Soviet scientists.

Lac was one of the important tropical biological resources. Both China and USSR needed to import lac from the expensive international market. In March 1953, the SAS sent a delegation to China and cooperated with the CAS to survey for lac resources for about a half year. This was the first time that the two academies cooperated in natural resources surveys. According to Zhu Kenzhen, the vice president of the CAS, Soviet scientists made a deep impression on their Chinese colleagues about their effective deployment of Marxist dialectic materialist viewpoints in their research during this survey.[7]

In 1955, the USSR asked for about 3,000 to 5,000 tons of lac import from China.[8] Clearly, lac became a main focus in tropic biological resources surveys in this period. Not

[6] The Archives of the CAS: Z374-23.

[7] *Zhu Kezhen*. Zai huansong sulian kexueyuan zijiao diaochatuan yanhuishang de zhici (address at the sending-off banquet for the SAS' lac survey team) // Zhu Kezhen quanji the completed works of Coching Chu. Vol. 3. Shanghai: Shanghai Scientific and Technological Education Press, 2004 (hereafter Zhu Kezhen quanji). P. 137.

[8] Zhongguo sulian kexueyuan zijiao gongzuodui gongzuobaogao (the report of Sino-Soviet workteam of lac) // Zhongguokexueyuan nianbao: Annals of the CAS of 1955 / ed. by the CAS secretariate, 1956.

all Chinese scientists agreed with this emphasis on lac. Zhu Kezhen, for example, wrote in his diary that "from my own point of view, Sino-Soviet cooperation should be all-around cooperation on tropic biological resources surveys instead of focusing only on lac. Some researches were more important than lac, such as animal and plant distribution, rubber and coffee".[9]

Indeed, rubber was an important tropical biological resource both in economy and national defense. In the summer of 1952 a Chinese delegation visited Moscow and signed a series of agreements with the USSR. Most of the agreements were in the nature of Soviet technical and economic aid to China, but some agreements were meant as Chinese rewards for Soviet assistance. Planting rubber trees in southern China was one such agreement because of the severe shortage of rubber in the Soviet Union due to the embargo by the west. Of course, rubber was also very important to the national economic construction in China. Thus China agreed to undertake a large-scale rubber plantation project in order to meet the Soviet and Chinese needs for rubber. Therefore, planting rubber trees became the second largest program during Chinese first five-year-plan (1953–1957).

Responding to the government's request and in accordance with the Sino-Soviet cooperation agreements, the CAS organized an "integrated survey team for tropic biological resources in Yunnan Province" in 1953, whose main task was to survey the feasible places for planting rubber trees. There were dozens of institutes and hundreds of scientists involved. In 1955, the SAS sent a seven-scientist delegation to China. Soviet scientists not only took part in the survey, but also gave 15 lectures during the 5 months they were in China, which covered topics in zoology, botany, entomology, and meteorology.[10]

During the survey, scientists found out that rubber plantation had proceeded on a massive scale even before detailed surveys and planning were conducted, causing serious environmental problems such as soil erosion and plantation failures. The scientists carried out research and gave local governments and the plantation authority advice on rubber plantation and environmental protection. It included suggestions on how to prevent damage from the wind, droughts and cold waves, on the need to forbid the burning of the grass on wilderness lands, on the responsible and optimal use of fertilizers. At the end of the survey, they also gave a formal report to the central government on these matters. But unfortunately few of these reports were taken seriously and the problems worsened as time went on. Rubber trees couldn't grow because of the cold local weather that was not taken into considerations, vegetation was destroyed in large area, and some land was turned into desert after reclamation. Lasting the end, nearly 333km$^2$ of rubber plantation had to be given up.

In early 1957, Zhu Kezhen led a survey team to south of China to survey tropical biological resources. In his team there were seven Soviet scientists who were experts in forestry, agrology, biology etc. and about a dozen Chinese scientists who were the experts in geography, economy, forestry, biology, forestry, agrology etc. The most prominent among them was Academician Vladimir N. Sukachev, director of the Soviet Academy's Forestry

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[9] *Zhu Kezhen*. Zhu Kezhen riji (Zhu Kezhen's diary). Beijing: Science Press, 1989 (hereafter Zhu Kezhen riji). Vol. 3. P. 703.

[10] Zhongguo-Sulian kexueyuan zijiao gongzuodui gongzuobaogao (The report of lac survey team of CAS and SAS) // Zhongguo kexueyuan shiliao huibian (Data collection of Chinese Academy of Science in 1955) / ed. by Wang Zhongjun. Printed by the Office of the Committee on the Collection of Materials and Studies on the History of the CAS, 1995. P. 200–203; and the Archive of the CAS (zhongguo kexueyuan danganguan): Z374-7.

Institute, who had bravely opposed Lysenkoism in 1950s.[11] Even though the Soviet scientists could not provide many useful suggestions on rubber plantation due to unfamiliarity with the plant and the tropical environment, they, especially V. N. Sukachev helped introduce the concept of ecology to their Chinese colleagues which in turn helped Chinese scientists to examine the problems caused by the mismanaged rubber plantation and propose solutions from a holistic point of view.[12]

The problems with rubber plantation were not only from the natural conditions and mismanagement, but also from changing international political environment. While the reclamation met the trouble in China, international restrictions on rubber trade had eased up by the late 1950s. Soviet Union was now able to buy rubber from the international market. Therefore, the Sino-Soviet agreement on exploring rubber resources was no longer enforced. Even though China did eventually develop a successful rubber plantation in southern China, it paid a dear price in terms of resources wasted and environment damaged. For the Chinese scientists involved, the experiences provided a lesson in how international scientific collaboration was not only shaped by practical needs and environmental restrictions but also unpredictable domestic and international politics.

**2.2. Integrated Survey in Xinjiang**

In May 1956 the Integrated Survey Team in Xinjiang, which was also one of the cooperative projects between the two academies, was founded.

Xinjiang has many subjects for valuable survey and research, such as continental petroleum stratum, landform formation in drought areas, surface and underground water replenishment, alkali-saline soil meliorating, and vegetation evolvement in drought areas. Soviet scientists had rich experiences in this research field. As early as 1935, they had done some research on the geography, hydrography and climatology in Xinjiang. And Soviet scientists had done many researches in drought area in USSR.

When the Xinjiang team was founded, the scientists paid more attention to collecting scientific data. Scientists from different research fields were involved in the team, such as physiognomy, climatology, hydrography, geology, agrology, botany, zoology, entomology, agronomy, economy, etc.

During the first two years, most of the subgroup had paid more attention on collecting scientific data and doing scientific research instead of doing research for serving economic construction. This kind of approach was criticized by the Soviet experts soon. In October 1957, a CAS delegation went to Moscow to get Soviet advice on the CAS' scientific long-term plan, including its integrated survey of Xinjiang. The SAS organized a committee with 16 experts to discuss the plan on the survey. The committee pointed out that the plan had no clear aim and provided no clear relevance to local economical construction.[13]

To follow up on the Soviet experts' suggestions, the Xinjiang team began to establish groups according to specific assignments for serving the local economic construction. This

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[11] *Charles H. Smith*. Sukachev, Vladimir Nikolaevich, accessed in February 2009 at: http://www.wku.edu/~smithch/chronob/SUKA1880.htm.

[12] Zhu Kezhen diary entries for March 5 and 6, 1957 // Zhu Kezhen. Zhu Kezhen riji. Vol. 4. P. 25–26.

[13] *Zhu Kezhen*. Canjia 1957 nian zhongguo kexuejishu fangsu daibiaotuan de baogao (the report of the Chinese science and technology delegation to the USSR in 1957) // Zhu Kezhen quanji, Vol. 3. P. 444–449.

kind of group had clear task and could correspond easily to the needs of the local government. But some research fields were not amenable to such an approach because they had no direct relations with economic construction.[14]

From 1957 onward, Soviet scientists began to join the Xinjiang team as it became a cooperative program of the two academies (table 2). They helped the team to make the survey plan, answered questions during the fieldwork and solved the problems during the work.

Table 2

Soviet scientists in the Xinjiang team[15]

| Year | 1957 | 1958 | 1959 | 1960 |
|---|---|---|---|---|
| Person's number | 8 | 10 | 11 | 6 |

During the fieldwork, Soviet scientists found out that the salinization of soil was serious in lands reclaimed for agriculture. Therefore, solving this problem became the major work in 1958. And a Soviet expert on ameliorating saline soil was invited by the team and came to China soon. Soviet scientists also gave a training course in ameliorating saline soil, which had 150 Chinese young scientists attending.

During the fieldwork in Xinjiang, Soviet scientists trained many young Chinese scientists through answering their question during fieldwork, holding symposiums, giving lectures, etc. There were many academic exchanges during the fieldwork. Sino-Soviet scientists also worked together to publish summaries of their fieldwork.

**2.3. Integrated Survey in Heilongjiang River Valley**

The Sino-Soviet collaboration on the integrated survey in the Heilongjiang River (Amor River) valley is the largest cooperative projects between the two academies.

In the 1950s, the branch of Heilongjiang on the Soviet side often caused flooding and serious damage. Therefore, the SAS decided to survey around the valley for building reservoir. The survey needed the cooperation of the Chinese side. In early 1956, the SAS sent a letter to the CAS proposing a cooperative survey of the Heilongjiang with water conservancy in mind.

The CAS reacted positively. Chinese scientists lacked the experience in conducting an integrated survey of a river valley. So they regarded this as a good opportunity to learn from Soviet scientists.

The Chinese government also reacted positively to the idea of a joint survey of the Heilongjiang by the two academies, but it was cautious on the specific contents of the survey. The Heilongjiang valley was a disputed area of Sino-Soviet border and this problem hadn't been solved at that time. But neither China nor the Soviet Union wanted to raise the issue of the border problem at that time due to their close political relationship and the massive Soviet assistance to China.

[14] "Zonghe kaocha weiyuanhui ge kaochadui dierge wunianjihua shiqi de kaocha renwu he zhuyao baozhengcuoshi ji wenti" (main tasks, measures and problems of the survey teams of the Chinese Integrated Surveys Commission during the period of the second five year plan), available from the Reference Room at the CAS Institute of Geographical Sciences and Natural Resources.

[15] The Archives of the CAS: Z374-52.

Chinese Vice Premier Li Fuchun held a meeting with CAS leaders in June 1956 to discuss the proposed cooperation. He told the Chinese scientists that this cooperation in the Heilongjiang valley should be limited to just the survey during the first five-year-plan (1953–1958), that any step beyond that, such as the exploitation and development of this area should be left for the third or forth five-year-plans. Premier Zhou Enlai also indicated that Chinese scientists' task was to survey the resources, to learn from the Soviet scientists, and to train young scientists. The cooperation on exploitation shouldn't be discussed during this phase of the cooperation.[16]

In May and June 1956, the two academies carried out extensive discussion on the schedule, contents, and the method of cooperation on Heilongjiang. In August, the Sino-Soviet cooperation treaty was signed, and at the same time, the CAS established the Integrated Survey Team of Heilongjiang Valley and sent Chinese scientists there in several groups.

There were five component groups of the team and each group had a Chinese and a Soviet leader. On the Soviet side, there were more than ten institutes and more than 100 scientists involved in the survey. Most of them were senior scientists and among them there were some famous scientists, including four academicians. But on the Chinese side, although there were about 100 to 200 scientists who took part in the survey each year, most of them were young scientists. This is because that the CAS just wanted to get more experience on the river survey and train its scientists[17].

There were five groups of the team in the early phase of the survey: economics, water conservancy, transportation, geology and geography, and agriculture. Because it had no immediate plans for development in the region, the Chinese government canceled the economics group and water conservancy group in 1957.[18] But the Soviet side paid much attention to economical developments in the region, including especially the prospect of irrigation works. Therefore, the SAS insisted that economical studies be an important part of the joint undertaking. As the SAS had sent several economists to the team, the Chinese side agreed to revive the economics group and water conservancy group for the sake of maintaining Sino-Soviet friendship.

One of the central objectives of the economics group and water conservancy group was to choose the place for reservoirs, which turned out to be controversial. Taipinggou was one of the examples. Technically, Taipinggou was considered a perfect place for building the reservoir, but it would result in the flooding of a large area of agricultural land on the Soviet side and thus was opposed by the Soviet leader of the survey team. To prevent it from evolving into a political problem, the State Council of China instructed the Chinese scientists in 1957 that they not raise the issue with the Soviet scientists formally.[19] Nevertheless, the issue still stirred up fierce debates between the Chinese and Soviet leaders during the survey.[20] Later the dispute faded away when the general Sino-Soviet political relationship was broken in 1960.

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[16] *Yuan Zigong*. Heilongjiang liuyu zonghekaocha wangshilu (past events of the integrated surveys in the Heilongjiang Valley) // Yuanshi ziliao yu yanjiu (materials and research on the history of the Chinese Academy of Sciences). 2001. № 6. P. 1–23.

[17] The Archives of the CAS: Z374-43.

[18] Zhu Kezhen riji, (Diary of Zhu Kezhen). Vol. 4. Science Press, 1989, P. 48.

[19] Zhu Kezhen. Guanyu canjia zhongsu zonghedui kaocha heilongjiang zuoyouan zhongsudiqu de baogao (On the report of participation in the survey team along the riversides of Heilongjiang) // Zhu Kezhen Quanji. Vol. 3. P. 383.

[20] Gu Zhun talked about it in Gu Zhun Zishu and Fan Hongye had a detailed description of the incident // Zhukezhen riji li de Gu Zhun (Gu Zhun in Zhu Kezhen's diary). Nanfang zhoumo (Southern Weekend). 2004. December 2.

According to the 1956 treaty, a joint academic committee was founded to organize the survey, unify the methods, inspect the fieldwork, and review the resultant reports. The committee also planned to organize academic conferences on the subject at the pace of once a year, to be held in Moscow or Beijing.

In 1960, the fieldwork phase of the cooperation was completed and the two academies would hold the last academic conference in October 1960 in Beijing. But at this time the political relationship between the two governments had worsened. Therefore, holding of the last conference was in doubt. The leaders of the SAS suggested that the conference be postponed with the reason that the reports couldn't be finished.

Finally, the conference was held in April 1962 in Beijing. This was the first joint academic conference between the two academies after the two countries' relation soured. Therefore the two governments paid great attention on it. The Soviet ambassador attended the conference and Chinese Premier Zhou Enlai made a gesture of formally receiving the Soviet guests after the conference in the Great Hall of the People in Beijing. Thus, because of the special political circumstances, the conference became a showcase to demonstrate the diminishing friendship between the two countries and the achievements of the cooperation. It was perhaps successful in politics, but it did not help resolve the many academic questions raised during the survey.

## 3. The Influence of the Sino-Soviet Cooperation and Its Evaluation

Although Sino-Soviet ties worsened in early 1960s, the Chinese government and scientists gave high appraisal to the contributions of Soviet scientists who had worked in China. In August 1960, the Chinese State Council sent out a notice to government officials, which said that "we should affirm that most of the Soviet experts had given Chinese construction a great help and they were friendly. We should affirm their contributions and our mutual friendship."[21] The CAS also sent out an emergency notice and asked its institutes to have every thing well arranged for the Soviet scientists who were on their way home.[22]

During the cooperation, Sino-Soviet scientists had built ties of friendship. When they heard the bad news of the recall of their Soviet colleagues, many Chinese scientists were shocked and many Soviet scientists were not willing to withdraw.[23]

In the research field of natural resources surveys, most of the fieldwork had already finished when the two countries' ties broke. But the research work based on the data collected during the fieldwork was just beginning. Therefore, instead of cooperative research, the scientists did their research separately.

On the Soviet side, the scientists had by the early 1960s finished their survey reports during the last 3 or 4 years. They would have liked to get the permission to use the data of the survey in China and wanted to get more information from the Chinese side. Some scientists even hoped that their reports could be published in China. When faced with such requests, the CAS asked the State Council for instructions. Afterwards, the CAS replied to the Soviet officially that the CAS had no obligation to give any advice or data on their inquiries, but it would send Soviet academic reports to Chinese scientists for feedback and suggestions. But

[21] The Archives of the Ministry of Foreign Affairs, Beijing: 109 00927 01.

[22] The Archives of the CAS: Z374-77.

[23] Zhu Kezhen riji. Vol. 4. P. 460.

at the same time, the CAS told Chinese scientists involved that their responses to the Soviet inquiries should depend on the political attitudes of the scientists in questions and contents of their reports and that they did not need to reply in every case. The only exception to this cooperative gesture was the reports on the survey of Xinjiang. Because some reports touched upon the border problem, the CAS refused the requests of Soviet scientists to use the Chinese data from the surveys in Xinjiang in their publications for fear that such use would imply acceptance of their conclusions.[24]

On the Chinese side, scientists eventually finished their survey reports independently. But because of the worsening political relations between the two countries, the contributions of the Soviet scientists to the surveys were cut out in their reports. Of course, the drafts of those reports completed before 1960 had given Soviet scientists high praises, but most of these reports were not published later. Therefore, for a long time in China people had little knowledge about what the Soviet scientists did in these important surveys. Only recently, along with the opening of various archives to the public have we been able to research and evaluate the extent and evolution of Sino-Soviet scientific cooperation in natural resource surveys.

When the CAS began to organize the surveys, Chinese scientists lacked the experiences in this research field. During the cooperation, Soviet scientists helped their Chinese counterparts to make the fieldwork plan and solve problems. Perhaps the most important contribution of the Soviet scientists was the training of young Chinese scientists. Besides working with young Chinese scientists in the field, Soviet scientists also trained them through courses, lectures, and scientific reports. According to Chinese statistics, during the Heilongjiang Valley Survey, Soviet scientists helped train more than 300 young scientists, and half of them were able to carry out survey work independently afterwards during the four years of cooperation.[25] Comparing with sending students to the USSR, this kind of training benefited more young Chinese scientists, required lower financial support, and was very effective.

The integrated surveying of natural resources was one of the important areas of Sino-Soviet cooperation in the 1950s. Studying this history, we can see the many connections between scientific advances, political developments, the international environment, and the shifting ties between the two countries which in turn exerted a great influence on the scientific cooperation between the two academies. Perhaps this review of the past experience will be useful for both the scientists and policy-makers involved in current and future international scientific cooperation between China and Russia and other countries.

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[24] The Archives of the CAS: Z374-137.

[25] Zhu Kezhen riji. Vol. 4. P. 441.

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# Selection and Transformation under the Influence of the Soviet Union: Formulation of the Regulations on Postgraduate Cultivation by Chinese Academy of Sciences in Its Early Stage

In 1953, due to needs of self-development and national construction, in view of experiences of Soviet Academy of Sciences, the Party Leadership Group of Chinese Academy of Sciences decided to take the cultivation of scientific cadres as one of the central tasks and the cultivation of postgraduates as one of the focal points, following which the formulation of *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences* (hereinafter referred to as *Regulations*) was carried out. The *Regulations* was formulated in 1955 and issued in August, 1955. Its contents were obviously edified by the Soviet policies and systems for cultivating scientific cadres; however, to formulate regulations on postgraduate cultivation applicable for China's actual conditions, Chinese Academy of Sciences didn't indiscriminately imitate them, but made discreet screening and modification, with the absorption of many comments and suggestions from inside and outside of the Academy. The formulation of the *Regulations* laid momentous systematic foundation for Chinese Academy of Sciences to rapidly play an important role in China's postgraduate education in the next ten years since then. The *Regulations* also provided reference basis for China's institutions of higher learning to accumulate experiences on postgraduate education, and thus facilitated the development of postgraduate education towards the normalized direction.

***Keywords:*** Chinese Academy of Sciences; Soviet Academy of Sciences; scientific cadres; postgraduate cultivation system; licentiate.

The Chinese Academy of Sciences (hereinafter referred to as "CAS") was established in the autumn of 1949, which was the People's Republic of China's supreme scientific institution and scientific research center. Due to needs of self-development and national construction, in view of experiences of Soviet Academy of Sciences, the Party Leadership Group of CAS decided to take the cultivation of scientific cadres as one of the central tasks and the cultivation of postgraduates as one of the focal points in 1953. On August 31, 1955, the State Council promulgated the *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences*, which was the first formal ordinance stipulating the postgraduate cultivation. In September, 1955, CAS started the first enrollment of postgraduates, with the examination held in January, 1956, since when CAS had become an important training base for China's senior research personnel.

The academic circles had made some in-depth research on CAS's postgraduate education at its early stage. The *Educational phylogeny of Chinese Academy of Sciences* compiled by Zhang Li et al was a piece of representative works. However, there was no special probing on the formulation of the *Interim Regulations on Postgraduate Cultivation by Chinese Academy*

*of Sciences*. In fact, the study on the formulation process of the *Regulations* can help understand and know the specific operation process and influence factors during the first formal formulation of postgraduate cultivation system by CAS and promote the research for the history of postgraduate education in its early stage. In view of this, based on the archival data in CAS and related original documents, this study mainly investigated the formulation process of the *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences* with analysis on the influence of the *Regulations* formulated by CAS.

## Part I. Internal Needs and Soviet Experiences: Origin of CAS' Postgraduate Education

The modern postgraduate cultivation system originated from Europe in the early 19th century, generally with the establishment of University of Berlin in Germany in 1810 as the symbol of its birth. In the 20th century, the postgraduate cultivation system was introduced to China proper. Till 1949, despite that the National Government's Academia Sinica which was the highest national academic research institution failed to establish the postgraduate cultivation system, the postgraduate education in colleges and universities had already begun to take shape and formed the normal master and postgraduate cultivation system. Since the foundation of New China in 1949, the people's government abandoned the academic degree system of the National Government, but also recognized the importance of postgraduate education in the national education system; therefore, the master and postgraduate education was still carried out in colleges and universities, with strict requirements imposed over the enrollment of postgraduates.

As the national highest scientific institution and scientific research center, CAS soon attracted and recruited many accomplished scientists after its establishment. Till 1953, there were more than 340 advanced research personnel, but the scientific research force in the research institution was unbalanced, moreover, many scientific research groups were still very weak, with some lack of research foundation. After the implementation of the first the Five-Year Plan, the construction work in various aspects were carried out in large scale, while due to the irreplaceable academic position in China, CAS undertook a lot of difficult national construction tasks. To meet the requirements for national construction and self-development, it was necessary for CAS to rapidly expand its scientific research team.

In February, 1953, in the fervor of learning from the Soviet Union nationwide, CAS dispatched the Soviet-visiting Delegation with the leadership of Qian Sanqiang to visit Soviet and learn how to organize and lead the scientific research work. The major institution that the Delegation visited was the Soviet Academy of Sciences (hereinafter referred to as SAS). On March 19, SAS held a symposium regarding the cultivation of scientific cadres for the Delegation. The Academic Secretary-general named A. B. Топчиев, Director of Scientific Cadre Cultivation Office named Novikoff, and Academician's Delegate Secretary of Department of History and Philosophy and Communication Academician named A. M. Pankratova all made speeches on the introduction of scientific cadre cultivation. A. B. Топчиев especially focused on the introduction of the importance that Soviet and SAS attached to the cultivation of scientific cadres and the significance of cultivating scientific cadres. He said:

Among the various measures of the communist party and the Soviet nation, the cultivation of scientific cadres has occupied an important position for all the times. We spared no money to cultivate scientific cadres and develop the cultivation network widely in Soviet. Till now, there are hundreds of institutions of higher learning and scientific research institutes engaged in the cultivation of postgraduates. In the realization of this glorious mission, SAS played a central role. Every year, there are thousands of scholars passing the thesis defense for candidate doctors and doctors who then joined the expert procession in the national economic and cultural departments and scientific institutions and became teachers of the institutions of higher learning, and staff of government offices.

Novikoff made a speech after A. B. Топчиев and mainly introduced the specific measures and methods that SAS adopted to cultivate the scientific cadres. A. M. Pankratova was a historian with high reputation in Soviet, who had instructed more than 20 postgraduates at that time. She introduced her experiences in cultivating the candidate doctors and doctors.

These introductions touched the Delegation of CAS greatly. After returning to China, every member of the Delegation mentioned "Cultivating talents is an extremely important task for SAS" in the report. The Delegation also stressed in the work report that: One of the major experiences for Soviet and SAS accomplishing huge achievements in a short span of 30 years was to take the cultivation of scientific cadres as the central link. At this time, CAS was seeking for good idea of rapidly expanding the scientific research team. The experiences of Soviet's cultivation of scientific cadres deeply touched the leadership of CAS. From October 14, 1953 to November 7, 1953, CAS held the meeting of directors of institutes and decided to take largely cultivating scientific cadres as a long-term central task. On November 19, in the report submitted by the Party Leadership Group of CAS to Chairman Mao Zedong and CPC Central Committee, this central task was emphasized, with the proposal of adding the postgraduate office, formulating the drafted regulations on postgraduate cultivation, enrolling the first-year postgraduate in the 3rd quarter of 1954, and starting to plan the cultivation of scientific cadres.[1]

On 28 January, 1954, Guo Moruo, President of CAS, made the speech of *Report on the Basic Situation of Chinese Academy of Sciences and the Future Work Tasks* in the 204th execution meeting of the Government Administration Council, stressed again the importance of cultivating scientific cadres, considered the cultivation of postgraduate as the basic link of scientific development, and proposed to start from the actual and present facts of China in combination with the Soviet experiences to "formulate practical systems and measures". This report was approved in that meeting. On March 8, the CPC Central Committee approved the report submitted by the Party Leadership Group of CAS on 19 November, 1953 and pointed out that: "Vigorously cultivating the new scientific research strength and expanding the scientific research team are important links of developing our country's scientific research career. CAS and institutions of higher education should seriously carry out the work of cultivating young scientific researchers and establish relevant systems to ensure that". This means that the decision of establishing the postgraduate system by CAS was formally confirmed and supported by the CPC Central Committee.

[1] Report on Current Basic Situation and Future Work Tasks of Chinese Academy of Sciences by the Party Leadership Group of CAS and Written Instructions from CPC Central Committee (Zhong Ke Yuan Dang Zu Guan Yu Mu Qian Ben Yuan Gong Zuo Ji Ben Qing Kuang He Jin Hou Gong Zuo Ren Wu De Bao Gao Ji Zhong Yang Pi Shi). CAS Doc.: 1954-1-1.

## Part II. Formulation Process of Regulations on Postgraduate Cultivation

In fact, at the previous day when the CPC Central Committee approved the report submitted on November 19, 1953, CAS already instructed the Academic Secretariat to carry out the preparation work for formulating the regulations on postgraduate cultivation. The Academic Secretariat was an organization set up in the executing meeting by imitating the organizational setting mode of SAS to strengthen the academic leadership. The Secretary-general named Qian Sanqiang, Deputy Secretary-general named Wu Heng, and Secretaries named Bei Shizhang, Liu Danian, Wang Zhihua, and Zhang Wenyou respectively were all the members of the Soviet-visiting Delegation. On March 6, 1954, the Academic Secretariat held the first meeting, mainly discussed the matters about formulating regulations on postgraduate cultivation. This meeting decided that the Academic Secretariat and Personnel Bureau would jointly undertake the basic preparation work and Wang Zhihua would take charge of the work in the Academic Secretariat and sort the materials. At the same time, the meeting proposed to establish the Drafting Committee for Postgraduate Regulations.

No Later than May 12, Wang Zhihua and the Personnel Bureau drafted the initial regulations on postgraduate cultivation. On May 12, 14, and 17, the Academic Secretariat held three academic affairs meetings in succession to discuss and revise the draft, and finally completed the revised *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences (Draft)* (hereinafter referred to as *Regulations (Draft)*). The Academic Secretariat made large change for the initial regulations drafted by Wang Zhihua and the Personnel Bureau, mainly referring to Soviet policies and systems of cultivating scientific cadres, including the introductions made by Soviet Experts in the symposium for cultivation of scientific cadres held by Soviet Academy of Sciences for CAS on March 19, 1953 and the *Regulations on Cadre Cultivation of Soviet Institutions of Higher Learning and Scientific Research Agencies* brought back by the Delegation from Soviet.

The *Regulation (Draft)* was divided into the General Provisions, Enrollment of Postgraduates, Cultivation of Postgraduates, and Treatment of Postgraduates in turn, with each chapter including 27 articles, among which 16 articles were quoted from the Soviet policies and systems of cultivating scientific cadres, while some regulations were modified in combination with China's actual situation. For example, the length of schooling for Soviet off-job postgraduates was 3 years, and Wang Zhihua and the Personnel Bureau adopted this regulation in drafting the initial edition, but the Academic Secretariat revised it to 4 years. Meanwhile, the Academic Secretariat considered that Wang Zhihua and the Personnel Bureau set too high standards and requirements for the postgraduate cultivation in the initial edition and revised it to: "The scientific research cadres cultivated from the postgraduate system shall reach a certain Marxism-Leninism level, have solid theoretical foundation in his/her own scientific field, and independently carry out the professional and creative scientific research work."[2]

On June 12, 1954, CAS organized the establishment of the Postgraduate Cultivation and Scientific Incentive Regulation Drafting Committee (hereinafter referred to as Regulation Drafting Committee), with the Vice President of CAS named Zhu Kezhen as the Chairman

[2] Minutes and Work Plan of Academic Affairs Meeting in 1954 of the Academic Secretariat of Chinese Academy of Sciences (1st – 29th) (Zhong Ke Yuan Xue Shu Mi Shu Chu Yi Jiu Wu Si Nian Chu Wu Hui Yi Ji Yao Gong Zuo Ji Hua Yi Zhi Er Shi Jiu Ci). CAS Doc.: 1954-22-2.

of Committee, and the members mostly being the scientists and academic leaders with high domestic popularity. On July 3, the Regulation Drafting Committee decided to set up a group composed of Qian Sanqiang, Qian Weichang, Zhou Peiyuan, Zeng Yi, Bei Shizhang, Yin Da, and Shen Qiyi to review the postgraduate cultivation regulations. After the review, the 7-member group put forward the *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences (2nd Draft)*, which was passed in the 29th Academic Affairs Meeting of CAS on July 29, 1954. After that, CAS asked for the comments from the relevant government departments and institutions of higher learning. On May 6, 1955, the Party Leadership of CAS submitted the revised draft which incorporated the comments from relevant departments to the Propaganda Department of the CPC Central Committee for review and asked for approval from the Secretariat of the Communist Party of China Central Committee.

In June, 1955, in the inaugurating meeting of the Academic Divisions of CAS, the members of the Academic Divisions ardently discussed the *Regulations* (revised *Draft*) and put forward many ideas and suggestions. Wang You proposed that the requirements of the *Regulations* (revised *Draft)* were too high and not practical, and thought that the postgraduate tutors' level were not possible to be raised suddenly, as well as the national scientific level and the postgraduate level. Huang Ziqing, Zhang Qinglian, and Wu Xuezhou pointed out that the learning term for postgraduates was too long and suggested changing it from 4 years to 3 years, which shall be so especially when our country was in urgent need of scientific cadres. Huang Ziqing, Zhang Qinglian, Zhao Chenggu, Zhao Zhongyao, Yu Ruihuang, and Qian Linzhao proposed to change the name of academic degree for postgraduates "Vice-Doctorate" to commonly-used "Candidate Doctor" or "Master". Huang Ziqing pointed out that the postgraduate degree was better to be awarded by CAS in a centralized way. The degree thesis of the institutions of higher learning can be decided via the review of the Faculty of CAS. Meanwhile, some members of the Academic Divisions thought that it would be hard to cultivate the postgraduates who are too old and recommended to change the age of the candidates from younger than 40 to younger than 30.[3]

CAS then amended the *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences (*revised *Draft)* immediately. It can be known from the revised edition that some comments and suggestions, such as changing the period of schooling of postgraduates to 3 years, changing the "Vice-Doctorate" to Candidate Doctor or Master, and changing the age of candidates to younger than 30, were not adopted.

After the inaugurating meeting of the Academic Divisions, the executing meeting of CAS passed the revised edition of *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences (Draft)*. After that, CAS made technical modifications to some of the regulations, following which the whole regulations were divided into "General Provisions", Enrollment of Postgraduates", "Cultivation of Postgraduates", "Treatment and Work Assignment of Postgraduates", together 4 chapters, with each chapter including 28 articles. On August 5, 1955, the 17th plenary meeting of State Council passed the revised edition of *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences* which was issued on August 31 after being signed by Premier Zhou Enlai. The *Regulations* was the first formal postgraduate cultivation system in the People's Republic of China, whose issuance and implementation marked the initial establishment of the postgraduate system of CAS.

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[3] Manuscript of the All-round Comment Summarizing Materials in the Inaugurating Meeting of the Academic Divisions, of the Chinese Academy of Sciences (Zhong Ke Yuan Xue Bu Cheng Li Da Hui You Guan Ge Fang Mian Yi Jian Hui Zong Cai Liao De Di Gao), CAS Doc.: 1955-2-35.

## Part III. Concluding Remarks

To sum up, the reason why CAS carried out the postgraduate education in the 1950s was mainly due to the needs of self-development and national construction as well as the influence of the Soviet experience. The *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences* was formulated in 1955 and issued in August, 1955. Its content was obviously affected by Soviet policies and systems for cultivating scientific cadres. In particular, the requirements of the *Regulations* were basically consistent with those of SAS, which maintained high standard. This should be considered as one of the key points for CAS having good reputation in postgraduate education, as well as an un-ignorable factor for CAS having important position in national education system in the future. However, to formulate postgraduate cultivation regulations suitable for China's national conditions, CAS didn't indiscriminately imitate Soviet policies and systems for cultivating scientific cadres, but made discreet screening and modification.

On August 31, 1955, after being issued by the State Council, the *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences* soon aroused strong repercussions among colleges and universities. Some colleges even drafted the cultivation plans for postgraduates according to the *Regulations*. In view of these situations, on July 16, 1956, the Ministry of Higher Education issued the *Measures for Winding up and Further Improving Existing Postgraduates*, which stipulated: "The existing four-year postgraduates and three-year postgraduates majoring in clinic medicine have been cultivated according to the cultivation plan for Licentiate degree in the *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences*, that is, they will study according to the original plan." This indicated that the formulation of *Interim Regulations on Postgraduate Cultivation by Chinese Academy of Sciences* provided reference basis and accumulated experience for the institutions of higher learning to implement formal postgraduate education, and thus promoted the development of the postgraduate education toward the normalized direction.

Unfortunately, since 1957, the "Anti-Rightist Movement", "Great Leap Forward", "Four Clean-Ups", and other radical political movements occurred in new China in succession, and the implementation of the *Interim Regulations on Postgraduate Cultivation by Chinese Academy* experienced many difficulties and challenges, which severely influenced its implementation effect. After the outbreak of the "Cultural Revolution" in 1966, the postgraduate education of CAS was forced to be suspended, and soon the *Regulations* had been completely abolished. Moreover, as there were no issuance and enforcement of the supporting regulations on academic degrees, CAS wasn't able to grant the vice-doctorate degree to the graduated postgraduates.

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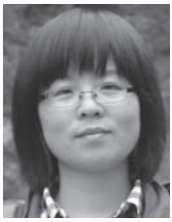

# Debate on Work Guideline of Chinese Academy of Sciences in 1981–1983

"Focusing on fundamental research and improvement, and serving for national economy and defense construction" was formally put forward by the Chinese Academy of Sciences as work guideline in 1981. Soon it was questioned by central leaders of China. And it brought about a debate on whether the work guideline of the Chinese Academy of Sciences needed to modify. The paper tries to hackle the specific process of the controversy and explore its significance.

**Keywords:** Chinese Academy of Sciences; work guideline; debate; fundamental research; applied research.

"Focusing on fundamental research and improvement, and serving for national economy and defense construction" was formally put forward by the Chinese Academy of Sciences (CAS) as work guideline in 1981. Soon it was questioned by central leaders of China. And it brought about a debate on whether the work guideline of the CAS needed to modify. Whether to modify or not, is a sticky subject for CAS at that time.

## Part I. CAS Determined Work Guideline for the First Time

CAS described its major task and direction many times in its early developmental history, and formally put forward the words "work guideline" to conclude its major task and direction until the early 1980s.

After the Cultural Revolution, the Chinese government redeployed the science and technology system to promote development of science cause. According to the 1978-1985 Outline of National Science & Technology Development, as the national comprehensive research center of natural science, CAS' major task was defined as follows: researching and developing new theory and technology of natural science, solving comprehensive and significant scientific and technical issues in the national economic construction in cooperation with relevant departments, and focusing on the fundamental research and improvement.[1] According to the definition, CAS described its work guideline as focusing on fundamental research and improvement, serving for national economy and defense construction at the enlarged work meeting of CAS in 1979.

On January 29, 1981, CAS reported to the Secretariat of the Central Committee and clearly proposed its work guideline: focusing on fundamental research and improvement, and serving for national economy and defense construction. Its main contents include: 1. Mainly engaging in fundamental science and some technological sciences research. By research classification, mainly responsible for fundamental and application researches as well as a small amount of development research; and strengthen basic work in the whole research. 2. Mainly involved in and responsible for science and technology tasks necessary to economic construction and national defense construction, and solving critical and pioneering issues in technology development and so on.[2]

The work guideline of CAS met the approval of Hu Yaobang and other central leaders at the meeting. According to the meeting minutes, Zhao Ziyang, premier at the time, was absent from the meeting.

On March 6, 1981, the Chinese government clearly stated that CAS was the supreme academic body and a national comprehensive research center of natural sciences, and its work guideline was completely correct.[3] After obtaining affirmation by the Chinese government, CAS formally announced its work guideline in the Statute of Chinese Academy of Sciences (Tryout) obtained on May 18, 1981: "Focusing on fundamental research and improvement, and serving for national economy and defense construction; mainly responsible for fundamental and application researches as well as a small amount of development research. Enriching and developing theories, methods or technologies of natural science in science studies, and solving important and comprehensive issues in national construction in cooperation with relevant departments."[4] Till then, CAS first formally established its work guideline.

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[1] The 1978-1985 Outline of National Science & Technology Development, Chinese Academy of Sciences Annual Report (1977, 1978). P. 80.

[2] Outline report on the work of the Chinese Academy of Sciences, Chinese Academy of Sciences Annual Report (1981), pp. 8-9.

[3] Chinese Academy of Sciences Annual Report (1981). P. 1.

[4] The Statute of Chinese Academy of Sciences (Tryout), Chinese Academy of Sciences Annual Report( 1981). P. 245.

## Part II. Query from a Central Leader

On December 25, 1981, Zhao Ziyang wrote a letter to Hu Yaobang and Deng Xiaoping to query on the work guideline of CAS. He said that he agreed with Yang Zhenning's view that Chinese scientific and technological circles (including CAS) should put more human resource, material resource and financial resource in technology development and product research, but not fundamental research. He mentioned in his letter that Tian Changlin also advocated this view.[5]

Yang Zhenning's view came from a letter he wrote to former Vice-Premier Fang Yi on December 1, 1981. He believed that developmental study investment in Chinese scientific and technological research system was very weak, and recommended Chinese government to concentrate forces on developing technology and product researches.[6] In addition, Tian Changlin, in his speech at CAS in June 1981, suggested that China should learn the developing experience of Japan to emphasize and strengthen technological science research and to develop economy.[7]

In fact, Lin Jiaqiao, a Chinese American scientist, has proposed to Deng Xiaoping that China should grow applied science as early as 1978. The query from central leaders of China on the work guideline of CAS was caused by not only Chinese American scientists' proposal but also the background of the times.

The third technological revolution that began in the late 1940s, especially the new technological revolution after the 1970s, brought enormous changes in the social productivity, and many countries began to use science and technology to develop national economy. The rapid economic development in Japan and West Germany after the World War II attracted high attention around the world. Many countries restudied the matters on their science and technology systems, science and technology policies, and the relationship between science research and production. They gradually adjusted their development strategies and policies of science and technology. Many countries adjusted their development strategy from defense - research dual structure to industry - research dual structure, which has brought new inspiration to Chinese leaders. After the Culture Revolution, the Chinese government established the development strategy of "taking economy construction as center". On April 16, 1981, the Chinese government officially published new development policy of science and technology, "developing national economy must depend on science and technology, scientific and technical work for the development of national economy".

At that time, there was much criticism on the effect of CAS in national economic construction. A number of ministries held that CAS has no obvious effect for directly promoting economic development. The media repeatedly called on that scientific research should serve for national economical construction.[8] Some people advocated that CAS should mainly deal with fundamental research and hand over applied research and development research to industrial sectors. Some argued that CAS should

[5] Chinese Academy of Sciences Files: 1982-1-1.

[6] Ibid.

[7] Chinese Academy of Sciences Files: 1982-1-8.

[8] Comrade Guangzhao we know — Zhou Guangzhao scientific thinking and scientific spirit collected works, (Beijing: Science Press, 2010). P. 190.

mainly engage in applied research and hand over fundamental research to colleges and universities.[9]

As stated above, many factors including the discussion on scientific and technical issues, adjustment of science and technology system, changes of science and technology policy both at home and abroad made the work of CAS face adjustment.

On December 28, 1981, three days after Zhao Ziyang dispatched the letter, Deng Xiaoping and Hu Yaobang instructed successively and proposed CAS to organize scientists and management staff to discuss and draft new work guideline.[10] On February 6, 1982, Hu Yaobang gave some opinions to CAS: fundamental research should not be weakened; however, the main mask of CAS was to strengthen applied science and technology research.[11] Here, central leaders pointed out the development direction of CAS.

## Part III. Discussion on Work Guideline at Work Meeting of CAS

According to leaders' instruction, CAS held a work meeting to discuss the work guideline on February 20, 1982. The participants include managers and scientists from CAS, relevant ministries, some colleges and universities, and scientific research institutions. Participants were more than 100.

In the discussion, most people held that the work guideline of CAS was appropriate and should not be changed. Some scientists hoped that the work guideline should be stable, and worried about that the policy modification would lead to adverse effects on science research. Many scientists believed that they could improve the wording of the work guideline, but the original basic content and meaning did not need to modify.

Many found that the understanding of "fundamental research" in "focusing on fundamental research" actually related to the general understanding of the work guideline, which may cause some people's misunderstanding on the work guideline. Most participants expressed that the "fundamental research" in "focusing on fundamental research" includes not only purely fundamental research but also applied research.

During the discussion on the concept of fundamental research, how to classify scientific research became an important meeting topic. The confusion of the concept of fundamental research and applied research was relevant to classification method of scientific research work in CAS. In the 1960s, CAS classified scientific research work into four types as follows: fundamental research, applied fundamental research, applied research, promotion research. Hereafter, this classification method was used by CAS. Until the early 1980s, CAS decided to adopt the international classification method. Most scientists at the work meeting proposed to adopt the classification method of UNESCO. According to the UNESCO' definition, scientific research activities can be divided into three categories: fundamental research, applied research, and experimental development.

At the work meeting, many participants repeatedly stressed that fundamental research has extremely important significance for scientific undertakings and the national development, so it could not be weakened.

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[9] Outline report on the work of the Chinese Academy of Sciences, Chinese Academy of Sciences Annual Report (1981). P. 7.

[10] Chinese Academy of Sciences Files: 1982-1-1.

[11] Chinese Academy of Sciences Annual Report (1982). P. 6.

For the ratio of fundamental research and applied research in CAS, a lot of people made a detailed analysis. Some pointed out: at that time, China's civilian research funding was 2.8 to 3 billion Yuan RMB each year, national fundamental research funding was about 110 to 120 million Yuan, making up less than 5% of the total funding for civilian research. In CAS, funding for applied research and development accounted for about 85% to 90%, and fundamental research accounted for about 10% to15%. In the view of nationwide scientific funding situation, fundamental research proportion of CAS was appropriate in general, and absolute amount was not too much.[12] Participants generally agreed that the funding for fundamental research of CAS did not account for significant proportion, even small.

Many scientists believed that it was difficult to clarify only by talking about the work guideline of CAS. The impression of limited success caused by CAS to the society related to a lot of factors, and the reason was very complex. According to the analysis of the participants, the reasons included lagging of the research evaluation system, dispersion of scientific research force caused by subject allocation model, rigidity of the personnel management system, aging of science and technology team, and unreasonable structure of CAS staff and so on. In addition, defects of the Chinese government on a range of systems and policies including the planned economy, financial and taxation, price and so on also restricted the development of CAS. Thus, so-called "problem" of CAS was not due to the work guideline, which related to all aspects of the factors. It was related not only the scientific research system and management system of CAS but also scientific research system, political system and economic policy in China.

The work meeting of CAS lasted for a week. Most people believed that the work guideline should not be modified. Even if the work guideline needed to be modified, it only needed a brief explanation or modification the wording. But, the topic on modification of the work guideline of CAS did not stop.

## Part IV. Recommendations on Modification of the Work Guideline and Introduction of New Work Guideline

In September 1982, Twelfth National People's Congress in Chinese Communist Party took science and technology as a strategic important point of national economy, and placed great emphasis on the great role of science and technology to promote economic development. The conference report enhanced science and technology's position as an element for promoting national economic growth, in the meantime, proclaimed the great expectation of China government to rely on science and technology to promote rapid economic growth.

In October 1982, Premier Zhao Ziyang, at the National Awards Conference of Science and Technology, pointed out in his speech, "scientific and technological work must serve for economic construction, and economic construction must rely on science and technology, which is a basic strategic principle."

In the end of November 1982, Zhao Ziyang stressed again at a meeting, that both applied research and fundamental research should be in accordance with the subject

[12] Chinese Academy of Sciences Files: 1982-1-9.

characteristics for the economic construction as much as possible. Popularization and application of the results of scientific research should be raised to the equally important status with scientific research itself.[13]

On January 5, 1983, Hu Yaobang again spoke, during a visit to CAS' scientific research exhibition, that "to promote scientific research and researchers to the four modernizations and increasing of productivity. Fundamental scientific research should be valued; however, current research focus should be placed on strengthening applied research."[14]

From September 1982 to January 1983, just a few months, China's leaders made a series of decisions and instructions about the position, function, and development of science and technology in constructions of four modernizations, further demonstrated the attitude and determination of China government to rely on science and technology for the rapid development of the national economy. So, the work guideline of CAS became a problem that must be resolved by Chinese government and CAS.

On October 21, 1982, Li Chang sent a letter to CAS and China's central leaders and put forward, with the progress of four modernizations, the work guideline of CAS did not meet the requirements of the four modernizations and national science policy, and it should be changed.[15]

On October 22, 1982, Fang Yi expressed his opinions in a conversation as follows: he thought that the work guideline related to the future of CAS, and he hoped CAS could consider carefully the problem and show work effect as far as possible in order to reverse the passive situation and fight for better development environment.

Faced with the new scientific and technological work policy and requirements proposed by leaders, at the work conference in January 1983, Lu Jiaxi, President of CAS, put forward a serious proposition as follows, "How should CAS do? " What should be of CAS? How should CAS play its role in development of the national economy, society and science and technology?[16] At that time, there was no answer on how to modify the work guideline.

In order to promote institutional reform of CAS, in March 1983, Reform Working Group of the Central and State Organs and Institutions entered CAS to investigate work. They submitted an investigation report to the State Council on August 6. The report claimed that the work guideline should be modified; scientific research work of CAS should face the economic construction and emphatically strengthen applied research and actively participate in research and development, at the same time, continue to improve basic theoretical research.

In 1983, the State Council Leading Group of Science and Technology also did work survey in CAS. They also obtained the conclusion that the work guideline of CAS needed to modify.

On December 15, 1983, state leaders and leaders of CAS again sat together to discuss the work guideline. Zhao Ziyang expressed that he agreed with the view of the two investigation reports on the task of CAS, "CAS must vigorously strengthen the applied research, actively participate in the work of the research and development, and pay emphasis on fundamental research. The central point is to strengthen the applied research." He fully agreed that it

[13] Chinese Academy of Sciences Annual Report (1983). P. 8.

[14] Ibid. P. 1.

[15] Chinese Academy of Sciences Files: 1982-2-3.

[16] Chinese Academy of Sciences Annual Report (1983). P. 319.

was not enough to execute only applied research but no fundamental research.[17] Formed opinion of the work guideline at the meeting was approved by Fang Yi, Lu Jiaxi, and Yan Dongsheng and so on.

Immediately, the 103rd meeting of Central Secretariat made a formal decision as follows: "the work guideline and task of CAS should be clearly defined as vigorously strengthening applied research, actively participating in the work of the research and development, and putting emphasis on fundamental research. The central point is to strengthen the applied research, which is also the key."[18]

On January 1984, according to the Central Committee's decision, CAS officially announced its new work guideline: "vigorously strengthening applied research, actively participating in the work of the research and development, and putting emphasis on fundamental research."[19] The new work guideline made clearly different location of three types of research work, and more clearly expressed the attitude and determination of the national emphasis on applied research and development. Till then, the debate on work guideline of CAS for two years finally came to a close.

## Part V. Conclusion

In fact, the work guideline's modification is the problem about the adjustment of tasks and development direction in CAS. Throughout the history of CAS, with the adjustment of the national development strategies, changes in science and technology policy, and changes in science and technology system, the focus of the work and tasks of CAS repeatedly had appropriate changes. In the history of the development of CAS, China government raised urgent requirements many times to CAS, including the development of "Atomic Bomb, Missile and Man - made Satellite". The debate on work guideline of CAS in the 1980s appeared in the beginning period of Reforming and Opening, with the urgent requirement by China government that science and technology must to contribute to economic development.

However, the work guideline identified in 1984 didn't really solve the problem of CAS and did not achieve longer stability. Thereafter, the work guideline of CAS was adjusted in 1987 and 1992, which was the further development of work guideline in 1984. For total requirements of the national scientific and technological work, the work guideline of CAS was marked with national science and technology development policy in new period.

This debate on the work guideline of CAS is not only the problem about CAS how to deal with fundamental research and applied research, in a deeper level, but also the problem about selection and transformation of the national science and technology development strategy. In the process of amending the work guideline, problems highlights including: the tension between scientists and government, choice space of CAS about its work guideline. The debate also shows understanding and views of Chinese scientists and leaders on science and technology and economic development issues in initial stage of Reforming and Opening. This is also an important case to study Chinese modern history of science and technology.

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[17] Chinese Academy of Sciences Files:1984-2-72.

[18] Chinese Academy of Sciences Files:1983-1-2.

[19] Chinese Academy of Sciences Annual Report (1984). P. 24.

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# How Russian science is being reconstructed? (The historical-sociological analysis of reforms for the last 20 years)

The paper looks at the path traveled by Russian science in the last two decades from the concrete-historical and sociological perspective. Reform of science is explored, concrete data of empirical sociological polls conducted by the Centre for Sociology of Science and Science Studies, St. Petersburg branch of the Institute for the history of science and technology named after Sergey I. Vavilov, Russian Academy of Sciences, as well as results of an annual monitoring of the Academy institutions' work are provided. Development of science in Russia is summed up, conditions of its functioning that could secure Russia's innovative future are formulated.

***Keywords***: reform of Russian science, historical-sociological analysis, transformation of science, academic personnel, scientists' adaptation to socio-economic changes, mobility of scientists, problems of scientists' reproduction.

## Introduction

The problem of reform in Russian science — its aims, tasks, ways, outcomes and long-term prospects — was in the focus of many publications in the last two decades. The dominant — several years ago — negative judgments of the situation in Russian science caused by changes that had started in the early 1990s were gradually replaced by more optimistic declarations from the government and leadership of the scientific community. Nevertheless, there has been up to now big differences in emphasis. The Ministry of science and education launches more and more new reform projects, whereas the scientific community is more discreet referring not only to the brilliant achievements of the Soviet science but also to the three-century old traditions of the academic community that was founded by Peter I and that allegedly has preserved its original form up to now. There is a popular saying by academician L. A. Artsimovich about immutability of two Russian institutions: the Russian Orthodox Church and the Academy of sciences.

Nevertheless, even a perfunctory glance at the history of the Russian Academy of Sciences reveals how far these beliefs from reality (Летопись Российской академии наук, 2003). Since its inauguration on August 1, 1726 the academic community has remained a major feature of the Russian state, but not only has it changed its social functions and priorities during dramatic changes of the political systems but it has also undergone profound structural, institutional, financial, personnel, and sometimes even moral-ethical and value-normative changes.

The Soviet science in 1991 was a product of a lengthy adaptation of scientists to the socio-political conditions in the Russian empire and the USSR that were themselves in constant socio-political and economic transformations. Thanks to flexibility of the academic community in their relations with government and society, not only did it manage to create but also to increase Russia's scientific potential, overcoming various crises that were seen once and again in the 18th century, to say nothing of the stormy 20th century full of tragic events.

The Soviet model of science, as it existed in the mid 1940s, refuted the myth that political freedom was necessary for successful scientific work. It turned out that science produced significant results even under a totalitarian regime, but it dies out soon without a governmental support.

The scientific community and the authorities were united by a shared belief that science could solve all the global problems and secure social progress. Within this symbiosis, the authorities wished to use scientists to build up economic and military power, to justify their policies ideologically, to raise their international prestige. Scientists were engaged as experts in taking important economic and techno-scientific decisions. Along with education, science constituted a single system that governed reproduction of intellectual resources for the Soviet Union, the whole of its infrastructure, including the management system, health care, economy, and so on.

Scientists, in their turn, learned how to use the authorities in solving their own problems, securing a numerical growth of their community, institualization of their research. They made the authorities believe that their work was of tremendous importance for the state that as the only project customer provided huge material, financial and human resources to science. That symbiosis gave fairly good yields as it ensured priority in the main areas of the scientific-technological progress, made advanced military equipment, in space exploration, and so on. Under the rigid party-and-government control, science was virtually the only island where one could freely implement his or her creative ideas. Science attracted gifted and ambitious youth, enjoyed a social prestige, provided better pay compared with other job careers. Science was the field with the real competition between research institutions, teams, and persons.

The academic system in the USSR was to provide research across nearly the whole range of fundamental sciences and to maintain the lead position in the world. The number of scientists and the volume of government financing in the Soviet Union exceeded sometimes those in all other countries. Since the Great Patriotic war leaders of the scientific community in the USSR were part of the ruling elite and enjoyed all the attendant privileges. At the same time, the situation was not so serene, as many scientists recall now. The party interference in science led to lagging behind the world leaders in many scientific fields, first of all in biology, electronics, stagnation in social sciences and humanities. The standard of living of researchers and university teachers — their salaries had not changed since the late 1940s — was inevitably going down at the background of a creeping

inflation. A huge number of scientific developments lay idle for decades until their commercialization. The vertical and horizontal mobility of scientists was low.

The late 1960s saw growing dissatisfaction of the scientific community at their situation, which led to sympathy with the dissident movement, the symbol of which was A. D. Sakharov. Basically, scientists supported actively the perestroika. The overwhelming majority of them believed that it was of vital importance to abandon as soon as possible such postulates in the Soviet academia like centralization, militarization, isolation from the global scientific community, ideologization and politization in humanities and social sciences. They hoped that they would preserve their position in the society, and their scientific work would be prestigious as before. But instead of the long-awaited improvement the academia fell in a crisis — the gravest since the time of the October revolution — provoked, first of all, by the collapse of the USSR by the end of 1991, and a shock transition to market economy in 1992. The transition stretched out for almost two decades, and one cannot see its completion so far.

It would be reasonable to analyze the road covered by Russian science in the last twenty years from the concrete-historical and sociological perspectives. In the late 1990s to early 2000s, researchers at the St Petersburg branch of Institute for the history of science and technology named after Sergey I. Vavilov, Russian Academy of Sciences (SPb IHST) carried out a big international project that included a historical-comparative analysis of crisis situations in science in a number of countries starting from England at the time of the 17th century bourgeois revolution to the PRC during the cultural revolution (Наука и кризисы, 2007). Since 1992, the Centre for Sociology of Science and Science Studies, SPb IHST, has monitored transformations in St Petersburg's scientific community. As a rule, results have been published in collected papers entitled "Problems of activities of scientists and scientist teams" (St Petersburg, 1995–2008). The findings make possible to look at the reforms in the present-day Russian science in the light of the general algorithms of how academia in different countries overcame the crisis that was provoked by a break-up of the existing state structures and that affected the basics of relationship between a state and academia, as well as its position in a society.

Based on this research and also using data from other sources we are going: 1) to examine the main stages and trends in the transformations Russian science saw between 1991 and 2012; 2) to look at dynamics of how St Petersburg's scientific community responded to these changes; 3) to draw conclusions and outline prospects of the science reform.

The reforming period of Russian science may be defined by stages as crisis (1991 to 1996), transformation (1996 to 2001), stagnation (2002 to 2005), a new phase of reforms (2006 to 2012). The transformations which occurred during each period are lighted up in the article in detail.

## The Crisis Stage of Russian Science 1991–1996

In the early 1990s the situation in Russia's science was especially tense and ambivalent. Science was obviously in social and organizational crisis that was caused by a number of factors. Emergence of market economy from scratch as a result of political, institutional and economic reforms, persistent economic crisis, recession, business insolvency, decrease in the internal market, the growing budget deficit, all these contributed to

a failure to maintain the funding of R&D at the previous level. The post-Soviet reform years saw a dramatic drop in the state allocations for science from 2.03 % to 0.4–0.5 % of GDP (Дежина, 2007: 35). According to the most pessimistic evaluations in that period, some years saw the funding fall to one eighteenth or to one twentieth (Юсупов, 2002: 22–39).

The dissolution of the USSR's Academy of Sciences as a united administrative organization and the break-up of scientific and innovative relations following the collapse of the Soviet Union, the change of an ideological paradigm, unstable political situation, all this exerted a negative influence on development and implementation of strategic and tactical solutions including science and technology policies.

Cuts in the general funding of science led to a sharp deterioration of the living standards of those employed in science and engineering.

Such a funding situation in the Russian Academy's science had a negative impact on the technical support of research institutions. Expenses on equipment and instruments in the Russian Academy science fell about tenfold over the period of 1991 to 1995. Not only there was no money to buy equipment, chemical reagents and compounds, but to pay for electricity, mail, heating, scientific journals and literature. Most academic and technical staff had to survive in the literal meaning of the word. That was how the shock therapy worked.

The Russian society, scientists included, faced social and psychological changes that were dangerous for science. The prestige of science kept on falling in the public perception as well among academics themselves.

The years 1990 to 1995 are judged to be a stage in science called the "employment collapse" (Аллахвердян, Агамова, 2006: 71). According to data of Centre for Science Research and Statistics of the Ministry of Education and Science of the Russian Federation for 1991 to 1994 the number of researchers dropped by 40.2 percent compared with 1991 (Science of Russia in figures, 1996: 26). The number of postgraduate students went down: more than by 15.6 % only in the Russian Academy of Sciences (RAS) over 1991 to 1992 (Поиск, 1994).

Scientists left academic institutions in two ways: they moved to other activities or went abroad. Evaluating the quantitative scale of the post-Soviet brain drain has been a controversial issue.

According to the data from the passport and visa department of the Russian ministry of internal affaires 4,576 people employed in science and education emigrated from the country in 1992, 5876 in 1993 (Лебедев, Миленин). The total of those emigrated amounts to five percent of the total reduction in the number of employed in science and research (Китова, Кузнецова, Кузнецов, 1995: 41–56). According to foreign experts, in 1990–1992, 10–15 % of the total number of scientists and engineers who have left the scientific sphere, emigrated from Russia (Научно-техническая и инновационная политика, 1993).

The leaders in the scientist emigration were largely physicists and mathematicians, with biologists, chemists and Earth scientists half as many. The flows of humanities and social scientists were the least numerous. Geographically, the biggest brain drain was from the main science centers: Moscow, St Petersburg and Novosibirsk (Дежина, 2007: 140).

The internal scientist migration — moving to other jobs, especially business — became widespread.

The quantitative reduction in the human capital among scientists was accompanied by its demographic degradation. The average age of Russian scientists went up: it was 38.5

in 1960, and 43.2 in 1992. The proportion of researchers above the age of 60 grew from 9 % to 22 %, while the share of the most active and inventive age groups of 30–39 and 40–49 year-olds dropped sharply (Волков, 1999). The inflow to science of young graduates fell significantly: more than 3,500 graduates from universities and polytechnic colleges were hired by the RAS in 1989, but only 1,000 in 1992 (Поиск, 1993).

Russian science was unable to function normally in such a severe crisis. Russian scientists faced a lot of troubles. The situation needed an urgent reform of academic and research institutions. However, government could offer only bureaucratic alterations, changing endlessly the name of ministries that were in charge of science. There appeared numerous obstacles to real improvements, for instance, allocation of funding through competition. The Russian Humanities Foundation and the Russian Foundation for Basic Research were able to provide not more than 5 to 6 percent of total funding for the civil science. The declared restructuring of the RAS turned into the primitive sackings.

A federal law "On science and the state policies on science and technologies" adopted in 1996 provided for allocation of 4 percent of the budget expenses for science, although it was cynically not fulfilled for years. The maximum proportion never exceeded 1.58 %, and even with the start of financial stabilization this figure kept on falling.

## Transformation of the Academy's Science, 1996–2001

The next decade of Russian science is often called the "transformation period"[1]. The transformation involved self-organization of the scientist community, emergence of individual and collective practices of scientists' adaptation.

The following transformations took place at this stage:

- stabilization, increase in activities, growing financing from Russian science foundations (the Russian Humanities Foundation and the Russian Foundation for Basic Research), emergence of funding through competition;
- decentralization of administration, growing independence of departments, teams, institutions;
- foundation of small businesses and innovation centers;
- free communication between Russian and foreign scientists; more joint projects;
- more ties between the Academy institutions and universities; formulation and implementation of programs to integrate science and education;
- more scientific papers by Russian scientists, more book publishing;
- establishment of the Academy's new institutions (over 100) in promising scientific fields;
- adoption of new IT and Internet;
- the rate of redundancies became slower (10–20 %);
- the scientist's average salary went up.

Whatever improvements in funding the Academy section of science, it should be noted that the state support of the basic research and development remained insufficient. Though in 2000, the state funding rose by 10.7 % compared with 1996. What was important in that period was a bigger activity of the science foundations which led to more extensive grant

[1] The data of science study research "Transformation of the academic science" under grant INTASS-RFFI (1999–2001).

funding based on competition. The first foundation, the Russian Foundation for Basic Research was established in 1992, and the Russian Humanities Foundation in 1994.

Since expansion of the foundations proceeded at the background of the crisis in science, their first priority was to help science to survive and only after that, during the transformation period, to assist in developing and reforming it (Аллахвердян, Дежина, Юревич, 1996).

The grants proved to be the only factor for many scientists to keep on working. They helped to adapt and to maintain working conditions. The foundations encouraged the world integration of Russian science.

The transformation stage saw changes in the forms of scientific organizations and the system of financing: decentralization for institutions' administration, more autonomy for departments and branches of Moscow's institutions in other regions, foundation of new teams within institutions (innovation centers and small businesses) that were more independent economically from the umbrella organization (Олимпиева, 2001).

Emergence of innovative businesses within the Academy institutions was one of mechanisms to adapt scientists to social and economic changes both in the country and in the RAS. Small innovation business is an additional source to finance the institutions attached to the St Petersburg Research Center, RAS. This source provides the Academy institutions with new investments from the state, foreign customers, industry sector (Дежина, 2007: 162–168). Innovation firms provided additional jobs for specialists and young employees which facilitated the process of reproduction in science.

The number of employed in science continued to fall during the transformation period, but the rate was lower than in the previous crisis stage. The years 1995 to 1998 are defined as the stage of "moderate redundancies" in the number of scientist staff (Аллахвердян, Агамова, 2008: 136).

These years saw grave distortions in demography: the average age of scientists was rising. Unlike the early 1990s with a dramatic rise in the pathological mobility, exodus of scientists from science, mass emigration, the scale of emigration at the transformation stage was not so impressive. But still it was going on and the role of social and economic motivation prevailed (The data of science study research, 1999–2001).

During the transformation stage, the issue of staff reproduction stood high on the agenda of the Academy institutions. As of 1996, the number of young scientists at the age below 30 dropped by 30 percent, the number in the group of 30 to 40 year-olds fell by 40 %, whereas the total number of researchers went down by 20 % over the same period.

Various types of cooperation between ministries, universities and the Academy were created to attract young graduates to science: one state-run program "The state support to integration of the higher education and the basic science" ("Integration", 1996–2006) and two programs based on funding from Russian and foreign sources.

However, the programs brought tangible benefits to higher education only: universities thanks to cooperation with the Academy research institutions succeeded in improving the training conditions of undergraduates, and the Academy's scientists got the opportunity for training young specialists for themselves.

During the transformation period, access to information resources became wider, the number of IT users among academics went up.

## Stagnation or stabilization in academic science (2002–2005)?

The transformations in science were followed by a period of stagnation. At the background of reforms in economy and political life, science hardly saw any improvements at that stage. The administration of leading academic institutes and laboratories in R&D highlighted signs of stagnation in science at that time. According to the Center's data in the spring of 2005, the poll in the form of interview yielded the following distribution of replies to the question: "What changed in science over the last four years?" 63.6 % of respondents saw no significant changes, 27.2 % saw the only improvements in the fact that scientists used their own initiative more often.

When discussing the projects — revealed since the autumn of 2004 — of how to radically reorganize the academic community, it became clear that there was no normal dialogue between scientists and the authorities, and the relationship of partnership was lacking.

Nevertheless, on closer inspection, certain stabilization trends in the Russian science were visible in that period. In 2002, the Security Council approved the science development program until the year 2010 worked out by the President's council for science and high technologies with active participation of scientists themselves. For the first time, the development of science and technologies was listed among Russia's top national priorities, and the growth of the Russian economy in 2002 to 2003 allowed for an increase in financing science. Expenses on science rose more than threefold and amounted to about 2 billion dollars in 2005.

The relative salary in the sector "Science and science support" became stable. According to official statistics, in 2003 the average salary in Russia's science sector was 7,187 rubles or $256. In April 2005 the average salary in the science sector amounted to 10,102 rubles or about $360. Nevertheless, inflation was higher than increases in salaries. Remuneration for work in science was low given the high initial salaries of graduates in the trades other than science and engineering. An opinion poll in 2004 found out that 70 percent of respondents considered their conditions "a bit better than poverty", 9 % replied "poverty" and only 19 % "relatively satisfactory".

That period saw a boom in publishing books, growing number of publications and citations of works by Russian authors, the number of innovation centers and technoparks rose.

In 2003 there was an attempt to solve a recruitment problem in science. At the government level, the Ministry for industry, science and technologies was in charge of working out the Guidelines for preserving the workforce potential in the science-and-technology complex, as well as the Federal draft program "Scientists' workforce in the Russian Federation" for the period of 2004 to 2009.

All these efforts yielded only one result — young PhDs who were the winners of a special competition for young scientist got bigger remuneration, and the presidential and state awards went up. Opinion polls suggested that young researchers found it important not only salaries, but also the working conditions (modern equipment, involvement in contracts, etc), and career path in science. Those organizations that took into consideration these factors and made the appropriate provisions were successful in recruiting young talents for scientific positions.

So the government was not efficient enough in recruiting young researchers because their measures were local and inconsistent, they were not supposed to root out the underlying causes that had generated the workforce shortages in science (Дежина, 2002).

Academics themselves were aware of the need for a reform but had no clear-cut idea of its strategy and basic concepts. Not only scientists but the government also had no thought-out plan of reforms.

## The new stage of the science reform (2006–2012)[2]

Exploring the six-year stage of the Russian academia's development it is possible to identify three mega projects of reforms in Russia's science:

1. The pilot project on improvement of the payment system for scientists and chief executives of research institutions, as well as academic staff at science centers of the Russian Academy of Sciences (implementation by stages between 2006 and 2008).

2. The federal target program "Academic human resources of the innovation Russia" for the period of 2009 to 2013.

3. *The Innovation Russia 2020* strategy.

A major event in reforming the Russian academia was decree N 236 issued on April 22, 2006 by the Russian government on implementation from 2006 to 2008 of the pilot project on improvement of a payment system in the Russian Academy of Sciences. (Постановления президиума РАН, 2006). In the period of 2006 to 2008 the following measures were taken: 1) a departmental payment system was introduced to raise the average salary to the level of $1,200–1,400 (2008) which was to be 1.2–1.4 times higher than the national average; 2) the Academy's staff was cut by 20 %, though without consideration of each institution's work by themes, number of publications, participation in conferences, and so on; 3) rather insignificant measures were taken to recruit young graduates; 4) government programs were drawn up for priority areas (nanotechnologies, atom energy, health care, and so on) for the years 2007 to 2012.

The fundamental research programs for the state-run academies of sciences for the period of 2008 to 2012 with a budget of 254.5 billion rubles gave an illusion of growing allocation to the academic field. In 2008 under this program the Russian Academy of Sciences received more than 38 billion rubles (Программа фундаментальных научных исследований государственных академий наук на 2008–2012 годы) that is a bit more than $ one billion which certainly did not solve the problem of providing the Academy institutions with advanced equipment. Only 9.1 % of respondents said that equipment in their institute corresponded to the world level.

At the new stage of the Russian science reform (2006–2008) a new system was adopted to evaluate scientists' performance in the academic area. Now the scientist's pay consisted of a basic salary, extra for academic degree, as well as stimulating premiums calculated on the basis of the coefficient of the scientific efficiency indicator (SEI) (Онищенко). As a result, since July 2008 the range of a researcher's monthly salary varies from 11,500 rubles (345$) for a junior researcher to 27,100 rubles (833$) for head of a scientific team.

It was of interest to find out how scientists judged the new pay system and downsizing. Replies to the question "Is the increase in salary felt by you?" suggest a relative improvement in the financial situation for a number of researchers (40 %). A rather big proportion did not notice clear changes (26.7 %) or noticed insignificant ones (33.3 %) (See Fig. 1)

Only 30 % of respondents believed that the lay-off did not affect their teams, one third of the scientists said that those measures would cause in future serious problems at the institute. At the same time, essential changes could be seen in the last three years in the scientists'

[2] Assessment of the new reform stage on the basis of content analysis of the normative acts and documents, national and departmental statistics and sociological data of polling scientists at the institutions of the Saint Petersburg scientific center conducted under the SPSC's program in 2008, 2011. The goal of this study was to identify judgments of scientists themselves on changes in academia, and efficiency of scientists' adaptation mechanisms to the situation in 2006–2012.

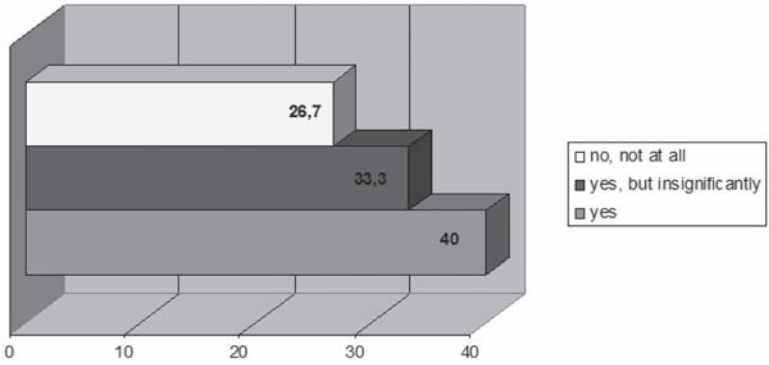


Fig. 1. Distribution of replies to the question "Is the increase in salary felt by you?" (%)

attitude to emigration. Replying to the question: "Do you contemplate emigration in order to work as a researcher or professor abroad?" 71.4 % of academics noted that they would work in Russia's academia. Nevertheless, mobility of the Academy staff in St Petersburg remains rather weak, professional links scarce and concentrated mainly in Russia (see Fig. 2). This has a negative influence on the indicators of Russian scientists' integration into the global scientific community.

Significant reduction of the entire scientific community in Russia is accompanied by even quicker drop in the share of young scientists in the most productive age. For example, the proportion of youth under 35 at institutions of the Saint Petersburg scientific center, RAS (SPSC) is 20 %, the middle-aged group 36 to 39 is 6 %, aged 40–49 is 13 %, older age groups are about 40 %. In the period between 2000 (7 %) and 2011 (19 %) the number of researchers aged above 70 at the Academy institutes grew nearly threefold. Layoffs of scientists affected the age group of 40 to 49 (see Fig. 3).

The problem of generation change is a complex problem that requires analysis of the causes of a weak recruitment of young people to academia, as well as the causes of why young scientists leave research institutes (see Fig. 4). The main reason why so few young people choose scientist careers remains, as before, the low prestige of scientific work in the

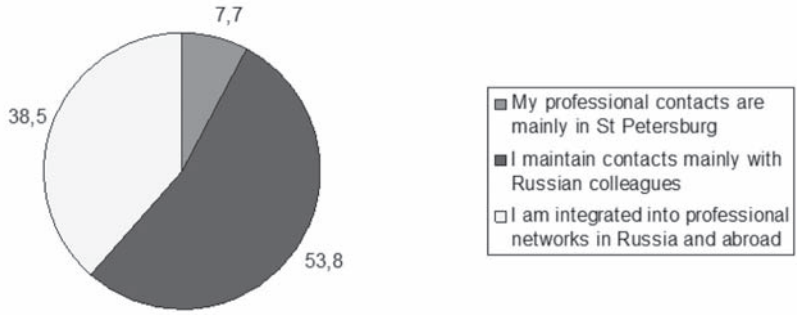


Fig. 2. Distribution of replies to the question:
"How could you evaluate your network of professional contacts?" (%)

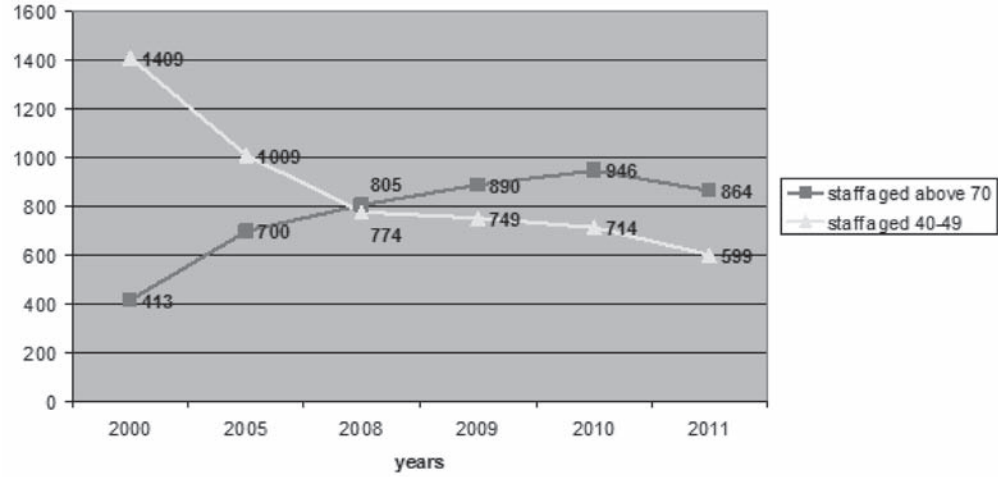


Fig. 3. Dynamics of staff at Saint Petersburg scientific center's institutions of Russian academy of sciences by years and age groups

Russian society. In the mid 1960s the occupational rating in the USSR placed a physicist job on the first place, with radio engineer on the second, whereas today this rating puts science on the ninth place only, and lawyers, businessmen, politicians, programmers, and journalists stand higher.

One of the strong causes — though not primary — of the weak recruitment of young people is the public image of a scientist that does not correlate absolutely to the idea of

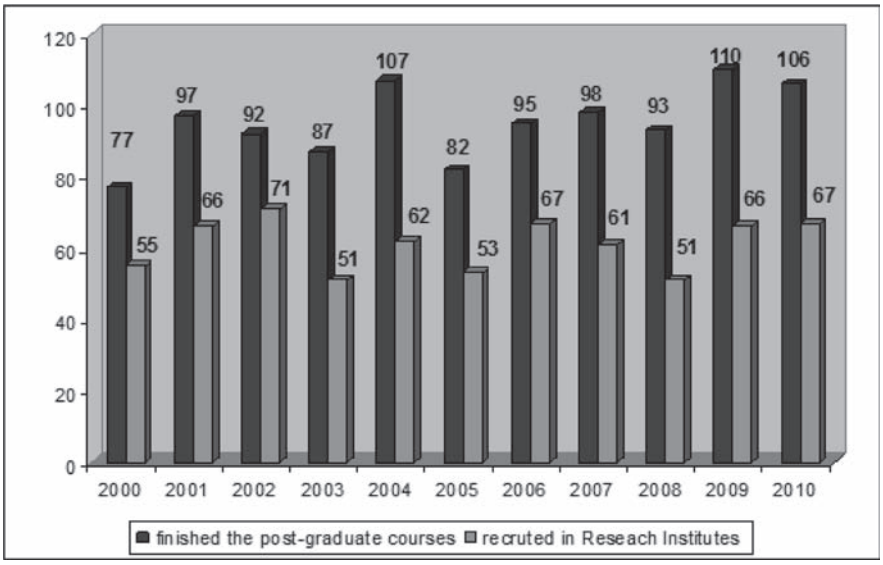


Fig. 4. Employment of graduates in Research Institutes of St Petersburg Scientific Centre of RAS (2000–2010)

a successful person. Today's labor market makes lucrative offers to the youth which worsens the human resource situation in academia. Until now an initial salary is low (for interns, junior researchers), especially in comparison with financial opportunities on the market. Nevertheless, the number of postgraduates in Russia has grown over the last decade, and in 2009 the postgraduate schools taught 154,470 people (Центр исследований и статистики науки). In St Petersburg there were 14,859 postgraduates in 2009, and 15,447 in 2010 (Петростат). But the Russian Academy of Sciences sees a decrease in the number of students in the last decade. The number of postgraduates is low, and the Saint Petersburg scientific center's institutions had only 468 people in 2011 (see Fig. 5).

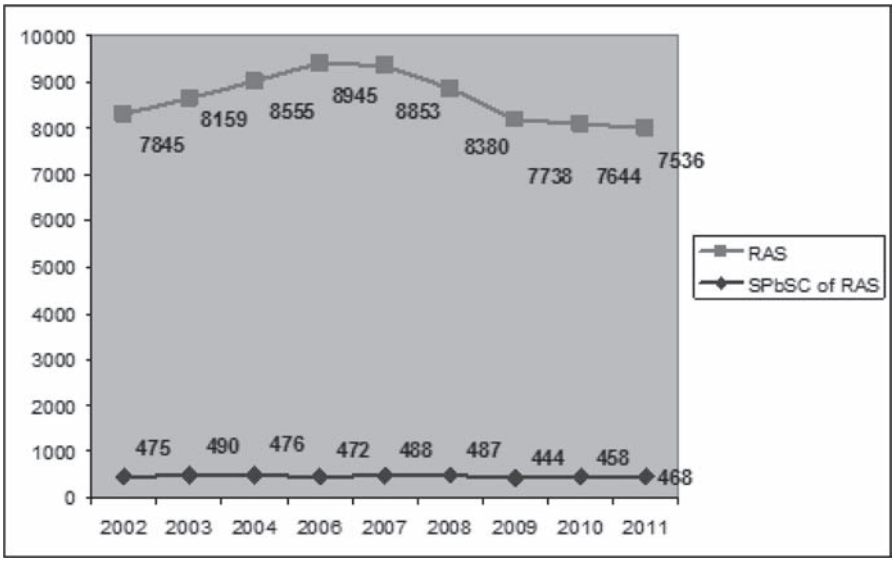


Fig. 5. Number of postgraduates in Russian academy of Sciences (RAS) and St Petersburg Scientific Centre of Russian Academy of Sciences (SPbSC of RAS) institutions (distribution by years)[3]

The weak inflow of the youth is aggravated by a significant exit of young scientists from academia. Which obstacles can see the youth on their road? The main reasons for young scientists to leave academia are equipment that does not correspond to the world level and a weaker position of scientific schools of thought in academia. Now many Russian academics are overloaded with work, sometimes even with several jobs, a lot of time is spent on traveling. Pension-aged scientists often do not work at the world level and are not integrated into the global scientific community. That produces a negative effect on supervision of postgraduate students, and on expert consultations given to young scientists. At some institutes young scientists say about lacking scientific guides for them to achieve world standards.

Higher academic positions do not have age limits which also plays a negative role. The system of professional motivations in young people has changed in the 21st century.

[3] Data from the Saint Petersburg scientific center human resource department for academics and postgraduates as of 01.12.2011 (Fokichev Yu. N.).

Young people of talent especially those who did internship in the West and who can compare the academic age structure and working conditions consider their career progress to be it important.

A young scientist's low salary is one of the essential factors that lead to departures. With the new salary system, a young researcher, in a lucky situation, may expect 30,000–35,000 rubles a month. But it requires to work about 7–10 years at an academic institution.

Young scientists' participation in the grant system has also its difficulties. It is rather trying to get an investigator-initiated grant from the Russian foundations (Russian Foundation for Basic Research, Russian Humanities and Social Sciences Foundation), because experts follow the well-known Matthew effect. These foundations do not have programs to support young researchers' internship at the leading international centers. A further problem is that despite the available programs for young scientists funded from the federal budget (Russian President's grants, the *Education* national project, Federal target science and technology program, Federal education agency's program, international programs), non-government foundations for young scientists (V. Potanin foundation, Foundation for advancement of Russian science, the Dynasty foundation for nonprofit programs, and so on), young researchers are unable to make sense of them. Postgraduates' tutors are sometimes unaware of specific programs that could raise a postgraduate's monthly stipend, as well a tutor's income.

To solve the human resource problem, the Federal target program (FTP) *Academic staff in the innovation Russia* was worked out for the period of 2009–2013 (Рудь). Governmental special projects to attract scientists from abroad and to deal with the Russian diaspora are being implemented and funded. In 2009–2010 a competition was held for researches conducted by teams headed by scientists invited from abroad; a mega grant competitive program was introduced to invite leading scientists who lived abroad to Russian universities (Постановление № 220, 2010). Nevertheless, the number of the projects supported is not big: a competition for researches conducted by teams headed by scientists invited from abroad amounted in 2009 to 110, and to 100 in 2011; a mega grant competitive program secured 40 in 2010 and 39 in 2011. It is absolutely unclear what criteria were used in taking final decisions and whether the winners were real leaders in the world science.

In 2011, the Russian Ministry of education and science paid a special attention to undergraduates and postgraduates' academic mobility programs. The Ministry of education and science's program for 2011 implemented along with the RASA (Russian-Speaking Academic Science Association)[4] — President's stipends for undergraduates and postgraduates — is in operation. The program aims at development of priority modernization areas and provides for training under guidance of professors — fellow countrymen — how to organize a scientific process, new experimentation methods, including in the International Refresher Training Center laboratory. In 2011, the President's administration and the Russian government developed a project — funded from the federal budget — to train for a master's degree as well as in postgraduate school up to 500–1,000 students each year. Upon coming home, these scientists are to occupy important positions both in Russian business and higher learning. But the number of stipends to train abroad is small: they amount to 40 stipends for students only, 60 stipends for postgraduates. Even if all of them return home, they will not be able to change the academia situation.

[4] The center that unites scientists — our country fellows — from 12 academic groups in Europe and the USA headed by Russian expatriates.

A status differentiation of universities was conducted based on the National priority in the development of Russian science — support to science in Russia's higher learning. The national (Moscow, St Petersburg), federal (South, Siberian, North (Arctic), Kazan, Ural, Far Eastern, and North-Eastern) and national research universities were identified (29 in total). But the criteria of the university gradation aren't clear and objective enough. In 2011, the federal expenses for education grew by 28 % and amounted to about 500 billion rubles. It is planned in 2011–2013 to continue the annual additional funding of the leading Russian universities to the amount of 30 billion rubles, which was started in 2010, but on the whole it will not even make up for inflationary loss. New trends can be seen in the activities of the science foundations which were generated by introduction of non-scientific criteria of project assessment. If in the Russian Humanities and Social Sciences Foundation "before 2009 50–55 % of projects were carried out by the RAS researchers and only 25–30 % by university researchers, then in 2009 the proportion of projects conducted by universities was 38.5 %, and as high as 42.2 % in 2010. The share of projects conducted by RAS institutions dropped to 33.3 % in 2009, and 25.9 % in 2010" (*Булгакова, 2011*). Eventually, funding was allocated on the basis of internal departmental criteria and the quality of the projects funded started to deteriorate steadily, because since Soviet times, universities ranked below the Academy in quality and quantity of basic research. There is no evidence that there was a significant increase in research and publications at universities. Moreover, the situation at St Petersburg university is quite contrary. All research institutes were closed there, instead of elected deans all financial and faculty matters are run by appointed pro rectors in appropriate disciplines.

There is nothing odd that Russia has been more and more lagging behind in indicators that characterize the level of integration of a particular country into the world science: weak participation of Russian researchers in joint projects, in international scientific conferences, symposia; insignificant number of joint publications with foreign colleagues, international grants and awards obtained, a low citation index. We believe that the underlying reasons for that can be found in arbitrary decisions by the Ministry of science and education that do not have a well-thought-out science reform program based on Russian and international experience.

## Findings

On the whole, the science crisis in Russia over the past two decades and the ways of solving it are similar to an ordinary scenario of crisis situations in other countries. Adapting to new socio-political and economic conditions, Russia's scientific community went through tremendous transformations. Despite endless reorganization of academia administration bodies, a consistent science-and-technology policy has not been properly articulated. Up to now the ruling circles hold different views on how to reform academia.

Unfortunately, Russia adopted the strategy of transferring science to universities and institutes that is the new configuration of research that we believe to be erroneous for several reasons.

First, the historically conditioned division of research and education was not taken into consideration. Science was done in the Academy institutes, universities educated. Research and educational potential of the Russian Academy of Sciences remains underestimated.

Second, dissimilarity of research potential in universities and department chairs is clearly seen. Education is a conservative environment and science will not emerge in several years in places where it has never existed.

Thirdly, the staff problem. The structure change: overall staff ageing, constantly diminishing middle-aged scientist group, young scientists leave the research institutions, more intensive departure of the staff that assist research process, low mobility, brain drain rather than brain circulation. The number of scientists who return home or those who come to study, internship, or work in Russian academia is small. The most active and promising scientists keep on leaving to continue their academic careers abroad.

Small innovation business continue to function in academia as an additional source of funding the RAS institutes providing the Academy institutes with new financial investment from the government, foreign customers, industries. The innovation business plays an important role in the Academy structure: it raises innovation activity in Russia which gives real opportunities of attracting private capital to science, establishing an elaborate network of small and mid-sized specialized firms capable of adopting high technologies over a short period of time, bringing them to Russian and foreign markets. The innovation business needs several conditions for better work in the academic sector: industrial demand, industry should abandon its raw materials orientation, financial and legislative support from the government, assistance from sponsors, a more developed network of innovation sector foundations. However, our findings suggest that many venture companies have to literally survive; this fighting for survival lowers optimism of their staff, changes the psychological climate in their teams. The main source of income in the RAS innovation firms remains profits from selling high-tech products, commercialization, one-off highly profitable jobs.

As early as in 1998–1999 the Saint Petersburg scientific center, RAS and the Techno-scientific council under the governor of St Petersburg collected data on the main research institutions in the city, including the Academy institutes, and published a book "Science to the city" that consisted of about 600 proposals from the city's research teams. Revised versions of the book "Science to the city" were prepared and submitted to the city government in 2001 and 2003. However, most of these proposals did not attract investors. The gap between science and industry has remained. Science is neglected as before, with the national economy based on supply of raw materials to foreign countries.

Business, on the whole, proved to be incapable of implementing its own post-university program of specialist training. This must be done by the Academy institutes, as well as by the higher learning system. Though postgraduates' low stipends and the lack of decent payment for academic tutors makes it hard to solve this problem. Nevertheless, according to our data, many Academy institutes made progress in solving this problem by way of founding their own elite schools, colleges, universities attached to the Academy institutes. This makes it possible to alleviate the human resource crisis.

Academics themselves when looking in general at the situation in science, their institutes' status, and their own circumstances, form their judgments that are basically different. A significant part of the scientific community believes that Russian academia managed, on the whole, to survive in the new environment. At the same time, a lot of scientists did not put up with the loss of the previous social status, with research jobs turned into an occupation devoid of the social prestige; so they continue to perceive the situation as crisis. They find it difficult to reconcile themselves to the fact that results

of their work are ignored by society in general, and industries in particular, and that the high tech manufacturing is weak until now.

International experts give a rather critical assessment of the innovation advancement in Russia. The OECD experts' main conclusion is: "On the whole, one can see imbalance between government resources allocated to knowledge production and results observed in the innovation field". The conclusion is underpinned by statistical data on innovation-oriented companies, high tech exports, scientific publications (OECD, 2011).

The cause of this harmful and protracted inefficiency of the National innovation system cannot be found now in the consequences of the Soviet model's break-up only. It lies in the government's inefficient innovation and science policy.

Nonetheless, thanks to collective and individual adaptation practices it was possible to preserve Russia's scientific potential, to work out new forms of cooperation between science, education and industry, generated by the scientific community itself. The present situation points to the necessity of a deeper dialogue between academia and the authorities and a stronger partnership. Today's geopolitical situation and socio-economic conditions in Russia require creation of the science system as soon as possible that could ensure the innovation way of development.

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# Distinctive features of academic mobility in today's Russia

The paper investigates practice of international mobility in Russian science. Special attention is paid to the experience of the BRIC group in the field of migration management. Characteristic features of academic mobility, both international and Russian, are brought to light. Significance and prospects of academic mobility are assessed.

***Keywords**:* science, scientific community, intellectual elite, migration processes, management of migration processes.

> ...Nowadays migration is a global problem. It is not an European private property, but the universal phenomenon. And it'll never end: it is our future whenever we like it or not, whenever we happy about it or not.
>
> *Zygmunt Bauman*

According to the outstanding sociologist Z. Bauman the peculiarity of modern social institutions and *modi vivendi* of individuals can be accurately and succinctly described with the "fluidity" metaphor. International intellectual migration is a socio-anthropological phenomenon and not the recent invention. Suffice it to say about the Middle Ages, when famous university cities pulled together students from all over Europe, and, thanks to Latin, education had become international.

International mobility has always played a prominent role in Russian science and in shaping of the scientific elite. Russian science has to a large extent been formed and enriched by the international mobility of scientists. The Russian Academy of Sciences owes its origin to well-known fact: a pleiad of brilliant young scientists came to the country and their work resulted in the creation of the Academy of Sciences as well as science itself. It is also well-known that during the XVIII and in early XIX century many German scientists came to Russia and a lot of them became professors and adjuncts in the Saint-Petersburg Academy of Sciences and Russian universities. To be educated in leading European, especially German, universities and higher technical schools meant a lot for the successful professional career of Russian scientist in XIX — early XX century. International mobility of scientists

acquires new features in modern society: it is institutional in its nature and is formed by new forms of social organization of science and unique traits of its competitive environment.

Since the early 1990s there is a growing outflow of Russian scientists abroad. This phenomenon (comprehended in terms of "brain drain" and "emigration of highly-qualified specialists") has become a subject of fierce discussions conducted by specialists in science studies, foreign researches and experts in the field of state science and technology policy.

In studies of directions of migration researchers usually use two verified theoretical constructions: "repulsion and attraction" and "core — semi-periphery — periphery" (Safonova, 2011: 262–263). Those constructions are rather complementary than mutually exclusive. Streams of migrants are under the influence of centripetal force: highly-qualified specialists move from the "periphery" to the "core" with its concentration of capital-intensive industry requiring intellectual skills and education and high quality of life. Alma Maldonado-Maldonado, who investigates the challenges of globalization in the sphere of science and education (Cantwell and Maldonado-Maldonado, 2009) and the migration of highly-qualified specialists in particular, insists on strict distinction between the concepts of "brain drain" and "brain exchange". And if the first describes characteristic features of migration in the periphery countries, then the second represents peculiarity of scientific mobility in the core countries, the centers of research and development.

Emigration of highly-skilled specialists, i. e. brain drain, has been traditionally negatively evaluated, and its consequences have usually been connected with the threat to national security of a donor county and aspiration to turn back the stream of intellectual migration. The periphery countries respond to the brain drain with a number of measures in the sphere of science and technology policy aimed at repatriation of scientists. Researches have assessed the situation in the post-Soviet Russian science differently. For example, B. M. Firsov in the article "The reproduction of scientific elite" (Firsov, 1998) pointed out that "the fact that scientists go abroad and that some of them have to give up professional research work is the most significant factor, which will decide the fate of this social group".

But in the course of time discussions on the migration of scientists conducted by sociologists and specialists in science studies if not ceased to be disturbing, then assumed another character. As a rule, in recent years researches become increasingly aware of the fact that migration plans of representatives of scientific community (to begin with academic elite, including its future members) make decisive and positive impact on the fate of the "parent" scientific environment, making widespread motto "international character of science" come true.

In Soviet Russia functioning of science, formation of the scientific community and reproduction of the scientific elite were inseparable from such an important element of self-organization of the scientific community as the "scientific school". Scientific school played very significant role in Soviet science. But this idea is devalued in the eyes of new generation of scientists (including middle-aged, forty-year-old researchers). Their professional development fell on the 1990s with their institutional instability and intense outflow of highly-qualified specialists, who represented some established scientific schools. In this situation "personal characteristics" of a young scientist, his or her ability and talent not only for research work, but also for management, have become the dominant factor of reproduction of the intellectual elite. Young scientists got accustomed to new rules of the game: nowadays their professional viability depends not so much on government support, as on ability to obtain means of the implementation of research and development from additional sources. At this point Russian scientists' connections with the international scientific community,

which were minimized during Soviet times, have acquired a new quality. We are speaking about programmes for the international mobility of scientists, research grants given by international foundations, internships, academical exchange between different institutes, etc. For local researchers those are new ways of entering into international research networks which are as a matter of fact transnational and open. It seems that today it is international scientific network that plays an important role in the process of functioning of science, reproduction of the scientific community; its significance is comparable to the role played by Russian research schools in the past. Nowadays mobility (both virtual, i. e. with usage of Information and Communication Technologies (ICT), and real) is a way to shape a "new generation" of scholars, who'll constantly have to prove their worth to their colleagues, to experts when applying for a grants, to managers and, after all, to public who wishes to know how tax money is spent and what are the practical benefits of research and development. And that is why modern scientist is a public figure: he or she is able to present himself, to expound clearly his or her achievements, to be is involved in scientific networks and, of course, mobile.

Several years ago Russian scientists (members of the National Research University — Higher School of Economics) obtained data indicative of significance of international mobility (Gohberg, Chepurenko, eds., 2005). The study examined an impact of overseas internships on scientific potential and professional strategies of scientific elite. The authors noted that scientific potential of the majority of the respondents, who went abroad for internship, has risen to a whole new level; they also listed the positive results of internships, which was mentioned by scientists themselves: contacts with foreign colleagues, visits to academic conferences in Europe, possibility to conduct research at the global level, to use scientific equipment of high quality, to improve the academic qualifications and the material conditions. The main results of scientific internships are articles, published in international journals, and successfully defended dissertations. After their return to Russia those representatives of the academic elite are strongly attached to foreign research centers; they identify themselves with the international scientific community rather than with Russian science and thus contribute to involvement of Russian scientists into the international scientific community.

We believe that there are reasons to assert that nowadays international mobility is an important new tool which enables to maintain the status of the scientific community and reproduction of the scientific elite; even more so: international mobility has become one of the most important means to integrate Russian science into the global scientific community. The participation of Russian scientists in the international division of labor allows us to solve a number of difficult problems of post-Soviet science, including the problem of generational shift.

In their search for determinants of migration modern theories depart from a number of factors, which in the long run are defined by cross-country differences in economic, social, political, and demographic spheres. Apart from such important factors as historically established interrelations, an extensive network of social contacts within the diaspora, proximity and knowledge of the language, the quality of life becomes the main impulse determining the direction of migration. This means that developed countries are the main recipients of highly-skilled professionals, while developing countries with transitional economics become the donors. Intellectual migration fits into this scheme: for example, the flow of scientists — emigrants from Russia — heads first of all for the USA, Germany and France.

The fact that the developed countries as well make an intensive exchange of intellectual assets is also worth attention. Thus, according to a study by F. Dokera and A. Marfuka, the majority of highly-skilled migrants living in member countries of the OECD (Organization for Economic Cooperation and Development) are from the UK (1441 thousand), Germany (848 thousand), Canada (515 thousand), USA (431 thousand) and Italy (408 thousand). (Tsapenko, 2009: 83). To explain this fact we should try to understand how the field of science is organized and what requirements it imposes on its agents. The key notion is the notion of scientific capital, "which is a form of symbolic capital, consisting in recognition granted by a group of colleagues and competitors within the scientific field" (Bourdieu, 2001: 56). The varieties of scientific/symbolic capital include involvement in the recognition and initiation rituals (defense of theses resulting in awarding of master or doctoral (PhD) academic degrees, conference presentations, participation in expert councils), academic titles and awards, patents, publications in journals with impact factor and, finally, a high citation index. This so-called institutionalized capital is expressed in formal evaluations and seemed by managers working in the field of education and science as the main indicator of scientific productivity.

The quest for a high rating causes competition within the scientific and educational environment: universities try to "outbid" highly successful specialists, thus increasing their symbolic capital. A by-product of such a policy is the circulation of scientists between universities of the world and the intensification the intellectual mobility which is one of the forms of organization of modern science. Participation in international internships (i. e. becoming a research fellow) and academical exchange programmes has already become an essential part of professional development, which contributes to the increment of scientific capital. Science is international by nature and the scientists engaged in research and development are drawn to well-equipped laboratories, up-to-date experience and leading experts; to buy "brains" occurs to be economically more profitable than to shape them. The famous Hungarian sociologist, professor P. Tamas believes that the issue of "brain drain" is not a scientific problem, but a special case of the general problem which can be formulated as follows: the need for highly-educated specialists is growing faster than the country's ability to produce them. All industrialized countries suffer a "gap" between supply of personnel and demand for it, and the demand is growing at 7–8 % per year. It results in "withdrawal" or "exhaustion" of such a personnel by highly developed countries. Personnel should be not "kept" but "bought".

Nowadays strategies of the international mobility have fundamentally new character. It is obvious that intellectual migration cannot be stopped as well as prohibited. But it is possible to change the "looking glass" reflecting this social phenomenon: to replace traditional ("conservative") one with "liberal". In this case a scientific diaspora can be seen as a resource for scientific and technological development of the "parent" science, and intellectual emigration is a necessary aspect of the global movement of human resources "from the periphery to the core". It should be noted that in the modern world the word "diaspora" gets new connotations. Today "diaspora" — is not so much an ethnic group of immigrants which "physically" occupies some territory as a collective agent of scientific and technological cooperation, emerging on web pages and within online social networks. H. Jimenez points out that over the past twenty years diaspora's knowledge networks and new "invisible colleges" have been formed which "conceptually transformed the traditional "brain drain" into "brain gain", the loss of human resources into the assets of influence networks in science and technology. In several countries science and technology policy has been switched

from attempts "to return" expatriates to endeavors "to interact" with them. Transfer of knowledge and technologies is the main advantage obtained by the countries from which specialists depart abroad. Expatriate investments, outsourcing, remittances and lobbying for social and political interests are of equal importance to the development of the country.

Thus, nowadays we have to get a different view of academic mobility: it is not the "brain drain" but "brain gain". Of course, the "pendulum" international mobility is not a threat to the intellectual asset of the country. But irretrievable migration and migration presupposing maintenance of relations with motherland imply that a scientist changes his or her permanent place of residence; the International Labour Organization regards those kinds of migration as a cause of losses in scientific potential of the state, especially when migration becomes widespread and turns into a "brain drain". In this situation mobility is a negative factor in the process of national science development, since ever-increasing scale of emigration threatens the existence of certain fields of science or science of certain region or country in general.

J. Jimenez and his co-authors (Jimenez et al., 2010: 67–89) in the article "Mobility or 'brain drain"? The case of Mexican scientists" describe the current strategies used in the sphere of international mobility. The USA, the EU, Korea, Canada, China and Japan encourage repatriation of scientists and subsidize professional associations and networks of local and expatriate researchers. The Chinese government takes active measures to make expatriate scientists come back but does not abandon its "open doors" policy for students. It is impossible to stop flows of student migration from developing to scientifically and technologically developed countries (i. e. "to close the door"). Moreover, many developed countries actively use various programmes to attract foreign students and financially support their education. More and more countries (the USA, Canada, Switzerland, France, Japan, Australia, New Zealand, Ireland, Germany etc.) provide foreign students with employment opportunities after the graduation, and grant them firstly student and then work visas. So, what practices, which make it possible for a donor country to turn emigration of highly-qualified specialists to advantage, exist today in the world? Researchers point out at least two ways: 1) scientific diaspora networks, which owe their existence to application of new communication and information technologies, shape scientific elite in a developing donor-country; 2) the diaspora's participation in scientific projects conducted in homeland is an important tool allowing expatriate scientists from developing countries to enter the global scientific community. It must not be forgotten, though, that effectiveness of diaspora networks depends first of all on science and technology policy of a donor country.

The scale of the international scientific mobility in Russia is not comparable with those in the world and should be increased. Nowadays Russian authorities make some moves to stimulate mobility of Russian scientists while working out programmes designed to get expatriate researches involved in cooperation in the sphere of science.

Russian science management seeks to employ foreign models for organization of educational and research process, and the sphere of academic mobility is not an exception. In "The Concept of the Federal Target Programme for the Development of Education 2011–2015", approved by the Government in February 2011, necessity of "improvement of academic mobility rate for teachers and students" providing "interaction of different educational systems" is indicated (Concept, 2011). Encouragement of intellectual migration and invitation of foreign specialists (including members of Russian diaspora) are the main trends of modern science policy. However, there is no panacea for all the problems. Since in 1990s the theme of the "brain drain" has been discussed at all levels, including government circles,

but only recently programmes designed for "partial" return of Russian scientific diaspora had been worked out and came into operation. A certain turn in Russian scientific policy can be noted: now it is obvious that flow of much needed specialists cannot be stopped while the migration is inherent in the organization of modern science. But it is possible not to lose researchers who left the country: to achieve this goal it is sufficient to choose the healthy pragmatism as a ground for cooperation; it'll allow to turn the "brain drain" into the circulation of highly skilled human resources.

In 2010, in accordance with the Government Decree "Measures to Attract Leading Scientists to Russian Educational Institutions", the Ministry of Education and Science announced a competition of mega-grants which would support the invitation to Russian educational institutions leading scientists living abroad; scientists of all nationalities and countries of residence were eligible to apply. All in all a visiting scholar should spend at least 4 months working in a Russian educational institution while having direct control over conduction of the research. Among the 40 specialists, who have won the competition, there are representatives of Russian diaspora: prominent scientists who have earned international recognition. If these trends continue, the scientific potential and symbolic capital of universities and research centers will grow. The Federal Target Programme "Scientific and Scientific-Pedagogical Personnel of the Innovative Russia" for 2009–2013 years (Activity 1.5. "Performing scientific investigations by groups under the leadership of the invited specialists") is another project designated for cooperation with expatriated scientists. Invited foreign specialist is a scientist of Russian origin, who has (had) Russian (Soviet) citizenship. This project presuppose that this foreign scientist will participate in educational process: he (or she) will deliver lectures, organize seminars and workshops, as well as be in charge of students', post-graduates' and doctoral students' research work; the duration of his (or her) direct participation in the research work shall not be less than two months. The Government has allocated 12 billion rubles (in the form of 100 competitive grants) for this programme. There is one more project of the Ministry of Education and Science in 2011 which enters into the series: that is Presidential scholarships for undergraduate and graduate students, implemented in cooperation with RASA (Russian-Speaking Academic Science Association Home), an association uniting scientists of Russian origin belonging to 12 research groups from Europe and the USA and led by Russian expatriates. This programme focuses on the development of priority areas of modernization (power efficiency, nuclear maintenance and software, medicine and pharmacology etc.) and aims for adoption expatriate professors' practices of scientific work organization and exploration of new experimental techniques, in the laboratory of ICAS (International Center of Advanced Science) in particular. Thereupon we should remember about a project which is currently being developed by the presidential administration and the Government of the Russian Federation: to support overseas internships for 500–1000 students and postgraduates annually at the expense of the federal budget. After their return those specialists will take important positions both in Russian business and in institutions of higher education.

All of those mobility programmes focus first of all on cooperation with expatriate scientists of Russian origin and aim at reproduction of scientific personnel and training of young specialists.[1]

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[1] An eloquent example gives the foundation of a competitive laboratory in the Saint-Petersburg State University under the guidance of a visiting scholar, the German professor Jörn Thiede, an outstanding specialist in marine geology. "The laboratory should become a research platform for young

The scientific community discusses a number of problems which impede effective cooperation. Those are the difficulties relating to the legal regulation of the relationship between a visiting scientist and a host organization, to the problem of government purchases (for purchase, however small, amount of reagents it is necessary to announce a tender), to impossibility to invite colleagues from abroad to found a laboratory, etc. At the same time benefits, which parent science earns thanks to interconnections with members of the diaspora, are undeniable. The projects under the guidance of expatriate scientists attract "motivated young people", the results of research are quickly introduced into academic curriculum, geography of scientific communications (including online-communications) becomes wider. The leading scientists emphasize the need to develop new areas of cooperation with the important role of educational component: a visiting scholar should take upon himself a responsibility for lecturing, postgraduates' and students' training, supervision over work on dissertations and monographs. As to pedagogical projects it is worth to learn from the West: the practice of granting financial support for researchers (invited, for example, as "visiting professors") and (on a competitive basis) for those, who want to carry out a national or international conferences and summer schools, where guest lecturers could actively participate in the training of young specialists, should be developed in Russia.

In general, a positive trend in science policy towards Russian scientific diaspora has recently been noted. New ways of cooperation with expatriate Russian scientists are associated with the pendulum mobility, and Russian diaspora is kind of a "mediator", allowing Russian science to become a part of the global scientific networks.

From this point of view the experience of other vigorously developing transition economy countries, especially China, seems to be interesting. Mobility of Chinese scholars and students is rather high: for example, according to the data for 2009, since at least 2002 Chinese scientists constitute a majority of doctoral students studying in Germany (2019 people); in this competition China has left other countries (India — 1037 people, and Russia — 789) far behind.[2] In 2009 47 % of the students, studying natural sciences and engineering in the USA, were from China and India.[3]

Science policy in China designed to attract expatriates for research work in their motherland seems to be extremely effective. China does not begrudge money for science: its annual outlays for research work increase by 18 % per year, and to 2020 China expects to become an innovative country. There are many repatriates in Chinese research and education centers[4]: as a rule they have undergone extensive training in the USA and Germany.

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scientists", — Vice-Rector for research (SPbU) Nikolay Skvortsov says, — "That is why a visiting senior scientist — in this case, Jörn Thiede, — plays a double role. He ought not just to guide the research, but also to transmit his knowledge and skills (both scientific and methodological) to young people, so that our students and postgraduates could understand what the modern global science looks like" (Blagodatova, 2011).

[2] Statistics is provided by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst, DAAD) together with the German research institution "Hochschul-Informations-System" (HIS) (Wissenschaft weltofen, 2011).

[3] The data are given by the National Science Foundation (the USA) (National Science Foundation, 2011).

[4] The UNESCO Science Report (2010) has noted that "despite the large amount of materials on migration it is almost impossible to make a systematic quantitative picture of long-term migration of highly-skilled specialists all over the world". The case of China isn't very different. The number of repatriates in China is assessed very differently: it varies from 100 people (which seems to be incorrect

More than half of the heads of Chinese research institutions had already worked abroad. Two models of modernization for academic science have appeared: the Shanghai Institute of Life Science is an example of the first one. It combines several academic institutions and research centers. One of these institutions is headed by Gang Pei, a young scientist, who has returned from the USA. Very favorable conditions are offered to the scientists, who decide to return to China. The "guest" laboratories established on the grounds of mutually beneficial international cooperation can be considered an example of another model. E. g. the "guest" laboratory of German Max Planck Society works as a part of Chinese Institute of Cell Biology. The Chinese Academy of Sciences pays salaries and overhead expenses of scientists, while the Max Planck Society provides laboratory with all the necessary scientific equipment (Melikyants, 2001).

On the basis of this model a "100 Talents Programme" has been worked out; it aimed at the invitation of the most productive expatriate scientists, who had been worked in the USA, Japan and Australia. Those scientists had to organize research laboratories, to recover lost or to create new scientific schools for the training of young specialists. From 1998 to 2004, 778 specialists under age 45 have gone through this programme (Sterligov, 2008). It is important to note that this programme assumed the possibility for a scientist to keep his or her position in a foreign scientific institution. Repatriates' salaries were twice as much as average salary of Australian scientists and almost equal to that of American scientists. In addition, significant extra fees were paid to stimulate the publication of articles in scientific journals or elaboration of lecture cources. Apropos of duration of contracts, foreign scientists (or expatriates) have been contracted for different periods of time from 2–3 weeks to 3–5 years: in this respect conditions of cooperation were very flexible.

Nowadays China funds research and educational work not only at home but also abroad. The country partially pays salaries for those foreign scientists, who participate in Chinese projects, i. e. teach Chinese students. In 2007 in China a resolution was adopted, according to which students studying abroad at the expense of the state have to work after the internship at home for at least two years, and only after that they can continue their studies as postgraduates. Otherwise they have to pay a considerable penalty. Such a restrictive measure seems to be rigorous but effective: the vast majority of students prefer to return home.

It is obvious that Chinese experience of work with expatriates should be considered. Russian scientific policy in this area can be described as not active enough, unlike the Chinese, more "aggressive" and methodically considered, but also extremely flexible.

Speaking on the exceptional importance of mobility in the organization of modern science, we should not reduce it only to return of Russian scientists, who once have gone abroad. It seems that Russian universities and academic institutions should just invite leading scientists — the Germans, the Americans, the Chinese, and so on, — and create the appropriate working conditions (as our football clubs, which "buy" the best football coaches and players and offer them terms of cooperation not vey different from those throughout the world, do). We also should pay attention to the CIS countries (Armenia, Azerbaijan, Ukraine, Belarus), since our shared historical interrelations are considered by experts in

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and understated) to 200,000 people (which is probably an overestimation). It is well known that 81 % of those who have studied and worked abroad have returned to the Chinese Academy of Sciences; it'll be 54 % for the Chinese Academy of Engineering. In 2009 the Chinese government has approved a programme aimed to attract to China in the course of 5 years about 1500 leading scientists who had achieved remarkable progress in various fields of science (Echo of Moscow, 2009).

the field of sociology of science as one of the determinants of mobility. Intellectual resources of our neighbors can fill up the gap which has emerged as a result of "Russian brain drain".

New forms of research and teaching which are actively introduced by educational management contribute to the intensification of mobility.

The emergence of high-status universities (http://univer.ntf.ru/p55aa1.html and http://mon.gov.ru/) is a result of implementation of business strategy aimed at integration and differentiation of educational institutions, which led to formation of Federal universities. The main directions of development of these institutions are claimed to be "the arrangement of conditions for academic mobility of students, teachers and researchers, the integration of the university into the world educational space and the achievement of international recognition for university curricula in order to export educational services and technologies". Thereby it is clear that the reorganization of institutes of higher education designed also for encouragement of mobility.

All in all it should be noted that academic mobility in Russia has become an integral part of the process of Russian scientific community's entry into international scientific and educational space. It contributes to the international recognition of Russian science, helps to overcome national isolation of Russian researchers as well as to gain an access to the European and world labor market. Participation of Russian scientists in the international division of labor makes it possible to solve such a difficult problem of post-Soviet science as generational change.

Russian science will never resemble Soviet science. In these conditions, the role of international mobility is exceptionally important: it is difficult to overestimate it. Academic mobility gives Russian science an opportunity to enter into the international scientific community, to become a part of this community and to become truly international.

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A Programmed Interview with Dr. Niu Jianlin from the Institute of Population and Labor Economics (the Chinese Academy of Social Sciences), which has been given on the 1st of December, 2011 in the Institute of Population and Labor Economics (CASS, Beijing).

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# Boris E. Raykov's activity as a natural science historian in the Institute of History of Natural Science and Technics (1940–1960-s)

This paper presents the overview of activities of the famous historian of science and educator Boris E. Raykov. The motives that led him to the history of science were examined. Attention is paid to his work both in the Institute and before.

***Keywords:*** Boris E. Raykov, Institute for the History of Science and Technology, evolutionary biology before Darwin.

Russian and Soviet universities had no faculties or departments of history of science. Therefore, the path of every scholar in the history of science has been a different story, many of them came to this area already being experienced scientist in the first field of study (biology, physics, mathematics). The community of historians of science in USSR have never been numerous so the fate of each of them deserves a special research.

Boris E. Raykov was a well-known Russian educator, natural science's methodologist and a historian of science. He lived a long life, which was devoted to two fields of activity — pedagogics and history of natural science. The first period of his life was mainly connected to teaching natural sciences in secondary school. He was one of the first educators to use so-called "research approach" in school practice (modeling the scientific process at children's level). Also, he taught natural sciences technique in Neuropsychiatric University and later at A. I. Herzen Pedagogical institute. But unfortunately, during social conversions of 1920-s, his point of view appeared to become contradictory to the dominating doctrine of Commissariat of Public Education for the new school. He was arrested and incarcerated in internment camp, where prisoners were forced to work on building area of the Belomor-Baltic canal. He was released in 1934, but decided to stay in the place of his imprisonment, called Medvezhya Gora. When the Great Patriotic War started, he was evacuated to Arkhangelsk. There he worked in Pedagogical Institute, where he managed to found a faculty of geography and natural sciences. He got a possibility to return to Leningrad only in 1945 and recommence his teaching practice in A. I. Herzen Pedagogic Institute. He also took active part in the Academy of Pedagogic sciences sessions. He made a difficult choice and decided to go to Leningrad, where he hoped to find his colleagues. He refused the Minister of education's offer to work in the Pedagogic sciences' Academy in Moscow (he was nominated to be its member in 1945). He headed the natural sciences department of the Leningrad branch of the Academy of Pedagogical Sciences. But besides teaching at that time historical work began to take an important place in his life. In 1945 he became a researcher in the just founded Institute for the History of Science.

It couldn't be said that Raykov didn't work in history of natural sciences before getting his position in the Institute. His interest in this field continued throughout his long career. The history of teaching natural sciences, when he had just started his activity in high school, soon led him to broader context of those processes. He wrote in his memoirs:

"When I was working with methods of teaching natural sciences, I've been interested in history of natural sciences itself — especially in teaching it. And my investigations took place even before the revolution" (Raykov, 2012).

He was studying the history of teaching natural sciences in schools of medieval Russia (Raykov, 1916), natural history education in XVIII century (Raykov, 1922) and the activity of Russian teachers of natural history in XIX century (Raykov, 1924). Many of these studies were reflected in Raykov's late works. His laborious work made him to realize the history of natural science more widely and broadly. He came to the problem of spreading the evolution theories in Russia[1] in the "pre-Darwin" period of time, through investigating the history of scientific works' refraction and evolution ideas. He started his examination of this problem in 1920-s and continued the work during surviving a quite hard period of his own life — after being released from the camp in Medvezhya Gora. There he was managing a sanitary-bacteriological laboratory (he forced to get new knowledge in microbiology,

[1] Today historians of science today by evolutionary theory actually understand Darwin's theory and all that grew at its base, but during B. Raykov's time — any concept of transformism (inconstancy and mutability of species).

parasitology and chemistry but it was the way to survive during his imprisonment and to get money after). This job was not sufficient for the mind of the scientist. Because of the lack of teaching, he came back to his history investigations with a great enthusiasm. Raykov got an opportunity of occasional visits to Leningrad for working in libraries and archives. He arrived twice a month, for 3 — 4 days and spent this time only for his researches — visiting archives, ordering books from the library and other work, connected to searching information about the problems of developing evolution theories in Russia. At that period Raykov got his most important contacts — the ones, that became a base for his future cooperation in the Institute of History of natural science and technology. Thanks to personal assistance of Vladimir L. Komarov — the president of Academy of Sciences, Raykov could receive books from the funds of Academy of Sciences' library. Though he wasn't a member of this academy he could even take these books with him to Medvezhya Gora and return them back after using unlimitedly. There was no exception for rare books, dated XVIII century, both Russian and foreign. Raykov wrote in his memoirs:

"I came to the library with a suitcase, filled it up with books, which I'd ordered before, and left for Medvezhya Gora the same evening. When I had some time, free from the laboratory, I was studying those books" (Raykov, 2012).

And he also had to work with some books in the Public Library (now Russian National Library), because some of them the Academy Library just didn't possess. So Raykov had to spend there about 12 hours a day. But the hardest task was to work with the state archives. Scholar asked Sergey I. Vavilov (the scientific head of Optical University and the deputy of Leningrad's council) for help. Vavilov wrote an official letter to the archive, on behalf of the council's deputy. Only that way Raykov was allowed to work with the archives. But still he had to give all his notes to the archives' employees for censoring before actually using them. Such were the working conditions for Boris Raykov during the first years of his historical investigation activity. We can't say that this kind of activity was typical, but the whole situation of professional reshaping during imprisonment and the later years, spent outside the scientific society, was quite ordinary. We should also note that Raykov's destiny became a happy exception from the row of broken lives of scientists, which were destroyed during Stalin's repressions. Raykov himself noted that he has been arrested before the mass repressions begun — this saved his life. When the repressions were at their peak, he had been luckily forgotten in Medvezhya Gora. So Raykov considered reasonable not to come back to capital before 1945.

His first serious work, named "Essays on the History of the heliocentric views in Russia", was published in 1937 (Raykov, 1937). We should note that the fact of appearance of this book itself can be considered a unique one. The book's author wasn't quite well-known in scientific society and has been claimed politically vicious. It was almost impossible to publish a book, also considering cruel repressions and being stuck in Medvezhya Gora. S.E. Vavilov helped Raykov a lot at that time, though they were not even familiar to each other. Vavilov has read Raykov's manuscript and made a conclusion: "The book is remarkable, but the conditions in which you wrote it, are even more remarkable. It has to be published. I'll take care about the redaction myself to make sure, that everything goes the right way." This book has been published by Academy of science's publishing house, edited by S. I. Vavilov personally. He hasn't been the president of the Academy yet, but already took a big part in publishing house's activity.

But the scientist himself admitted that this work was a kind of a test for him. He wanted to know, what he is capable of in the history of sciences. Raykov planned to write a big summary work, dedicated to Russian pre-Darwin transformists. First volume covered the period

since 1936 to 1941. The materials about that topic were kept in 10 huge folders. But the Great Patriotic War forced him to stop his visits to Leningrad. So he practically didn't have any opportunities to continue his scientific investigations. He could only take a part of his materials to Arkhangelsk. The rest of them were dug in the abandoned garden of his house in Medvezhya Gora. He could only find them when the war was over. Then he processed and systematized these unique files, commented on them and got a new book as a result. It was named "Essays on the history of evolutionary ideas in Russia before Darwin" (Raykov, 1947). In this book, there were scientific biographies of XVIII academics such as Peter Simon Pallas and Kaspar Friedrich Wolf, the forgotten medical philosopher Yakov Kaidanov from XIXc., evolution biologist Afanasiy Kaverznev from the end of XVII c. and completely unknown Mark Tausher, who was an entomologist and a scientific traveler. Raykov commented that this mixed group of scientists had one thing in common: all of them were the first transformists in Russia. They all admitted that live creatures change during evolution and denied that species remain static. This statement, which was at first considered to belong exceptionally to Lamarck and Darwin, has become a huge ideological movement towards the development of biological sciences. This way, in his first biological work, Raykov showed that there were transformists in Russia before Darwin and even before Lamarck, in contrary to the other point of view. This work was written with the old typewriter on yellow sheets of wrapping paper, accompanied by the sounds of bombing. But for Raykov it became a pass ticket to the world of serious historical science. It was declared as a dissertation to the Lenin's Pedagogic Institute for the doctor of pedagogic sciences' degree. On 25th of July, 1944, the Academic council has decided to appropriate a scientific degree "doctor of pedagogical sciences" to Boris E. Raykov. And he didn't even have to defend his dissertation.

In 1945 he was enlisted as a senior researcher in the Institute of natural science history. The Institute's functioning was initiated on 9th of February by the president of the Academy of Science, Vladimir L. Komarov. After his death, the Academy and Institute headed by Sergey I. Vavilov. Thanks to him, Raykov employed there. We should note that in 1938 the Institute, headed by N. Bukharin, was crushed. And the organization of its structure has remained a strong necessity for the scientists. So temporarily, the there was a History of Academy of science Commission (KIAN) from Leningrad with president Sergey I. Vavilov.

When Raykov was finally employed in the Institute, he was set to work in Leningrad permanently. It was very important for him, because the Institute itself was situated in Moscow. Raykov had a right to visit the Institute of natural sciences only for a couple of times a month. The rest of his time he has been working at home in Leningrad. His salary has been delivered to him by post. That continued for 8 years (1945–1953), until the branch of the Institute has been opened in Leningrad.

In 1948 Raykov left his professorship in Herzen Pedagogical Institute and the Leningrad branch of Pedagogical Sciences' Academy because of pressure from administrators after the tragically known VASHNIL session. He and his colleagues were accused in weismanism-morganism. The Presidium has sent a request to the sciences' Academy about Raykov's activity. The answer to this request has been written by N. A. Novikov and S. L. Sobolev and it was so positive, that the Raykov hasn't been fired. After that, B. E. Raykov completely concentrated on his historical scientific activity and has left pedagogics.

In 1940–1950-s the history of biology mainly had 2 directions: the history of evolution theory and the history of biology in Russia. In 1957 two volumes of the "History of Natural Sciences in Russia" were prepared for publishing. Raykov took active part in Institute's investigations.

He has been extremely productive. Raykov published 86 articles only during his work in the Leningrad branch of IIET. It included 14 his own monographs and 15 have been personally redacted by him. It was Raykov, who made a basis of the biological history direction in Leningrad. He worked himself, used his old contacts and created new ones, collecting talented teachers and people, ready to give all their power to the history of science.

The main result of his hard work, which was started back in 30s, has become a fundamental monograph, published in four volumes, named "Russian evolution biologists before Darwin. History of evolution theory in Russia" (Raykov, 1952, 1959). It has contained about 20 essays on Russian scientists' life and work. Most of these scientists were completely forgotten. Raykov was the first, who traced the evolution of Peter Simon Pallas' philosophy and processed the most of Kaspar Friedrich Volf's works, and then he made some important conclusions about this scientist's biological point of view. Raykov has introduced Kaverznev's name into the history of natural sciences — he was unknown before. A lot of modern historians admit that Raykov became a founder of Russian "Studies of Baer" — the area of history of biology, dedicated to K. M. Baer's activity. The first volumes of this work were edited by a very talented and attentive historical scientist, L. S. Sobol'. He spent many years publishing the history of Darwin's correspondence. A part of these essays were translated into German and published in German Democratic Republic. Also Raykov started to investigate the history of German evolutionists, showing the connection between Russian and German sciences, which defined in many ways the direction of science's development in both countries (Raykov, 1969). Active contacts with historians of science, such as H. fon Knorre, also were Raykov's achievements. Raykov has been accused in cosmopolitism many times because of the attention that he paid to connection between Russian and German biology, and his statements that these connections have made a basis for the development of science in future.

Raykov came to the history of sciences in a very hard period of time and started working on a complicated and ambiguous topic. During the domination of lysenkoism, in 1950, the Darwin theory itself was indissolubly connected to socialistic ideology. So this topic was quite slippery and was usually reduced to searching for some ideas in history that were equal to Lysenko's ideas, not to objective consideration of the whole development of evolution theories. Another excess of historical works at that time, was the aspiration of proving the leadership of Russian scientists in evolution outlook, comparing to western scientists. B. E. Raykov also couldn't escape the latest tendency, offering quite doubtful conclusions, made on the basis of unconcerned or incomplete translations of scientific works. Nevertheless, the volume of documents, introduced by Raykov to scientific circulation can hardly be even estimated. And these documents are still being used, with some correctives of course.

At first, Raykov was working in Leningrad alone. Only in 1951 Udif H. Kopelevich and Tatiana A. Lukina joined him. Ivan I. Kanaev and Ksenia V. Ryazanskaya (Manoilenko after marriage) came to that department. When the quantity of employees grew bigger, Raykov showed himself as a wonderful organizer. He was making investigation plans, offering different topics, which could've been called "projects" in the modern world. He insisted on a precisely planned investigation of the Sciences Academy's archive, which has contained many scientists' funds. Raykov noticed that in spite of active file processing, there were a lot of materials about A. F. Sevastianov, F. F. Brandt, A. F. Middendorf, A. Langsdorf, M. A. Maksimovich, F. I. Ruprecht which have been left unused. He tried to involve into his activity some professors from the University of Saint-Petersburg, such as his teachers: V. M. Shinkevich, V. T. Shevyakov and others. Finally, he offered to pay attention to the works of scientists,

which have been working in the Military-Medical Academy: E. Brandt and N. A. Kholodkovsky. Nowadays each of these topics is still being developed; they are still actual and keep attracting scientists' attention. This way Raykov really did make a basis of scientific school in history of biology in Leningrad.

B. E. Raykov took active part in publishing a series of collections, named "The History of biological sciences" in structure of "Institute of History of natural science and technics' works AN USSR". He has edited some of these collections, published in Leningrad. But in the early 1960s, this publishing was stopped. Only thanks to Raykov, it was restarted by Leningrad branch after 5 years break. He signed the advanced copy of first release on 25th of June in 1966, just a month before his death.

B. E. Raykov showed himself as a very gifted teacher, giving knowledge to a whole group of talented historians of science. The problem of preparation of future natural sciences' historians has always worried him a lot. At that time, there were no special faculties or departments in any higher education institution. That's why Raykov suggested to teach such specialists in his institute. He recommended giving young employees small topics for investigation, which were available and could've become first steps to professionalism and real creativity. Raykov was fastidious both to himself and his pupils. He demanded laborious work with the source every day, searching for new documents, unknown or unused before, attention to new problems and careful work on every topic. Many scientists were writing their works under his direction: K. V. Ryazanskaya (Manoilenko), T. A. Lukina, N. N. Banina. Some of the books that he has been editing, were published after his death: "Carl Bar's correspondence about geographic problems", compounded by T. A. Lukina (1970), "Reflections over the freaks' theory" by K. F. Volf, prepared by U. E. Kopelevich and T. A. Lukina (1973).

Professor Raykov's 70-th anniversary was celebrated in 1950. The scientist council's meeting, that took place on 16th of November, has been dedicated to him. Many famous scientists made a report on this meeting. And finishing my own report, I'd like to introduce you some citations about our hero's activity:

"Raykov is celebrated as one of the founders of Russian science's history. He is said to be a history of biology himself" (H. C. Hoshtoyants).

"There is no doubt, that the new maintenance that you systematically bring to the pages of sciences' history, completely changes our old concepts about the development of biological sciences in Russia" (I. A. Polyakov).

The breath of his interests and research was enourmous and his published work prodigious. There are more than 650 publications, from scientific and popular books and articles to book forewords and a lot of reviews. We can conclude that Raykov's achievements in science and organizations of this area of knowledge are doubtless, though many of his works are overestimated and criticized.

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# Pharmaceutical hunger and medicinal plants: Mobilization of the botanists during World War I

In my paper I will describe the involvement of Russian botanists in the collection and cultivation of medicinal plants as part of the war effort. In the autumn of 1914, when cut off from foreign suppliers, Russia was quickly faced with the situation of "pharmaceutical hunger". In 1915–1917, with advice or/and leadership of botanists, special meetings were organized, botanical trips were made, manuals and reference books were published, experimental stations and fields were created, lectures were read and so on. As a result of all these actions taken by the governmental and public organizations, high prices and steady demand were established. It made an enabling environment for the cultivation and collection of officinal plants. The structures created during WWI not only survived the war and revolutionary years but developed into large institutions. Many of those botanists who began to study medicinal plants during WWI successfully continued their work in the Soviet times.

***Keywords:*** medicinal plants, Russian botanists, Pharmaceutical industry, Word War I.

Botany would seem to be an absolutely peaceful occupation. However, the World Wars in the 20th century disrupted normal life for the entire Old World and spared no one. Russian botanists worked in support of the military industry during the First World War on two important projects: the extraction of tannins from tree bark (mainly in the production of jackboots) and medicinal plants. I will emphasize the role of medicinal plants because the most active team of scientists in this area conducted their research in the Baltic region. Whereas most studies on tannins were concentrated in Crimea and the Caucasus, medicinal plants were studied in the whole territory of European Russia and the most active groups worked in St. Petersburg and Dorpat (Yuriev, now Tartu) University.

In the autumn of 1914 Russia realized that the enormous amount of goods it received from abroad, including Germany, compromised their national security. As professor of the Dorpat University, Karl K. Saint-Hilaire, said in his inaugural lecture in the autumn of 1914, "I used to speculate: what will we do if there is a war with Germany? But this suggestion seemed to be so fantastic that I left it at once" (Сент-Илер, 1915: 11).

In contrast to Russian industry, which was dependent on Europe, during the previous 3–4 decades Russian Universities had graduated an army of naturalists, including botanists — both 'pure' as well as applied specialists — and a number of small but effective research centers were created. During WWI, when the state was in need, botanists were able to adapt their pure scientific research quickly in service of the homeland to address applied problems. Botanists were involved in the war effort in several ways, but in this article I focus on medicinal plants. Botanists were involved in the project of studying the natural resources of the Russian Empire (e. g. tannins), the improvement of food preservation, sanitary and hygiene problems etc. (Федотова, 2007).

Cut off from their foreign suppliers, Russia quickly found itself in the tragic position of "pharmaceutical hunger". Therefore, collecting and cultivating medicinal plants became one of the highest priorities for the Agricultural offices and for the Agency of the High Chief of Medicine and Evacuation (Управление верховного начальника Санитарной и эвакуационной части). The head of the Office was Duke Alexander of Oldenburg (Голиков, Сапронов, 2010).

In March, 1915 the Department of Agriculture called the "Interagency Meeting on improving the production of medicinal plants in Russia" (Труды Междуведомственного... 1915).[1] As a result of the meeting the lists of appropriated plant species for every region were published, as well as information about the market of pharmaceutical raw materials, and essays on the cultivation of medicinal plants.

Before the meeting the Department of Agriculture sent to the provincial Zemstvo boards, agricultural societies, and agricultural inspectors a list of questions "on the current situation in Russia on collecting, cultivating and processing medicinal plants". The answers revealed a sad picture: the cultivation of medicinal plants was almost absent, the collection of wild plants was not organized, and the prices were random and dependent entirely on resellers. As the report stated, even in localities that had some production before the war, at the present time there was nothing. It turned out that all of the goods were exported to Germany and then a significant portion were returned back to Russia at a higher price after processing (or even without it) (Фаворский, 1917: 183).

In the spring of 1915 several botanists started developing projects to solve this problem. In Petrograd Botanical Garden a Department of medicinal plants was created. Its head was Nikolay A. Monteverde,[2] with Vladimir N. Lyubimenko[3] and Nikolay N. Monteverde employed as his assistants. The Department included an information office, laboratory, and test plot. The Department's staff made botanical excursions for the study of medicinal plants, distributed seeds, published manuals and popular articles to develop the Russian pharmaceutical industry.[4] The Department consulted the Agency of the High Chief of Medicine

[1] See also: Russian State Historical Archive. Fond. 382. Opis 9. № 189.

[2] Nikolay Avgustinovitch Monteverde (1856–1929) — plant physiologist, specialist in medicinal plants. See: Fedotova, 2011; binran.ru/botmus/foto/history.html.

[3] Vladimir Nikolayevitch Lubimenko (1873–1937) — plant physiologist. See: Манойленко, 1996.

[4] Some manuals and information editions published by Agricultural Department: Монтеверде, 1915; Сбор, сушка... 1915.

and Evacuation, the Military-Industrial Committee, the Ministry of Trade and Industry, KEPS, agricultural societies, zemstvos, agricultural experimental stations, and agronomy schools. "In general, the Department received requests from almost all regions [...] of the Russian Empire. It indicates a rapid advance in the development of collecting and cultivation of medicinal plants" (Отдел лекарственных... 1916).

Manuals and popular articles on medicinal plants were also published by the Commission for the Study of Natural Productive Forces at the Russian Academy of Sciences (Комиссия по изучению естественных производительных сил — KEPS, see: *Кольцов*, 1999) and the Bureau of Applied Botany of the Agricultural Academic Committee (see for example: Регель, 1916). KEPS included a number of eminent botanists: the members of the Academy of Science Andrey S. Famintsyn, Ivan P. Borodin, and Vladimir I. Palladin, as well as professors Vladimir N. Sukachev, Nikolay A. Busch, Dmitriy N. Prjanischnikov, Georgiy F. Morozov, and Nikolay A. Monteverde.

In February of 1916 the Agency of the High Chief of Medicine and Evacuation, prince Peter of Oldenburg, called a "Special meeting on cultivating and collecting medicinal plants" (Труды Особого... 1917). The professors of the Military Medical Academy and the Universities, the specialists of the Department of Agriculture, botanical gardens and research stations, delegates of provincial Zemstvos as well as pharmaceutical companies all participated. Several botanists were present at the Meeting: Alexandr A. Fischer von Waldheim (the head of St. Petersburg Botanical Garden), Nikolay I. Kuznetsov (the head of Nikita Botanical Garden), Alfred Rollov (the head of Tiflis Botanical Garden), V. V. Markovich (the head of Sukhum Botanical Garden), Jan Muszinski (the main gardener of Sukhum Botanical Garden), Vasiliy V. Pashkevich (the main gardener of St. Petersburg Botanical Garden) professors Voldemar K. Varlih, Vladimir L. Komarov, Vladimir N. Lyubimenko, as well as Nikolay A. Monteverde, Robert E. Regel and some others. The Agency for the High Chief of Medicine and Evacuation created the special department — the Agency for collecting and cultivating medicinal plants (Pharmaceutical Agency). The vice-director of the Department of Agriculture A.I. Shakhnazarov, was appointed as the commissioner for Russia. K. I. Shashkovskiy, A. I. Shcherbakov, V. G. Rostmistrov, A. D. Voeikov, V. V. Pashkevich, Ye. M. Val'nev and D. V. Antonov were all appointed as the Regional commissioners. To organize the chemical and pharmaceutical industry in Russia a special unit was established. Professor Vasiliy K. Anrep was appointed as its head, the members of the Academy of Science, V. S. Kurnakov and Vladimir I. Ipatiev, professors V. K. Varlikh, V. E. Tishchenko, A. E. Favorskiy, L. A. Chugayev and L. F. Ilyin as members.

That same year botanists at the request of the Pharmaceutical Agency initiated expeditions: V. I. Lipsky and V. A. Dubyanskiy — to Russian Turkistan, N. N. Monteverde — to Middle and Lower Volga, V. N. Lyubimenko — to the Crimea, and so on.[5] These surveys made it possible, first, to immediately begin a planned procurement of raw materials, and secondly, to prepare the ground for further work on the collection and culture of medicinal plants.

Medicinal plants were not an entirely new subject of research for the Russian botanists. Vladimir N. Lyubimenko, working in the Crimea in the Nikita Botanical Garden in 1908–1912, experimented to determine the influence of external factors on the formation of essential oils from aromatic plants. Experiments on the cultivation of some medicinal

[5] See preliminary reports of this expeditions: Дубянский, 1917; Липский, 1917; Монтеверде, 1917; Любименко, 1918; Федченко, 1917.

plants were organized by the St. Petersburg Pharmaceutical Society, by V. K. Ferrein (the head of the pharmaceutical company) in the Crimea and on his estate in Butovo near Moscow. During Soviet times, at the Butovo estate, the first Soviet courses for the breeding of medicinal plants was organized in 1919, and later VILAR — the Institute of Medicinal and Aromatic Plants was created.

Before the war, scientific societies and botanical gardens tried to persuade the government to fully support this important pharmaceutical work. For example, in 1913 St. Petersburg Botanical Garden attempted to get funding to create a special experimental station of medicinal plants. But management decided that a special station would be excessive and that it was sufficient to incorporate this program into the functions of the Bureau of Applied Botany and Museum of the Botanical Garden (Отдел лекарственных... 1916). Only the critical situation of war had finally convinced the authorities of the need to fund this research.

During the war years work on medicinal plants commenced in many botanical institutions with financial support from the Ministry of Agriculture, the Pharmaceutical Agency, as well as some zemstvos. At the Nikita Botanical Garden this work was conducted under the leadership of Nicolay Kuznetsov, Eugenii Wulff and V. N. Lubimenko, who regularly visited Nikita from St Petersburg. It was conducted at Tiflis (by D. I. Sosnovskiy, A. A. Mayorov, A. H. Rollov) and Sukhum (by V. V. Markovich and Jan Muszinski) Botanical Gardens.

In Kiev, professor of zoology Nikolay F. Kashchenko, funded by the Department of Agriculture, developed an experimental garden of medicinal plants. Kashchenko, whereas before the war such research was merely a hobby, afterwards he became a dedicated and successful experimentalist and was later elected a member of the Ukrainian Academy of Sciences. In 1916, Kashchenko organized courses on the collection and cultivation of medicinal plants, with an enrollment of 35 students (Липшиц, 1952; Пашкевич, 1917).

An experimental nursery of medicinal plants for demonstration purposes was established at Moscow Zoo (Указатель к показательному... 1915). P. I. Gavsevich and N. N. Voroshilov organized an experimental station at Lubeny Agricultural Society (Poltava province), which operated successfully into the Soviet years (Гавсевич, 1916; Львов, 1926). Nurseries and experiments on the culturing of medicinal plants were organized at the Voronezh Agricultural Institute, in Penza and in Uman Agricultural Colleges, in Botanic Gardens of Kharkov, Moscow and Dorpat University, in Gagra, Tashkent, in Kovno agricultural societies, etc (Komarov, 1916).

An important issue was the improvement in the botanical education of pharmacists, gardeners, and agronomists. Botanists, pharmacists and physicians organized courses and popular lectures in many cities, such as in Moscow at the Imperial and at the People's Universities, at Petrograd Botanic Garden, at the Odessa experimental station, etc (Изучение лекарственных... 1916).

In addition to botanists in Petrograd and Moscow, there were also several groups in the provinces. Every region published reports on the year's work in 1916. In some cases the commissioners of the districts mostly complained about the difficulties that came from a lack of funding and personnel, for example Pashkevich — the head of the Pharmaceutical Agency in the North-West region (Пашкевич, 1917), while in other regions a great deal was accomplished, especially in Caucasus and Crimea — in Tiflis, Nikita and Sukhum Botanical Gardens. Additional work was also successfully carried out by the botanists from Dorpat University — the region with the least favorable climatic conditions and located close to the front line. The work of the Dorpat botanists was successful partly due to the fact that the head of

the Agency for collecting medicinal plants in the Northern District, A. I. Shcherbakov, was a trustee of the Riga educational circuit. Another reason, I believe, lies in the fact that in the late 19th — early 20th century there was a very active group of botanists led by Nikolai I. Kuznetsov. Kuznetsov left to Crimea in late 1914, but many of his young researchers remained active and they were able to organize the work of the Pharmaceutical Agency.

At Dorpat University courses for the recognition, collection and cultivation of medicinal plants were funded by the Ministry of Agriculture in the spring of 1916 for pharmacists and school teachers. They included Botanical and Pharmaceutical divisions. The courses were headed by assistant professor of botany Nikolay P. Popov (he was also the head of the botanical division, his assistants were N. I. Borshchov and A. M. Kolpinsky) and Adolf K. Kessler, a lecturer for the Physiological Institute was head of the Pharmacology Department. The Kiev courses were organized on a voluntary basis, but in Dorpat instructors were paid. Courses were conducted at the University Botanical Garden. The two-month course trained 75 people. The program included excursions in the vicinity of Dorpat, practical exercises were conducted on special plots, and it concluded with a botanical excursion to Dagestan.[6]

The success of the spring courses helped to obtain funds from the Pharmaceutical Agency to conduct more extensive one-year courses and to create a demonstration factory. New courses started in September 1916 and were equipped with a factory in the University riding hall. This building could be obtained only through direct intervention of Shcherbakov. During the early months of the war it was utilized as a military warehouse.[7] In Tartu Archive I've managed to find a correspondence between Shcherbakov and the rector of Dorpat University. Having achieved success in acquiring this building, Shcherbakov continued advocating for additional resources. The rector sometimes granted his requests, but in other cases, especially with the more outlandish requests, they were denied. In January 1917 Shcherbakov asked the rector to provide a stable with a loft and a plot of land adjacent to the building containing the riding hall to expand the factory and warehouse for him. To this the rector had to respond that the stable was to be used as a stable, hay would continue to be stored in the loft because the University required the stable for its normal activities.[8]

The factory provided practical training for course participants, conducted numerous tours with detailed explanations and demonstrations for schoolchildren, farmers, etc. The Pharmaceutical Agency provided students with the work of collecting medicinal plants. Graduates extended this work to the peasants. In addition, the Pharmaceutical Agency funded the creation of an experimental and demonstration plot for the cultivation of medicinal plants (Организация по сбору... 1917).

Similar short-term courses were set up in Yekaterinburg, Syzran horticultural school, at the Tiflis Botanical Garden, etc. In 1916 this helped to prepare the required number of employees for the Pharmaceutical Agency.

Pharmacists and physicians likewise participated in this work. In the spring of 1915 at the therapeutic clinic of Moscow University there was an exhibition of medicines. The laboratory of V. K. Ferrein's Pharmaceutical Company estimated the quality of Russian pharmaceutical raw materials. In 1915 Bekhterev Psychoneurological Research Institute in Petrograd initiated the three-year pharmaceutical curriculum (Акименко, Шерешевский,

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[6] Вестник русской флоры. 1916. Т. 2. Вып. 4. С. 291–292.

[7] Estonian Historical Archives. Fond. 402. Opis. 5. № 1988. List. 7, 8, 24–25.

[8] Ibid. List 28, 30–31.

1999). Botanists of Petrograd Botanical Garden took an active part in its organization and Vladimir L. Komarov had a leading role. The department later became the independent Chemical and Pharmaceutical Institute.

Of course, none of the professionals believed that the problems could be solved in the immediate future, but it was during the war years that this development of a Russian pharmaceutical industry shifted forward. Many of the initiatives of those years not only survived the First World War and revolutionary upheaval, but grew into large institutions. Thus, a small nursery of medicinal plants, founded in Saratov Experimental Agricultural Station in the spring of 1917, survived the Civil War and successfully developed in the 1920s. In 1931 it became one of the main zonal stations of the newly created VILAR (Institute of Medicinal and Aromatic Plants). The Department of Medicinal Plants in Petrograd Botanical Garden continued successfully for many years. N. A. Monteverde remained its head until his death. In 1919 the Department was transformed into a laboratory for the study of plant foods and medicinal plants. Many botanists continued these successful endeavors — V. V. Pashkevich, A. D. Wojeikow, F. A. Satsyperov, N. F. Kashchenko (he was the director of experimental garden of the Ukrainian Academy of Science until his death in 1935) and others. It was during the Second World War that many "pure" or academic botanists put their knowledge into application for the development of medicinal plants.

As a result of actions taken by the Agricultural Agencies and Pharmaceutical Agency in 1916, high prices and strong demand created fertile ground for the cultivation and collection of medicinal plants. However, in 1917, due to the complete destabilization of society this sector was nearly decimated. In place of the once fertile fields of medicinal plants now potatoes and rye were planted. The Soviet government began to take steps towards the development of a pharmaceutical industry in 1919 and since 1922 has resumed exports of medicinal plants.

The activity of the Pharmaceutical Agency, as instituted in Russia, faced many bureaucratic obstacles. For example, A. D. Wojeikow (Commissioner of the South-Eastern District) attempted to place Nikolay I. Kuznetsov (not to be confused with the Dorpat professor, but "Kuznetsov of Vladimir", known for his work on the flora of Siberia, Central and Northern Russia) as his senior assistant. In the spring of 1916 Kuznetsov was serving as an enlisted serviceman in the division of grain procurement for the Army. His transfer into the Pharmaceutical Agency was denied. Of course, this was a more fortunate outcome than Wojeikow's other assistant, A. A. Gorbovsky, who was sent into active duty and killed on the front.

## Conclusion

Botany would seem to be the science furthest away from militarism, but the pharmaceutical requirements that arose during two World Wars demonstrate that even this "peaceful" occupation can be forced into the service of armed conflict. Botanical knowledge was essential to a state and an economy totally transformed by war. No one was immune. Richard Howard (2000) in his article "The role of botanists during World War II in the Pacific theatre" showed that during the Second World War, this trend had reached its highest point.

In recent years historians have contended that it was during the First World War that the modern form of interaction between science and government began to take shape

(Колчинский, Кольцов, 2003). This strengthened relations with the central government and later turned into a complete bureaucratization of science, promoting the separation of national scientific communities. Botany is a good illustration for this hypothesis (Федотова, 2007). The hunger for pharmaceuticals during the First World War was as great a threat as any military assault. This national crisis drafted botanists and agricultural specialists into the war effort and the defense of the state.

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# Expedition of the Russian Academy of Sciences and the Study of China in the first half of the XIX Century, the documentary-organizational aspects

This article shows, by means of several examples, how the Academy of science implemented its expeditionary programs actively collaborate with various agencies, companies and academic institutions both within the country and abroad. The joint expeditions were one of the forms of the mutual cooperation. Thanks this cooperation the Academy of Sciences could to conduct research in remote or enclosed areas to researchers (the Caucasus, Central Asia, and China).

***Keywords*:** Russian Academy of Sciences, China, expeditions, first half of the XIX century, documentary aspects.

The first contacts of Russia and China were in the XVI century. Russia has received the reliable data about China, when Russia began to explore the lands of the Far East and Siberia. In the XVII century a question about the exact definition of the Russian-Chinese border

has risen, and from the Russian side there were the attempts to establish the diplomatic relations with China. The first credentials between Russia and China have dated 1619, 1649 and 1654. These documents have regulated the trading and territorial questions between Russia and China. However, they did not solve all the problems when the first contacts mainly were the cross-border armed conflicts. During one of the Russian-Chinese conflicts on the Amur River, in 1685, the Albazin's fortress was captured by the Chinese. 45 Cossacks were captured and transported to Beijing. Chinese emperor has transferred to this Cossacks Buddhist templo for departure of religious practices. The presence of the inviting priests also were allowed by the Chinese emperor, that was the beginning of many years' residence of the Russian Orthodox Mission in China. Russian Spiritual mission has organized in Beijing in 1715 by Peter's I decree. In addition to their religious mission, the Russian spiritual legation in China performed the role of a diplomatic mission in the country, closed to foreigners (Тихвинский, Пескова, 1977).

In the first half of the XIX century the policy of self-isolation was consistently pursued by China. The only reliable source of knowledge about this country was the task of the Russian Orthodox Mission in Beijing. Along with missionary work, the priests of the mission carried out the linguistic, ethnographic, botanical and other studies in China, translated the historical books and documents, and collected a variety data (I. K. Rassokhin, O. Kovalevsky, P. I. Kafarov). In addition, the priests, working in China, transmitted to the Academy not only collections and books, but also their own compositions (N. Bichurin).

Russian Ambassador in China failed to get permission from the Chinese government in Beijing for organization the secular Russian consulate. Even in the form of the Mission, the availability of this diplomatic representation, allow for Russian Empire to be only one of all the European countries having this representative office in Beijing.

The beginning of mission' existence was put by Peter I, on June 18, 1700 having issued the decree about "finding" for occupation of mitropolichy chair in Tobolsk. Except the priests, for studying Chinese, Manchurian, Mongolian and other east languages, local customs and the Chinese culture the two students were entered into the structure of mission. From 1715 to 1917 the structure of mission was replaced 18 times. 10–12 people, as a rule, were arranged in the mission, including students (4–6), which joined the mission from 1727 to 1864 (Православие на Дальнем Востоке, 1993). The structure of Orthodox mission changed every 10 years, but at desire, this term could be prolonged. For instance, mission of 1792 in connection with a delay accidents at the Russian-Chinese border has worked up to 1805.

Siberian metropolitan, resided in Tobolsk, carried out the ecclesiastical jurisdiction about the Orthodox mission. Financial support of the mission was carried out not only on the part of the Russian Empire, but the Tribunal External Affairs (China). The monthly salary to the members of mission was appointed by Tribunal. The Chinese government had, therefore, put the members of the Orthodox mission in the service along with the Chinese. Unlike the Catholic and Protestant clergy, the Russian Orthodox mission was not engaged in the spread of Orthodoxy among the Chinese, and not interferes in the internal affairs of the empire, so Chinese government was more loyal to it.

In Kyakhtinsky (1727) and Tyantszinsky contracts (1858) the legal basis of existence of Orthodox mission in China (its site, the status, structure, and the contents) was fixed. The main terms of stay in Beijing, material security, its ways of communication with Russia, subjects of occupations of her members were defined by the Instructions made by the Ministry of Foreign Affairs and the Synod of the Russian Empire.

The colonial policy of the Europeans countries has been activated in the XIX century. At the beginning of XIX century the state of the China was weakened by the destructive internal processes (Manchurian uprising led by the secret society "Baylyan jiao" (White Lotus Society) (Поршнева, 1963).

Political weakness of China allowed the British and French increase the pressure on the government and gradually undermined the Chinese sovereignty. Thus, a policy of isolationism, help the Manchurian Qing dynasty maintain the integrity of the country.

In interstate relations with Russia, China has been conducted the position of "highest to lowest", placing it on a par with vassal states (Мясников, 2004). For the relations with Russia in China were responsible management agency vassals, which were in charge of the affairs of both management Mongolia, Huhunorom and Muslim principalities in West China. China's relations with Russia gives priority to political interests, Russia is committed to have sustainable economic relations with the China Empire. In fact, equality in the relationship has been recognized with the China side (and then relatively) only in the middle of XIX century, after the defeat of the Empire against the Western countries — Britain, France and the United States (Внешняя политика России ..., 1979). By the colonial wars these countries have began to involve China in the global political and economic ties. Russian government had considered both states (Russia and China) as natural allies in resisting the onslaught of Western countries.

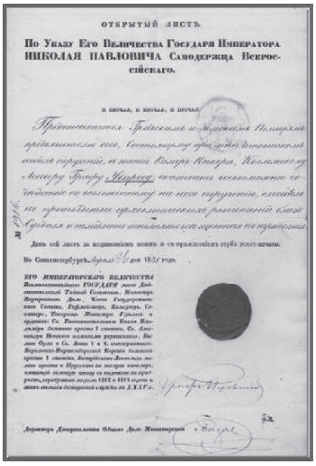
The closed nature of the country, lack of interest in the development of China's relations with Russia (the desire to delay the talks the Chinese side of the border and the status of p. Cupid), and intrigue, Catholic missionaries in Beijing and British residents in Guangzhou have been explained the difficulties faced by the expedition of the Academy of Sciences in China. Many of them have not been able to fulfill their tasks.

## Documentary aspects of the organization of the expeditions

Months or years of hard organizational and administrative preparations, were preceded by expeditions of the Academy of Sciences in the first half of the XIX century, which largely depended on the success of the enterprise.

This work included the preparation of the necessary things and writing instruction for scientists leaving for the expedition, as well as obtaining permits and accompanying papers and podorojniy (books, which have been written arrival station and money spent on travel).

Before departure in expedition, the scientist should provide the plan of the forthcoming expedition for Conference consideration. In the documents were reflected: 1) scientific justification of expedition, 2) structure of alleged participants and 3) estimate of expenses. after approval, the plan of expedition was transmitted to the president of Academy of Sciences, and then to the minister of national education. Sometimes the president (the president of Academy, count S. S. Uvarov — from 1818 to 1855) combined a position of the president of Academy of Sciences and the minister of national education. The minister of national education sent all complex of documents to the Cabinet of Ministers. The final decision about the organization of expedition was accepted by the emperor (SPb B ARAN. F. 2. L. 1. F. 1). After the royal statement paper came back to the Cabinet, and then was transferred to the minister of national education. And further, through the President and Conference of Academy of Sciences, paper with necessary approval reached to the organizer of expedition. After the final positive decision on expedition, addressed to the president of Academy


ОТКРЫТЫЙ ЛИСТЪ.

По Указу Его Величества Государя Императора НИКОЛАЯ ПАВЛОВИЧА Самодержца Всероссійскаго.

Я ПОЛЬЗА, Я ПОЛЬЗА, Я ПОЛЬЗА.

Дань сей листъ за подписаніемъ моимъ и съ приложеніемъ герба моего печати.

Въ Санктпетербургѣ, Апрѣля 18 дня 1835 года.

ЕГО ИМПЕРАТОРСКАГО ВЕЛИЧЕСТВА

of Sciences the highest command from the emperor who concretize terms of expedition, structure of her participants and ways of financing registered have been came. The same command went to ministers: finance (when financing was from the State Treasury), the Military and Sea ministries (at joint expeditions).

All this procedure usually took up about half a year, therefore if the academician wished to go to expedition in summer months, in order to submit the application on travel permission the documents should be submitted in the autumn of previous year. Besides, for purpose of financing of expedition from the State Treasury, it was necessary to include it the next fiscal year.

Due to the strict regulation of documentation in the Russian Empire in the XIX century, the correspondence between the ministries and the Academy of Sciences was extremely diverse and rich. Any question of the expedition, demanded written confirmation and clarification. Thus the nature of the interaction between the organizations in the Russian Empire can better define the studying of the joint expeditions of the Academy of Sciences with the Navy Department, War Ministry and the Russian Orthodox Church and other institutions.

In addition to the preparatory documents (various notes, relationships and command (the ministers and the emperor) before the departure of the expedition had to be prepared and the accompanying documents, such as the "open letter", passport, roadside (the book, which was recorded the way the cost of the expedition and horses) and Cord of the book (the book, which recorded expenses of the expedition).

In the first half of the XIX century, there was the concept of "open list". The open list signed by the emperor, has provided to the presenter the assistance of the local authorities. In these sheets was prescribed — who, for what purpose, and where have to direct. Open letter to be issued by the Ministry of Finance, the Ministry of Internal Affairs, Ministry of Education, the Holy Synod, the Russian-American Company.

## Expedition of the Academy of science to China in the first half of the XIX century

In 1805, Emperor Alexander I decided to send a large embassy to China to notify the Chinese emperor on his accession to the throne. However, the main objective was to assess the capabilities of the Embassy of diplomatic and permanent trade relations between Russia and China (Козырева, 1999). The aspiration to development of economic and political connections between the countries also was connected with growth of the economic development of Siberia, expansion of international trade. Using different diplomatic manners, the Russian government tried to solve a number of issues of Russian-Chinese relations and above all, the question of trade across the border line, or at least on the border with Xinjiang, China's entry into its ports of Russian ships on the navigation on the Amur River, and on the border territories (Amur, Primorye). In September 1805 the embassy head by Count Y. A. Golovkin came to Irkutsk. With him in Beijing followed next, 9th Spiritual Mission.

Simultaneously with re-equipment Embassy in China, the Academy received an offer to join scientists to the spiritual mission. On March 20, 1805 President of the Academy of Sciences, N. N. Novosiltsev read in the meeting of the Academy a few letters from the Minister of Foreign Affairs of the A. A. Czartoryski. One of them, according to the highest command, ordered academician F. I. Schubert (astronomer) and M. I. Adams (associate in zoology) to go to the Russian Embassy in China. Another letter from the Academy was instructed to provide travelers detailed instructions. By the end of 1805 it became known that this embassy, along with F. I. Schubert and M. I. Adams, I. I. Redovsky (associate in botany), L. Pansner (mineralogist, PhD) and J. Klaproth (associate in oriental languages and literature). According to the instructions, M. I. Adams received an order to collect samples of animals and produce stuffed. J. Klaproth had to acquire a variety of works that could enrich the collections of the Library of the Academy of Sciences. For I. I. Redovsky an instructions were given by T. A. Smelovsky (botanist, physician, pharmacist). I. I. Redovsky had to buy some tea bushes and learn everything related to the plant, in particular, and what type of soil is suitable for growing tea. Instructions mineralogical part was composed academician V. M. Severgin (mineralogy). In addition to V. M. Severgin and T. A. Smelovsky instructions were given by A. K. Storch (economist and statistician) and A. F. Sevastyanov (naturalist). Expedition financed of the State Treasury and included a list of expenses on acquisition of botanical, zoological collections and historical collections (Ширина, 1987).

After arrival in Urga, the embassy was compelled to refuse further following on the territory of China. The reason for the incapacity of the future mission of the embassy was a condition of the Chinese court, namely, the ambassadors were to perform the ceremony nine-fold prostration before the attributes that symbolize the identity of the Chinese emperor (About embassy of count Yu. A. Golovkin, 1807). This procedure protocol was perpetrated by vassal states. Russian Ambassador Y. Golovkin could not accomplish this because of fear of dropping the authority powers. As a result, the embassy returned to St. Petersburg from Urga. The real reason for the failure of the Embassy was isolationistical policy of the Chinese Empire, which was not interested in developing relations with foreign powers and, in particular, sought to postpone talks with Russia on the issue of the Amur. A role in determining the position of the Chinese court played Chinese merchants in Kyakhta, who feared that the organization of systematic and regular trade across the line of the Russian-Chinese border, their interests may be affected, and the intrigues of the Catholic missionaries in Beijing and British residents in Guangzhou also played role in this (Внешняя политика России ..., 1979).

From behind of the impossibility of travel in China with the Embassy, scientists were forced to rely on their own resources and replace journey through the Chinese empire survey south-eastern regions of Russia. M. I. Adams made the trip on the Lena River to the shores of the Arctic Ocean, during which he discovered one of the first skeleton of a mammoth. I. I. Redovsky planned to explore the Sayan Mountains and Abakan, the Kuril Islands and Sakhalin (the expedition was not completed due to the death of the scientist). J. Klaproth gathered a wealth of material on the life and language of the Tungus, Bashkirs and Yakutas.

The Head of the 9-th Mission priest Iakinf (N. Bichurin), spent 10 years in China, and with the help of local scientists and Beijing residents translated into Russian different Chinese sources, “Syshu” (Four Books) — a set of teachings of Confucius and Confucian, geographical work in three volumes, a summary history of China in the 17 volumes, Chinese history, “Description of Tibet,” “description Dzungaria,” “Description of Beijing,” essays on religion, philosophy, law, medicine, economics, agriculture, trade and others. Iakinf was

also a multi-volume Chinese-Russian dictionary, translated into Russian by the Manchu-Chinese dictionary in 4 volumes.

Another 10-th change of the Russian Orthodox Mission was sent to China in 1819, 4 students were joined to mission for studying Chinese and Manchurian. The students were: N. I. Vosnesensky (20 years), V. K. Abramovich (24), K. G. Crimsky (25) and Z. F. Leontief (22). They were given detailed instructions by the Academy of Sciences. Students are instructed, according to their knowledge, to pay attention to the Chinese medicine, literature, philosophy and history. One of the students had to study ways of farming. In addition, the student — a philologist was found in Chinese chronicles mention of "Fo Mozhno" (this name in China was called Christ) and, if possible, to find descriptions of the western countries (SPb B ARAN. F. 2. L. 1. F. 1).

Students, who went along with the mission, instructed to contact the Imperial Peking Mathematical Tribunal and report Chinese scientists on all of the latest improvements in the field of topography and geography, made at that time in Europe. Dissemination of knowledge among the Chinese astronomer should promote books, which were translated into Chinese by students. The necessary tools for researching Chinese, scientists recruited through St Petersburg, Russian topograthysts supposed, what Chinese scientists, after training in modern methods of engraving and topography maps, would have made the necessary adjustments, sending several improved copies of maps to Russia. Thus, instead of using its own scientists, and without organizing a separate expedition, Topographic Depot of the General Staff and the Academy of Sciences could get the most detailed and reliable information about the state (SPb B ARAN. F. 2. L. 1. F. 1).

Due to the fact that the students' skills in drawing and engraving of cards was not enough, the Academy of Sciences supposed to send the skilled artists from the Imperial Military Topographical Depot together with the spiritual mission in China. Send them along with the 10-th mission in 1819 was not possible due to the failure of the Chinese side to pass surveyors territory the Chinese Empire. For the students it was impossible to follow the detailed instructions made by the Academy of Sciences and the Military Topographical Depot. The translation the Old and New Testaments from the Russian language to Chinese was the only one result of this expedition.

Next change of the Mission sent to China was in 1829. The Academy of Sciences offered to the minister of education K. A. Lieven to attaches to the new mission two scientists, who would gather collections and data treatment. The Emperor approved the project of the expedition.

E. N. Fus (astronomer) was sent to China in the rank of astronomer, and A. A. Bunge was sent to China like the naturalist.

In Urga the linguist and orientalist O. M. Kovalevsky joined to the mission. In Beijing O. M. Kovalevsky studied the languages and acquired books and manuscripts for the library in Irkutsk.

Implementation of the plan of the expedition was fraught with financial difficulties, because the Academy did not have its own funds and was forced to ask to allocate funds from the State Treasury in the amount of 13,000 rubles. The money was given in the form of silver bullion. Bullion transported together with a salary for the other members of the mission to China. The mark as "the silver for the mission" has been made on the bullions (RGIA. F. 733. L. 12. F. 401).

The sums about 6000 rubles were allocated by the Academy of science out of economic sums in order to purchase the necessary equipment and tools.

Instructions for scientists were written by E. I. Parrot (physicist), A. Kupfer (chemist, mineralogist), F. Schmidt (Orientalist) and A. K. Mertens (Botany, Zoology). According to them, scientists had to conduct the following research: "astronomical observations to determine longitude and latitude of settlements along the route, barometric elevation measurement, magnetic and meteorological observations, zoological and botanical researches." In addition to barometric and topographical studies, scientists were required to acquire for the Asiatic Museum of the Academy of Sciences dictionaries and philological manuscripts in Tibetan and Mongolian languages, as well as other works of historical nature. Scientists have got 3,000 rub to buy those too. Scientists used the priests' help, who worked in the Russian Orthodox mission, in the acquisition of books and manuscripts (SPb B ARAN. F. 2. L. 1. F. 1).

In addition, priests have helped scientists with the direct purchase of books, served as an interpreter to communicate with the Chinese.

A. A. Bunge has described collecting material in his book "Enumeratio plantarum quas in China boreali collegit" (St Petersburg, 1831) and "Plantarum Mongolico-Chinensium decas I" (Kazan, 1835). A. A. Bunge also compiled a large botanical collection containing 365 herbarium sheets.

E. N. Fus gathered a large collection of zoology, ethnology and linguistics samples.

On the way back from China, E. N. Fus, separate from the main expedition, was ordered to determine the astronomical position of the settlements in southern Siberia and west of the Yenisei River.

Expedition E. Fus lasted 8 months. The result of this expedition was a series of geographical studies, subsequently published. Fus has identified more than 50 sites lying from

east of the Yenisey to Nerchinsk. The magnetic deviation and inclination were observed by E. Fus in the 30 points.

This expedition to China was the first scientific expedition to the country. In addition to the rich natural science collections, the scientists brought to St. Petersburg collections that reflect the life and culture of China (all the collections were either received as a gift from the local residents and members of the Mission, or were purchased with money specifically allocated for this purpose the Academy of Sciences). Collection in the future placed in the museums of the Academy of Sciences (ethnographic, botanical) allowed Russia and Europe to learn more about nature, culture and traditions of China.

* * *

From the XVII century, China entered the sphere of interest of the Russian Empire. Extended common border with one hand was to facilitate trade between the states, and on the other hand, the political unsettlement of the boundary line gave rise to constant conflicts. Establishment of normal diplomatic relations hindered isolationist policies of the Chinese empire, and the intervention of Britain, France and the United States who would like to take in the East Asian strategic positions, including the bases for territorial expansion. Russian Empire pushed in this region the process of colonization and settlement of the Transbaikal and Eastern Siberia, the growth is agriculture, cities and trade. Unlike other countries, Russia has managed to obtain from the Chinese government permission to establish a Orthodox Mission in Beijing. This mission fulfilled mission functions for the Russian Cossacks, who living in China and diplomatic function. In addition to the priests of the Orthodox mission included scientists from the Academy of Sciences, who, under the auspices of the mission have been studying the country closed to foreigners. Due to the interaction of scientists of the Academy of Sciences and Beijing Orthodox Mission, Russian science has been enriched by the knowledge of the closed Chinese empire, and academies museum enriched by the collections of unique items. Thus, being in China since the XVIII century Orthodox mission played an unique role as the exclusive — Russian — embassies in China and have a major positive impact, both on the development of Russian-Chinese political relations and the cross-cultural ties between Russia and China.

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РГИА. Ф. 733. Оп. 12. Д. 388. (RGIA. F. 733. L. 12. F. 401.)

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# Bibliometric analysis of Russian and Chinese publications on modernization in DBs Web of Science

Bibliometric analysis of publications on modernization in leading countries of the world was carried on. The results, based on Web of science data (1945–2011), are given in tables and figures. Special attention is paid to the dynamics of modernization publications in Russia and China.

***Keywords:*** Russia, China, publications on modernization, Web of Science, bibliometrics, research activity, period 1945–2011.

## Introduction

'*Modernization*' is one of the most frequent words in public discussions in Russia, China and other countries. Research group for China modernization strategies China Center for Modernization Research Chinese Academy of Science presented a report outlook for the period 2001–2010, which included annual reports on modernization in the world and China. The translation of this book in Russian was published in 2011 (1).

The aim of the present paper is to compare those two countries in DBs Web of Knowledge as far as modernization goes. The methods of bibliometrics will be used for this purpose.

## Methods and material

Since the beginning of the 1960-ies, a new direction in the study of science has been gaining ground — the quantitative analysis of information flows (bibliometrics). (Some precedents of bibliometric studies go back to1917). Various bibliometric methods fall into two major approaches. The first is based on the analysis of the dynamics of individual features: "plain bibliometrics". The second is associated with the study of the correlation between objects, their clustering and classification: "structural bibliometrics". The development of both approaches in bibliometricstudies was greatly facilitated with the advent of the ISI/Thomson Reuters systems, which are a universal (world-wide and polythematic) information base. In this study, the methods of plain bibliometrics were used for the assessment of Russian and Chinese (and some leading countries) publications on modernization presented in world and national corpora in DBs Web of Science (2). Material for this study was drawn from DBs ISI Web of Knowledge: Web of Science Citation Databases:

Science Citation Index Expanded (**SCI-EX**) — 1945-present;

Social Sciences Citation Index (**SSCI**) — 1956-present;

Arts & Humanities Citation Index (**A&HCI**) — 1975-present;

Conference Proceedings Citation Index — Science (**CPCI-S**) —1990-present;

Conference Proceedings Citation Index — Social Science & Humanities (**CPCI-SSH**) 1990-present;

Book Citation Index– Science (**BKCI-S)** — 2005-present;

Book Citation Index– Social Sciences & Humanities (**BKCI-SSH)** — 2005-present.

## World Research Activity countries in field of modernization

Results of search in all databases of Web of Science for all countries discovered 14529 publications by keyword (*modernization or modernisation*) for all years (1945–2012.05.23):

| | | |
|---|---|---|
| SCI-EX — 3584 | CPCI-S — 1854 | BKCI-S — 73 |
| SSCI — 7811 | CPCI-SSH — 922 | BKCI-SSH — 296 |
| A&HCI — 2626 | | |

For the period 1945–2011 there were 14,346 publications, for the most part of them applied to 1960–2011 period: 1945–1955 — 8, 1945–1959 — 51, 1960-2011 — 14,314 publications.

Distribution of 14,346 publications by Web of Science Categories with more than 100 publications it is shown below: Sociology (1,412), History (1,394), Political Science (1,322), Area Studies (913), Economics (834), Planning Development (596), International Relations (537), Anthropology (473), Environmental Studies (440), Social Sciences Interdisciplinary (423), History Philosophy of Science (137), History of Social Sciences (194), Law (155), Philosophy (122), Architecture (76) Language Linguistics (73), Literature (115).

Engineering Electrical Electronic (434), Metallurgy Metallurgical Engineering (401), Materials Science Multidisciplinary (132), Computer Science Software Engineering (75),

Computer Science Interdisciplinary Applications (145), Operations Research Management Science (127).

The number of publications on modernization in ten leading counties is shown in table 1 and fig 1 for 2007–2011 period. This table demonstrates the contribution in publications on modernization of China (471) and Russia (134) among 10 countries (USA, Canada, Japan and EC leading countries) in 2007–2011. The place of China is third (471) and Russia is 6 (134). The majority of Russian publications (51.5) are included in DB SCI ex, while Chinese publications spread evenly between DB SCI and BD SSCI.

Table 1

Number of publications on modernization in 2007–2011 (Total publications = 4445)

| Rank | Country | **All DBs** | **SCI ex** | | **SSCI** | | **A&HCI** | |
|---|---|---|---|---|---|---|---|---|
| | | Publ | Publ | % | Publ | % | Publ | % |
| 1 | USA | 812 | 222 | 27.3 | 469 | 57.7 | 163 | 20.1 |
| 2 | England | 472 | 91 | 19.3 | 335 | 71.0 | 71 | 15.0 |
| 3 | Peoples-R-China | 471 | 73 | 15.5 | 73 | 15.5 | 29 | 6.2 |
| 4 | Germany | 272 | 88 | 32.3 | 127 | 46.7 | 43 | 15.8 |
| 5 | Spain | 135 | 40 | 29.6 | 64 | 47.4 | 37 | 27.4 |
| 6 | Russia | 134 | 69 | 51.5 | 37 | 27.6 | 13 | 9.7 |
| 7 | Canada | 119 | 28 | 23.5 | 65 | 54.6 | 27 | 22.7 |
| 8 | Italy | 94 | 23 | 24.5 | 43 | 45.7 | 21 | 22.3 |
| 9 | France | 88 | 29 | 33.0 | 45 | 51.1 | 18 | 20.4 |
| 10 | Japan | 58 | 15 | 25.7 | 26 | 44.8 | 10 | 17.2 |

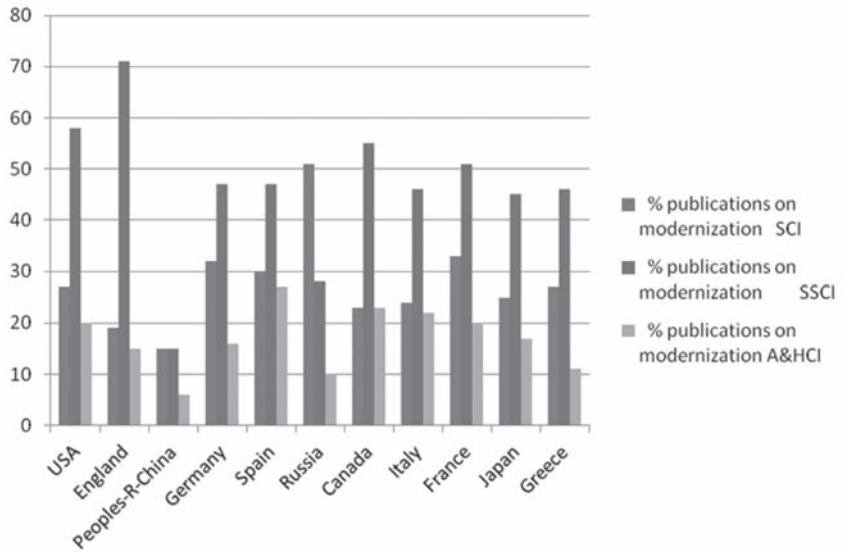


Fig. 1. Per cent of publication on modernization in DBs SCI, SSCI, A&HCI

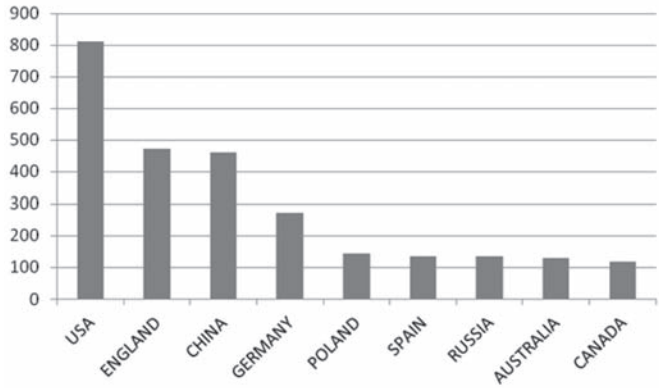


Fig. 2. Distribution of the publications on modernization by countries

It is clear that publications on modernization are present in DB SSCI; the only exceptions are China and Russia. Their number for China is equal in two first DBs, while Russian publications in DB SCI (51 %) greatly exceed those in DB SSCI (28 %).

Distribution of the 4445 publications on modernization by Web of Science Categories with more than 200 publications shows 4 social science categories and one science category: History (379 publications), Political Science (309), Sociology (305) Economics (269), Engineering Electrical Electronic (218).

Those 4445 publications were done in Document type: Article (3,041), Proceedings Paper (963), Book Chapter (222), Book Review (220), Review (152).

The publications on modernization are very frequent in other countries as well:

USA (812), England (472), **Peoples-R-China (462)**, Germany (272), Poland (143), Spain (135), **Russia (134)**, Australia (130), Canada (119), Netherlands (110), Romania (109), Byelarus (5) (see fig. 2).

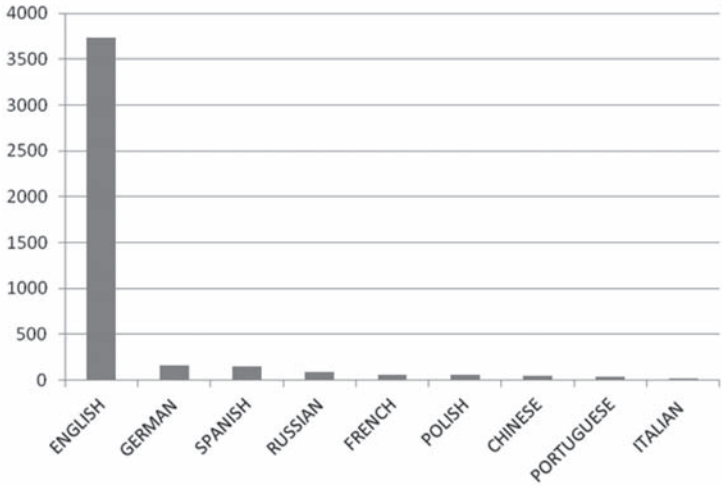


Fig. 3. Distribution of the publications on modernization by languages

As might be expected the great majority of publications on modernization are written in English (3730). Other important languages are German (157), Spanish (151), **Russian (85)**, French (59), Polish (59), **Chinese (47)**, Portuguese (37), Italian (18) (see fig. 3).

The number of total publications in ten leading counties in Citation databases is shown in table 2 for 2007–2011 period. Per cent of total publications in DBs SCI, SSCI, A&HCI is shown in fig. 4.

Table 2

Total number of publication in Citation databases in 2007–2011

| Rank | Country | All DBs | SCI ex | % | SSCI | % | A&HCI | % |
|---|---|---|---|---|---|---|---|---|
| 1 | USA | 2,697,260 | 2,042,727 | 75.7 | 445,647 | 16.5 | 143,821 | 5.3 |
| 2 | Peoples-R-China | 951,168 | 657,839 | 69.2 | 22,988 | 2.4 | 3,083 | 0.3 |
| 3 | Germany | 635,605 | 519,566 | 81.7 | 50,905 | 8.0 | 13,401 | 2.1 |
| 4 | England | 633,200 | 463,810 | 73.2 | 115,403 | 18.22 | 46,815 | 7.4 |
| 5 | Japan | 530,114 | 447,426 | 84.4 | 14,607 | 2.7 | 1,789 | 0.3 |
| 6 | France | 429,509 | 360,472 | 83.9 | 24,260 | 5.6 | 11,253 | 2.6 |
| 7 | Canada | 393,522 | 302,593 | 76.9 | 62,023 | 15.8 | 18,542 | 4.7 |
| 8 | Italy | 368,797 | 310,799 | 84.3 | 21,859 | 5.9 | 6,518 | 1.8 |
| 9 | Spain | 299,170 | 244,801 | 81.8 | 30,247 | 10.1 | 9,197 | 3.1 |
| 10 | Russia | 163,719 | 145,691 | 89.0 | 4,043 | 2.4 | 1,732 | 1.1 |

The number of publications on modernization in DB SSCI for ten leading counties is shown in table 3 for 2007–2011 period. This table demonstrates that for the most leading countries it is significant a light share of publications on modernization in DB SSCI (0.1–0.3 %),

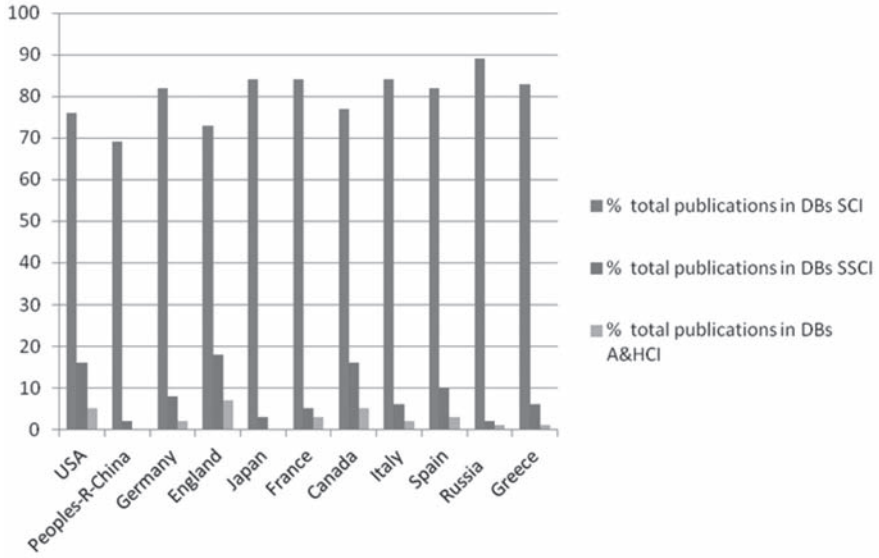


Fig. 4. Per cent of total publications in DBs SCI, SSCI, A&HCI

but for Russia this share comes 0.9 %. In social sciences modernization is treated in historic and economic context in contrast to science proper, where this concept is discussed in terms of technological innovations.

Table 3

% publications on modernizations in DB SSCI 2007–2011

| Country | SSCI Total publ | SSCI publ on moderniz | % publ on moderniz in SSCI |
|---|---|---|---|
| USA | 445,647 | 469 | 0.1 |
| England | 115,403 | 335 | 0.3 |
| Peoples-R-China | 22,988 | **73** | **0.3** |
| Germany | 50,905 | 127 | 0.2 |
| Spain | 30,247 | 64 | 0.2 |
| Russia | 4,043 | **37** | **0.9** |
| Canada | 62,023 | 65 | 0.1 |
| Italy | 21,859 | 43 | 0.2 |
| France | 24,260 | 45 | 0.2 |
| Japan | 14,607 | 26 | 0.2 |

## Comparative analysis of publications on modernization in Russia and China

The number of publications on modernization in China and Russia is shown in table 4 and fig. 5 for four cumulative periods. Material for this study was drawn from all DBs included in Web of Science. The first decade of the XXI century witnessed a spectacular rise in such publications both in Russia and China. In China the process is going on an accelerating pace.

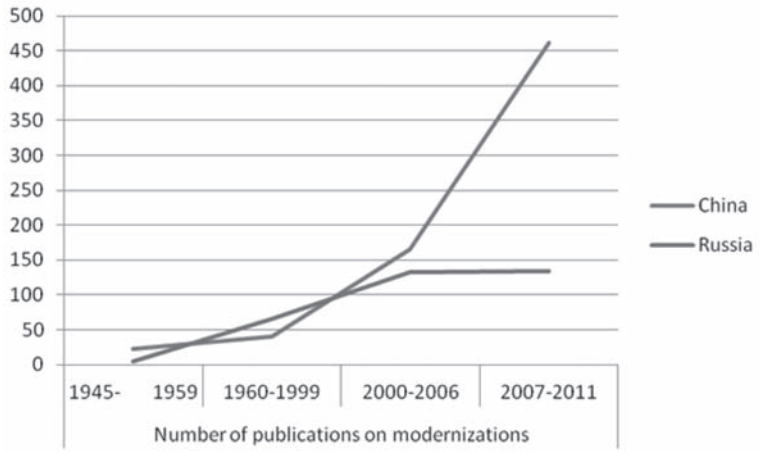


Fig. 5. Dynamics of publications on modernization

Table 4

Number of publications on modernization and average yearly (av.year) (All DBs)

| Country | 1945–1959 | Average yearly | 1960–1999 | Average yearly | 2000–2006 | Average yearly | 2007–2011 | Average yearly |
|---|---|---|---|---|---|---|---|---|
| China | 22 | **1.5** | 40 | **1.0** | 165 | **23.6** | 462 | **92** |
| Russia | 4 | **0.3** | 65 | **1.6** | 133 | **16.1** | 134 | 27 |

Table 5 and figs. 6–7 show distribution of Russian and Chinese publications in five DBs of Web of Science for 3-years periods: 2000–2002, 2003–2005, 2006–2008 and 2009–2011. This table and figures show that Russia and China differ markedly in their policy of participation in international conferences.

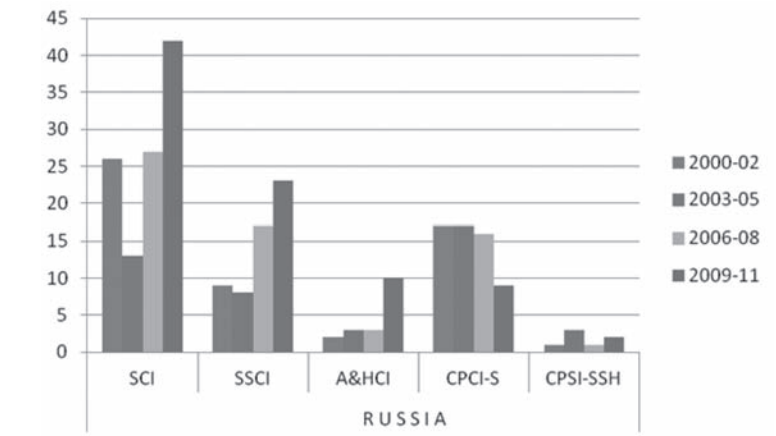


Fig. 6. Distribution of Russian publications on modernization in Web of Science

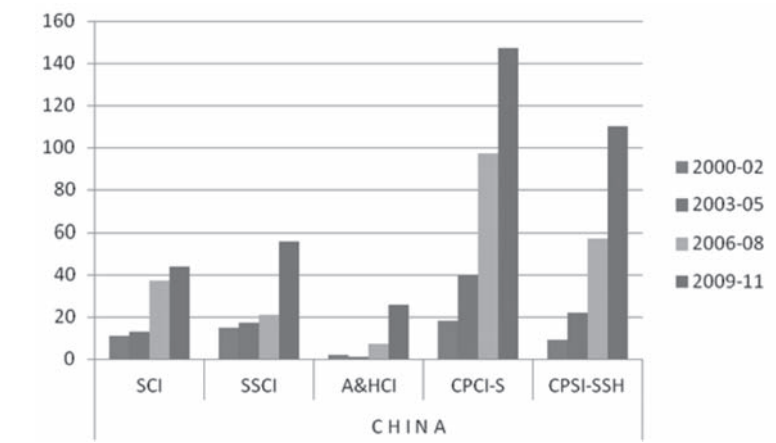


Fig. 7. Distribution of Chinese publications on modernization in Web of Science

Table 6

Distribution of Russian and Chinese publications on modernization in Web of Science: 2000–2011

| Years | RUSSIA | | | | | CHINA | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SCI | SSCI | A&H-CI | CPCI--S | CPSI--SSH | SCI | SSCI | A&H-CI | CPCI--S | CPSI--SSH |
| 2000–02 | 26 | 9 | 2 | 17 | 1 | 11 | 15 | 2 | 18 | 9 |
| 2003–05 | 13 | 8 | 3 | 17 | 3 | 13 | 17 | 1 | 40 | 22 |
| 2006–08 | 27 | 17 | 3 | 16 | 1 | 37 | 21 | 7 | 97 | 57 |
| 2009–11 | 42 | 23 | **10** | ***9*** | ***2*** | 44 | 56 | 26 | ***147*** | 110 |

## Analysis of Russian publications on modernization

The database Web of Science includes 134 Russian publications on modernization in a total of 4,445 records (documents) in 2007–2011 (see table 1). The papers on modernization are analyze by (1) categories, (2) institutions and (3) journals in which those papers was published.

(1) **Web of Science Categories:** Instruments Instrumentation (15), History (12), Sociology (12), Metallurgy Metallurgical Engineering (11), Engineering Multidisciplinary (10), Education & Educational Research (8), Physics Applied (8), Physics Particles Fields (7), Physics Particles Fields (7), Engineering Electrical Electronic (6), Engineering Electrical Electronic (6), Political Science (6), International Relations (3), Philosophy (3), History Philosophy Of Science (2), Anthropology (2);

(2) **Institutions:** Russian Acad Sci (13), All Russian State Inst Cinematog (1), Ctr Independent Social Res (1), Ctr Independent Social Res (1), Gr Derzhavin Tambov State Univ (1), Higher Sch Econ St Petersburg (1), Moscow Carnegie Ctr (1), Russian State Univ Humanities (1);

(3) **Journals:** 33 Russian publications on modernization (2007–2011 period) were spread over 16 journals indexed in the fields: History, Sociology, Political Science, Philosophy. The most number of them was published in the journal *"Sotsiologicheskie Issledovaniya"*:

| Title of journal | Number of papers |
|---|---|
| Sotsiologicheskie Issledovaniya | 10 |
| Otechestvennaya Istoriya | 5 |
| Voprosy Filosofii | 3 |
| Historical Social Research-Historische Sozialforschung | 2 |
| Osteuropa | 2 |
| Cahiers du Monde Russe<br>Current History<br>East European Jewish Affairs<br>Environmental Politics<br>European Review Of History-Revue Europeenne d Histoire<br>European Societies<br>Japanese Journal of Political Science<br>Russian Politics and Law<br>Sixteenth Century Journal<br>Sociological Review<br>Voprosy Istorii | 1 |

Bibliographies of those 33 Russian papers on modernization are presented in Annex.

DB Journal Citation Reports: Social Science Edition in 2010 included 6 Chinese journals and 6 Russian journals. Tables 6 and 7 show the journals and bibliometric indicators (total Cites, Impact factor, Immediacy Index and number of articles in 2010) and Web categories in which those journals were indexed (3).

Table 6

Chinese Journals in DB JCR: 2010 SSE

| **Abbreviated Journal Title (language of publication)** | **Category** | **2010 Total Cites** | **Impact Factor** | **Immediacy Index** | **2010 Articles** |
|---|---|---|---|---|---|
| Ann Econ Financ (Eng) | Economics | 49 | 0.278 | 0.062 | 16 |
| Asia Pac Law Rev (Eng) | Law | 9 | 0.059 | 0.000 | 17 |
| China Rev (Eng) | Area Studies | 65 | 0.125 | 0.059 | 17 |
| Chinese Law Gov (Eng) | Law; Political Science | 18 | 0.048 | 0.024 | 42 |
| Chinese Soc Anthrop (Eng) | Anthropology Sociology | 10 | 0.053 | 0.000 | 9 |
| Transportmetrica (Eng) | Transformation | 64 | 0.808 | 0.100 | 20 |

Table 7

Russian Journals in DB JCR: 2010 SSE

| Abbreviated Journal Title (language of publication) | Category | 2010 Total Cites | Impact Factor | Immediacy Index | 2010 Articles |
|---|---|---|---|---|---|
| Anthr Archeol Euras (Eng) | Anthropology | 12 | 0.031 | 0.000 | 15 |
| Eurasian Geogr Econ (Eng) | Area Studies Geography | 339 | 1.472 | 1.077 | 39 |
| Psikhol Zh **(Ru)** | Psychology, multidis | 111 | 0.115 | 0.052 | 58 |
| Russ Polit Law (Eng) | Political Science | 10 | 0.027 | 0.030 | 33 |
| Sotsiol Issled+ **(Ru)** | Sociology | 321 | 0.147 | 0.020 | 205 |
| Vop Psikhol+ **(Ru)** | Psychol., Educationl | 189 | 0.157 | 0.036 | 84 |

## Conclusion

1. Publications on modernization are concentrated in social sciences and are reflected in DBs Social Science Citation Index (SSCI) and Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH). In social sciences modernization is treated in historic and economic context in contrast to science proper, where this concept is discussed in terms of technological innovations.

2. XXI century witnessed a growth of modernization publications in Russia and China. In case of China this trend turned into a real boom in 2009–2011.

3. It should be specially mentioned that Russia and China differ markedly in their policy of participation in international conferences. While in 2000–2002 the two countries were on a par, in 2009–2011 the figure for China was twenty times greater than that for Russia.

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China Modernization Report Outlook (2001–2010) / ed. Chuanqi He. Peking University Press, 2010. (Translation in Russian; ed. N. I. Lapin. Moscow. "Ves'; Mir', 2011.)

ISI Web of Knowledge: Web of Science.

ISI Web of Knowledge: Journal Citation Reports: Social Science Edition 2010.

## Annex

33 Russian publication on modernization presented in DBs Web of Science: 2007–2001

Title: **Modernization: the Burden of the Past**
Author(s): Yanitsky Oleg N.
Source: SOCIOLOGICAL REVIEW Volume: **59** Issue: **4** Pages: **741–757** DOI: **10.1111/j.1467-954X.2011.02039.x** Published: **Nov 2011**
Title: **Modernizing Russian Foreign Policy**
Author(s): Trenin Dmitry
Source: RUSSIAN POLITICS AND LAW Volume: **49** Issue: **6** Pages: **8–37** DOI: **10.2753/RUP1061-1940490601** Published: **Nov-Dec 2011**
Title: **The Asian Values Thesis Revisited: Evidence from the World Values Surveys**
Author(s): Welzel Christian
Source: JAPANESE JOURNAL OF POLITICAL SCIENCE Volume: **12** Pages: **1–31** DOI: **10.1017/S1468109910000277** Part: **Part 1** Published: **Apr 2011**
Title: **Social Cultural Factors for Russian Stagnation and Modernization**
Author(s): Lapin N. I.
Source: SOTSIOLOGICHESKIE ISSLEDOVANIYA Issue: **9** Pages: **3–18** Published: **2011**
Title: **Education in Russia and Modernization of Economy**
Author(s): Beliaeva L. A.
Source: SOTSIOLOGICHESKIE ISSLEDOVANIYA Issue: **12** Pages: **13–24** Published: **2011**
Title: **Modernization of Pedagogical Education**
Author(s): Zasypkin V. P.; Zborovsky G. Ye.
Source: SOTSIOLOGICHESKIE ISSLEDOVANIYA Issue: **2** Pages: **87–93** Published: **2011**
Title: **On Modernization in RUSSIA: a Historical Sociological Analysis**
Author(s): Andreev A. L.
Source: SOTSIOLOGICHESKIE ISSLEDOVANIYA Issue: **9** Pages: **111–120** Published: **2011**
Title: **Modernization in Russia and around. Synopsis**
Author(s): Yanitsky O. N.
Source: SOTSIOLOGICHESKIE ISSLEDOVANIYA Issue: **5** Pages: **136–145** Published: **2011**
Title: **Private Property and Social Interest — the Dilemma of Russia**
Author(s): Glinchikova A. G.
Source: VOPROSY FILOSOFII Issue: **3** Pages: **3–11** Published: **2011**
Title: **Prolegomena to the Idea of Technology**
Author(s): Rakitov A. I.
Source: VOPROSY FILOSOFII Issue: **1** Pages: **3–14** Published: **2011**
Title: **Medvedev's Potemkin Modernization**
Author(s): Shevtsova Lilia
Source: CURRENT HISTORY Volume: **109** Issue: **729** Pages: **275–280** Published: **OCT 2010**
Title: **Anti-Jewish Violence in Russia and the American Omission for Freedom at the Turn of the Twentieth Century**
Author(s): Zhuravleva Victoria
Source: EAST EUROPEAN JEWISH AFFAIRS Volume: **40** Issue: **1** Pages: **43–60** Article Number: **PII 921575815** DOI: **10.1080/13501671003593642** Published: **2010**

Title: **Russian Society and Elites in 1989–2009: Transformation Results and Future Perspectives**
Author(s): Gaman-Golutvina Oxana
Conference: **Conference on Transition Transformations — Trajectories of Social, Economic and Political Change after Communism** Location: **Jena, GERMANY** Date: **2009**
Source: HISTORICAL SOCIAL RESEARCH-HISTORISCHE SOZIALFORSCHUNG
Volume: **35** Issue: **2** Special Issue: **SI** Pages: **41–53** Published: **2010**
Title: **Computer Modeling of Historical Processes by Means of Fractal Geometry**
Author(s): Zhukov Dmitry; Lyamin Sergey
Source: HISTORICAL SOCIAL RESEARCH-HISTORISCHE SOZIALFORSCHUNG
Volume: **35** Issue: **3** Pages: **323–350** Published: **2010**
Title: **Dead End Authoritarian Modernisation in Russia**
Author(s): Gel'man Vladimir
Source: OSTEUROPA Volume: **60** Issue: **1** Pages: **3-+** Published: **Jan 2010**
Title: **Social limitations for Russia's modernization**
Author(s): Yanitskiy O. N.
Source: SOTSIOLOGICHESKIE ISSLEDOVANIYA Issue: **7** Pages: **17–27** Published: **2010**
Title: **On Modernisation of Russia in the Book by B. N. Mironov**
Author(s): Ostrovsky A. V.
Source: VOPROSY ISTORII Issue: **10** Pages: **119–140** Published: **2010**
Title: **Evolution of Russia's military command during the first quarter of the eighteenth century: The role of European influence in the implementation of Peter's reforms**
Author(s): Cernikov Sergej
Source: CAHIERS DU MONDE RUSSE Volume: **50** Issue: **4** Pages: **699-+** Published: **Oct-Dec 2009**
Title: **Backwardness and Modernization: Poland and Eastern Europe in the 16th–20th Centuries**
Author(s): Ivonin Yuri
Source: SIXTEENTH CENTURY JOURNAL Volume: **40** Issue: **2** Pages: **457–458** Published: **Sum 2009**
Title: **The Processes of Modernization on Russia's European North in the 1920s–1930s: Social and Economic Aspects**
Author(s): Filimonchik S. N.
Source: OTECHESTVENNAYA ISTORIYA Issue: **3** Pages: **185–194** Published: **May-Jun 2009**
Title: **Ethnic and Cultural processes in the context of economic modernization on European North-east from the 1930s till 2000**
Author(s): Maksimova L. A.
Source: OTECHESTVENNAYA ISTORIYA Issue: **3** Pages: **247–251** Published: **May-Jun 2009**
Title: **The Modernisation of Imperial Russia and the wealth of its population**
Author(s): Mironov B. N.
Source: OTECHESTVENNAYA ISTORIYA Issue: **2** Pages: **137–155** Published: **Mar-Apr 2009**
Title: **Concentration of working-age male mortality among manual workers in urban Latvia and Russia, 1970–1989**
Author(s): Andreev Evgueni; Hoffmann Rasmus; Carlson Elwood; et al.
Source: EUROPEAN SOCIETIES Volume: 11 Issue: 1 Pages: 161–185 DOI: 10.1080/14616690802054358 Published: 2009
Title: **Experts on Kazakhstan society modernization**
Author(s): Ermakhanova S. A.; Korel' L. V.
Source: SOTSIOLOGICHESKIE ISSLEDOVANIYA Issue: **5** Pages: **81–86** Published: **2009**
Title: **The Russian History in the Mirror of Modernization**
Author(s): Fedorova V. G.
Source: VOPROSY FILOSOFII Issue: **12** Pages: **3–18** Published: **2009**

# РЕЦЕНЗИЯ

## Рецензия на монографию Ж. Т. Тощенко. Кентавр-проблема: опыт философского и социологического анализа. М.: Новый хронограф, 2011. 552 с.

Идеи всегда правили миром, противоречивые идеи правят миром современным. И если мы утверждаем, что современное общество полно противоречий, то уж современное российское общество особенно. В условиях быстрой смены стереотипов, разрушения традиций и отсутствия твердой уверенности в понимании завтрашнего дня приходится мириться со многими социальными явлениями нашей жизни. Перелистывая страницы интереснейшей монографии Жана Терентьевича Тощенко, с радостью обнаруживаешь, как на основе глубокого анализа реалий российской жизни раскрываются причудливые формы этой самой действительности.

Выявление и изучение вновь открытых противоречий объективной реальности проводится на протяжении всего изложения материала, которые обозначаются как кентавр-проблема. Понятие «кентавр-проблема» содержательно раскрывается как такое состояние сознания (и знания), которое отражает сочетание несочетаемого. Использование данного понятия при анализе особой формы противоречий общественного сознания и практики компенсирует методологическую недостаточность логико-понятийных средств. Автор ставит своей задачей выяснить, как соотносится кентавр-проблема с законом единства и борьбы противоположностей, с универсальной формулой диалектики, которая допускает, предполагает, а порой и требует преобладания одного из противоборствующих начал над другим. Исследование кентавр-проблем позволяет автору обратить внимание на дискуссионные проблемы природы познания и преобразовательной деятельности, их взаимодействия, выявить ряд особенностей соотношения знания и реальности, условия достоверности и истинности знания. Специфической характеристикой кентавр-проблем в современной истории России является то, что они появились не в процессе умозрительных рассуждений, а эмпирически обнаружены в природе и обществе. Это феномены в виде кентавр-явлений, кентавр-процессов, кентавр-образов, кентавр-идей, кентавр-организаций, кентавр-личностей. Автор подчеркивает, что наука, научное познание сталкивается с этим разнообразным классом феноменов (процессов, образов, личностей и т. д.) не только как с идеальными,

умозрительными конструкциями, но, прежде всего, как с «реальными казусами», которые опровергают ранее существовавшее знание и проявляются в преобразующей деятельности человека. Это приводит к появлению новых характеристик общественного сознания и новой социальной практики.

Важно то, что, раскрывая суть обозначенных феноменов, автор использует не только метод описания, но и обсуждает причины появления «кентавров» в общественной жизни, способы их преодоления и решения. Как объяснить возникновение и существование этих феноменов, представляющих единое целое в познании и на практике, в то же время отражающих совместимость и несовместимость? Чтобы понять это явление, мы должны ответить на такие вопросы:

— как мы воспринимаем окружающий мир?

— что мы видим вокруг себя?

— как объяснить то, с чем мы встречаемся и что привлекает наше внимание?

Ответы на эти вопросы неразрывно связаны с понятием «кентавризма». Анализ этого явления обнаруживает три подхода. Сторонники первого подхода выделяют в окружающей действительности только позитивное, прогрессивное, что устраивает их в окружающем обществе. Они демонстрируют мировосприятие, которое успокаивает и убеждает людей, что все происходит в общественных интересах. Если и есть ошибки, то они случайны и незначительны, и даже сейчас, в условиях финансового и экономического кризиса, трудности носят временный характер. Представители второго подхода, занимая противоположные позиции, утверждают, что все происходящее в российском обществе плохо и пагубно. Некоторые из сторонников этого подхода предлагают перенять опыт США или Китая, или Германии, или Аргентины и т. д., некоторые предлагают схемы, не имеющие никакого отношения к действительности. В третьем случае рассуждения строятся по принципу: «с одной стороны, ... но с другой стороны»...

Монография носит энциклопедический характер, охватывая все основные сферы жизни современного общества — от экономики и политики до культуры. Особенно это относится к новейшей истории и современности, охватывая основные периоды развития советского и постсоветского общества. Рассматривая проблему приватизации, автор глубоко рассматривает имитацию преобразований, показывая, что кооперация была нужна, но не за счет разбазаривания государственной собственности. Путь, на который толкали страну так называемые реформаторы, привел страну к упадку промышленного развития, отраслевой науки.

Специальная глава посвящена кентавризму перестройки и ее последствиям. Показательно, что руководители коммунистической партии и страны (Андропов, Горбачев и др.), признавали, что мы не знаем общество, в котором живем, но начинаем «перестройку». Естественно, это могло привести только к тому, к чему, собственно, и привело — развалу всего и вся.

При рассмотрении кентавр-проблем автор использует различные методы социологического исследования. Так, для изучения кентавр-процессов используются количественные методы, которые позволяют получить представительную информацию об основных или ведущих тенденциях, присущих сознанию и поведению большинства людей. Количественные методы в этих исследованиях позволили выявить своеобразную и нетипичную тенденцию и определить ее как распространенную норму, характерную для сознания и поведения людей в период кардинальных общественных изменений. Исследование кентавр-личностей — фантомов — проводится

автором с использованием качественных методов. Определяющие их облик показатели выделяются на основании трех характеристик — отношение к власти, капиталу и славе в органическом сочетании социального и индивидуального. Этот методологический прием позволил автору не просто создавать психологический портрет, а вывести определенные типы личности.

Монография Ж. Т. Тощенко может быть использована не только для теоретического конструирования социальной реальности, но и в эффективном решении практических задач, связанных со всем разнообразием социальных, политических, экономических и культурных процессов современного мира. Об этой книге сложно писать по обычной, «накатанной» схеме, принятой для задач такого рода. Поднимаемые вопросы иллюстрируются настолько богатым и насыщенным эмпирическим материалом с яркой эмоциональной окраской, что через некоторое время начинаешь «слышать» текст как повествовательный рассказ самого автора. В этом, наверное, и состоит искусство творения, когда за обычными книжными страницами, на которых обычным шрифтом напечатаны все те же обычные слова, состоящие из знакомых букв, но при этом такой эмоциональный накал, так чувствуется душа автора, душа Социолога с большой буквы, переживающего за будущее своей страны, старающегося своим неравнодушием сделать, насколько это возможно, неравнодушными других, «разбудить» душу и сделать нашу жизнь чуточку светлее, чуточку радостнее и счастливее. Тонкая, если не сказать ювелирная, подборка огромного числа фактов, имен, событий, глубокое осмысление результатов многочисленных социологических исследований служат лучшим свидетельством того, что данная книга выражает собой определенный этап жизненного и творческого пути Автора.

В заключение сформулируем два небольших замечания. Первое касается проблемы элит. Автор рассматривает это понятие в историческом и современном звучании. Справедливо отмечает поверхностное и легковесное использование этого термина журналистами и некоторыми исследователями. К сожалению, автор даже не упомянул о двух крупных исследованиях научной элиты: первое было проведено в Санкт-Петербурге, второе — в Москве в 90-е годы прошлого столетия[9].

Также в монографии рассматривается проблема высшего образования. Делая это достаточно основательно, автор утверждает, что в процессе реформирования нужно учитывать зарубежный опыт, но не копировать его; необходимо учитывать не потерявшие своего значения российские традиции в образовании. Но вместе с этим автор начисто отрицает позитивное влияние Болонского процесса на российскую систему образования.

Эта книга, мы уверены, несомненно, очень достойная, и она будет интересна преподавателям, научным работникам, аспирантам, студентам и т. д. Но вне зависимости от профессиональной принадлежности и личных предпочтений читателя, она не сможет никого оставить спокойным, равнодушным.

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кандидат социологических наук, доцент **Л. А. Лебединцева**.

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[9] По результатам первого исследования опубликована монография в трех томах под общим названием «Интеллектуальная элита Санкт-Петербурга» под ред. С. А. Кугеля, 1993–1994 гг. Издательство СПбГУЭФ. Второе исследование отражено в монографии: *Добрынина В. И., Кухтевич Т. Н.* Формирование интеллектуальной элиты в высшей школе. М.: МГУ, 1996.

# НАУЧНАЯ ЖИЗНЬ

Мы продолжаем публикацию серии интервью, которые любезно согласились дать редакции ведущие российские ученые, руководители академических институтов. В № 3, томе 3 «Социологии науки и технологий» было опубликовано интервью директора СПИИ РАН, чл.-корр. РАН Р. М. Юсупова. В этом номере на вопросы редакции отвечает **Ирина Ильинична Елисеева,** директор Социологического института РАН, чл.-корр. РАН.

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## «Разрушение РАН тождественно разрушению российской науки». Интервью директора Социологического института РАН, чл.-корр. РАН И. И. Елисеевой

**— Какое место Социологический институт РАН занимает в пространстве городской социологии?**

— Сегодня социологическое сообщество разобщено. Социологи плохо между собой умеют договариваться и распределять роли, не удается создать такую партнерскую сеть, которая дала бы новые силы и возможности. Я согласна с мнением, высказанным в газете «Троицкий вариант», что в Санкт-Петербурге активность в профессиональной области социологии смещается к негосударственным организациям. У нас это Европейский университет в СПб и ЦИСН. Вместе с тем все не так однозначно. В частности, Европейский университет заявляет, что они готовят социологов с новым видением профессиональных задач, находящихся на международном уровне профессиональной подготовки. Это хорошо. Но когда выпускники Европейского университета защищают диссертации в СИ РАН, то видны их уязвимые места: великолепные теоретические разделы (обзор литературы, большое количество вводимых западных источников, статей, множество понятий) и крайне слабая эмпирическая часть, отсутствие аналитических навыков. Так что у каждой школы есть свои сильные и слабые стороны.

СИ РАН выполняет некую интегрирующую функцию в научном пространстве. Я думаю, наша задача — укреплять профессиональные горизонтальные контакты в рамках Санкт-Петербурга и всего Северо-Западного региона, не говоря о России в целом и зарубежье. Наш институт тесно сотрудничает с факультетом социологии СПбГУ. Так, профессор В. В. Козловский, являясь зав. кафедрой в СПбГУ, возглавляет сектор в нашем институте; то же можно сказать о докторе социологических наук Т. В. Шипуновой. Заведующий сектором, кандидат политических наук А. В. Дука читает лекции студентам-политологам СПбГУ. Сотрудники СИ РАН регулярно участвуют в Сорокинских, Ковалевских чтениях, мы совместно организовывали конференции по социологии труда, в которых принимал участие В. А. Ядов, а главный научный сотрудник нашего института, Б. Г. Тукумцев, был членом оргкомитета. В прошлом году наш институт выполнял работу по социологии конкурентоспособности для правительства Ленинградской области, которое поставило нам задачу — выявить, как предприниматели, представляющие малый бизнес, видят себя на рынке и оценивают свою конкурентоспособность и собственный потенциал. Эта работа была выполнена при поддержке Центра социологических исследований (ЦСИ) при факультете социологии. ЦСИ нам помогал в проведении опроса, который надо было проводить в Ленинградской области в определенных местах и видах деятельности (транспорт, торговля, строительство). У нас действительно имеются плодотворные контакты со многими социологическими площадками Санкт-Петербурга. И хотя я вначале отметила разобщенность социологов, но взаимопомощь тоже присутствует.

**— Ирина Ильинична, с тех пор, как Вы возглавили Институт, прошло почти 10 лет. Что удалось сделать за эти годы**?

— За этот период удалось сделать многое, на мой взгляд. Наш институт существенно омолодился. К нам пришло много молодежи, причем молодежь проводит интересные исследования, защищает диссертации, продвигается. Сейчас готовится к защите интереснейшая диссертация о специалистах в области IT («айтишниках») как профессиональной группе с особым социальным статусом, сетевым окружением и карьерным ростом. Ее автор, Лилия Земнухова, исследовала эту относительно новую социальную группу, собрала большой эмпирический материал, провела опросы «айтишников» разного уровня, с разным профессиональным опытом, ведь среди них большая дифференциация по специальностям, по профилям. Она все это охватила, и должна получиться хорошая работа. Очень интересный молодой исследователь — Константин Дивисенко, изучающий жизненный мир подростков, молодежь юношеского возраста с тем, чтобы понять, проектируют ли они жизнь или живут сегодняшним днем, какие цели и задачи перед собой ставят, какова их жизненная траектория. Это исследование основывается на идеях Э. Гуссерля. Подкупает преданность исследователя науке, он работает с большой отдачей и ответственностью. Ольга Озерова возглавляет Совет молодых ученых в СИ РАН и занимается изучением здоровья населения в свете социальных проблем, таких как алкоголизация и табакокурение. Я надеюсь, что она успешно защитит диссертацию. Молодежи много, молодежь творческая. И я возлагаю на них большие надежды.

Укрепилась материальная база СИ РАН. Нам удалось вернуть те площади, которые в свое время были утрачены Институтом. В результате наш институт сможет создать хороший конференц-зал, лабораторию для эмпирических исследований и обработки данных. Вот такие у нас амбициозные планы. Так что

мы планируем нашу жизнь на долгие годы. Мы верим, что академическая наука для социологии и социология для академической науки имеют важное значение. И для Санкт-Петербурга как исторического центра РАН важно иметь академическую науку, представленную всеми направлениями: чем больше академических институтов, тем лучше. Мне кажется, что Академия наук должна сохранять (и сохраняет) флагманскую роль в российской науке. Так сложилось исторически. И наш институт стремится достойно выполнить свою функцию.

**Как удается привлекать молодых в институт?**

В городе много образовательных центров, готовящих социологов: институт культуры (Санкт-Петербургский государственный университет культуры и искусств. — *Прим. редакции*), педагогический университет им. А. И. Герцена, социологический факультет СПбГУ, Европейский университет, Инжэкон (Санкт-Петербургский государственный инженерно-экономический университет. — *Прим. редакции*), так что создается конкуренция. Получить место в научном учреждении и заниматься исследованием стало привлекательным, молодые к нам просятся. В РАН в результате трехступенчатого сокращения штатов ввели заметные ежемесячные надбавки, основанные на индивидуальном рейтинге ученого. Но мы живем в рамках жесткого штатного расписания, и кадровые возможности у нас ограничены. К нам в аспирантуру приходят хорошие, талантливые выпускники, и мы стараемся наших аспирантов оформить на полставки, чтобы у них, помимо заинтересованности, была еще и материальная подпитка. Занятие исследовательской работой становится привлекательным.

**— Как вы оцениваете проводимую правительством политику «переноса» науки в университеты**?

— Я всемерно поддерживаю сохранение института РАН как главного сосредоточения научной деятельности, и разрушение РАН тождественно разрушению российской науки вообще. Если хочешь поставить крест на российской науке, тогда разрушай Академию наук. Университеты не готовы вести серьезные научные исследования. Они долгое время «барахтались в яме», сейчас ситуация меняется, но разрушились научные школы, пострадала лабораторная база. В академических институтах она за последние годы укрепилась. В университетах это все еще в стадии становления, у кого-то лучше, у кого-то хуже. Но одним росчерком пера сконцентрировать науку в университетах, закрыв институты РАН, — это равносильно потере всей российской науки. Это окончательный удар, ее разрушение.

**— Сейчас РАН накануне реформирования, работает всем известная «комиссия Алдошина». Каковы критерии оценки академических институтов?**

— Разработан ряд критериев. Это — социальная и когнитивная значимость института, публикационная активность сотрудников, место их работ в определенном сегменте науки, качество материальной базы. Критерии известны, но им трудно дать оценку. Знаете, когда вводили индивидуальный рейтинг ученого, сколько было сопротивлений, но, тем не менее, я считаю, это оказало стимулирующее воздействие на труд ученых. Если бы работа комиссии не сопровождалась финансовыми репрессиями, то введение системы индикаторов и оценка научной продуктивности — дело полезное. Но когда это сопряжено с ухудшением финансирования института, его выживаемостью, с судьбами исследователей, то невольно задумаешься, что это: объективная оценка или форма расправы над Академией. На мой взгляд, перевод института в разряд, в котором государственного финансирования вообще может не быть, равносильно гибели коллектива. Насколько это

оправданно — вопрос непростой. Тут надо быть очень осторожным. Надеюсь, что за период своей работы Комиссия приобретет определенный опыт, что позволит принимать взвешенные решения.

**— Как преодолеваются трудности института?**

— Трудностей много, это трудности, прежде всего, квалификационного роста. Социологи — люди более свободные и раскрепощенные, нежели экономисты, например. Некоторые из них считают, что ученые степени ни к чему, зачем «вторая» степень, зачем «вторые» диссертации, зачем плодить бумаги... Но работу института та же комиссия, о которой мы только что говорили, будет оценивать по показателям, а где у нас доктора наук, защитившиеся в последние 5–10 лет? Только один Г. В. Каныгин сумел преодолеть многие барьеры и защитил докторскую диссертацию. Хотя в институте достаточно активных, результативных ученых с опытом организации международных мероприятий. Существует, я бы сказала, некоторое непонимание того, что профессиональная деятельность должна получать общественное признание, выражающееся, в частности, в присвоении докторской степени.

**— Интегрирован ли Ваш институт в международные программы, или контакты имеются только на индивидуальном уровне?**

— Наш институт готовит монографию «Семья в России и Китае» совместно с коллегами из Института социологии Шанхайской академии общественных наук. Это амбициозный проект, инициирован китайской стороной. Наши коллеги из Шанхая считают, что мир плохо знает Китай, с недоверием относится к Китаю, впрочем, как и к России, говорят китайцы. Представляя результаты исследования института семьи, его эволюции, раскрывая функции современной семьи, мы определенным образом позиционируем себя в мире. Мы намерены завершить проект в мае 2013 года, перевести монографию на английский язык и издать ее в США, Китае, России. СИ РАН участвовал в крупном международном проекте, включающем 11 постсоциалистических стран Центральной и Восточной Европы. Проект был направлен на изучение проблем социальной трансформации, социального неравенства, социальной идентичности (человек и общество, человек и церковь, человек и семья). Этот проект инициировал Европейский Совет, и сектор, возглавляемый кандидатом философских наук Г. В. Еремичевой, выполнял его в течение 5 лет. Проект завершился изданием международного сборника (на английском и на русском языках), включающего статьи польских, российских, литовских, британских и других авторов. Международное сотрудничество поддерживает сектор социологии здоровья.

**— Ваше отношение к Сколково?**

— Пока весьма настороженное. Многие эксперты оценивают инновационность Сколково как «инновационность второго сорта», т. е. инновационность вызывает сомнение, а большие деньги просто развращают. Сколково позиционирует себя не только как исследовательская организация, но и как инвестиционная компания. Хорошо, что там собирается некоторый пул, но, кажется, было бы более эффективным изначально создать «точку роста» на базе какого-либо академического центра, например Сибирского отделения РАН или связки московских, петербургских и сибирских институтов, т. е. использовать сложившиеся центры и научные школы, доказавшие свою продуктивность. Здесь имеют значение сложившиеся научные связи, наличие коллективов, имеющих определенный задел,

ведь нанотехнологиями занимаются многие, не только Сколково. Кажется, это не самый эффективный путь развития науки. Подождем результатов. У них есть амбициозные идеи, посмотрим, жизнь покажет...

**— Ваша оценка перспектив российской науки.**

— Трудно говорить в оптимистических тонах. За 20 лет мы многое потеряли. Российская наука не может развиваться изолированно — чем больше контактов, чем больше мы будем «вливаться» в мировую науку, тем лучше будет для нашей науки. Мы должны быть открыты новым идеям, инвестировать в коммуникации, новые инструменты взаимодействия. Это требует новых навыков, компетенций и знаний. Но есть ли для этого условия? Если я могу поехать в командировку исключительно за собственный счет, то молодой сотрудник, получающий 15–20 тысяч, не может себе этого позволить, а у институтов нет средств. Поддержит ли молодого ученого какой-либо фонд? Не факт, вдобавок в фондах было принято решение ограничить зарубежные командировки. Это ставит барьер между российской и мировой наукой. Барьеры приводят к тому, что молодежь начинает задумываться, а нужно ли тут оставаться, не эффективнее ли будет свои силы приложить где-то за рубежом. Барьеры приводят к «утечке мозгов». Молодых людей тревожит нарастающая изоляция. Наш изоляционизм и провинциализм нас погубят. Желание жить на своем острове — губительно для ученого, который должен широко смотреть на мир и быть включенным в мировые интеграционные процессы. Иначе он не увидит перспектив и не сможет понять ни своего места в науке, ни направления развития науки. Я — за всемерное расширение интеграции и взаимодействие в разных формах. Без этого нам не выжить. Что касается условий научной деятельности, то два фонда — это очень мало для российской науки, пора подумать об организации еще какого-либо фонда. Если правительство не может выделить из бюджета средства, тогда кто-то (к примеру, Газпром или Роснефть) должен выступить спонсором науки. Бизнес должен повернуться к науке. Наша страна по природе инновативна, наука всегда возрождается при создании соответствующей среды. Так устроен россиянин, что его склонность к каким-то мечтаниям, философствованиям, приводит к тому, что рождаются новые идеологемы, концепции, технические проекты. Недаром так хорошо наши люди приживаются на Западе. Они несут в себе творческий заряд и, попадая в другую среду, его реализуют. В России очень большой потенциал, но необходимо создавать условия для его реализации. Промедление подобно окончательному разрушению науки.

## Науковедческий семинар в Санкт-Петербурге

При Санкт-Петербургском научном центре РАН работает Совет по науковедению и организации научных исследований. Он периодически проводит — то в узком кругу, то в расширенном — семинары. В декабре 2011 года состоялось заседание за круглым столом. Заявленная тема: сравнительный анализ организации науки в России, США и Западной Европе. В программе семинара было зафиксировано три основных докладчика — **Тенникова Татьяна Борисовна, Ерохин Владимир Анатольевич,**

**Соколов Михаил Михайлович**. Ведущий заседания за «круглым столом» — **Кугель Самуил Аронович**. Представляем вниманию читателей стенограмму прошедшего семинара, полагаем, что этот материал вызовет интерес.

Первой выступила доктор химических наук, профессор, заместитель директора по научной работе Института высокомолекулярных соединений Российской академии наук **Тенникова Татьяна Борисовна**:

— Добрый день. Для меня неожиданно, что наши личные дискуссии вылились в такой представительный круглый стол. Но прежде всего я хотела бы сказать, что предлагала именно такой формат. Это не выслушивание докладов, а возможность поделиться своими мнениями, своими ощущениями с вами, и я бы хотела, чтобы публика, сидящая здесь, активно участвовала и чтобы это проходило в виде диалога. Я думаю, что все докладчики согласятся с этой идеей.

Во-первых, почему я оказалась здесь. Прежде чем занять административный пост, я активно занималась наукой. Собственно говоря, я — академический человек и попала в академию наук сразу после окончания химического факультета Санкт-Петербурского государственного университета. Более того, я закончила кафедру физическо-органической химии, которая, к сожалению, не имела непосредственного отношения к тому, чем я занималась и продолжаю заниматься всю жизнь. Это вопросы на стыке наук: химии, биологии, медицины. Моя узкая специализация — это smart-материалы, то есть материалы, подстроенные под биологическую функциональность для нужд аналитической биотехнологии, фармакологии и медицины. Когда мы обсуждали в моем кабинете какие-то вопросы, я, уже сидя в административном кресле, высказывала некоторые мысли по поводу того, как организована наша академическая наука. Как я уже сказала, я — академический человек, всю жизнь проработала в академии наук. Но это не совсем точно — после окончания аспирантуры я работала какое-то время в прикладном институте. Это был на тот момент очень мощный институт медицинского назначения — Всесоюзный научно-исследовательский институт антибиотиков и ферментов. Я сделала и защитила там работу. После этого я защитила диссертацию в институте высокомолекулярных соединений, там же где делала диплом. Затем моя судьба так счастливо сложилась, что я имела возможность очень долго работать за рубежом. Начинала я с Праги — работала в Институте макромолекулярной химии. Сначала это был межстуденческий обмен — маленькие визиты по 2–3 недели. Совместно с моими коллегами из Института макромолекулярной химии в Праге мы придумали очень хорошую вещь, которую очень удачно запатентовали. Мы имеем три американских патента, несколько европейских и, естественно, патенты Российской Федерации. После получения такого опыта я полагала, что наука должна быть организована по образцам, аналогичным европейским, где исследования и постановка задач отличались от советских. Это был мой первый зарубежный опыт и первый опыт перехода от науки к технологиям, потому что те патенты, которые мы получили на наши изобретения, мы дважды очень удачно продали в виде лицензии. Сначала продали лицензию в Западный Берлин крупной компании Solartechnik. (Речь идет о сорбентах, которыми я также занималась всю жизнь, но тогда это были сорбенты с особым дизайном.) При продаже этой лицензии я получила опыт коммерциализации научных изобретений. Это совершенно отдельная вещь, но для меня она была наиболее понятной, потому что, как говорила, я проработала какое-то время в прикладном институте и очень хорошо представляла, что сделанное

в исследовании, то есть исследовательская работа на лабораторном столе, в лучшем случае может лечь в основу лабораторного метода.

Наши продукты производятся сейчас в мировом масштабе (после Берлина — в Словении, которая перекупила лицензию) — по всему миру используются так называемые монолитные сепарационные среды. Работая в прикладном институте, я знала, что от лабораторного метода до заводского регламента, от промышленного регламента до продукта очень длинный путь. И я точно знала, что этот путь будут проходить не те люди (в частности, я сама), которые занимаются исследованиями, представляющими лишь первый шаг в создании лабораторного регламента, которое является уже следующей ступенью, а инженеры, которые имеют соответствующее образование, хорошо себе представляют, что это такое и могут осуществить выход на промышленный регламент. Результатом прохождения этих стадий явилась моя работа в Берлине и Словении в качестве частного консультанта — мои научные консультации при создании и переводе лабораторной технологии в промышленную технологию были необходимы производителям. Именно я и выполняла эту функцию. На данном жизненном этапе нашего института это единственный прецедент, когда научная разработка института продана за рубеж, выпускается под коммерческой маркой и имеет большой успех.

Потом моя жизнь сложилась так, что я долгое время жила и работала в Германии, в городе Майнц, в компании, которая занималась производством сорбентов, а также в университетах и научно-исследовательских центрах при университетах Ганновера, Гамбурга, Майнца и других. Затем я работала в Высшей Политехнической школе в Лозанне. Это также был для меня интересный опыт: как наука и образование сливаются в таких мощных, очень хорошо финансируемых и поддерживаемых промышленностью научно-исследовательских центрах.

Собственно говоря, это весь мой опыт, который мы обсуждали в приватных беседах. Меня попросили поделиться этим опытом и провести какие-то параллели, сравнения с тем, что делается у нас. Я не буду трогать советские времена и «лихие» девяностые, когда наука очень сильно пострадала на волне борьбы за демократию. Отголоски того времени мы до сих пор испытываем. Но кое-что меня, честно говоря, как административную единицу настораживает (а я имею много дел с бумагами, с различными распоряжениями, которые идут из Президиума академии наук, из Министерства науки и образования и из других отделов). Сейчас очень модное слово «инновация». Эти самые инновации мы должны, я подчеркиваю, должны, выдавать как гарантию, потому что в любом институтском плане, отчете мы должны вставлять определенные цифры, от которых зависит рейтинг института и его статус, но не финансирование. Это приводит к тому, что непосредственно от Академии наук начинают требовать каких-то там технологических решений. Это довольно безумная затея, потому что нет людей, которые могут провести научную идею по всем технологическим стадиям и довести ее до продукта. Сейчас я заведую лабораторией, у нас есть разработки, которые могли бы стать продуктом, но, к сожалению, нет людей, сотрудников и коллег, которые бы серьезно интересовались этими разработками, потому что они прекрасно понимают, что в этот путь нужно вложить много денег. Мы очень много общались с различными инвесторами: и с государственными инвестиционными компаниями, полугосударственными, и с венчурными капиталами, и даже с «Роснано», в котором наш проект уже третий год проходит экспертизу. Но все это ничем не конча-

ется, потому что отсутствуют те самые прикладные институты (их потерю я считаю очень большой ошибкой), которые были раньше, которые брали на себя и выполняли полезную функцию доведения высокой фундаментальной научной идеи, хотя бы до промышленного полупродукта.

Когда от нас требуют эти инновационные разработки, то, естественно, это приводит к нехорошим последствиям. И я это наблюдаю. Раз нам надо включать «инновации» в какие-то пункты, мы начинаем более свежие идеи выдавать за инновации, говорить о них как об инновациях, отчетливо понимая, что это совсем не то, о чем идет речь. И складывается впечатление, что те люди, которые предъявляют нам такие требования, они, собственно говоря, большей частью тоже манипулируют какими-то бумажными цифрами, чем действительными реальными делами. Есть интересные и очень перспективные работы и исследования, так называемые ориентированные исследования, то есть исследования, ориентированные на выход какой-то конкретной продукции. Но для того чтобы действительно этот продукт получился, научная идея должна пройти очень большой путь и должна идти рука об руку с инженерными науками, с практиками, которые были бы в этом кровно заинтересованы.

Недавно я вернулась с заседания бюро нашего отделения химии и наук о материалах в академии, которое было связано с переименованием и получением нового названия и утверждением нового устава, а также с вопросами дальнейшего финансирования. Там нам рассказали, что грантовое финансирование, которое шло через академию, то есть через программы отделений, через программы Президиума академии наук на 2012 год будет сокращено на 25–30 %. Это и так были не деньги, а можно сказать «слезы», которые всерьез рассматривать нельзя, а уж думать, как на них оборудовать лабораторию — это представляется весьма проблематичным. Тем не менее даже эти деньги будут сокращены.

Работая в Германии, я совершенно без проблем получила 4 гранта Немецкого научного общества, будучи даже иностранкой. Эта организация — Немецкое научное общество — финансирует работы, представляемые как фундаментальные исследования. Деньги при этом выделяются весьма скромные. Последний грант, который мы имели, — это порядка 70 000 евро на 2 года, то есть 35 000 в год. Естественно, на эти деньги тоже не купишь оборудования, но там с оборудованием не было проблем. Значительную часть вложений в науку осуществляют различные коммерческие негосударственные фонды. Это и большие индустриальные концерны, такие как Volkswagen и другие. У них есть свои фонды, которые ориентированы на поддержание научных исследований. И там, естественно, более серьезные деньги. Сейчас мы получили грант, который измеряется уже 500 000 евро на 2 года. Конечно, фонды практически ориентированы, и при подаче заявки нужно это учитывать так же, как и заинтересованность финансирующей стороны в конечном продукте, который можно будет продавать и который позволит хотя бы частично компенсировать те затраты, которые этот фонд терпит, финансируя разработку. То же самое, насколько я знаю, происходит и в других странах Западной Европы. Насчет США я не буду говорить, потому что я не работала в Штатах, но у меня есть коллеги, которые там работают. С их слов я знаю, что там есть государственные фонды, которые серьезно поддерживают науку, но все-таки основная часть поддержки идет через коммерческие и частные фонды.

Что у нас в стране? Наши коммерческие и венчурные фонды очень бюрократизированы. «Роснано» — это вообще что-то страшное. Два года я сижу с ними за столом и обсуждаю, обсуждаю, обсуждаю, и конца края этим обсуждениям нет. То есть у нас все все-таки уповают на государственную поддержку. А что такое государственная поддержка? Если говорить об академии наук и ее грантах — это гранты академических программ, но эти деньги все время сокращаются. Сейчас я честно могу сказать: стою перед выбором. Меня приглашают работать. Я знаю, какие финансы идут сейчас в университеты (во всяком случае, в те, которые являются национальным достоянием: в Санкт-Петербургский государственный университет, Московский государственный университет, Екатеринбургский государственный университет, Казанский государственный университет и Краснодарский государственный университет). Если говорить об академических и университетских вливаниях, то деньги там просто фантастические. Я знаю, что на химический факультет в конце этого года пришел 1 млрд рублей на оборудование, который нужно мгновенно освоить. Весь факультет находится все время в режиме низкого старта — постоянно готовя заранее какие-то бумаги, счета, договоры с фирмами. Это уже очень серьезная база. Я своими глазами видела на химическом факультете два новых ресурсных центра: спектроскопический и аналитический, которые стоили миллионы долларов. Поэтому тенденция, которая вырисовывается, представлена следующим образом: есть университеты, являющиеся национальным достоянием и имеющие огромный бюджет, но есть вузы, которые, естественно, этого не имеют и неизвестно, будут ли иметь. Но сама тенденция сращивания науки с образованием не нова. В Европе, Америке и где угодно основная наука делается на базе университета. Наши пришли к такому же выводу, что нужно революционным или эволюционным путем примкнуть к этой картине мира. По сути, идея очень хорошая, и мне она очень нравится, потому что у меня в Академии наук, например, лаборатория построена по университетскому принципу. Почему она так построена? Потому что я имела возможность сделать таким образом, так как долгое время сама работала в университете и могла выбирать студентов. Лаборатория построена по пирамидальному принципу, то есть профессор, ассистенты (кандидаты наук), далее — аспиранты всех годов обучения, потом дипломанты, магистранты и бакалавры, а также студенты, которые готовятся только стать бакалаврами или магистрами. Постоянный штат лаборатории очень маленький, а остальной штат складывается из перечисленных мною людей. Я знаю, о чем говорю. Это действительно хорошо управляемая структура, состоящая из высокомотивированных молодых людей, которые приходят и работают, несмотря на низкие стипендии и зарплаты. Они работают на свое будущее, потому что мы сразу начинаем посылать их за рубеж работать, мы пишем статьи в журналы с хорошим импакт-фактором, они попадают в мировую сеть, они начинают учить языки, и, как правило, они выходят из аспирантуры уже со знанием одного-двух иностранных языков, и дальше, если у них есть желание, я с удовольствием их протежирую на какое-то время на работу за рубежом. Кроме того, такой симбиоз университетов и науки повышает качество образования, потому что на самом деле образование продолжается и на рабочем месте. То, что студент после курса лекций приходит на какую-то хорошо оборудованную и экипированную кафедру с хорошим преподавательским составом, с хорошим примером перед глазами, или в какой-то хороший научно-исследовательский центр и продолжает что-то делать там, прикладывая то, что он

услышал на лекции, — это действительно предполагает повышение уровня образования и повышение уровня компетентности тех молодых людей, которые выходят из университета после обучения. Но для нас пока эта система является не на 100 % работающей, потому что в тех же университетах есть сильные кафедры, есть кафедры «так себе», есть и совсем слабые, которые вообще не в состоянии принимать студентов и выполнять дипломные работы, отсылают их в другие организации, в частности к нам в академию наук. Сейчас наше правительство направило силы на то, чтобы все-таки науку перетащить в университет. Это, с одной стороны, хорошо, но с другой — там есть свои подводные камни, о которых я сейчас не хочу говорить. Могу лишь сказать, что там все непросто. Как, что из этого получится в конечном счете — не знаю. С одной стороны, я оптимистично смотрю на эту картину, но, с другой стороны, зная наши реалии и нашу действительность...

Теперь по поводу академии наук: это прогрессивная организация или устаревшая форма? Я не знаю, как сказать помягче, потому что, как я уже неоднократно повторяла, я — академический человек, я выросла в академии, многим ей обязана. Но опять же, если вспомнить теорию нобелевского лауреата Пригожина: всякая структура в конечном счете должна превратиться в хаос, чтобы потом структурироваться уже на какой-то новой основе. К сожалению, в 1990-е годы академии был нанесен серьезный урон. Существует масса моментов, делающих ее недееспособной. Если бы спросили моего мнения о том, что делать с академией — реформировать ее или закрыть, я бы ответила следующим образом: для реформ время уже ушло, чтобы делать что-то глобально-серьезное. Если бы я была на месте правительства, я бы оставила академию в покое, а стала бы делать какую-то параллельную структуру с хорошей, здоровой основой и идеей. Тогда люди из академии наук, которые еще способны и хотят работать в науке, так или иначе перетекут в эту новую систему.

**Вопросы докладчику:**

**1.** Относительно академии вы высказали свое мнение — дипломатично, но суть дела ясна. У меня несколько частных вопросов. У вас в институте существует такая система: плановые темы утверждаются на 3–5 лет. В Германии та же система?

**Татьяна Борисовна:** Нет, в Германии нет такого жесткого планирования, контроля над планами.

**2.** Засчитываются ли работы, выполненные по грантам, как плюсы к так называемой плановой части или же это совершенно отдельная работа?

**Татьяна Борисовна:** Конечно, засчитываются, но, как правило, все работы, которые подаются на гранты, являются плановыми. Такого, чтобы люди просили поддержку в работе вне плана, я, честно говоря, не знаю.

**3.** Имели ли вы дело со «Сколково»? Если имели, то какой у вас опыт?

**Татьяна Борисовна:** Мы — нет, но я знаю людей, которые имели дело со «Сколково», поэтому мы не стали иметь. Я присутствовала на очень многих заседаниях, посвященных этой организации. Там достаточное количество ограниченных тем, которые я не знаю, кто взял. Там масса советов, комиссий, которые ведут отбор проектов для того, чтобы они были приняты под эгиду «Сколково». Пройти через всю эту бюрократизированную систему человеку со стороны, как ни грубо это звучит, достаточно сложно. Но прецеденты есть. Я знаю такой прецедент в Екатеринбурге. Их включили с какой-то разработкой, но не в текущий, а в перспективный

проект «Сколково», стали финансировать эту работу, но ровно в течение трех месяцев. На четвертый месяц финансирование прекратилось, но машина была уже запущена. С них требовали отчеты по этой работе, а где-то через 6 месяцев все закончилось.

**4.** Вы сказали, что вы можете привлекать аспирантов благодаря тому, что работали какое-то время в университете. Если бы вы не работали в университете, была ли бы у вас возможность привлекать аспирантов и каким образом?

**5.** Для сотрудников вашего института, если они захотят поработать в университете, насколько легко им туда попасть, совмещая это с работой в институте?

**Татьяна Борисовна**: Я сказала, что у меня была возможность выбора лучших студентов, то есть не просто студентов, а тех, кого я видела в лицо в учебном процессе. Поэтому я могла приглашать тех, кто уже казался мне перспективным. Как я уже говорила, некоторые кафедры университета просто не могут обеспечить всех студентов работой на своей территории, поэтому они приходят к нам и просят принять студентов на дипломную работу, потом, если они захотят, в аспирантуру и т. д. Что касается работы в университете наших сотрудников — да, у нас довольно много сотрудников работают на химическом факультете и совмещают эту деятельность.

**6.** Не возникало ли таких ситуаций, когда увольняются из университета из-за академии?

**Татьяна Борисовна:** Нет, нас это не касалось.

**7.** Вы, должно быть, знаете перспективы развития такой системы, как подготовка кадров. На примере моих аспирантов, я могу сказать, что ходят слухи о том, что допуски отменят, кандидатских не будет, что ВАК реорганизуют, а советы распустят. Мне бы хотелось, чтобы вы внесли какую-то ясность. Я знаю, что за рубежом совсем иная система подготовки кадров. И я знаю, что мы слепо идем — как за рубежом, так и у нас.

**Татьяна Борисовна:** Да, я знаю, что сейчас даже на сайте ВАК вывешено специальное объявление о том, что все слухи о закрытии советов не имеют под собой оснований. Что касается общей PhD степени, которая есть за рубежом, а у нас делится на две степени: кандидаты и доктора наук — может быть, в перспективе мы к этому придем, как пришли, например, в Чехии. Там они очень быстро встроились «в хвост» Германии и, отказавшись от нашей системы, стали готовить PhD. У нас даже было специальное заседание в академии по этому поводу, но пока речь не идет о таких изменениях. Что касается советов: сейчас, действительно, ужесточаются требования к диссертационным советам, потому что их в России просто тьма. И в первую очередь, эти ужесточения будут касаться советов, которые выпускают только кандидатов наук. Если совет докторский, то есть он имеет право выпускать и кандидатов, и докторов наук, то эти советы никто не собирается закрывать.

**8.** Позвольте уточняющий вопрос. Скажите, пожалуйста, вот специализированный докторский совет по специальности. Ограничивается ли качество этого ученого совета? Должно ли быть определенное количество представителей, защитившихся именно по этой специальности, или как у нас происходит: Иван Петрович Петра Ивановича привел и соответствующим образом организовали совет?

**Татьяна Борисовна:** Сейчас, как я и сказала, происходит ужесточение правил для диссертационных советов. Будет обращаться внимание на то, что все-таки

большая часть (не могу точно сказать процент, но порядка 70 % членов диссертационного совета) должны соответствовать специальности.

**9.** Я бы хотел узнать ваше мнение в отношении нашего круглого стола. Когда мы говорим о научной деятельности в России и, допустим, в Европе, то о какой науке в России мы будем говорить, сравнивая? Если об академической науке, то она деморализована уже настолько, что сегодня мало кто не плюнет в эту урну, так сказать. Если говорить о вузовской, то она еще только начинает. Если говорить о ВПК, то можно говорить — не говорить — мы ничего не узнаем о тех, кто работает на ВПК. О какой науке мы сегодня будем говорить и с какой мы можем сравнивать? Потому что все, что сегодня здесь выясняется, — это то, что все у нас хуже.

**Татьяна Борисовна:** Я бы не стала вообще делить науку, говоря об академической, вузовской или какой-то другой. Мы говорим об организации науки, а не о науке как таковой. Как я себе это представляю. Наука — это общее понятие, — это накопление знаний, перевод этих знаний в какие-то законы, опыты, обмен знаниями. Это характерно для вузовских наук и прочих. Если говорить о фундаментальной, например, науке и ориентированной (сейчас не говорят «прикладная наука», это считается нехорошим словом), то эти вопросы можно обсуждать. На Западе вообще заниматься фундаментальной наукой (basic research) — почетное право, и, как я уже сказала, поддержка такого рода исследований очень ограничена. Очень небольшой круг ученых может позволить себе заниматься такой высокой наукой, оторванной от практики. А ориентированная наука — это немножко другое. Что мы сегодня здесь обсуждаем, вы спрашиваете у меня? Я думаю, что мы обсуждаем организацию науки там и организацию науки у нас. С этой точки зрения, у нас — да, сейчас все хуже, потому что академия, как вы правильно сказали...

**Реплика с места:** Извините, что я Вас перебью. Только «организация» больше похожа сейчас на дезорганизацию, когда урезается государственное финансирование и квоты, когда сегодня уже не платят институтам за свет и электроэнергию, говоря о том, что платить вы будете сами, мы вам платим только зарплату. Причем инфраструктурные подразделения давно сокращены. Они убежали еще тогда, когда в 1990-м году перестали платить зарплату. Они ушли все в другие организации. Остались одни ученые, которые делают все сами: ремонтируют, покупают, изготовляют, рассчитывают и ведут бухгалтерию, потому что никто больше делать этого не может. Их нет. Так можно ли эту организацию назвать организацией?

Можно еще одно дополнение — деньги, полученные по грантам, мы не имеем право тратить на плановую тему? Мы должны заниматься чем-то другим, а не тем, что по плану?

**Татьяна Борисовна:** Это — да. На это я хочу сказать следующее. Вот это дезорганизация, и я с вами согласна, что это действительно дезорганизация. Но у нас есть организаторы в виде наших академиков, Президиума Академии наук. Они все время обсуждали какие-то вопросы с теми людьми, от которых мы финансово зависим. Мы с вами ничего не решаем, и мы не общались с президентом и другими. Почему наше правительство в виде Президиума Академии наук довело это все до такого состояния? Почему они не боролись?

**Реплика с места:** Дайте сказать. Наш сегодняшний «стол», очевидно, настолько ценен, насколько он выработает какую-то оценку ситуации, которая сейчас есть, и, во всяком случае, послужит основой для каких-то публикаций, правильно?

Потому что иначе, в противном случае, мы просто собрались поговорить, разошлись и испортили друг другу настроение.

**Самуил Аронович:** Вы правы, уже испортили. Так, ну все, спасибо, пусть теперь выступят те, которые уже готовились специально, а потом уже еще вопросы и краткие выступления. Иногда по телевидению с четырех до шести вы, наверно, иногда слушаете... «Открытая студия»... Так называется? Там какие-то темы, многие актуальные, но ни разу я не слышал, чтобы они приняли решения, которые эту ситуацию могли бы кардинально изменить. Тут дело не только в наших академиках. Прямо скажем, дело в политике научной, которая у управленцев была. Мне так кажется... Пожалуйста, Владимир Анатольевич.

**Ерохин Владимир Анатольевич, доктор физико-математических наук:** Добрый день. Я хочу сказать, что являюсь представителем активной части ученых в том смысле, что я, прежде всего, ученый. Я занимаюсь исследованиями в области теоретической атомной физики. По роду занятий от половины до трети времени я провожу за рубежом. Прежде всего, в Германии, но отчасти и во Франции, Польше. Поэтому я знаю систему организации европейской науки не со стороны, а вполне в нее вовлечен. И с другой стороны, я также отчасти вовлечен через национальную контактную точку в систему организации науки, поэтому у меня, возможно, есть еще перспективы. Я сейчас попробую поделиться своими наблюдениями и, возможно, обобщениями по поводу тенденций в системе поддержки фундаментальной науки в Европе. Если мы возьмем последние двадцать или тридцать лет, то, я думаю, что не открою большого секрета, если скажу, что наблюдается довольно выраженная диспропорция между финансированием фундаментальной науки и прикладной в сторону прикладной науки. И причины здесь, в общем, вполне понятны. Дело в том, что традиционное финансирование фундаментальной науки рассматривается в рамках так называемой линейной инновационной (53.43) модели, где сначала идет фундаментальное исследование, потом в какой-то момент оно перетекает в прикладные исследования, потом в научно-конструкторские разработки, которые, в конце концов, дают продукт. Сама по себе эта модель не вызывает особенных вопросов. Вопросы начинаются там, где эта модель начинает прикладываться в рамках, например, отдельно взятой страны. Представим себе небольшую европейскую страну, Бельгию например, и финансирующее агентство. Оно задается вопросом: «Какова вероятность того, что какой-нибудь прорыв в фундаментальных исследованиях, достигнутый за счет денег налогоплательщиков Бельгии, будет реализован в какую-нибудь инновационную разработку в этой же самой Бельгии?» При этом нужно понять, что дистанция между фундаментальной наукой и инновацией сейчас составляет где-то тридцать-сорок лет. И с учетом глобализации современной науки понятно, что эта вероятность не слишком высока. Я намеренно все утрирую. Тем не менее такая действительность существовала, и это явилось одной из причин, почему центр тяжести финансирования был смещен в сторону конца инновационного процесса, то есть от фундаментальных к прикладным разработкам. Надо сказать, что именно это мы сейчас наблюдаем в России. Нам говорят, что наука должна выдавать результаты для народного хозяйства. И если не в этом финансовом году, то хотя бы в следующем. Надо понимать, что это не только наша российская особенность, что Европа, в общем, впереди нас в этом отношении лет на двадцать, и что мы можем уже посмотреть, к чему это их привело. Как нетрудно догадаться, ни к чему хорошему эта тенденция, в общем,

не приводит. И, как следствие, в последние годы большое число публикаций в западной прессе, в аналитических работах, в которых обращают внимание на очень тревожные факты. Во-первых, это нарастающая потеря конкурентоспособности передового края европейской науки в сравнении с американской. Это «утечка мозгов» из Европы в Соединенные Штаты. Это стремительно сокращающийся разрыв с передовыми азиатскими странами. Я процитирую более подробно резюме аналитического обзора Европейской комиссии, которая говорит о том, что в США сейчас выходит треть мировых публикаций, которые получают половину от общего числа мировых цитирований и представляют собой две трети от общего числа выдающихся исследований, то есть сформулирован вывод о том, что наука в Соединенных Штатах качественно опережает европейскую науку. При этом если брать средние показатели, то объединенная Европа примерно соответствует Соединенным Штатам, где-то Европа впереди, где-то — США. Если брать именно передовые, ведущие исследования, там США уверенно лидируют практически по всем направлениям.

Об основных проблемах европейской науки — тоже по аналитическим материалам. *Первое* — это неоригинальные замечания об уровне финансирования, то, что процент бюджета на RNDI... development (58.14) в объединенной Европе отстает от соответствующего процента в Штатах и в Японии. *Второе* — это упреки в неэффективности общей политики и раздробленности усилий в европейских странах, поскольку стандарты в разных странах Европы разные. Это создает барьеры для перемещения ученых внутри Европы. И *третья* больная проблема Европы — это отсутствие прозрачного механизма роста для молодых ученых: от защиты кандидатской диссертации PhD до получения постоянной профессорской позиции. В частности, практическое отсутствие в Европе аналога американской системы, когда академические позиции являются сначала временными, потом, в результате оценки независимыми экспертами деятельности человека, они конвертируются в постоянную позицию. Можно заметить, что текстуально эти проблемы вполне соответствуют тому, что сейчас пишут и говорят про российскую науку, хотя, конечно, в наших российских реалиях эти проблемы наполняются несколько иным смыслом. Надо сказать, что, к чести европейской системы, эта озабоченность услышана. Она была озвучена на самом высоком уровне и на представительных конференциях. И предпринимаются довольно серьезные шаги по компенсации существующего дисбаланса. Одной из наиболее заметных попыток решения этой проблемы явилось создание в 2007 году нового финансового агентства. Это европейский исследовательский совет. Он формально действует в рамках седьмой рамочной программы. Тем не менее, сегодня он является вполне независимым игроком на рынке финансирования научных исследований. Понятно, что те неполные пять лет, которые он работает, в общем, слишком малый срок, чтобы делать какие-то выводы, но, тем не менее, широко распространено мнение, что европейский исследовательский проект — это лучшее, что произошло в финансировании фундаментальной науки в Европе за последние годы, и это и лично мое мнение. Деятельность этого совета была признана настолько успешной, что в программе развития Европы 2020 предусматривается увеличение его бюджета на 77 %, при том что в настоящий момент его бюджет 7,5 млрд евро на период 2007–2013 годов. Это, по европейским меркам, достаточно серьезные деньги. Что же он из себя представляет? Если искать пример в наших российских реалиях, это будут мегагранты

Минобрнауки. Понятно, что отличий здесь, наверно, больше, чем сходств, но, тем не менее, это можно привести в качестве примера. Это попытка сформировать небольшое количество, порядка 300–500, очень больших и очень престижных грантов. Размер грантов составляет порядка 1,5–2, в некоторых случаях 3–4 млн евро на срок до пяти лет, которые даются фактически под одного человека. В реалиях Европы это, наверно, самый большой и самый престижный грант, который один человек может получить на научные исследования, из которых он может платить зарплату. Большой конкурс и большой размер гранта призваны сделать его действительно престижным, нечто вроде маленькой Нобелевской премии, и повысить привлекательность европейского пространства, в первую очередь, для мировой научной элиты. Концепция концентрируется вокруг понятия «прорывные исследования», но в Европе его понимают немного по-другому, чем обычно это интерпретируется в нашей прессе. «Прорывные исследования» понимаются как фундаментальный прогресс знаний или понимания мира без каких-либо ограничений на область знания или направление. Это подход «снизу вверх», они называют это “bottom up approach”, в котором исследователь волен заниматься всем, чем угодно, но должен обещать достичь существенного прорыва по сравнению с мировым уровнем в выбранной им теме. Выбор того, какие именно из исследований должны обеспечить искомый фундаментальный прогресс, достигается в рамках независимого экспертного рецензирования. Следует сказать, что это организация нового для Европейского союза типа. Во-первых, она управляется самими учеными. Во главе стоит совет, который состоит из ученых мирового уровня, которые определяют политику фонда. Он старательно проводит дистанцию между любыми политическими мотивированными решениями, и для Европейского союза это действительно новое слово, потому что для европейских программ характерен принцип «справедливая отдача», в которой из общих европейских программ европейские страны получают примерно в соответствии с собственным вкладом. Здесь речь не идет о «справедливой отдаче», фонд подчеркивает, что критерии отбора исключительно научные. Можно еще отметить, что отдельный вид грантов назначается для молодых ученых, которые должны формировать научную элиту следующего поколения. И они предназначены для обретения ученым независимости именно для облегчения шага, для создания молодым ученым научной лаборатории или собственной научной группы. Я могу сказать, что за пять лет своего существования они сумели поддержать весь свет, по крайней мере, молодой европейской науки. Из тех имен, что на слуху, можно назвать Константина Новоселова — Нобелевский лауреат по физике, Константина Смирнова — медаль Филдса. Причем и Нобелевскую премию, и медаль Филдса они получили уже после того, как у них были гранты Европейского исследовательского совета. И многие другие. То есть они действительно сейчас делают очень и очень хорошую работу.

Еще я хотел бы остановиться на концепции перспективных исследований, потому что сейчас это звучит очень часто и в российской прессе. Действительно, часто делаются попытки сформулировать список приоритетных исследований в надежде на то, что концентрация средств на сравнительно небольшом количестве направлений поможет повысить отдачу в виде научных продуктов или каких-либо инновационных разработок. Следует сказать, что термин «перспективные исследования» может употребляться в двух смыслах. Первый смысл — чисто научный. Есть направление, которое, с точки зрения компетентных и непредвзятых экспертов,

является перспективным в науке и т. д. И другой смысл — это финансовое направление, вклад в которое может принести наибольшую отдачу вкладываемых в научные разработки средств. Часто предполагается, что эти два смысла если не эквивалентны, то, по крайней мере, сопровождают друг друга. Я хочу сформулировать тезис противоположный, а именно — что в тот момент, когда направление становится действительно перспективным так, что всем экспертам это уже очевидно, вкладывать деньги в это направление уже поздно. Следует понимать, что современная наука отличается исключительно острой конкурентной борьбой. Очень нередки случаи, когда прорывные результаты публикуются различными конкурирующими группами в одном выпуске журнала или в соседних. Причем на получение этих результатов затрачено, может быть, десять лет и больше. То есть можно себе представить какая конкуренция должна быть, чтобы на забеге в десять лет результат был получен с разрывом в несколько недель. Это значит, что в тот момент, когда направление становится перспективным, по нему существует уже много групп, которые в данном направлении работают на протяжении десятилетий. И в тот момент, когда они сделали это направление очевидно перспективным, они получают уже максимальное финансирование в рамках существующей системы. Это значит, что для финансирующего агентства, если у него нет уже группы, которая работает на мировом уровне по этому направлению, финансировать направление бессмысленно, потому что деньги уходят в песок и разрыв с мировыми лидерами только увеличивается. И это осознание присутствует в европейских финансирующих агентствах — направления следует финансировать до того, как они становятся перспективными, с одной стороны, и, с другой стороны, практически невозможно предугадать, в какой области науки произойдет очередной прорыв. Это приводит к тому, что в последнее время большой популярностью пользуется концепция +K Research. Этот термин не имеет ничего общего с метеорологией. Я бы его вольно перевел как «концепция поддержки исследований без заранее установленных приоритетов». И концепция, по-моему, хорошо иллюстрирует высказывание, что самолеты появились не в результате новых потребностей общества в средствах передвижения, а в результате извечной мечты человечества о полете. В рамках такой концепции основными критериями отбора на финансирование новых исследований является творческий потенциал научной группы или исследования и амбициозность поставленных задач. При этом допускается определенный риск, что может не получиться, что заявленная задача не будет решена. Соответственно, надежда на то, что выход от успешных проектов покроет расходы на неудачные проекты. Это так называемый подход “High risk, high gain” — «Большой риск — большая отдача», которым также руководствуется, в частности, Европейский исследовательский совет. В этом контексте, конечно, большое значение приобретает борьба за научные таланты. Всем, я думаю, хорошо известен тот факт, что 90 % научных продуктов производится 10 % ученых. Этот закон был сформулирован почти сто лет назад. Тогда в помине не было никаких библиографических систем. Если брать выдающиеся исследования, действительно вносящие вклад в мировую науку, они будут распределены еще более диспропорционально. И поэтому вывод Европейского исследовательского совета о том, что борьба за научный талант очень остра между лидирующими игроками на мировом научном рынке. Она будет только обостряться по мере того, как общество входит во все более наукоемкую постиндустриальную фазу.

И последнее, что я хочу сказать, — тоже из опыта работы Европейского исследовательского совета. Привлекая ведущий научный талант, помимо прямого результата в виде научных работ высочайшего уровня, получают своеобразный эффект доминант, который называют “excellence attract excellence” — «талант притягивает талант». Анализируя результаты деятельности Совета за пять лет, можно увидеть, что гранты поделены между 410 университетами в Европе. Тем не менее 50 % грантов сосредоточены в менее чем 10 % университетов. Это значит, что действительно “excellence attract excellence”. Эти престижные гранты имеют тенденцию образовывать центры, которые притягивают к себе молодых и перспективных исследователей. Тройка ведущих университетов Европы по числу грантов выглядит следующим образом: университет Кембриджа в Великобритании, университет Оксфорда в Великобритании и Шведский институт. На этом я, наверно, закончу.

**Самуил Аронович:** Спасибо большое. У меня есть пара вопросов. Вы можете не отвечать, я Вас потом еще поймаю. Значит, первый вопрос. Очень интересно все то, что Вы говорили. Я, как главный редактор журнала «Социология науки и технологии», приглашаю Вас написать статью. Итак, к вопросу... Значит, Вы предлагаете финансировать направление с риском? Судя по Вашему выступлению, не так важно, что что-то не получилось... Мне кажется, что в Вашем выступлении потерялась научная бюрократия. Или ее там нет? Только у нас?

**Владимир Анатольевич:** Я хотел бы заметить, что пытался не озвучивать свою личную позицию. В данном случае я пытался говорить о тенденции и практике. Если говорить о личной позиции, то не нужно забывать, что все-таки научное финансирование и в Европе, и в США отличается большой однородностью, то есть можно утверждать, что группа, которая работает на международном уровне, получает финансирование, — условия для работы есть. Можно говорить о том, что она получает больше или меньше. В США она получает больше, но, тем не менее, условия есть. Если говорить о поддержке прорывных, перспективных, элитных направлений, то речь идет о дополнительной поддержке, об особых усилиях.

По поводу бюрократии. Бюрократия, конечно, есть. В этой связи я хотел бы процитировать сравнение, которое делал Константин Новоселов. Он также сравнивал системы финансирования в разных странах. Он говорил о том, что отчет по гранту в США составляет две страницы. Отчет по гранту Европейского исследовательского совета — не заключительный, правда, а промежуточный — семнадцать страниц. Характерный, типичный отчет европейского гранта составляет двести страниц.

**Самуил Аронович:** Какие вопросы? Пожалуйста.

**10.** Спасибо за подробную структуру, изложенную здесь, этих замечательных направлений финансирования научных исследований. Это очень интересно. Особенно интересны два чарующих слова — финансирующее агентство. Вот хотелось бы узнать о них более подробно. Может быть, я прослушал, и Вы сказали, с кем имеют связь эти финансирующие агентства? Или они имеют дело с бюджетом, или они имеют дело частным капиталом? И зачем они вкладывают эти деньги?

**Владимир Анатольевич:** В отношении Европейского исследовательского совета это, скорее, на нашем языке бюджет. То есть он технически действует в рамках Седьмой рамочной программы Европейского союза, и деньги берутся из взносов стран-участниц Европейского союза, из взносов в совместные программы. Я использовал термин «финансирующее агентство», потому что в Европе достаточно

большой ассортимент этих агентств, а некоторые из них государственные, как, например, Немецкое научное исследовательское общество. Есть агентства, которые финансируются индустрией, есть какие-то совместные схемы. Если финансирование идет без какого-то дальнейшего перевода этих изобретений, этих результатов в сферу бизнеса, то агентства должны быть каким-то образом заинтересованы, потому что иначе они вряд ли будут вкладывать деньги. Вот у нас, например, плановый бюджет. И говорят, что проедают ученые весь бюджет и никакой отдачи нет. А там как они заинтересованы?

Это как раз то, с чего я начинал свой рассказ. Фундаментальная наука финансируется в основном из бюджета — это деньги налогоплательщиков. Традиционная проблема фундаментальной науки в том, что налогоплательщикам нужно объяснять, зачем и куда уходят эти деньги. Однозначного ответа на этот вопрос нет. Тем не менее все-таки существуют некие схемы, которые работают, — есть понимание, что фундаментальная наука нужна для развития общества. Она нужна и на масштабе 30–40–50 лет дает какую-то отдачу. Но понимание пониманием, а вопрос, где находится центр тяжести финансирования, — это уже более технический вопрос, и он может варьироваться в зависимости от страны, в зависимости от политической конъюнктуры.

**Самуил Аронович:** Может быть, тогда оставим время Михаилу Михайловичу? А потом уже будут другие вопросы. Михаил Михайлович, пожалуйста.

**Соколов Михаил Михайлович, кандидат социологических наук:** Во-первых, я буду выступать, опираясь в бóльшей степени на литературу, чем на собственный опыт. Зато этой литературы будет много, потому что социология науки — это моя основная специализация в последние годы. Во-вторых, я буду клониться в сторону социальных и гуманитарных наук, то есть на самом деле на не совсем настоящие науки.

Говорить о науке в целом сложно, так как наука очень разнородна. Там очень много разных специфических практик, даже внутри одной и той же дисциплины. В общем, это совершенно разные миры и совершенно разные формы работы. Поэтому любые обобщения «про науку» могут быть спорными. Институт, который может быть хорош для одной академической культуры, может быть убийственным для другой. Социология не наука, если представлять ее себе как «правильную» науку физику (а она, разумеется, такой не является), социология может преподать только некие очень практические вещи. В основном, она позволяет нам посмотреть на происходящее глазами других людей. Разные люди видят одни и те же вещи очень по-разному, а социологи занимаются тем, что спрашивают о том, как же они их видят, а потом рассказывают о том, как вы выглядите с точки зрения тех, с кем вы давно взаимодействуете. Это не то, чтобы большая хитрость или большая наука, но это очень полезные практические вещи. Наконец я расскажу немного об организации, которую представляю — Европейский университет в Санкт-Петербурге. Это необычная институция для всей постсоветской науки. Она вообще не связана с государством, не связана с государственным бюджетом. За время своего существования Европейский университет никогда не получал денег из государственного бюджета напрямую в сколько-нибудь значимых объемах. Единственное, чем он пользуется, это налоговыми льготами при аренде здания. До какого-то момента в недавнем прошлом мы существовали в основном за счет западных грантов, а сейчас — за счет частных российских доноров. В этой работе

приходилось не брезговать никакими источниками, так что мы получали деньги от «Роснано», от «Сколково», мы почти выиграли мегагрант на развитие социальных исследований науки и технологии.

Я, наверно, остановлюсь не на всех вопросах из списка, а на тех, в которых речь идет о состоянии Академии наук и ее перспективах. Попробую немного заострить внимание на вопросе — была ли Академия наук в той форме, в которой она существует, обречена с самого начала? Сегодня мы знаем, что она находится в тяжелом положении, у нас есть разные предположения, почему она в нем находится. Можем ли мы сказать, что с самого начала этот проект был неудачным? Люди, которые защищают Академию наук, могут сказать, что в ней работало очень много ученых. Достаточно указать на эти стены, чтобы увидеть многих из них. В XX веке, после Второй Мировой войны, эти ученые совершили замечательные открытия. Все это правда, но тут, как всегда, есть хитрости, даже несколько хитростей. Говорить об Академии наук как об одной организации сложно, потому что там есть известная преемственность, но при этом произошла принципиальная смена организационных принципов, как все собравшиеся очень хорошо знают. И то, что было до 1917 года, было, по современным меркам, подобием Принстонского института продвинутых исследований или перспективных исследований, в который попадает некоторое число выдающихся ученых, а им дают возможность на государственные деньги за очень несложные повинности, вроде обучения наследников, удовлетворять свое любопытство. Тут нет никаких вопросов. Как известно, после 1917 года есть короткий промежуток, после которого правительство решает, что делать с Академией наук, — там располагались «буржуазные» академики, некоторые были кадетами, были замечены в политической активности. Потом правительство решает оставить ее как есть, правда, тогда уже вызревает идея: хорошо бы, чтобы она была подальше от университетов. Пусть они занимаются своей наукой, главное, чтобы студентам свои идеи не прививали. Как утверждает один из историков российской науки, вот это разделение исследования и образования отчасти было политически мотивировано. Академии начинают передавать институты, в 1917 году — один-единственный институт, созданный на общественных началах, а потом начинает появляться грандиозная система и экспансия, которая продолжается до 1970–1980-х годов. Появляется огромное Министерство науки. Это единственный в своем роде эксперимент. Следующие Академии наук, которые появляются, очень похожи или прямо копируют советский образец. Это социалистические страны в Восточной Европе и некоторые азиатские страны, идущие по социалистическому пути развития. Академия наук очень любит сравнивать себя, чтобы показать, что она не чужда мировому опыту, с французской академией, которая, однако, работает по совершенно другой схеме, создает лаборатории, которые преимущественно работают в университетах. Это детище университета и национального центра, причем обе стороны вкладывают деньги в равных пропорциях. Какие-то ученые числятся на балансе центра, какие-то — на балансе университета, но это, как правило, не целиком академические предприятия. Такой формы, как у нас, когда люди занимаются только наукой, мы, скорее всего, в таком масштабе нигде больше не найдем. С самого начала у Академии были противники. Первый советский министр высшего образования в России Салтыков приходит с мыслью о том, что Академия должна умереть, и пытается вместо нее придумать какие-то другие формы. Он и какое-то количество реформаторов

предполагают, что эксперимент неудачный, что-то идет не так. Об этом пишут, к слову сказать, американцы, которые начинают экспериментировать с подсчетом количества публикаций и количества цитирований на одного ученого и на доллар, вложенный в науку, и говорят, что по этим параметрам Советский Союз проигрывает, проигрывает и по количеству Нобелевских премий, проигрывает по любым другим показателям. Если мы повторим все расчеты — получается то же самое. Если мы сейчас посчитаем затраты на одну публикацию — возьмем бюджет государств во вложения на исследовательские разработки и количество статей в индексе цитирования и посмотрим, сколько стоит одна статья, выясним, что современная Россия — это одна из стран с самой дорогой наукой. Я это как-то подсчитывал и выяснил, что одна статья стоит устрашающую сумму в 780 тысяч долларов. Ясно, что это очень условная цифра, потому что ВПК не публикует статей с большим госбюджетом. Они страдают, потому что вложили в науку, которую нельзя показать, а страны без большой армии и без закрытых расходов, которые содержат науку ради собственного удовольствия, выглядят лучше в таком сравнении. Например, Швейцария выглядит хорошо, очень хорошо. Но при этом получается, что какой показатель ни выбери, плохо будет выглядеть вся российская наука, и Академия наук, в частности, не очень хорошо выглядит. Их собственные наукометристы придумали, как посчитать, чтобы выглядеть неплохо, но сделали они это путем очень странных приемов, которые при ближайшем рассмотрении совершенно удивительны. В чем же дело? Почему Академии наук кажется, что до 1980-х годов, до того как начался экономический кризис, она занимала позиции? Ответ с социологической точки зрения. Джозеф Дэвид, один из главных социологов науки в XX веке, написал книгу о роли ученого в обществе. Главный тезис книги — развитие науки, с социологической точки зрения, происходило путем нескольких рывков или нескольких сдвигов. Есть изобретения, которые знакомы нам, — научные изобретения, технические инновации, а есть социальные, которые мы не очень замечаем. Когда появляется самолет, все понимают, что в небе какая-то новая штука, о ней пишут в газетах. Когда появляется социальная инновация, она не столь заметна, и мы ее не видим. Однако последствия, которые эти инновации имеют, могут быть не менее, если не более значительны. Развитие науки происходило путем нескольких таких инноваций. На протяжении нескольких столетий, с XI по XIV, сложился в знакомых нам формах университет. И это очень существенная инновация, потому что там происходит многое, что для современников было не очень заметно. Но при этом впервые возникает класс людей, которые занимаются сложными интеллектуальными новинками, преподают их студентам, они — совсем другая порода, не та, которая была раньше. С XVII века появляется научный журнал из смеси нескольких практик и институтов, уже появились какие-то газеты, появились добровольные ассоциации. Мы знаем, насколько это важная инновация для дальнейшей деятельности науки. Академия — это действительно наследие XVII–XVIII веков. Американская наука, об успехах которой столько будут говорить в XX веке, появляется за счет еще одной инновации — исследовательского университета, который тоже результат гибридизации разных институтов на американской почве. Эта гибридизация, этот институт оказывается способным успешно адаптироваться к новым условиям очень дорогой науки и не просто успешно адаптироваться, но и стать моделью, которую имитируют сегодня, которая, судя по политике современного российского Министерства образования и

науки, вытесняет из России доминирующую форму организации науки — Академию наук. Общее мнение — невозможность централизованного управления наукой, которое неизбежно начинается, если фундаментальной и прикладной наукой пытаются управлять как промышленностью или здравоохранением. Главный момент — целый цикл превращения фундаментального знания в прикладное — занимает 30–40 лет. Цикл, которым живет фундаментальная наука, и цикл, которым живет политика, любое государственное управление — это абсолютно разные циклы. И эти циклы «наталкиваются» друг на друга, потому что нормальный политический цикл это 3–4, максимум 5–6 лет. Политик думает, как избираться в следующий раз. Для этого нужно, чтобы избиратели увидели результаты его трудов, надо в обозримой временной перспективе предъявить свой успех. Если вы строите дороги, то избиратели катаются по этим дорогам и видят, что эти дороги работоспособны. Если вы вкладываете в здравоохранение и изменились поликлиники, снизился коэффициент детской смертности, — избиратели вам благодарны и понимают, куда вложили их деньги. Если вы вкладываете деньги в «оборонку», то здесь все сложнее. Результат не так просто показать, но в общем результат налицо: эффективность какой-то формы управления, эффективность капиталовложения, эффективность изменения политики — она видима. Одно из исследований, которые предпринимались в ранних 1990-х по поводу управления наукой, показало, что комитет, который руководил разными ведомствами, чтобы достигнуть лучших эффектов в оборонной промышленности, работал гораздо лучше, чем тот, который пытался координировать инновации в целом, потому что в оборонной промышленности была ясная точка сравнения — наши ракеты должны летать не хуже, чем их ракеты. Действительно, любой военный конфликт сталкивает военные технологии. Конфликт 2008 года с Грузией открыл много вещей. Например, российские беспилотники не летают, не могут выполнить ту задачу, которая перед ними стоит. Но это технологии, а не фундаментальная наука, с фундаментальной наукой так не получается — ее нельзя предъявить. Ученые говорят вам что-то, но вы не знаете, что они вам сказали. Любой чиновник, любой политик, любой администратор приходит в панику от этого положения вещей. Ученые, кроме того, просят дать им специальный закон о госзакупках, не тот, который действует. А с точки зрения чиновника, который не знает, что такое наука, но знает, что такое коррупция, этот закон о госзакупках — это грандиозная дыра, через которую можно столько денег «вылить». Если мы дадим «Сколково» особый налоговый статус, они начнут торговать водкой. Это доведенная до абсурда логика чиновника. История науки в России — это история последовательной попытки управлять ею так, как обычный нормальный человек, обычный администратор, умеет управлять. Некоторые из следствий этого мы до сих пор вполне ощущаем на себе. Кое-что закладывалось еще в Императорской России, например наша многоуровневая система степеней. Первые степени присваиваются на рубеже XVIII–XIX веков, устав 1803 года предписывает степени присваивать. А в 1816 году всплывает факт продажи степеней. Можно стать доктором юриспруденции, заплатив известную сумму руководству университета. Министерство народного просвещения — централизованный орган. Это разновидность институциональной инновации, это изобретение, которое имеет очень большие последствия, оно уникально. Есть централизованный рынок труда. Все конкурсы на все позиции проводятся через централизованные ведомства, но степени присваивает каждый университет. А в России

появился «банк», то есть централизовали выдачу степени, а не принятие каких-либо решений на рынке труда. Дальше действует та же логика. Мы пытаемся централизовать все в одно ведомство, мы пытаемся не допустить коррупции на местах. Мы подозреваем ученых в том, что они пытаются украсть наши деньги, и пытаемся сделать так, чтобы им, по возможности, было сложнее это сделать. Бесконечная бюрократия, она ведь вырастает тоже не на пустом месте. Не потому что чиновники сами по себе любят плодить бумаги, а потому что каждое введение в документацию дает иллюзию того, что это контроль, что мы видим, куда деньги ушли, что мы можем показать вышестоящему чиновнику, что процесс прозрачен. Самая известная и очень важная особенность такого управления наукой — это структурная логика, когда Академия наук структурируется так, чтобы избежать дублирования функций между подразделениями. Нужно, чтобы в организации каждое подразделение отвечало за свою задачу и функции не дублировались, потому что как только функции начинают дублироваться, между ними возникает конкуренция или, наоборот, никто ничего не делает и показывает пальцем в другую сторону, поэтому желательно, чтобы у нас наука была поделена на проблемы, за каждую проблему отвечал институт. Ясно, что в реальности так не происходило, что там, где наука развивалась сама по себе, и конкуренция была, но конкуренция была «вопреки», а не «благодаря». Есть социальные структуры, которые снижают конкуренцию между научными группами, влекут за собой сильное снижение темпов научного развития, потому что научное развитие — это конкуренция, а там, где эту конкуренцию насильственно снижают, ученые позволяют себе работать медленнее или вообще ничего не делать, или занимаются какими-то своими странными вещами, и никто не говорит, что эти вещи странные. И в этом смысле американские университеты были почти идеальными для поддержания конкуренции научной среды институтов, потому что не было одного доминирующего университета, там было много разных университетов, т. е. всегда в каждой дисциплине есть примерно от 7–8 до 20–25 университетов, которые находятся примерно на одном уровне. Они имеют примерно одинаковые лаборатории, поддерживают примерно одинаковые исследования. Поскольку один из них уходит вниз, остальные вырываются наверх, и единственный способ вырваться вперед — это оставить кого-то позади. В этой системе заинтересованы, чтобы поддерживать наиболее способных ученых, потому что только они выведут вперед. А вторая вещь, которая специфична для американских университетов — это то, что американские абитуриенты приносили в университет большую часть денег по удивительной и не совсем прозрачной причине. Вообще качество образования и качество научных исследований связаны между собой опосредованно. Хороший преподаватель вовсе не обязательно должен быть хорошим ученым, а хороший ученый может быть отвратительным преподавателем. Здесь низкая корреляция. Когда мы учимся в магистратуре, корреляция становится сильнее и ближе в плане научных исследований. Только когда вы пишите диссертацию, важно, чтобы ваш научный руководитель был, по возможности, научной звездой. Но большую часть денег в университеты приносят не аспиранты, а как раз бакалавры. И тем не менее американский рынок высшего образования устроен таким образом, что университеты рекламируют себя, прежде всего, указывая на свои научные успехи. Рейтинги американских университетов на 70–80 % состоят обычно из разных индикаторов, которые указывают на академическую успешность. Конкурентная, жестокая во многих отношениях

и в чем-то неэффективная система, в том числе потому, что она поддерживает не вполне добросовестную конкуренцию между учеными, секретность например. Но при этом, безусловно, очень эффективная в стимулировании конкуренции и в том, чтобы поддерживать наибольшую продуктивность. Создается впечатление, что в XX веке это была успешная интеллектуальная инновация, которая вышла вперед, вытеснив те формы организации, которые в большей степени представляют науку как одну управляемую большую систему, как министерство открытий, которой была Академия наук. Может быть, произойдет следующий рывок. Может быть, появится какая-то новая институциональная форма организации науки. Может быть, она возникнет на основе Академии наук, но, скорее всего, это будет какая-то совершенно новая форма, о которой мы еще не знаем. Спасибо!

**Самуил Аронович:** Так, какие вопросы? Можете задавать любому из главных деятелей нашей сегодняшней встречи.

**11.** Как создавалась наша Российская академия наук, вы все знаете. Вы в своем выступлении высказали мысль, что именно изначально в составе академии была заложена какая-то ошибка — какая? И второй вопрос: вы сразу перешли в советские времена. До революции здесь, у нас, в России, создавались университеты, институты, развивалась промышленность. Так вот, почему не получилось у нас так, как на Западе, — не срослось в этот период — 200 лет?

**Михаил Михайлович:** Да-да, спасибо большое за вопрос. Я с удовольствием бы рассказал все, что знаю, про эти 200 лет. Люди, которые знают про это больше, сказали бы гораздо больше моего. Я могу попробовать только очень коротко рассказать то, что прочитал в других книгах на этот счет. При академии должна была быть академическая гимназия, университет. СПбГУ отсчитывает свою родословную от этого петровского указа. Университет существовал, в нем читали лекции, но он благополучно «умер», потому что академики не особенно горели желанием читать лекции, а Романовым после Петра Академия была не очень интересна. Она была и была. Денег много она не просила, а те, которые просила, очень часто задерживали. В общем, они не сильно ею интересовались. Академия благополучно существовала в качестве клуба академиков или в качестве института продвинутых исследований, куда попадали самые лучшие из лучших на государственную зарплату или государственную пенсию. Момент, когда Академия приближается к государственной инновационной политике, — это Первая мировая война. До этого ученые в Академии рассматривают свое положение как вариант удовлетворения попыток на этот счет, они преуспели, они доказали свою самостоятельность, им дали заниматься наукой, они занимаются наукой. История промышленности — это совсем не моя область. Конец XIX века — грандиозный рост, очень успешное технологическое развитие. Но компании, которые возникают в России и работают в России, предпочитают покупать изобретения, патенты, инновации, которые произведены где-то еще, а не делать их на месте. Почему — сложно сказать. Наука, университеты, зарождающаяся промышленная лаборатория — разрозненные области, которые больше занимаются адаптацией, чем соединением научных идей и производства. Бюрократическая логика, мысль администратора — каждый вид деятельности должен быть отделен от каждого другого. Вот *эти* открытия делают, *эти* их внедряют.

**12.** Создается очень устойчивое впечатление, что после разрушения Советского Союза все то, что мы имеем сейчас, — это наследие той самой науки — совет-

ской, которая была неправильно организована, по Вашему мнению. Что будет через лет 15? Что станет с нашей страной? Что говорит Ваша наука по этому поводу?

**Михаил Михайлович:** Я бы посоветовал не верить прогнозам социологов на 15 лет, еще за неделю выборов — можно. А чуть дальше — уже совершенно нельзя. Я не хотел бы, чтобы осталось впечатление, что советская наука была совершенно неправильно организована и ничего после себя не оставит. В любом институте, организации есть две разные составляющие, одна должна действовать при создании — на короткой дистанции, другая — должна воспроизводиться. Вначале институты эти работали отлично, но дальше возобладала система, которая и позволяла людям все оставшееся время работать на одном и том же месте за счет очень низкой мобильности между институтами, за счет отсутствия внешних стимулов в виде конкуренции. После 1960-х мы видим скорее спад, чем какой-то подъем. Опять же это «средняя температура», появляются новые институты, новые группы, новые лаборатории. Они получают меньше, чем мы могли надеяться, чем мы могли бы ожидать. Тем не менее на какой-нибудь 1989 или 1990 год Советский Союз занимает по показателям цитирования третье, четвертое, пятое место, в зависимости от того, как считать, и вполне честно его занимает, там нет никакой фатальной ошибки. Ясно, что происходит «сжатие» за счет миграции, за счет того, что новые люди не приходят в науку. Если мы возьмем публикационные показатели, сжатие близко к тому, чтобы остановиться. Нет оснований полагать, что Россия станет научной сверхдержавой в ближайшей перспективе. Есть надежда, что она останется в первой десятке.

**13.** У меня только один вопрос. Вы идете вслед за американскими чиновниками из науки — цитирование, количество публикаций. Вы не помните: у нас в 1960–1970-х годах была разработана шкала для выявления реальных результатов. Я не против цитирования, я этим занимался еще 20–30 лет назад. Но есть и другие методы...

**Михаил Михайлович:** Другие методы? Вот с другими методами сложно. Я согласен, что в большом цитировании есть большое количество недостатков. Все цитируют работы, которые перестали быть революционными. А новые работы — никто на них не ссылается, потому что они не понятны никому из коллег. Действительно, в цитировании есть бесконечное количество недостатков. Индекс цитирования тоже будет разным. Почему цитирования настолько важны — большой наукой управляют чиновники. Наукометрия позволяет как-то сравнивать научную успешность. Плохо, но лучше плохо, чем совершенно никак. И других своих успехов в управлении наукой вы не можете предъявить совершенно, потому что это фундаментальная наука и технологии будут в лучшем случае у ваших внуков. Единственное, что вы можете показать, это — смотрите, мы вырвались по показателям цитирования на вторую строчку. Это хоть кому-то можно предъявить. Для людей, которые занимаются наукометрией и социологией науки, это важная задача и большая ответственность — придумать какие-то показатели, которые бы подходили к политической системе, к логике и при этом не калечили науку.

**14.** Здравствуйте! Все практически говорили, как устроена верхняя ступенька образования и науки. В общем-то, понятно, что та система, которая была разработана Российской академией наук, не имела «подпитки» кадров, кадров, которые должны были быть авангардными, передовыми. В этом плане системы Европы, США гораздо более перспективны, на мой взгляд. Они более объективны, более

рационально устроены, чем вот эта система. Но вопрос не в этом. Мы знаем, что в США и Западной Европе вся система образования, вся цепочка продумана и разработана, начиная со старшей школы, потом — бакалавриат, колледжи и научная деятельность. В России мы не видим такой последовательности, мы из школ получаем плохо подготовленных абитуриентов. Большая масса абитуриентов, которые выходят из школ, которые поступают — это не очень подготовленные люди. Второе — у нас есть образовательные учреждения, которое мы назвали колледжами. Но они не выпускают людей, которые потом будут продвигать науку от фундаментальных исследований в экономику, промышленность. Как должна выглядеть вся система, цепочка образования, чтобы она у нас, в России, работала?

**Владимир Анатольевич:** Давайте я отвечу совсем коротко. Я бы не хотел сказать, что у нас так уж все не работает в плане цепочки образования. Я немного жил в Германии и могу судить о тамошнем образовании на школьном уровне. Я хотел бы, чтобы мои дети образование получали в России. Если брать средний уровень образования в России — он окажется очень, очень низким, но если ориентироваться на выдающиеся экземпляры, то образованный человек в России имеет возможность выбирать, где его ребенок будет получать образование. Я считаю, что возможности, которые нормальный образованный человек может дать своему ребенку в России, лучше, чем в Германии.

**Татьяна Борисовна:** Я бы хотела поблагодарить присутствующих и замечательных организаторов этого стола за темы, предложенные для обсуждения, за то, что мы могли почувствовать гордость за страну, которую имеем, за те достижения, которые имела Академия наук, за тех людей, которые работали во всех научных структурах.

**Самуил Аронович:** Материалы круглого стола могут быть использованы в практической деятельности по организации научных исследований в нашей стране.

Материал к публикации подготовила кандидат социологических наук
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## Европейская наука сквозь призму ESOF2012

Для повышения экономической конкурентоспособности ЕС необходимо построение единого Европейского исследовательского пространства (ERA). Для этого требуется независимая арена, на которой мог бы развернуться открытый диалог о роли науки в обществе. Долгое время в Европе не было такой арены. Теперь она есть. По инициативе Euroescience каждые два года, начиная с 2004 года, в Европе проводится Открытый форум Euroscience (Euroscience Open Forum — ESOF). Оче-

редной, пятый форум, ESOF2012 проходил в Дублине (Ирландия) с 10 по 15 июля 2012 года. Основные задачи ESOF были сформулированы следующим образом:

• представить ключевые прорывные направления современной науки — как в естественных науках, так и в социальных и гуманитарных;

• привлечь интерес научной общественности (особенно молодежи) к новым достижениям науки и технологий;

• содействовать международному диалогу о роли науки и новых технологий в жизни общества, о путях развития науки, о проблемах, возникающих на этом пути.

Пленарные заседания и сессии были посвящены следующим основным направлениям: научная политика, будущее медицины и здоровье, энергетика, окружающая среда и климат, изменение границ областей знаний, научное образование, наука и культура, коммуникации в науке.

ESOF — это не обычная научная конференция, а междисциплинарный паневропейский форум. В форуме принимали участие известные исследователи, бизнес-лидеры, преподаватели, а также журналисты, пишущие о науке. На форуме большое внимание было уделено специальной программе для молодых ученых, что связано с актуальностью задачи кадрового обеспечения науки и высоких технологий в странах Евросоюза. В форуме ESOF2012 приняло участие около 4500 делегатов из 74 стран. Среди пленарных докладчиков было пять Нобелевских лауреатов. Делегаты приняли участие более чем в 150 лекциях, сессиях и дебатах. Из России было 28 делегатов и 4 журналиста.

Форум ESOF2012 включал в себя обширную научную программу, состоящую из пленарных лекций, научных сессий и семинаров о последних новинках из мира науки и технологий, программ «Карьера молодого ученого» и «Наука и бизнес», о выстраивании взаимосвязей между фундаментальной наукой и промышленностью, а также выставку новых достижений в науке и специальную программу для прессы, направленную на популяризацию науки.

В рамках форума была проведена Генеральная ассамблея «Евросайнс», на которой после перевыборных мероприятий выступили лауреаты Rammal (????) премии (премия «Евросайнс») главный научный советник Президента Еврокомиссии доктор Анна Гловер и профессор Крис Левеллин Смит, руководитель европейского проекта построения синхротрона в Иордании SESAME (проект способствовал развитию научного и политического сотрудничества на Ближнем Востоке и в Средиземноморье).

***Участие России.*** Несмотря на то что участников из России было немного, им удалось участвовать в научной программе и провести самостоятельную сессию. Кроме того, российские участники принимали участие как докладчики в одной из сессий «бизнес-программы».

Под эгидой правления «Евросайнс» была организована сессия «Действительно ли сотрудничество с Россией жизненно необходимо для Европы?» (Организатор — Н. И. Диденко).

Европейских коллег интересовало, как много европейских исследователей периодически работает в российских лабораториях. Им было важно знать, знают ли российские ученые о возможностях работы на европейском оборудовании в Европейских центрах коллективного пользования и пользуются ли они этой возможностью. Европейцам важно было понять, играет ли европейская диаспора

бывших российских ученых заметную роль в российских исследованиях и что надо менять в механизмах сотрудничества ЕС и России для расширения этого сотрудничества.

Все эти вопросы обсуждались на сессии. Было отмечено, что европейские исследователи, хотя и имеют возможность периодически участвовать непосредственно в работе российских лабораторий, но, в основном, это имеет место в «Сколково» и по проектам мегагрантов. Информация о возможностях проведения исследований в Европейских центрах коллективного пользования мало известна российским ученым, хотя, безусловно, те, кто может, с удовольствием пользуются этой возможностью.

Что касается роли российской диаспоры в продвижении российской науки в Европе, то она незначительна. В последние годы Минобрнауки России старается привлечь успешных российских ученых-эмигрантов к научным исследованиям в России путем мегагрантов и стажировки молодых российских ученых в лабораториях эмигрантов на деньги Минобрнауки. Между российскими учеными и выходцами из России существуют отдельные международные проекты, но они немногочисленны.

На сессии речь шла о последних реформах в российской науке, о создании национальных исследовательских университетов, где наряду с обучением студентов создаются современные научные лаборатории. Что касается «утечки мозгов» из России, то было отмечено, что эмиграция ученых продолжается, но не в масштабах 1990-х годов. Отток ученых «помолодел», часто студенты после получения диплома бакалавра стараются уехать в магистратуру зарубежных университетов.

Важно было услышать мнение европейских коллег о жизненной необходимости для Евросоюза сотрудничества с российскими учеными для повышения конкурентоспособности ЕС в мире. Это было особенно значимо на фоне проходящих в рамках ESOF2012 симпозиумов ЕС и США, ЕС и ASEAN, ЕС и стран Африки, ЕС и Китая.

Доктор **Ванесса Кампо Руз (ESF)** отметила важную роль российских партнеров в конкурсах 6-й и 7-й рамочных программ (РП).

Из неассоциированных стран именно российские партнеры были участниками наибольшего числа проектов и имели самое большое финансирование. Она привела несколько примеров крупных проектов РП7, которые реализуются при активном участии российских ученых, в частности исследование шельфа Баренцева моря и совместное использование ледокола для научных исследований в Арктике.

Доктор **Питер Тендеман**, генеральный секретарь «Евросайнс», в своем выступлении обсуждал вопросы сотрудничества ЕС и России с середины 80-х годов прошлого века. Он привел свои соображения относительно того, что могло бы улучшить это сотрудничество. По мнению Тендемана, сотрудничество в науке является механизмом для политического сотрудничества и распространяется по всему миру. До сих пор в России есть сильные специалисты в традиционных областях науки — математике, физике, химии, инженерных науках, науках о Земле, материаловедении. По его мнению, сотрудничество в космосе, безопасности, ответственности за устойчивое развитие и управление природными ресурсами в Арктическом регионе невозможно без участия России. Анализируя динамику сотрудничества ЕС с Россией, Тендеманн отметил важность участия российских

ученых в таких крупных проектах, как ITER, CERN, ISTC. Вместе с тем он отметил, что сотрудничество сфокусировано на обучающих семинарах, совместных конференциях, политических диалогах, а масштаб обмена учеными слишком мал. Для расширения сотрудничества между странами Питер Тендеманн предложил развивать стратегическое партнерство с Евросоюзом в исследовании прорывных технологий; упростить формальные моменты сотрудничества для индивидуальных проектов; снять визовые ограничения.

Профессор **Алик Измаил-Задэ** (Москва), имеющий длительный опыт работы в европейских институтах и университетах, предложил ввести на средства Европейского исследовательского совета (ERC) совместное европейско-российское профессорство, например на 5 лет, что дало бы возможность европейским ученым приезжать в Россию (или другую страну ЕС), основать лабораторию, возглавить институт. А европейские академические институты могли бы принять специальную программу для российских ученых, работающих в Европе, чтобы они могли некоторое время работать в своих институтах в России. Сегодня неуверенность в будущем России и боязнь потерять постоянную позицию в европейских странах удерживает наших ученых от возвращения в российские институты.

Доктор **Кампо Руз** отметила, что новые программы сотрудничества и информационные технологии дают возможность объединять усилия выдающихся ученых и инженеров разных стран и таким образом получать инновационные решения глобальных вопросов. Научно-технические программы, финансируемые государствами и частными компаниями, обеспечивают эффективное управление структурами, которое позволяет ученым сфокусироваться на своей работе и получить быструю отдачу. Необходимо, чтобы программы научной политики были более скоординированы.

В заключение сессии выступили **Энрико Предацци**, известный физик из Турина, главный руководитель ESOF2010 и профессор **Мирон Амусья** из ФТИ им. А. Ф. Иоффе (Санкт-Петербург, Россия). Энрико Предацци подчеркнул, что, несмотря на имеющиеся трудности в жизни российского научного сообщества, продолжаются деловые плодотворные контакты с физиками России. Советская система подготовки талантливой молодежи (физико-математические школы, лицеи) жива и дает новое поколение физиков России.

Профессор Мирон Амусья напомнил о помощи международных фондов российским ученым в тяжелые 1990-е годы и подчеркнул важность международного сотрудничества для ученых разных стран. Он высказал убежденность в возрождении российской науки, и в частности физики, несмотря на имеющиеся трудности.

По «бизнес-программе» была организована секция «Парадигмы инноваций, которые меняют экономику». На сессии были представлены четыре значимых инновационных центра: в Финляндии, в Аалто университете; в Ирландии, при Университете Ирландии; в Аризоне (США), но главное внимание было уделено российскому проекту «Сколково». По мнению европейских коллег, «Сколково» — самый большой и самый амбициозный инновационный проект на континентальной Европе за многие годы. Кроме того, речь шла о развитии Сколковского института науки и технологий (Сколтеха), который был основан в сотрудничестве с MIT (Массачусетским институтом технологий, США).

На выставке был представлен проект 7-й РП ACCESSRU. Этот проект направлен на повышение информированности европейских исследовательских

организаций о возможностях участия в российских исследовательских программах. На пути российско-европейского сотрудничества ученых стоит немало барьеров — административных, языковых и др. Все еще недостаточно информации о существующих российских программах. Безусловно, на каждом шаге расширения международного сотрудничества необходима техническая поддержка. Механизмы и административные процедуры с обеих сторон должны быть более гибкими и более простыми.

Европейское научное руководство и общественность придавали большое значение 5-му Открытому форуму «Евросайнс». Состав официальных лиц, которые принимали участие в форуме, свидетельствует о значимости и высоком статусе форума.

***Научные сессии.*** Впервые в истории форумов был организован День политики. Участниками Дня политики были такие ключевые фигуры Европейской и Международной научной политики, как Маэр Джоржиган-Куин, Европейский комиссар по исследованиям, инновациям и науке, Мэри Робертсон, бывший президент Ирландии, генеральный директор Еврокомиссии по исследованиям и инновациям Доминик Ристори, генеральный директор Объединенного исследовательского центра ЕК, профессор Анна Гловер, главный научный советник президента ЕК Бароссо, Хельга Новотны, Президент Европейского исследовательского совета и Сабра Суреш, директор Национального научного фонда США (NSF), а также представители министерств науки и академий наук ряда стран, в том числе Чехии, Норвегии, Дании, Новой Зеландии, ЮАР.

День политики — это новое явление в Открытом форуме, характерное именно для ESOF2012. В этот день было проведено более 20 сессий и семинаров на разные темы, касающиеся европейской научной политики. Это и сессия, посвященная новой программе Horizon 2020, исследовательским инфраструктурам, Европейской исследовательской зоне (ERA), молодым исследователям и программе Марии Кюри, международному сотрудничеству ученых, политическим последствиям изменения климата, научным публикациям и открытому доступу к статьям в Интернете, проблемам устойчивого развития.

На форуме было уделено большое внимание роли фундаментальной науки в жизни общества. Здесь главную роль сыграла **Хельга Новотны** (президент по вопросам политики в области исследований Европейского совета по исследованиям — ERC). Она была организатором и активным участником нескольких сессий. В том числе специальной сессии (для журналистов) о роли фундаментальных наук в жизни общества. В своем выступлении Хельга Новотны обратилась к актуальнейшей проблеме: риски при поддержке прорывных исследований, которые в момент подачи заявки могут не иметь очевидных будущих пользователей. Новотны отметила, что полезность новых знаний часто приходит по мере применения новых методов исследования. Тогда может быть, что «бесполезные» знания, полученные в ходе исследований, со временем находят новое конкретное практическое применение. Тема полезности и бесполезности знаний связана с вопросами финансирования научных исследований. Трудно получить финансирование проекта, если вы не можете предсказать результат и его возможное применение. Но в то же время наиболее интересные результаты нередко получают в неожиданных новых исследованиях. Поэтому при спонсировании ультрановых исследований всегда существуют риски.

**Хельга Новотны** совместно с заместителем генерального секретаря «Евросайнс» **Раймондом Зельцем** в цикле «Развитие карьеры молодых» была организатором сессии «Увеличение прорывных исследований в Европе». Докладчики, выступая перед молодыми учеными, подчеркивали притягательность занятий наукой. С одной стороны, это удовлетворение любопытства, с другой — польза для общества. По мнению докладчиков, в Европе должна быть создана плодородная почва для занятий наукой. Должен воспитываться «дух» европейского ученого. На сессии было принято решение об основании Академии молодых ученых Европы.

В настоящее время наука развивается как национальный феномен в каждом государстве, с другой стороны, глобализация научного сотрудничества создает «науку без границ». Очень важно, что наука играет значимую дипломатическую роль как один из инструментов преодоления конфликтов, налаживания контактов. Дипломатия через науку — это девиз политиков, который появился в США в последние годы.

Процессы глобализации, идущие в мире и в науке, привели к формированию международного научного сообщества, а это, в свою очередь, привело к тому, что начала развиваться «наука без границ».

Невозможно описать все научные направления, которые освещались на сессиях и пленарных заседаниях. Упомянем некоторые. Директор ЦЕРН **Рольф-Дитер Хойер** рассказал о недавнем открытии бозона Хиггса. **Крейг Вентер** выступил в Тринити-колледже с лекцией «Что такое жизнь в 2012 году?». **Брайан Грин** рассказал о состоянии теории струн. Глава Европейского центра космических исследований **Альваро Хименес Каньете** рассказал об успехах агентства и планах на будущее. Профессор **Джонатан Колман** из Института нанонауки в Тринити-колледже в Дублине представил обзор исследований о наноматериалах, которые приведут к технологиям завтрашнего дня.

Отдельное заседание было посвящено проблемам защиты интеллектуальной собственности.

***Для молодых ученых.*** Для молодых исследователей была организована специальная программа, посвященная карьерному росту молодых ученых. В программе было выделено три основных направления:

- исследователь XXI века;
- разнообразные карьеры исследователей;
- глобальный исследователь.

Термин Global Researcher (глобальный исследователь) появился в самые последние годы и связан с процессами глобализации, которые идут и в науке.

В пределах названной программы состоялись неформальные встречи молодых ученых с известными учеными за круглым столом «Каша с профессором». Правда, по словам участников, каши так и не принесли. Но молодые участники остались такими неформальными беседами очень довольны.

Программа «Карьера молодых ученых» состояла из 17 сессий. По теме «Глобальный исследователь» состоялось 4 сессии, посвященных международной мобильности ученых как интегральной части исследовательского процесса и развития карьеры исследователя. В частности, рассматривались различные модели мобильности. Обсуждался опыт европейского научного сообщества по «обучению мозгов» в ходе зарубежных командировок (brain train). Приводились примеры карьеры исследователей из Европы в разных странах. И, наконец, отдельная сессия была

посвящена проблемам, с которыми столкнулись ученые стран Юго-Восточной Европы при построении общества знаний и возможные пути решения этих проблем.

Важной частью программы «Карьера молодых ученых», были сессии, посвященные разнообразию карьеры для исследователей. Как сделать успешным переход из академии в промышленность? Как получить работу в промышленности? Каковы профессиональные навыки, необходимые для коммерческого мира? Был среди прочих поставлен вопрос о том, получил ли бы сегодня работу Эйнштейн? Институт физики Ирландии распространил среди молодых участников буклет на тему, что надо знать и уметь, чтобы стать физиком, и кем можно работать после окончания физического факультета.

На сессиях, посвященных «Исследователю XXI века», обсуждались актуальные проблемы, связанные с созданием идеального рабочего места для женщины, вопросы о будущем докторов наук (PhD) в XXI веке, о междисциплинарных инновациях и междисциплинарном сотрудничестве, об этике исследователей и кодексе ученого, о возможностях и проблемах будущих европейских школьников и ряд других.

На сессиях, посвященных карьере молодых ученых, прошли оживленные дебаты на тему публикаций и открытого доступа, проблемы ученых стран Юго-Восточной Европы, возможности и вызовы для следующего поколения европейских школьников. На сессии, организованной членом правления «Евросайнс» **Паулиной Мэтсон** и **Дэвидом Фельтцем**, были представлены результаты опроса молодых ученых европейских стран. Выступавшая на сессии **Рут Миллер** (Австрия) остановилась на проблемах отсутствия работы после получения докторской степени. Кроме того, на форуме были вручены премии молодым исследователям, а также журналистам, пишущим о науке. В рамках форума член Правления Euroscience профессор **Коннрейд** организовал сессию «Наука и поэзия».

В рамках Программы «Карьера молодых ученых» известным издательством “Elsevier” был проведен очень важный для молодых исследователей двухдневный семинар по научной грамотности. Начинающим ученым были даны советы — как планировать свою карьеру, как выбирать наставника, как заниматься исследованиями, как готовить результаты к публикации, как готовить презентацию и писать научную статью, как искать финансовую поддержку для исследований.

С целью развития постоянно действующих стратегических форумов по вопросам научно-технологического и инновационного сотрудничества Евросоюза с другими регионами в рамках ESOF2012 по инициативе руководства форума, кроме названных сессий и заседаний, было проведено четыре симпозиума:

Европа и США «Атлантика — общий ресурс»;

Европа и Азия «2012 год — год науки, технологий и инноваций»;

Европа и Африка «Наука для развития экономики»;

Европа и Китай «Наука и город будущего».

Следует отметить, что авторитет ESOF растет с каждым следующим форумом. Если в первом форуме в 2004 году приняли участие представители 33 стран, то в последнем уже 74 стран-участниц. Несмотря на то что форум вначале предполагался как Европейский открытый форум «Евросайнс», в ESOF2012 приняли участие представители Америки, Азии, Африки, Новой Зеландии и Австралии, обеспечив тем самым прекрасные возможности для установления и налаживания

профессиональных связей. Из США приехал целый «десант» — одних спикеров около 60 человек.

Закончился 5-й Открытый форум Euroscience ESOF2012. Научная жизнь продолжается. Следующий 6-й Открытый форум «Евросайнс» состоится в 2014 году в Копенгагене.

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# ПАМЯТИ ТОВАРИЩА

## Эдуард Михайлович Мирский
## 20.04.1935–28.04.2012

28 апреля 2012 года на 78-м году после тяжелой, продолжительной болезни завершился жизненный путь видного российского философа и социолога науки, доктора философских наук, заведующего лабораторией «Коммуникационные системы науки» Института системного анализа РАН Эдуарда Михайловича Мирского.

По окончании в 1958 году филологического факультета Ленинградского государственного университета по специальности «германская филология» Эдуард Михайлович учился в аспирантуре Ростовского-на-Дону государственного университета, которую закончил в 1969 г., защитив диссертацию на соискание ученой степени кандидата философских наук.

В формировании философских взглядов и исследовательских интересов Эдуарда Михайловича огромную роль сыграли как оригинальные идеи, так и яркая личность замечательного отечественного философа, историка и теоретика науки, культуролога Михаила Константиновича Петрова (1923–1987). Именно под его влиянием Э. М. Мирский стал разрабатывать проблематику науковедения, социальной организации науки, взаимодействия социального института науки с другими социальными институтами, которой он занимался на протяжении всей своей творческой жизни.

В начале 1970-х годов у Эдуарда Михайловича устанавливается идейный контакт с группой философов, ставших в нашей стране пионерами развития методологии системных исследований (И. В. Блаубергом, В. Н. Садовским и Э. Г. Юдиным). Сотрудничество с ними получило и организационное оформление, когда Э. М. Мирский стал работать в группе (впоследствии — секторе) системного развития науки Института истории естествознания и техники АН СССР, а затем — во Всесоюзном научно-исследовательском институте системных исследований ГКНТ и АН СССР (ныне Институт системного анализа РАН).

Среди тем, особенно интересовавших Эдуарда Михайловича, хотелось бы выделить такую, как коммуникации в современной науке (по его инициативе и при самом непосредственном его участии был издан ряд монографий по этой проблематике). Классическими стали исследования Э. М. Мирского по междисциплинарным

исследованиям и дисциплинарной организации науки, в ходе которых он с блеском проанализировал движение знаний от переднего края науки до учебника и одновременно — этапы усвоения знаний от студенческой скамьи до их использования в самостоятельных исследованиях. Именно этой проблематике была посвящена и его докторская диссертация «Организация знания и самоорганизация научного сообщества» (1996).

На протяжении двадцати лет — с марта 1992 г. по март 2012 г. — Эдуард Михайлович был главным редактором ежемесячного специализированного электронного журнала «Курьер российской академической науки и высшей школы». Журнал, на страницах которого получали всестороннее и порой весьма нелицеприятное освещение нравы отечественной академической науки, прекратил выходить в свет лишь тогда, когда у Эдуарда Михайловича иссякли силы и здоровье.

Эдуард Михайлович уделял самое пристальное внимание выявлению и анализу новейших тенденций в развитии науки, он обладал счастливым даром распознавать перспективные линии ее развития и в свойственной ему остроумной, подчас весьма едкой манере бескомпромиссно отсекать все конъюнктурное, бесплодное. Эти качества в полной мере проявлялись и на страницах «Курьера», и тогда, когда он вступал в полемику на научных собраниях, и при выполнении им обязанностей эксперта в Российском фонде фундаментальных исследований.

Последней публикацией Эдуарда Михайловича, которую ему довелось увидеть незадолго до кончины, стала наша совместная статья «Человеческое измерение НТП» (альманах «Наука. Инновации. Образование», вып. 10). В ней Эдуард Михайлович очень емко описал важнейшие особенности развития современной науки и сопутствующие ей глубокие изменения в типичной карьере и мотивации научного работника. Эти плодотворнейшие идеи, безусловно, еще ждут самой основательной проработки. Увы, сам он уже не сможет участвовать в этих исследованиях, которые придется проводить его коллегам, друзьям и ученикам.

*Б. Г. Юдин*

# Информация для авторов и требования к рукописям статей, поступающим в журнал «Социология науки и технологий»

**Социология науки и технологий** (Sociology of Science and Technology) — единственный в России научный журнал, специализирующийся на проблемах социологии науки и технологий.

Журнал учрежден в 2009 г. и издается под научным руководством Санкт-Петербургского филиала Института истории естествознания и техники им. С. И. Вавилова Российской академии наук. Учредитель: Издательство «Нестор-История». Издатель: Издательство «Нестор-История». Периодичность выхода — 4 раза в год. Свидетельство о регистрации журнала ПИ № ФС77-36186 выдано Федеральной службой по надзору в сфере массовых коммуникаций, связи и охраны культурного наследия 7 мая 2009 г.

Журнал публикует оригинальные статьи на русском и английском языках по следующим направлениям: наука и общество; наука и политика; научно-технологическая политика, коммуникации в науке; мобильность ученых; демографические аспекты социологии науки; женщины в науке; социальные позиции и социальные роли ученого; оценка деятельности ученого и научных коллективов; наука и образование; история социологии науки, социальные проблемы современных технологий и др.

Публикации в журнале являются для авторов бесплатными.

Гонорары за статьи не выплачиваются.

## Требования к статьям

Направляемые в журнал статьи следует оформлять в соответствии со следующими правилами:

1. Статьи могут быть представлены на русском или английском языках. Статьи должны быть представлены в формате Word. Объем рукописи не должен превышать 1,5 п. л. (60 000 знаков). Шрифт — Times New Roman, размер — 12 pt, интервал — 1,5, размещение — по ширине, название статьи — жирным по центру, ФИО — в правом верхнем углу; в сносках — 10 pt, через один интервал), сохраняется в формате .doc или .rtf (форматы .docx и .odt не принимаются). Фотографии и рисунки подаются в отдельных файлах формата .tif или .jpg. Объем материалов по разделам «Рецензии» и «Хроника научной жизни» — до 0,3 п. л. (не более 12 000 знаков).

2. Сокращения и аббревиатуры допустимы, но при первом упоминании в тексте должно стоять полное название с указанием в скобках ниже используемого сокращения. Цитаты из других источников заключаются в кавычки, и дается ссылка с указанием номера страницы (или архивной единицы хранения). Пропуски в цитате обозначаются отточиями в угловых скобках: <...>, уточняющие слова и расшифровки даются в квадратных скобках.

3. Список литературы в алфавитном порядке и без нумерации помещается в конце статьи. Названия журналов пишутся полностью, указываются том, номер (выпуск), страницы; для книг — город, издательство, год, количество страниц. Для сборников необходимо указывать ФИО редактора.

Пример оформления литературы: *Андреев Ю. Н.* Потенциал взаимодействия регионов и федеральных органов власти в научно-технической сфере // Наука. Инновации. Образование. М.: Парад, 2006. С. 320–335.

4. Ссылки на литературу даются в тексте статьи. В круглых скобках указывается фамилия автора, год выхода и, если нужно, страница (Wagner, 2008: 66). Все документы в статьях по возможности предоставляются на языке оригинала и, в случае необходимости, переводятся.

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6. Если в списке литературы содержится источник с интернет-сайта, то следует ссылку оформлять так: автор, название статьи, дата публикации, интернет-адрес, в скобках — дата последнего обращения.

7. В статье допустимы краткие подстрочные сноски. Дополнительные тексты большого объема оформляются в виде примечаний или приложений в конце статьи.

8. К рукописи прилагаются:

- аннотация — не более 100 слов на русском и английском языках;
- на русском и английском языках должны быть также указаны ключевые слова и название статьи;
- авторская справка: ФИО (полностью), официальное наименование места работы, должность, ученая степень, а также данные для связи с автором (телефоны, электронный адрес);
- фотография (разрешение — 300 dpi).

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# Sociology of Science and Technology
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Sociology of Science and Technology is a peer reviewed, bi-lingual international Journal (prints papers in both English and Russian) being published under the scientific guidance of the Institute for the History of Science and Technology, Saint Petersburg Branch of The Russian Academy of Sciences. The Journal was founded in 2009 and was first published in 2010 by the Publishing House Nestor-Historia.The journal's certificate of registration PI № FC 77-36186 was issued by the Federal Service of supervision in the sphere of communications, relations mass media and the protection of cultural heritage on May 7th, 2009, ISSN 2079-0910.

The journal aims to provide the most complete and reliable source of information on recent developments in sociology of science and technology.

The journal publishes research articles, reviews, and letters on the following topics: science and society; science and policy; science-technology policy, communications in science; mobility of scientists; demographic aspects of sociology of science; women in science; social positions and social roles of scientists; views of the activities of scientists and scientific personnel; science and education; history of sociology of science; social problems of modern technologies; and other related themes. The journal is dedicated to articles on the history of science and technology and prints special issues about leading sociologists of science and technology for example together with the Research Committee on the Sociology of Science and Technology RC23 of the International Sociological Association prepared a special issue in honor of the 100th anniversary of Robert Merton's birth (Volume 1, Number 4, 2010).

The journal serves as a bridge between researchers worldwide and develops personal and collegial contacts. The journal provides free and open access to the whole of its content on our website http://ihst.nw.ru/eng/ and webpage of The Research Committee on the Sociology of Science and Technology RC23 of International Sociological Association http://www.rc23.org/wordpress/?category_name=journals.

## Requirements for Manuscripts

1. Manuscripts can be presented in Russian or English.

2. Manuscripts should be presented in Word format, the volume of the manuscript should not exceed 10 000 words; font Times New Roman, size 12 pt; interval 1.5 pt; wide layout; the title of article — bold in the centre; full name(s) in the top right corner; footnotes — size 10 pt, interval 1; for citations font Arial; in the format .doc or .rtf.

3. Photos and figures should be sent in separate files, in the format .tif or .jpg.

4. Volume of articles in the "Review" and "Scientific Life" sections — up to 3 000 words.

5. Abbreviations are permitted, but the first mention in the text must include the full name. Citations from various sources quoted are referenced with indication of the page number (or archival storage unit) given. Spaces in citations are designated by angular brackets: <...>.

6. The literature list is in alphabetic order and without numbering is located on the last page. Titles of journals are written in full, along with volume, number (release), city, publishing house, year. For collections it is necessary to specify editors.

7. References to literature are to be given in the article text. In parentheses, the surname of the author, year of publication and, if necessary, the page number is given. For example: (Wagner, 2008: 66). All documents in articles are whenever possible given in the original language and translated if necessary.

8. If the author in one year has published several works, they are marked with letters both in the literature list and in the reference. For example: (Maizel, 1978a), (Maizel, 1978b). In case of references to foreign literature, the surname of the author should be repeated, for example: "R. Merton (Merton, 1976:7) claimed that..."

9. In articles, brief footnotes are admissible. Additional large texts are made out in the form of endnotes or appendices at the end of the article.

10. To the manuscript should be attached:

- an abstract/summary of no more than 100 words in Russian or English;
- keywords in Russian or English and the name of article;
- the author's details: names (in full), place of work, position, scientific degree, and phones, e-mail;
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