

American Science Foundations in Russia as Driving Forces of International Transfer in Knowledge and Professional Skills

*Irina Dezhina
Leading Researcher, Ph.D.
Institute for the Economy in Transition
Moscow, Russia*

Foreign foundations supporting Russian scholarship started to operate shortly after the disintegration of the USSR, and very soon the assistance they provided became vitally important for the development of Russian science. Among all sources of support for research and development (R&D) the share of foreign financing has grown from zero in 1992 to 17% in 1999. Sociological surveys showed that the most successful Russian research institutions derived 25% or more of their budgets from foreign sources. In 1995 Russian Academy of Sciences officials admitted that approximately 50% of Russian *basic* science was being financed at that time from foreign foundations. From this point of view Russia became a unique country; in comparison with both the developed countries of the West and the former socialist East European countries the level of foreign participation in research is very high, and the growth of this participation is unprecedented. The biggest number of foundations and the largest amount of financing come from the USA.

American foundations as institutions operating in Russian territory, promote international values in the Russian research community, and introduce new professional skills and behavior. To assess better the importance and impact of American (and other foreign) foundations that started to support Russian science after the dissolution of the USSR the brief description of the specificity of the Soviet science system should be given. The Soviet scientific system possessed both advantages and disadvantages. Among the advantages were generous governmental and social support for science, both financial and psychological; a strong educational establishment, many of whose most academically talented graduates went into the research institutes; and the ability, through political control and the command economy, to concentrate successfully on a few high-priority projects (nuclear weapons, space). Among the disadvantages of the Soviet scientific system were the separation of research and education, and of fundamental research from applied research, the absence of commercial culture; the distortion of priorities, particularly toward the military, which was given about 75% of all resources¹; the low productivity of the research system (especially when one considers the enormous resources devoted to science), a flaw that was connected to

the absence of multiple sources of financing (science and technology were totally supported from the federal budget), and of genuine peer review; political restrictions (secrecy, repression of dissidents, prejudice against some ethnic groups, such as Jews, and suppression of certain fields, such as genetics); and, finally, an emphasis on "reverse engineering" of Western innovations. The reverse engineering approach, however, was not always a disadvantage, since Soviet engineers proved adept at first copying and then sometimes improving Western technology.

Foreign foundations being aware of the peculiarities of the Soviet organization of science, tried not only to help researchers, especially at the beginning of 90th, when Russian science was in severe crisis (mostly due to unprecedented – tenfold and even larger cuts in government's financing) but also to influence reform and transition to new, market-oriented model of science. Although each foundation is important for Russian scholarship, their impacts vary in accordance with their different goals and budgets. Most of the goals of American foundations in Russia can be categorized as follows: (1) Building a civil society, promoting democratic ideas, and strengthening regional stability; (2) Saving Russia's best fundamental sciences and the researchers in these fields; (3) Nonproliferation of weapons, the conversion of military complexes to civilian purposes, and the prevention of brain drain of defense researchers to third "sensitive" countries; (4) Promoting marketization.

The forms and types of support provided by foreign foundations to Russian scholarship have changed over time. At first the most common form of support was individual or group grants for research in Russia, or for scholarships or fellowships to do research outside Russia. Another type of support that grew over time was cooperative grants on which Russian research teams worked together with foreign partners. Other types of grants are more local but not less important, such as travel grants, library support, telecommunications development, and institutional grants. Often one foundation supports a variety of programs. Over time the changes in the policies of American foundations may be approximately segregated into four periods.

1992-1994: a period of emergency help to Russian scholars mostly in the form of individual and group grants.

1995-1996: a period of growth of cooperation, the appearance of the concept of matching funding, and the active support of the scientific infrastructure (telecommunications, libraries, travel grants).

1997: growing support for the idea of institutional funding and institutional reform in Russian science, and for strengthening the bond between basic and applied research, as well

¹. Boris Saltykov, "The Reform of Russian Science," *Nature*, Vol. 388 (July 3, 1997), p. 16.

as between research and education. Also, it was the time of the first discussions of special support for young scholars.

1998 to the present: Implementation of support for institutional reform.

At the same time there is a visible growth in direct contacts at the level of single organizations (national laboratories, universities, private firms) by which joint research is implemented and that is funded by foreign organizations. To some extent this process has been accelerated by contacts between Russian researchers who emigrated and their home institutions. Such contacts have been especially evident in regional centers where local social and cultural environment leads to more solidarity than in Moscow and St. Petersburg. Regional researchers who emigrated not only maintain connections with their former colleagues but also try to establish partner relations between their new and home institutions, sometimes through creation of new organizations or small firms. Through this process they bring new culture, knowledge, and skills to Russian laboratories.

What has been **the impact** of American foundations?

In general, American foundations have influenced the following components of the research system in Russia:

1. New mechanisms of financing have been introduced, particularly open competition for funds and peer review-based selection procedures. New methods of payment have been instituted, including direct funding of research teams, rather than institutions as a whole. During the Soviet times all financing was provided only on the basis of block funding to institutions, and there was no correlation between the productivity of these institutions and the level of their financing. These new mechanisms of grant awarding were supported by 75% of scholars in Russia in surveys conducted in 1993-1994 and by 86% in 1995, showing growing acceptance of competition and peer review.² By 1999 the new grant system was so widely accepted that no longer was its existence questioned; now the discussion continues around the proper balance between grant and block funding.

2 New knowledge has been gained by the Russian scholarly community, such as the art of writing proposals, better awareness of conflicts of interest in grant competitions, and accountability among researchers.

3 Project management has improved, with special emphases on the roles of principal investigators and realistic approaches to the planning of research, budgets, and overhead costs.

4. International mobility of researchers has increased, promoted by the travel grants from foreign foundations.

5. The bond between research and teaching has been increased through special “institutional building” programs, and greater attention has been given to regions, the capabilities of women in science, and the needs of young researchers and students.

6. Special attention has been given to science as an area of economic activity and to the processes of commercialization of technologies, as well as to intellectual property rights issues and the significance of tax exemptions for R&D activities.

It should be noted, however, that foreign initiatives have not been large enough to change completely the situation in Russian science. Their most important influence has been as "demonstration models" that help adapt science to the new economic and political environment of Russia.

More detailed impact of foundations on transfer of knowledge and professional skills may be seen through the analysis of the activity of two major American foundations that operated in Russia after the disintegration of the USSR – the International Science Foundation (ISF) established in 1992 by American multi-millionaire George Soros with the budget of \$100M to support research in fundamental natural sciences, and the US Civilian Research and Development Foundation for the Independent States of the Former Soviet Union (CRDF) that started its charitable programs in the area of natural sciences and engineering in Russia in 1995.

The ISF played an important role in Russian science: the beginning of active participation of foreign foundations in Russia is usually connected with the name of this Foundation. Although George Soros was actually not the first person or organization from abroad to come to the aid of scholarship in the FSU, his effort was both early and large, and it contributed tremendously into the development of competitive-based approach to financing of research projects. The ISF conducted a variety of programs in Russia (including support of long-term – up to two years - research projects, telecommunications development, library support, travel grants) among which the largest one was the long-term research grants program through which teams of Russian scientists were supported to do basic research in the Russian territory. This program amounted 64% of the total ISF's budget. In 1994 and 1995 the ISF alone provided 12.6% and 13.6%, respectively, of total domestic expenditures on basic research in Russia.³ Furthermore, even after the closure of the ISF in 1996 Soros made possible the creation of a new foundation for natural sciences and engineering in the FSU by donating \$5 million to the U.S. National Science Foundation. On the basis of this initiative

² Irina Dezhina, **The International Science Foundation**. . . . , pp. 153-154.

³ - Calculated on the basis of: **Russian Science and Technology at a Glance: 2000**, Data Book/CSRS, Moscow, 2000; and Irina Dezhina, **The International Science Foundation: The Preservation of Basic Science in the Former Soviet Union**, OSI, 2000, p. 151.

the U.S. Civilian Research and Development Foundation for the Independent States of the Former Soviet Union was created. The ISF closed its operations in 1997 and the CRDF continues its activities at the present time.

Development of New Management Principles for Scientific Research

ISF's programs utilized a wide range of logistical innovations. They may seem routine for a developed Western country but it was absolutely novel for Russia at that period of time. The ISF was the first organization operating in Russian science that introduced the term "grant" and its definition. Among novel methods that contributed to the development of new organization and financing of the scientific research in Russia were the following:

1. Direct support of individual scientists rather than scientific institutions. This was accomplished through a system of awarding competitive grants. The quality of the submitted research proposals was the major selection criteria.

2. Introduction of the international peer review system. The fact that the projects were evaluated primarily by foreign experts gave Russian scientists an impression of greater objectivity and fairness of the selection results.

3. ISF applied a wide range of fundamental principles which were especially important for developing new managerial techniques in Russian science. Among these were a comprehensive approach to problem solving, well-developed public relations, and the targeted nature of support.

A *comprehensive approach* to problem-solving was one of the most important principles of the Foundation's operation. Science was viewed as a multi-component system; therefore, support was provided simultaneously to individual scientists, research institutions, and libraries. Special attention was given to replacing outdated equipment. Informational support of scientific research was based on the same principles. This was done through programs of library support, telecommunications development, and long-term grants. As a rule, procurement of personal computers was accompanied by the setting up of e-mail systems, which was the first step towards wider Internet use.

The *targeted nature* of support was evident in the flexibility and complexity of the systems and was illustrated by the fact that the financing was given to individual scientists or to individual research institutions.

Public relations were done in a very efficient manner. According to the poll conducted in 1994 and 1995, ISF was the only well-known foreign fund. In most regions of the

4 For detailed results of the poll see A. Alakhverdjan, I. Dezhina, A. Yurevich "Foreign Sponsors of Russian Science", *World Economy and International Relations*, No.5, 1996.

Russian Federation, ISF was the only fund known to local scientists, while scientists working in Moscow were able to name more than thirty international funds.

The fact that everybody involved in project implementation received additional *training* could be viewed as another example of the Foundation's effectiveness. For example, librarians learned to work with foreign publishers, and Russian scientists participating in the proposal review learned such ethical norms as confidentiality and conflict of interest. Applicants studied how to prepare grant proposal and later – to draft a paper for publication. More than that, scientists learned to rely upon themselves, and now they are able to conduct their research with less dependence on the management of their respective institutions.

Introduction of the grant system implied not only new sources and forms of financing, but development of economic skills and knowledge, creation of a new culture of project evaluation and implementation. All these elements were the first step toward transformation of the organizational structure of national science – a process which was slow and almost intuitive at first, but which is now recognized as essential and rather urgent.

Mobility And the Brain Drain

Mobility is generally considered a positive characteristic of scientific research and is promoted at the government level in many countries. However, particularly since the breakup of the Soviet Union, concerns are often expressed that mobility indirectly promotes so-called “brain drain” of scientists from the FSU, because traveling abroad can lead to contract work overseas or permanent emigration.

Surveys of the ISF grantees were implemented in 1995, when the ISF programs were in operation, and later, in 1998, after they had ceased. They showed that researchers' opinion concerning the influence of the ISF on mobility and brain drain changed to a considerable extent.⁵ If in 1995 almost a quarter of all respondents thought that ISF programs prevented brain drain, by 1998 almost all scientists were of the opinion that the ISF could not contribute to the resolution of the brain drain problem. The foundation's maximum possible impact was assessed as the “temporary deterrence” of the departure of scientists, especially young people. The impact was transitory because, in the opinion of most respondents, the average grant size was not large and did not permit the purchase of expensive equipment. Furthermore, the duration of the grants was in the best cases two years -- not enough for scientists who were accustomed to long-range planning.

Later, the CRDF started the Cooperation Grants program (CGP) that also promoted mobility of researchers. A major competition was announced in 1995 in which approximately

\$10 million was disbursed to 281 cooperative research teams from the United States and former Soviet Union (FSU). The CGP provided up to two-year support to joint U.S. and FSU research teams in all areas of basic and applied research in the natural sciences, mathematics, engineering, and biomedical and behavioral sciences. Grants under CGP averaged \$50,000 and were awarded on a competitive basis.

At CGP projects both Russian and US team members traveled internationally for project-related purposes. About 1/4th of all Russian researchers traveled and participated in the conferences and other events in the US and thus the level of mobility was rather high.

As with the ISF programs, the implementation of the CGP raised concerns about potential influence of mobility on the brain drain. In 1999 there was implemented a survey of all grantees – at the time right after the completion of their projects. Then, in 2001 the follow-up survey of former grantees was conducted, and it allowed tracking longer-term effects. The questionnaires were sent to former FSU principal investigators (PIs) as well as to the US project leaders. The response rate was about 62%.

The CGP survey showed that the level of outflow was significantly lower than the level of general mobility of Russian researchers. In general, there was no evident correlation between mobility and outflow. Research directions with highest indicators of mobility had comparatively low level of outflow.

Outflow of students was slightly higher than outflow of other researchers. It correlates with data from a number of all-country surveys that indicate students and young researchers as major contingent among those who left the country in the latest years. In average, 2.4% of the total number of FSU team members participating in CGP took positions abroad, and 3.4% of the total number of FSU students from the total number of participated students took positions abroad.

In a two-year period the indicators of outflow worsened: from 44% of the former CGP teams some members took research positions abroad for a period of more than one year. Then, in predominant number of cases there were students and young researchers among those who left abroad: youth left from 60% of CGP teams. And thus again the outflow of students was higher than outflow of other researchers.

This result demonstrates that foreign foundations, even very good ones and with large budgets, are not able to solve domestic problems of the country, and if the environment for research activity inside the country continues to be complicated and unfriendly, the outflow of researchers to other countries continues. At the same time mobility should be promoted

⁵. Irina Dezhina, **The International Science Foundation**. . . , pp. 158-159.

because it helps Russian researchers to be closer connected to international scientific community and to accept values of world science.

Developing Commercial Culture

An important impact of the grant system is the development of commercial culture for new technologies. CGP grantees after completion of the projects could describe their views, plans and intentions concerning commercialization of research results. The survey revealed that there was high level of enthusiasm on side of Russian researchers to commercialize their results. The most active teams in terms of commercial promotion of research results were in the fields of engineering, chemistry, and biology.

In general, three patterns of behavior by FSU teams were identified with regard to commercial promotion of CGP projects. The first group, which made up about 25% of projects, comprised project teams with proven marketable results, many of which had already found customers in US industry. Teams in this category indicated having addressed protection of intellectual property rights (IPR): they all had filed a patent application (joint or separate). Most of the teams were conducting marketing and IPR protection simultaneously.

The second group was the largest one - about 70% of all projects. It comprised teams where the FSU side was ready to pursue commercial application of the research results and the US side was calling for further R&D. In many of these cases, the FSU team could agree that further research required but they were optimistic about commercialization. That showed how different the knowledge about the commercialization process was between Russian and the US researchers. In the USSR there were no even such a term as “commercialization”, to say nothing about market-oriented mechanisms of this process, and Russian researchers learned completely new business.

The smallest number, about 5% of projects, belonged to the third group. These were projects for which the US team was planning on, or already promoting a commercial application while the FSU team had no such intentions. In some such cases, the FSU side noted that they were waiting for industry to express an interest while the US side was already actively and independently searching for customers. That again shows the difference and two major patterns of behavior: while some researchers were too optimistic, others – too inert, waiting when customers show up of their own.

What happened then? In two-year perspective it turned out that quite a bit researchers were able to start commercialization: it was implemented by 23.7% of CGP teams, and in 50% of such projects partners were commercializing their results together. The most common type of commercialization pursued was prototype development followed by seeking of patent

approval. The noticeable peculiarity is that one-third of project participants considered the results of commercialization very successful. It means that over years FSU researchers started to learn the contemporary commercial culture.

Another, more local example of transfer knowledge and skills in the area of technology commercialization is the CRDF Travel Grants Program (TGP) started in 1999. This program provides short-term travel support for face-to-face meetings between FSU scientists and engineers and U.S. for-profit companies to discuss a potential collaboration in research and development. The program seeks to fund proposals that demonstrate commercial potential for a new or improved technology, as well as plans to meet with specific U.S. for-profit companies to discuss potential collaboration. The outcomes of travel were analyzed in April 2002. The evaluation was based on the data from the travel reports that were filled in by grantees after a 6-month period from the date of the completion of the Travel Grants Program. The total number of those completed questionnaires was 277.

During their trips to the US researchers visited not only companies, but also universities, government labs or other organizations as well as took part in conferences and technology shows. Some travelers visited a number of companies simultaneously. Thus, 59% visited for-profit companies, 45.5% - universities, and 21.3% - government labs. Noticeably, researchers not just visited these organizations but every fourth traveler drafted a proposal with for-profit company, and 10% - negotiated a contract. In the universities the share of those who drafted proposal was slightly less – about 20%, and for government labs this number is, in opposite, the highest: about 30%. That may be explained by the long-term history of cooperation between Russian government R&D institutions and the federally-supported US government labs. While analyzing these results it should be taken into account that 93% of all TGP grantees visited companies for the first time; 74.6% were at government labs, and 46.5% - at the universities for the first time. These results reflect the evolving knowledge about the ways of technology commercialization.

Bridging the Gap Between Research and Education

In 1997 the MacArthur Foundation decided to add to its ongoing activities in the former Soviet Union by initiating a new program in support of research in natural science in Russian universities. This program was called "Basic Research and Higher Education" (BRHE) and was given additional financial assistance by the Carnegie Corporation of New York, the Russian Ministry of Education, and local administrations in Russia. Its management is handled by the Civilian Research and Development Foundation and the

Russian Ministry of Education. The distinctive feature of the BRHE Program is that it raises the status of universities as institutions where research is performed, and treats research and teaching as inseparable functions. The program supports innovative approaches to combining research and education, and to training of young Russian scientists through the establishment of the Research and Education Centers (RECs) within selected Russian universities. These Centers develop state -of-the-art equipment bases for research and teaching, and the program encourages the development of links with other research institutions (both domestic and foreign) and with industry. Twelve RECs have been established in Russian universities under this program, four more will be chosen in summer-2002, for a total of sixteen. Each REC receives financing for a period of three years at approximately \$1.05 million.

The first such Center started to operate on summer 1998, and three more centers are close to the end of their grant period. The distinctive feature of this program is in constant monitoring of the situation inside RECs, of their achievements and problems. It may be already stated that the creation of the RECs had multiple effects in the area of the transfer knowledge and professional skills.

The purchase of equipment in the RECs accounts in average 70% of the total amount of award. It allows not only renovating research equipment (which is currently about 80% out of date), but purchasing new one. The impact of new equipment was almost immediate: researchers were able to formulate principally new and very actual research tasks and to become better involved into international cooperation. Then, the speed of research has increased – what was done at the old equipment, let say, during three months, now may be implemented during three weeks. Also, due to new equipment, Russian scientists were able to learn new methods of research.

The REC encouraged closer cooperation of previously independent groups of researchers and all this is stimulating the development of interdisciplinary research. And interdisciplinary research is currently the main direction of the development of scientific knowledge.

Scholars at the RECs are now very much involved in the world research community, in part due to active participation in international conferences that are supported and promoted by the CRDF. It is connected with other important outcome: healthy competitions for better publications have risen among students and researchers which, in turn, has lead to intensification of research and education.

Benefits of Collaboration From the Russian Perspective

Russian researchers supported through the CRDF CGP grants (and many of them previously received the ISF grants as well) had admitted that there were multiple immediate effects on their professional knowledge, skills and even career paths as result of implementation of the grants. The most often cited benefits were the following, in descending order:

1. Access to the US research equipment and facilities
2. Exchange of ideas, joint publications, seminars, exchange visits
3. US expertise in particular research areas
4. Access to information, including previously unavailable data
5. Access to new research methods, particularly in experimental phases of research
6. FSU in-country support
7. Establishment of new contacts, including contacts with the US industry
8. Time and cost sharing
9. Educational effect for young researchers and students
10. Access to foreign scientific literature and periodicals

The most often cited benefits were *access to US facilities, learning of new methods of experimental work, and obtaining of new information*. These benefits were mentioned by 26.4% of all surveyed research teams.

Then, for 16.5% of the Russian teams an important benefit *was the expertise of US researchers* in specific scientific areas. Researchers often indicated that there was complementary expertise from the US and FSU sides and that exchange of ideas permitted to avoid false conclusions and deadlocks. In general, sharing of scientific knowledge was considered one of the major impacts.

Many project teams from universities that included undergraduate and graduate students put special emphasis on educational opportunities for young researchers and the ways how they studied and learned.

At the time right after the completion of the CGP grants researchers could not precisely assess the impact of the grants on their *career development*. They could talk about exchange of ideas, importance of the expertise and new knowledge obtained. But they could not predict how it will further affect their professional development.

After two years since completion of the grants PIs had a chance to think over the major benefits of their collaboration once again. This time they cited longer-term effects, very important ones, such as career development, international recognition, growing reputation in

scientific community, the appearance of new contacts, and broadening of subject area, including exploration of new directions of research.

In general, the follow-up survey allowed revealing significant influence of the US foundations. The predominant number (71%) of former grantees acknowledged that the CRDF grant impacted their professional development and reputation within their scientific field. What were the major benefits of collaboration as PIs could assess them after two years from the completion of the grants? In descending order the list of benefits looks as follows:

1. Successful career development, international recognition
2. Growing number of publications in peer-review journals
3. Development of new contacts
4. Broadening of subject area, appearance of new areas of research
5. Increased mobility, frequent participation at international conferences
6. New knowledge and new ideas obtained
7. New techniques learned
8. Russian researchers received support for survival and for some renovation of equipment

This data show that the biggest influence was on career development, international recognition of project participants, and on evolution of scientific knowledge and ideas. The typical example of the grantee's comment about the foundation's program: "During the awarded research I have found new possibilities to apply the developed technique, which opened a new area of research. The results of these investigations were presented at several conferences and highly appreciated. I am also using some of these results in the courses for students at our Department".

Then, new culture of doing business was the result, as scientists admitted, of foundations' support. As stated one of the scholars, "we have learned that if you want to get paid, get to work. If you want to travel abroad, know the foreign language. If you do not know the language, learn it".

Some other surveys⁶ show that along with positive, foundations brought also negative components of "market-oriented" culture. To the view of Russian researchers, new generations of scientists along with those who successfully adjusted to the grant system, have much more materialistic orientation: "When we started to work in science, we never thought about how much we would be paid....The new generation of scientists immediately asks about pay and about how stable their salary will be." They think that material orientation was

⁶ - Cited from T.Gerber and D.Y.Ball, "From Crisis to Transition: The State of Russian Science Based on Focus Groups With Nuclear Physicists" Forthcoming in **Post-Soviet Affairs**. May 2002.

inspired by foundations that encourage applied, instead of basic, research: “Western funds won’t give anything for ideas, they will only support a concrete undertaking, something that Western participants need or the production of some kind of special materials.” This emphasis on applied work leads scientists to propose projects that they think will be funded rather than those that most interest them.

Meanwhile the background of some problems is not in the “grant-awarding culture” brought by foundations, but in the economic situation when foreign grants mostly serve as substitution but not as the addition to the domestic financing of research, and are implemented in institutions that do not have adequate infrastructure for grant administration. Thus, researchers themselves have to do all bookkeeping work because institutes do not have resources to hire staff who specializes in grant administration. Then, many grants should be obtained simultaneously so that economically to support a laboratory. As a result researchers are doing much more projects but worse. There is proliferation of research projects that do not overlap and thus the quality of scientific work suffers.

The danger of the situation is not in the material orientation of grants-adjusted researchers but in the fact that Russian science is becoming more and more dependent on foreign financing. In case foundations decide to cut down their activities, Russian researchers may face a new crisis. As one of the leading Russian academicians noted recently, “Today 70-80% of all Russian science is supported by foreign money - because we do not have our own”⁷.

In general, positive influence of the American foundations dominates over possible side effects. Most of Russian researchers-recipients of American foundations could continue and develop their career in science, and to become active members of international scientific community.

7 - V.Debabov. “A konia I mech kupim sami”, **Izvestiia-NAUKA**, no. 16, May 17, 2002, p.4.