

## **THE U.S. NON-PROFIT FOUNDATIONS IN RUSSIA: IMPACT ON RESEARCH AND EDUCATION**

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Today the overall situation in Russian science and education is more stable and predictable than 5-7 years ago but still it is far from prosperity. Foreign foundations and programs continue to be very important for the viability of these spheres in Russia.

The first foreign grant-awarding foundations working in science and technology areas opened their offices in Russia in 1993. The largest was the International Science Foundation (ISF), founded and supported by billionaire George Soros. The total budget of this Foundation was 100 million dollars that had to be distributed during two years in the Former Soviet Union for support of researchers, research organizations and projects in the fundamental natural sciences. In fact, the ISF activity lasted during 1993-1996, and more than 130 million dollars were distributed. The first program of the ISF was the so called “emergency grants program” that provided researchers who had published not less than three articles in peer-reviewed scientific journals with one-time grants amounted \$500 each. It was very important program at those tough economic conditions because massive outflow of researchers started, including brain drain to third countries. The first priority therefore was to provide individual financial support for researchers.

Foreign foundations were the first who introduced open competitions and the grant system into Russian science, the knowledge of the management in science, as well as they attracted attention to the problems of protection of the intellectual property rights.

To the 1997 the situation slightly improved, and new needs started to rise. Support of researchers per se was not already a crucial issue. The problem number one became aging: aging of equipment, aging of facilities, and aging of the scientific workforce.

*Current situation in Russian science and education*

Official statistical data and surveys indicate further decline in the number of researchers and continuing brain-drain, especially internal; growing gap between science and education; dramatic aging of research equipment; problems in accessing scientific literature; and continued diminishing of prestige of research career in Russia.

In 1999 the number of researchers in Russia decreased by 11% in comparison with 1997<sup>1</sup>. Significantly, the decline was accompanied by the aging of researchers: if in 1994 the share of researchers under 29 years old was 9.2% of the total number of researchers, and the share of those who were 30-39 years old – 24%, in 1998 these number became 7.7% and 18.1% correspondingly<sup>2</sup>. *In 1999 the average age of researcher became 48 years old, and the average age of researcher with doctorate degree – 60 years old.* Brain-drain abroad continues – though at a smaller scale: for the last two years it was at a stable level of about 1 thousand researchers per year with additional 4-5 thousand researchers per year working abroad on contract-basis. Meanwhile there are some qualitative changes among those leaving science both internally and externally: every year their average age becomes younger. In the areas (such, for example, as molecular biology, gene engineering, biochemistry) where Russian specialists are in demand at the international market, the outflow of young researchers is at the level 90% of the total number of the university graduates<sup>3</sup>. As a result today there is an evident lack of researchers in the age of 30-40 years old<sup>4</sup>.

The educational system does not encourage science careers: in average, the share of university graduates who chose a scientific profession is about 8% of the total<sup>5</sup>. In the best universities such as, for example, Novosibirsk State University, only about 10-15% of graduates chose science career. These numbers are very low if compared with research universities in industrially developed countries.

The major tendencies of latest years were further decline of research in Russian universities and widening division between research and teaching staffs.

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<sup>1</sup> - Science in Russia in figures-1999. M., CSRS, 1999, p.28.

<sup>2</sup> - Science in Russia in figures-1999. M., CSRS, 1999, p. 37.

<sup>3</sup> - NG-nauka, no.5, May 24, 2000, p.2.

<sup>4</sup> - Interview with Mikhail Kirpichnikov, Minister of science. In: Poisk, no.47, November 26, 1999, p.1.

<sup>5</sup> - From the report of V.Sadovnishii, the President of the Russian Union of Rectors. In: Poisk, no.27-28, June 27- July 10 1998, p.3.

Expenditures on research in higher educational institutions have shrunk by 30%. Financing of research in universities from federal budget in 1999 was 2.5% from the total budgetary expenditures on civilian science<sup>6</sup>. Simultaneously the research staff in universities is decreasing: the total number of researchers has declined by 13% and the number of researchers in natural sciences has decreased by 14.6%<sup>7</sup>. *If continued, this tendency will lead to the loss below critical of scientific workforce and qualified teachers for education system.*

Financing from the federal budget continues to be the primary source of support for science<sup>8</sup>, and this area is not among government's priorities. As a result, more and more research equipment is becoming out-of-date<sup>9</sup>. The most of major equipment was not renovated during 6-10 years. Then, the majority of institutes can not afford subscriptions to scientific literature as well as to cover travel expenditures for their researchers to attend international conferences.

Russian grant-awarding Science Foundations – the Russian Foundation for Basic Research (RFBR) and the Russian Foundation for Humanities (RFH), modeled from the U.S. National Science Foundation - provide support to science but their financial possibilities are not large. Being federally funded both foundations experience lack of financing for their initiatives. The budget of these two foundations is only 7% of the total budgetary allocations for civilian science. For comparison, the budget of the U.S. National Science Foundation together with the grant-based portion of another government agency – the National Institute of Health – amount 30% of the federal expenditures on civilian research and development<sup>10</sup>. In absolute numbers the budgets of the Russian foundations and of the NSF and the NIH are incomparable: the NSF budget is 3.3 times larger than the budgets of the RFBR and the RFH taken together<sup>11</sup>.

Today there are two priority areas that need foreign support at first hand: be *renovation of equipment, and support of youth*. They may be fulfilled through two

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<sup>6</sup> - Materials of Hearings at Board of Federation, Russian parliament “Actual problems of legislative framework for integration of research and education”. Moscow, May 18, 2000.

<sup>7</sup> - Calculated on the basis of: Research and Development in the Russian Higher Education Sector. Data Book. Moscow, CSRS, 1998, p.45.

<sup>8</sup> - Today up to 60% of total expenditures on science is from the federal budget. Source: Science in Russia in figures-1999. M., CSRS, 1999, p. 49.

<sup>9</sup> - Former Minister of science M.Kirpichnikov recently said that material basis of research is permanently worsening.- Source: Poisk, no.9, March 3, 2000, p.2.

<sup>10</sup> - Source: Research and Development. FY 2001. AAAS Report XXV, p.p.71, 77, 162.

<sup>11</sup> - Calculated on the basis of: Science and Engineering Indicators – 2000. Vol.2, Appendix tables, p.A-60.

major forms: individual support, and institutional support. Individual and group projects (grant-based) may provide additional financial support for researchers. Today individual financial support takes a major share in foreign grants and this is a reflection of a very low average level of salary in science. Measured in US dollars it was about \$150 per month in 1997, \$130 in 1998, and \$67 in 1999<sup>12</sup>.

Then, the most productive way of institutional support in modern Russia is the encouragement of integration of research and education in Russian higher educational institutions. During the last five years these areas started to receive special attention of the foreign, particularly the U.S., foundations. The U.S. programs are the most noticeable – both by the number of foundations implementing such projects and by amount of financing invested into them.

There is an evidently growing tendency to support young researchers and students in such forms as individual financial support, fellowships and scholarships, travel grants for participation in international conferences, and some others. Simultaneously there is an increase in the number of programs aimed to support institutional reform and in particular to strengthen the bond between education and research in Russian universities. Another noticeable tendency that accompanies both priority directions is encouraging of financing on a matching basis. Foreign foundations try to attract support not only from Russian government but also from local budgets. The extent to which local and federal agencies participate in foreign initiatives reflects the level of importance of these programs for Russia.

The first impacts of these activities may be already evaluated.

*Impact of the U.S. programs on quality of education, involvement of youth into research, mobility, and prevention of brain drain*

*Support of young researchers and students* became a subject of special programs both in Russian and foreign foundations. Recent sociological surveys show that almost 50% of young scientists from the best research institutes and universities have grants from Russian foundations<sup>13</sup>. The same survey has revealed that at the same time young scholars are not very much involved into international projects.

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<sup>12</sup> - Monitoring pokazateley nauchnogo potentsiala: analiz i prognoz. Informatsionnyi bulletin. November 1999 —January 2000. M., CSRS, 2000, p. 5.

<sup>13</sup> - NG-nauka, no.5, May 24, 2000, p.5.

Meanwhile there are several foreign initiatives that demonstrate large participation of students and young researchers. Usually these programs have complex impact – both on research and education.

The first and one of the most successful initiatives of such type was started in 1995, when the International Center for Advanced Studies (INCAS) in Nizhny Novgorod was established. The Open Society Institute (more popularly known as Soros Foundation) and the regional administration funded it on a matching basis. The share of charitable support from the U.S. side was about 52% in average but for the last two years (1999-2000) it increased up to 80% because of the financial crisis in Russia that happened in August 1998. After that both regional and state administrations could not support this initiative at the same level as before.

The Center is a unique structure in Russia because it combines original research and educational programs. The initial idea was to create a program to support youth so that to encourage it to stay in science, to prevent brain-drain, and to make prestige of science in Russia higher. For that purpose the program encourages so-called “reverse flow” of foreign researchers to Russia – to participate in joint research projects or to give a lecture course for students. All research projects are in the form of half-a-year grants. Each team includes at least one foreign partner. Then, the results show that each project included in average two students – undergraduate and / or graduate. About 30% of the grant size were directed for individual financial support of youth. The educational program allows well-known foreign and Russian scientists to give lecture courses and conduct seminars in Nizhny Novgorod University.

The selection of the areas for support in the INCAS was conducted differently for research and education programs. Research grants were awarded in the areas that are traditionally strong in the region, namely in physics and chemistry. 50% of all awards were made to the projects in physics, and 25% - in chemistry. For educational program another approach was used: foreign and Russian lecturers were invited to teach courses in the fields that are underdeveloped in the region. These fields are biology and economics. For 1995-1999 about 130 original lecture courses were presented to INCAS students.

This program may be considered very effective. First, the involvement of youth is very high: 62% of all project participants are students and young researchers. Second, all projects resulted in publications in international (mostly) and domestic scientific journals. Third, about one-third of all grantees received new awards from

different sources to continue their collaboration after completion of INCAS projects. Fourth, for half of Russian project participants, including students, collaboration continued also in the form of visits to the laboratories of their foreign colleagues where they could continue research and conduct experiments on modern equipment. Many foreign researchers who participated in INCAS projects said that they benefited both from high level of science in Russia and from involvement of very well educated Russian students. Finally, a very noticeable result of this program is characterized by the fact that *no one of the researchers or students left abroad*. Everybody found a possibility to stay in Russia, to continue research career, and to obtain new grants or contracts.

Due to the high impact of the program the decision was made to extend it to another regions. And in 1998 two similar Centers were opened: one in Moscow and the other one in Saratov.

Another U.S. program directed towards complex support of research and education is called "Cooperative grants program" (CGP). It already had two rounds and was conducted in 1996-1998, and in 1997-1999 by the U.S. Civilian Research and Development Foundation (CRDF) for the Independent States of the Former Soviet Union. At the present time the program is under way: in May 2000 new awards were announced. This program provides two-year support to joint US-FSU research teams working in civilian research and development in the natural sciences, mathematics, engineering, and biomedical and behavioral sciences. The program conducted in 1997-1999 provided support to biomedical and behavioral sciences (BBS) projects only.

According to the rules, at least 80% of the funds awarded to each project have to be used for project-related expenses of the FSU component of the research team, including institutional overhead. No more than 20% may be used for U.S. team expenses. Then, CRDF strongly encouraged members of the FSU team to visit the U.S. team's laboratory for a stay of three to four months.

Under the first round of competition about 300 awards were made; second round, for BBS, included 46 awards, and recently about 200 new awards were made under the third round.

The analysis of impacts of CGP was based on the information from the CRDF program database and additional data received through the sample survey. The survey was conducted among those CGP grantees whose projects were near completion.

Since to the time of survey projects were just completed, only immediate effects and first impacts could be evaluated.

The major impacts are the following: increased involvement of students and young researchers, stimulation of mobility, and prevention of brain drain. But first of all an indicator of success is the fact that *all project team members from both sides said that they would continue collaboration*. Most of the teams are going to continue collaboration in the form of Internet contacts followed by joint publications, exchange visits, and joint applications for new grants.

About 60% of all Russian teams in both CGP programs included *students*. In average, each team included two students – that is unusual for a regular research laboratory in Russia where students often are not present at all.

Travel for project-related purposes may be considered as indicator of mobility. It is especially important for Russian team members since the country was so called “closed” for many years. In average in 87% of all projects Russian team members traveled to the US, and in 70% - to another countries. The data on student mobility show that from 40% of projects with students they traveled to the US, and from 25% - to the other countries.

At the same time there are always doubts that encouraging of mobility for Russian researchers will indirectly promote brain drain in the form of contract or permanent emigration. Since one of the CRDF goals was to offer scientists alternatives to emigration, this concern was very important. To assess the situation the following question was addressed to the FSU team members: “*Have anybody left the FSU for six months or more to take a position in a foreign laboratory or organization?*”, and whether there were graduate students among those who left the country.

The responses show that the level of outflow was incomparably lower than the level of mobility of Russian researchers. In the first program there were 20% of all projects from which anybody left for abroad, and in the second program – only 7.5%. *Outflow of students was not higher than of the other researchers*. In general *correlation between mobility and outflow was not found*. The case by case analysis suggests many examples when graduate students left from those projects where they did not have a chance to travel for project-related purposes or to participate in the conferences.

Meanwhile in average those teams from which somebody took position abroad, had the highest indicators of publication activity and conference participation. Therefore the popular assumption that emigrants are the best researchers or researchers from the best laboratories seems to be true.

Other surveys complement the picture of the phenomenon. Thus, they helped to reveal that some forms of collaboration prevent emigration more than others. Collaborative projects or short-term exchange visits have better effect from that point than long-term (up to one year) fellowships and scholarships.

One of important factors that may attract youth into science and to keep them there is possibility to work on *modern equipment*. CGP grant size could not permit purchase of large pieces of equipment but it was quite affordable for renewal of computer basis in research laboratories as well as for buying some smaller components, laboratory materials and reagents. The predominant number of Russian teams used part of the grant for purchasing equipment and supplies. Then, there was a possibility for the FSU researchers to travel to the U.S. so that to implement experimental parts of research together using modern facilities and techniques. More than 2/3<sup>rd</sup> of all FSU teams used the equipment of their American colleagues during implementation of the grant. Almost all these teams included students.

Finally, impact of the foundation's programs may be measured through self-assessment of the participants. Both the US and the FSU teams were asked about major benefits of collaboration. The results of the survey revealed that though the FSU and the US points of view are not coinciding they are overlapping to considerable extent, especially in the second, Biomedical and Behavioral Sciences Program. The major difference is not in general views on what was really beneficial but mostly in the frequency with which certain benefits were cited by each of the sides.

The most often mentioned by grantees impacts of collaboration are presented in the **table**.

***Most frequently cited by FSU teams impacts of collaboration under CGP programs***

*(in descending order)*

<b>1996-1998 program</b>	<b>1997-1999 program</b>
1. Access to the US facilities	1. US expertise in particular research areas and expertise in planning of experimental work

2. Access to information including data which were previously unavailable	2. Access to US facilities and laboratory reagents
3. The US expertise in certain areas of research	3. Exchange of ideas and methods of experimental work
4. Access to new research methods, especially in experimental parts of work	4. Access to previously unavailable data and information
5. Exchange of ideas, joint publications, seminars, exchange visits, new contacts	5. Experience in preparation of data for publications according to international standards
6. FSU in-country support	6. Financial support for research
7. Time and cost sharing.	7. Study of new computer programs

The benefit number one for the FSU teams was *access to the US facilities, methods of experimental work, and information as well as exchange of ideas and new methods.*

*Many projects from universities that included undergraduate and graduate students put special emphasis on the educational opportunities for young researchers.* About one-third of all students managed to write and defend thesis due to participation in the CGP. That is a rather high number. Besides, expert evaluation indicated that increased quality of education was one of the major impacts in about 20% of all projects.

The overall assessment of these programs showed that they had impact both on research and education. All FSU participants could work on modern equipment, travel, make presentations at international conferences, establish new contacts with colleagues from domestic and foreign institutions. All these factors are extremely important for inflow of youth into research and therefore for succession in science.

#### *Impact on institutional reform in the areas of Russian science and education*

The most productive and highest quality research occurs where senior researchers and young students work closely together. In Soviet period a rather strict division was made between scientific research and teaching; universities were not strong, as a rule, in basic research, a function given to the institutes of Russian Academy of sciences. Therefore the building up of *research universities* is a healthy reform in Russia. Till the date the most noticeable foreign initiative in this area belongs to the John D. and Catherine T. MacArthur Foundation. This Foundation originated a program entitled “The Program for Basic Research and Higher Education

in Russia” (BRHE). Its objective is to establish, on a competitive basis, several Research and Education Centers (RECs) in the area of natural sciences in selected departments of Russian regional higher educational institutions. All universities located outside Moscow and St.-Petersburg may participate in the program. The management of the program is conducted by the U.S. CRDF. The program is jointly supported by American foundations and Russian federal and local institutions.

In August 1998 the first demonstration project was initiated at the Nizhny Novgorod State University. Then, in October 1999 three other sites were selected on a basis of open competition – in Krasnoyarsk State University, Far Eastern State University, and Rostov-Kuban-Taganrog Universities (a joint project from three universities). Just recently, in May 2000, four new Centers were announced and there are plans to conduct competition for organization of eight more Centers. These Centers are very important for regional development since science and, correspondingly, best education in Russia were concentrated in a few large cities, first of all in Moscow, St.-Petersburg, and Novosibirsk. Due to financial crisis in Russia less students could go to study to these best centers and they have to stay at their home cities. This regionalization has decreased in average the quality of the students because the higher education institutions in smaller cities often do not have adequate libraries and equipment or highly qualified staffs. The creation of RECs may improve the overall situation and each REC may become Center of excellence for the entire region.

An interesting fact is that this initiative was not absolutely unique in Russia. Its “predecessor” was a program of Russian government. In 1997 a four-year program entitled “Federal support of integration of higher education and basic science” (*“Integration”*) was established. It was awarded the highest dual-status: presidential and federal program. One of the major goals of this program is the creation and support of Education and Science Centers (ESCs) in which researchers and teachers from universities and institutes of the Russian Academy of Sciences (RAS) collaborate with each other. Today 157 Centers receive support through this program. Ninety percent of them are in natural sciences and engineering. But as for most government initiatives, the funds available for that program despite its highest status are quite modest. In 1999 the total financing of all 157 RECs was \$7.7 million. Grant

size varied from maximum \$160 thousand per year<sup>14</sup> to minimum of \$2 thousand per year. Therefore the impact of that program is not big: grant size and its duration (every year ERCs have to re-submit applications) do not allow to buy equipment or participate in international conferences. Mostly funds are spent for support of young researchers and students, updating lecture courses and curricula, and for purchase some supplies. Regional distribution of ERCs indicates that impact on regional development is not very high too: more than half of them are located in two major Russian science cities - 43% in Moscow and 12% - in S.-Petersburg<sup>15</sup>.

The CRDF BRHE program has high potential for success. First of all the grant size for each university is rather large – more than one million dollars for three years. It provides the possibility for universities to purchase new equipment and develop communications including Internet access. Then, program consists of three key components: research project, education project, and project for development of linkages. The idea is to tie education and research, to develop them in the Centers as interconnected areas. The last component aims to promote collaboration of the Center with other research organizations as well as with industry and international research and educational community.

The major difference of BRHE with the Federal program “*Integratsiia*” is in the general approach. “*Integratsiia*” does not support and stimulate research in universities per se. It supports research in academic institutions through larger involvement of students; and it improves education through involvement of academic researchers in teaching. BRHE RECs provide possibilities to build basis for research in universities, and academic staff may participate in university research too, not only in teaching.

The first assessments show that there already are some evident effects of this program.

All Centers apply special mechanisms to attract best students and young researchers. Work usually starts at the level of high school students and involves also undergraduate and graduate students. High school students may visit lecture courses and participate in specially organized competitions. Best pupils usually become university students and continue to participate in REC. Special training initiatives for

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<sup>14</sup> - There are only 4 projects with the largest amount of financing.

<sup>15</sup> - All data for program “Integration” were obtained in the headquarters of this program.

best high school students is a rather old tradition that was quite developed in the Soviet Union. Now RECs help to reanimate it.

Then, competitions for best research projects were conducted at the RECs and the best projects received support from the Centers' budgets. Several graduate students at each Center already completed their thesis. The level of education in the Centers is rather high: in fact, it is almost individual education. The teacher-student ratio is about 1:1 while in average in Russian universities it is 1:14<sup>16</sup>. Students starting from their second-third year have access to new equipment and participate in REC research projects. They also learn management skills and that is very important for future development of research career.

Besides introduction of new lectures and seminars RECs also organize invited lecture courses and two-three-months fellowships for students in strong universities. Leading researchers from Russia and from abroad are invited to give lecture courses or seminars for REC students. Lectures presented by foreign professors have indirect effect as well: they provide a good basis for foreign language training. In general all students at the REC receive additional training in English language. It helps in their future collaboration with foreign partners and gives them opportunity to be better involved into international scientific community.

Research and education are interconnected: research results are immediately incorporated into education process.

As a result, assessments that were given by project leaders showed that students-REC participants have wider and deeper knowledge if compared with students in average; they may better apply knowledge from different disciplines, work in the interdisciplinary team, and make decisions in not standard situations. These are very important qualities, and there is a high probability that REC students will stay in science.

At the present time Russian Ministry of Education is discussing reshaping of the "*Integration*" program. The idea is to model it partially from the U.S. BRHE program. There is a plan to decrease the number of Centers to 30, and to concentrate larger support on the renovation of equipment and informational basis of research and education. That is also an impact of the U.S. non-profit initiative.

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<sup>16</sup> - Vuzovskaya nauka. Statistical Databook. Yaroslavl', 1997, p.53. Data are for 1996.

*Conclusion*

Russian science and education today continue to experience lack of internal resources and therefore international support is still very crucial. Foreign support from non-profit foundations in the critical areas has impact not only on research and education but it may also assist to the change of cultural and political attitude to these areas both on central and local levels in Russia. With the efforts of the U.S. non-profit foundations as an example, science and education have an opportunity to become an organic part of Russian society instead of being imposed on it from above, as it was in Soviet times.