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Developing Research in Russian Universities

Irina Dezhina

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Summary

This article addresses the key features and the state of research in Russian higher education establishments. It examines measures taken to support research in universities and to integrate R&D with higher education since the fall of the Soviet Union. The article shows that both the potential and efficiency of research in Russian universities remain rather weak. Recent government initiatives to create a network of elite universities have not been accompanied by the creation of the incentives for institutional change that would promote the development of scientific research in universities.

This article formed the basis for the author's presentation at the seminar "Research Universities: Prospects and Challenges. The Russian and French Experience crossed," organized by IFRI in Paris on 15th December 2010, in close partnership with the New Eurasia Foundation (Moscow).

Introduction

Research has never been a competitive advantage of Russian universities. During the Soviet era universities were primarily places of learning, while research was undertaken in a system of State Academies of Science. The quality of research in universities suffered no less at the beginning of the post-Soviet period than Russian research in general, but given its initial lower level of financial resources, the losses have become much more noticeable. Indeed, insufficient level of research causes an impact on the quality of education. As a result, the Russian government has initiated a plan for the integration of research and education, both external (involving cooperation with scientific research organizations in Russia), and internal (strengthening research in higher education, as well as the use of scientific research results in the education process).

The integration of research and education has not been easy, not only due to the difficulty of changing institutional structures, but also the difficulties of overcoming prevailing stereotypes. Universities are not considered equal partners by Academy of Science institutes, they are regarded only as institutions designed to train staff for research activities. Furthermore, the creation of successful research universities would mean the emergence of competition, viewed by rivals as disturbing the current "balance of power." Consequently, a section of the Russian scientific community does not welcome the real, successful integration and strengthening of research in universities.

Despite a series of efforts undertaken by the government, the structure of Russia's sciences complex has changed little, and in terms of funding and staff potential, universities still account for only a small part of research in Russia. In the last two years the Russian government has formulated, and started to implement a number of ambitious projects aimed at enhancing the position of Russian universities not only in the country but also worldwide. The reform measures place particular emphasis upon support for research in universities and the integration of research and teaching.

This article analyses the evolution of university research, and government policies aimed at its development as well as analysis of "best practices," which have been initiated in universities not because of, but to a certain extent in spite of Russian governmental policy.

Translated from Russian by Joe Carter.

Role of Universities in the Russian R&D Complex

The Soviet Legacy

The post-Soviet scientific complex inherited all the features of the Soviet system, in which the university research did not play a primary role. Soviet scientists were grouped together into three large pyramid-shaped structures: higher education, the Academy of Sciences and branch ministries (industry and factory science). Table 1 outlines the characteristics of the organization and the proportion of research staff and funding attributed to each of the three groups.

The largest and most important network of institutes was subordinate to the technical ministries: it mainly carried out applied research and development (R&D), although it did conduct some basic research (just as the Academy of Science performed some applied work). The main bulk of fundamental research was carried out by the USSR Academy of Sciences, the most prestigious scientific institution in the country. Military related research work played a very large role in all sectors of science, that is, not only in the ministerial branch sector, but also in universities and Academy institutions. In fact, by the time of the Soviet Union's collapse, the total funds allocated to defense-related R&D accounted for 75% of all research spending.[1]

Higher education institutions were mainly orientated towards applied research; often in cooperation with the relevant branch-specific institutions (this is particularly true for the vast networks of technical HEIs in the country). Basic science in universities was relatively weak: only so-called "elite" universities of the country collaborated with the Academy of Science.

University research had only an indirect relationship with teaching, and this link weakened in the initial post-Soviet period. In the 1990s the numbers of universities grew, however the number of staff involved in research and development—especially in university science departments—declined. In the 2000s the proportion of research staff in universities began to increase gradually (Figure 1), during this period Scientific Research Institutes (SRI) as autonomous units within universities began to be liquidated and incorporated or merged with other departments. However, this did not strengthen university research.

[1] B. Saltykov, "The Reform of Russian Science," *Nature*, Vol. 388, 3 July 1997, p. 16.

Table 1

The Organizational Structure of Science at the end of the Soviet Union, 1990

	System of higher education	Academy system of science	Ministries (Industrial Sciences)
All-Union level governing bodies	State Committee for Higher and Secondary Education of the USSR	Academy of Sciences of the USSR, Academy of Medical Sciences, Academy of Agricultural Sciences	Ministry of Industry, Ministry of Defense, etc.
Union Republic-level governing bodies	Ministries of the Union Republics, the committees of Higher and Secondary Education	Far Eastern, Siberian and Ural Branches of the Academy of Sciences of the USSR, and other branches	-
Type of subordinate organizations	Higher education institutions: universities and institutes, including the major universities (Moscow and Leningrad)	Academy of Sciences of the Union Republics: 14 academies of agricultural, medical and educational sciences	Branch-specific research institutes; secret research institutes under special regime
Number of research staff	600 000, including university faculty teachers	125 000	800 000
Share of personnel with academic degrees	9% with a PhD, 13% - candidates of science	54% with a PhD, 33% candidate of science	37% with a PhD, 54% - candidate of science
Part in total expenditure on R&D in the country	6.7%	12.5%	80.8%

Sources: L. Graham, D. Dezhina, *Science in the New Russia: Crisis, Aid, and Reform,* Indiana University Press, 2008, p. 2. *Nauka v Rossijskoy Federacii v 1991*, [Science in the Russian Federation in 1991], Statistical Yearbook, Moscow, Goskomstat, 1992, p. 38-39. Nauka *Rossii segodnya i zavtra. Tchast II. Nauchnyj potentzial: structura, cadry, financy* |Science of Russia Today and Tomorrow. Part II. Scientific Potential: Structure, Staffing and Finances], Moscow, AC NPP RAN, 1992, p. 7.

Contemporary problems of research development in universities

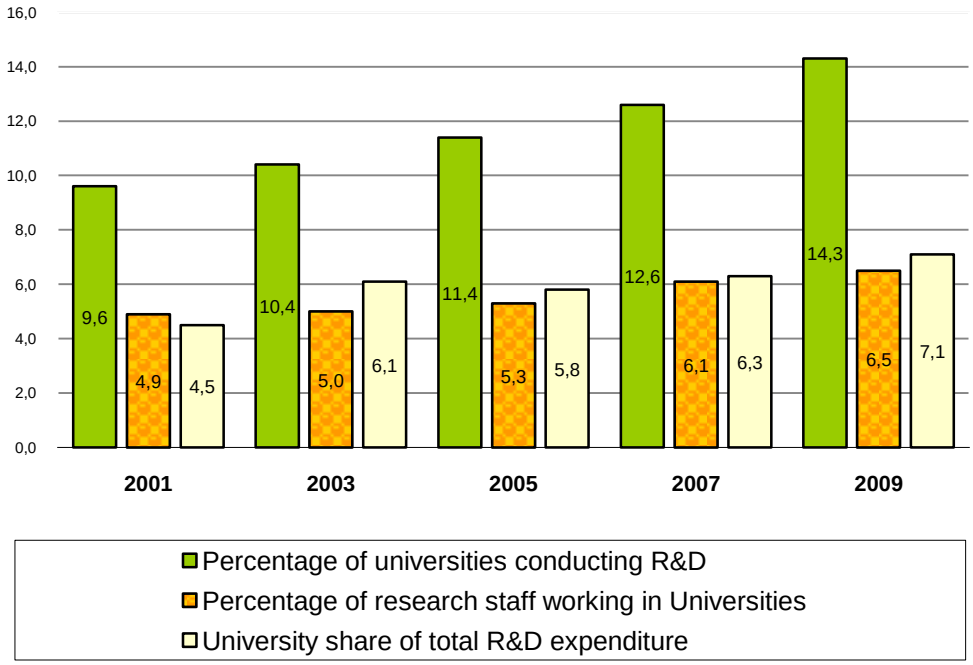
Funding for R&D in universities grew from the mid-2000's, when the State began to implement policies supporting higher education, including university research. However, this research is still in many ways not competitive compared to Academy research, particularly when comparing the number of citations and the prestige of scientific journals published by the Academy and universities. For example, of the 112 most cited Russian scientific journals, according to the *Web of Science* database, 95 are

published by Russian Academy of Sciences (RAS) institutes, while only two are published by universities.[2]

However, in recent years, a group of leading universities has emerged where research is being actively developed. These institutions have formed strategic plans for the development of research and their integration into international networks. But even the strongest universities in the country struggle to overcome the problems of a separation of education and research, and suffer from their poor integration with the rest of Russia's scientific complex, notably the RAS institutes.

Figure 1

Place of Universities in Russian R&D Complex



Source: *Nauka, tekhnologii I innovatzii v Rossii 2010* [Science, Technology and Innovation in Russia: 2010], Short Statistical Book. Moscow, The Institute for the Study of Science of the Russian Academy of Sciences (ISS RAS), 2010, p. 8, 36; Indikatory Nauki 2010 [Science Indicators: 2010], Statistical Yearbook, Moscow, State University Higher School of Economics, 2010, p. 206, 218.

Furthermore, researchers in universities have different status and legal rights than teachers. The basic pay of teachers is several times higher than that of scientists in university research divisions and they receive no bonus for academic qualifications. At the same time, the number of contact hours for teachers at Russian universities is much higher than at counterparts abroad. All this makes universities unattractive for research professionals on the one hand, and on the other hand reduces incentives for teachers to conduct research.

An additional problem hindering the development of research in higher education is the multiple positions held by university staff. In the post-Soviet era, most university professors started to combine work in several universities, and to provide private educational services working

[2] *Poisk,* No. 49, 3 December 2010, p. 8.

individually with students and postgraduates, consequently spending less time doing research. According to a study conducted by the Higher School of Economics National Research University (NIU-VShE), at least 40% of university professors regularly take supplementary jobs, but in less than 5% of cases does this work involve conducting research. At the same time, 12.2% teach at other state-run institutions, and nearly 40% are engaged in private tutoring, preparing students for university entrance exams, etc.[3]

The main criteria by which universities justify their funding are the number of admissions to the first year and teaching hours. Thereby, research is not considered a core activity for universities.

[3] Data for 2008. Source: excerpts from the Higher Ja. Kuzminov presentation "The Academic Community in Russia–Breaking an Effective Contract," *Poisk,* No. 47, 19 November 2010, p. 6.

The Integration of Research and Education as a National Priority

The first attempt at integration

In the 1990's the Russian government declared the integration of research and education as one of its top priorities. This has been supported by the Government since 1996, when a number of documents were adopted on the organization and financing of the President's Target Program *"State support for the integration of higher education and basic research 1997-2000"* (hereafter "Integration Program").[4] Its main focus was the creation of the Research-Educational Centers (REC), based on either Higher Education or Academy research organizations. Under this program, integration was intended as a partnership between Academy research institutions and universities, rather than the "growth" and strengthening of research within universities themselves.

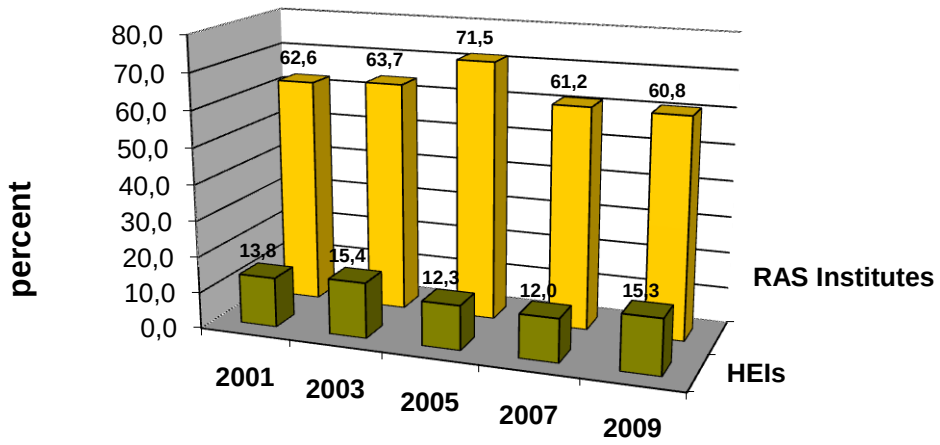
During the Soviet-era, research benefited from various forms of interaction between SRI and universities, many of which evolved spontaneously. In some cases, the historically formed strength of this tradition of cooperation was not destroyed, even during the difficult post-Soviet period. As a result, the "Integration Program" benefited those with previous experience of cooperation. Funds allocated to the integration measures were not large; therefore the development of the Program was carried out via the consolidation of original functions of research institutes and universities. Thanks to this program, universities improved the quality of specialists trained, and Academy institutions have been able to choose and employ the best junior researchers to work in their labs. Meanwhile, research in higher educational institutes did not improve, and Academy staff were no more encouraged to perform teaching activities. The structure, organization and funding of research did not change. Thus the overwhelming amount of basic research has continued to be carried out in Academy institutions, a situation which persists today (Figure 2).

The "Integration Program" had the opportunity to become a means of launching a system of "research universities." Draft laws to this effect were even prepared. Instead, the program was phased out and its funding reallocated to other federal programs, ultimately meaning the implementation of centralized measures to strengthen university research was been delayed by almost 10 years.

[4] Later the Program received a special federal status and was named "Integration of Science and Higher Education in Russia."

Figure 2

Fundamental research in Russian universities and academic institutions (% of total basic research funding in the country)



Source: Russian Science in Figures—2009. Statistical Yearbook, Moscow: CSRS, 2009, p. 91, Russian Science in Figures—2010 Statistical Yearbook. Moscow: CSRS, 2010, table 4.22.

"Best Practices": The Basic Research and Higher Education Program

Launched almost simultaneously with the "Integration Program" in 1998, the initiative of the "Basic Research in Higher Education Program" (BRHE) was aimed at strengthening natural and technical sciences in universities. The idea was that the convergence of research and education in Russia would not only strengthen the sciences and create the necessary conditions for modern education, but also attract more young people into science. The Program was focused on creating "centers of growth" in Russian Universities, with modern research facilities and high quality training for young professionals. Developing relations between universities and scientific organizations—both Russian and foreign—became a key component of the program.

The BRHE Program was a joint initiative between the Ministry of Education and Science and the US Civilian Research and Development Foundation (CRDF). In the first five years funding was provided on a parity basis: 50% allocated by the Russian side (including 25% from federal funds and 25% from local and regional government sources), and 50% from US side through the CRDF. Later, the share of American funding fell to 30%.

The Program has established 20 Research and Educational Centers (RECs). In the first phase of the program each REC received a guaranteed basic funding grant of approximately 1.5 million US dollars for the first 5 years. This was a significant sum for the late 1990's-early 2000's. Stable, long-term funding allowed the purchase of scientific equipment and development of modern teaching programs. On average, about 60% of the total grant was spent on equipment, 20% on wages and 10% to support young scientists and graduate students.

The next step in the Program's development was the shift from "basic" to project-based funding. The RECs began competing with each other for resources that were allocated specifically for the implementation of major scientific and educational projects. Unfortunately, project finance lasted for only three years, and currently support for the RECs is mainly from the Ministry of Education and Science (MES) in exchange for participation in its various programs and activities.

In terms of integration, RECs are an example of "good practice," allowing equal collaboration of scientists from Academy institutions and universities. The number of publications in international journals has increased by an average of 30%. Development of scientific research, in turn, has led to the modernization of teaching programs, which are now reviewed annually. Finally, retention of young people has improved: 60% of center staff are under the age of 35, and 37% of students having completed their thesis continued to work in the sciences—far higher than the national average.

The experience gained throughout the implementation of the program suggests that certain conditions are necessary for the successful creation of integration structures. The most important include aspects such as consistent state funding during the initial stages: at least 3-4 years. Afterwards, a combination of general funding and project-based financing is needed to: support young scientists and teachers, promote external relations, and maintain flexible management approaches and working frameworks.

Unfortunately, the REC model, developed within the framework of the BRHE program, was not implemented at a nationwide level. Scientific and educational centers which were established in universities later operate differently and receive far more modest levels of government support.

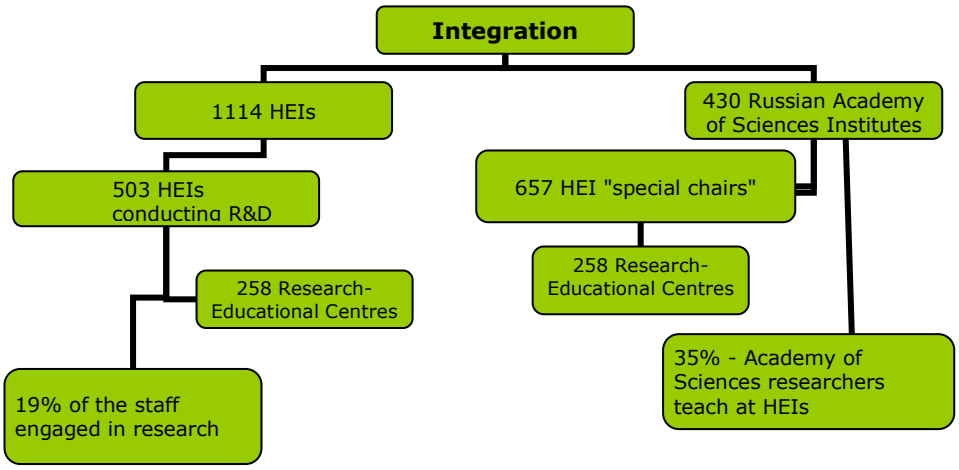
An invariable balance of power

Figure 3 summarizes the basic parameters of integration between university and Academy science today. It can be concluded from these data, that researchers from Academy institutions are more actively involved in the educational process than university professors in scientific research. Less than half of university staff spend time on scientific work. Of these universities, 80% are not associated with SRI and only approximately 19% of university staff are engaged in research—a woefully low statistic that has only increased by 2% over the past five years. At the same time, Academy institutions are creating new "special chairs" in universities,[5] and over a third of scientists at the RAS teach in universities.

[5] Educational divisions of the Academy, based in universities, that remain closely connected to research conducted at Academy institutions.

Figure 3

The Current state of the integration of education and science (based on data from 2009)



Research Education Centers created since 2009, have been funded through the Federal "Research and Teaching Staff for an Innovative Russia Program 2009-2013"[6] have not changed the situation significantly. By the end of 2010, about 1100 RECs had been created, receiving modest government funding for 3 years. Indeed, funds for each REC are limited to 15 million rubles annually. In practice, RECs created in 2009 received 12-13 million rubles; those established in 2010 between 4-5 million rubles.[7] Such a reduction is the consequence of the Federal Law "On public procurement."[8] Under this Law, the main criterion for selection of tendered projects is low cost, rather than quality or professionalism of the applicant team. These funding levels undermine the idea of a scientific and educational centre: meager resources are spread thinly, allowing only a small wage increase for staff, sometimes numbering several dozen per REC.

[6] Approved by the Government of the Russian Federation, 28 July 2008.
[7] Data from the National Training Foundation.
[8] Federal Law on placing orders for goods, works and services for state and municipal needs, 21 July 2005, No. 94-FZ.

New Government Policy on University Sciences

Research universities Russian-style

In 2009, support for research in universities became one of the important areas of state policy. University research has been given particular priority, due to government objectives of creating a competitive environment in science. The accent was placed upon universities, because with their relatively weak scientific base, they could not compete with Academy research organizations. The strengthening of science in universities is necessary to improve the quality of education in general and allow young scientists in particular to engage in R&D activities so that they are better prepared for scientific work. It became obvious that academics who are not regularly engaged in scientific research cannot effectively pass on contemporary knowledge to students, especially graduate students. These motives have been officially declared by the Minister of Education and Science Andrey Fursenko.[9] The government has adopted a popular Anglo-Saxon model of higher education, in which the bulk of fundamental research is done in universities. Finally, there were political reasons behind the reorientation of funds to support university research, related to the long confrontation between the Presidium of RAS and the MES on a range of scientific development.

The Government's policy to support science in universities has been realized through awarding selected universities special status, forming a multi-tier system. This has created a network of 29 national research universities (NRU). The State Universities of Moscow and St. Petersburg (MGU and SPSU) received the special status of "unique scientific and educational complexes."[10] Seven federal universities were also formed in which the development of science was declared a priority. It is expected that more will be created, at least two federal universities—in Kaliningrad and in the North Caucasus.

The selection of the so-called "elite" universities began in 2006 when the government initiated the "Innovative Education Program" (IEP) within the framework of the "National Project—Education." As a result of a tender, 57 universities were selected and received substantial government funding for a two-year period. The aim was to lend support for improving educational quality and scientific activities, through the purchase of new equipment, staff training and elaboration of new teaching methods. For

[9] A. Fursenko, "University Research Should Compete with Russian Academy," *Science*, Vol. 330, 19 November 2010, p. 1038.
[10] Federal Act "On the Moscow State University Lomonosov and the St. Petersburg State University," 10 November 2009, No. 259-FZ.

universities, it was the first major experience of project management, selection of development priorities and self-evaluation. The IEP is regarded as the first step in the policy of giving special status to universities. Those universities which won the public tender have come to be considered the strongest in Russia.

In 2006, two federal universities, the Siberian Federal University and Southern Federal University (SFU and YuFU), were formed. They were created through the fusion of several universities with different profiles, thus becoming the largest in the country. Federal universities have a regional focus: according to official documents, such universities aim to improve the competitiveness of leading industries within the regions. The status of "federal university" is accompanied by additional budget funding, which can be spent on certain activities. Federal universities must pay considerable attention to the development of research and its integration with education, in particular by inviting foreign lecturers and researchers and increasing the number and proportion of foreign undergraduate and graduate students, among other activities.

The "federal university" is a permanent status. In addition, in early 2010, federal universities were made "autonomous" bodies.[11] During a transitional period of three years, the State will provide support to these universities in various forms including the provision of guaranteed budget funding. The decision to establish federal universities can be regarded as a purely political decision taken at the highest level without any extensive coordination and discussion. This was confirmed once again in 2009, when President Dmitry Medvedev signed a directive creating five federal universities in Russia,[12] which were regionally distributed, using criteria that have not been publically explained. Moreover, as numerous comments have demonstrated, the conversion of a number of universities into new federal universities was unexpected even for employees of these institutions.

A somewhat different pattern has emerged as characteristic of national research universities. This third initiative begun in late 2008, when two universities (MISIS—National University of Science and Technology and MIFI—National Nuclear Research University) were awarded national research university status without tender. In 2009-2010 they were joined by another 27 universities awarded the status, this time by tender.

Research universities will be supported by the budget for a period of 5 years. By 2018, they should have realized their government approved development programs. It is interesting to note that the development programs for federal universities and national research universities were approved by the government *after* the new status was given. Two years after this initiative began, no single document explaining why it was necessary to build a network of national research universities has ever appeared. Furthermore, there is no coherence between the various

[11] Decree No. 12-p of the head of government of the Russian Federation, 16 January 2010. <http://government.ru/gov/results/9056/>. This status allows HEEs greater liberty to decide on their scientific and teaching activities as well as the use of government funds. However, state support is no longer guaranteed. Autonomous institutions only receive government funds in exchange for services rendered.

[12] Presidential Decree "On the establishment of federal universities in the North West, Volga, Urals and Far Eastern Federal Districts," 21 October 2009, No. 1172.

development programs. For example: all research universities aim to attract scientists within the Russian diaspora, yet taken together the number of representatives in the university programs greatly exceeds the number of Russian scientists abroad.[13]

The choice of research universities can also be considered in some way political. According to the rating of Russian universities *for* scientific achievements, compiled in 2009 by ReitOR (an independent Russian rating agency in education), new "research" universities occupy good positions, but not the best: only 5 out of 14 universities selected in 2009 were in the top twenty.

Research universities have received additional budget support, but they have an obligation to co-finance projects with their own funds (20% of the project cost). These funds can only be spent in five areas: the acquisition of educational and scientific equipment, training of universities teachers and researchers, curriculum development, development of information resources and improvement of the system for quality control.[14] The mechanism of allocation of resources is constantly adjusted, which complicates the work of universities. The budget allocated cannot be spent on research funding, support for research units and groups or graduate students. Yet these elements are vital to elaborating university research projects. Finally, the basic conditions governing the activities of Russian research universities remain the same as for other universities. On these premises therefore, the integration of science and education is still complicated.

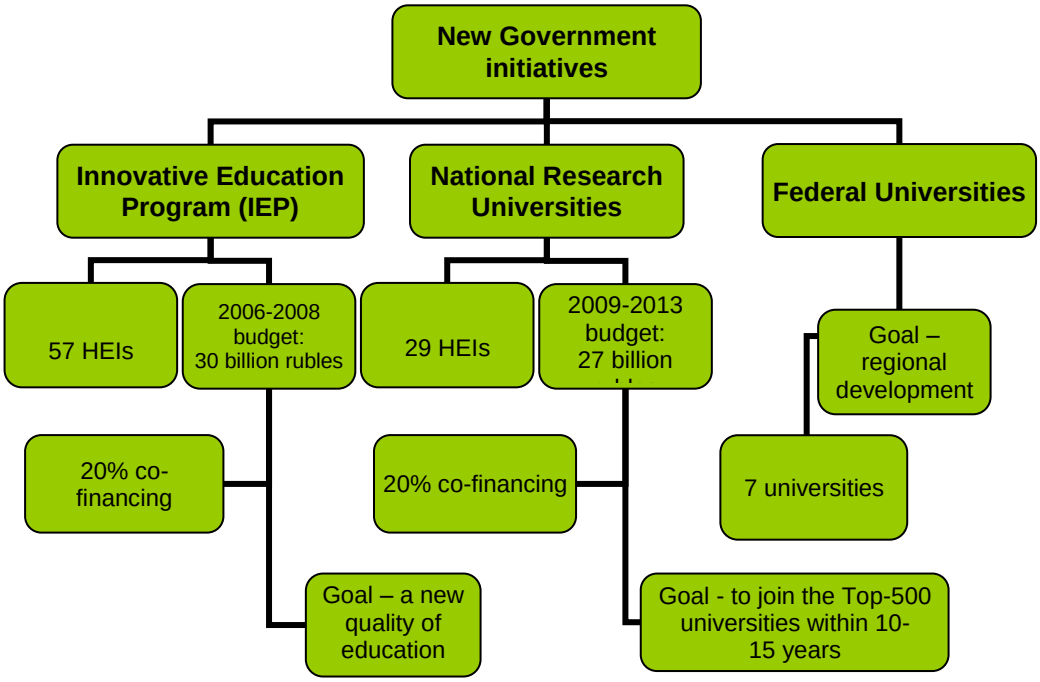
Federal universities find themselves in the same situation: ambitious goals are extremely difficult to reach. For example, according its development strategy for 2009, the Southern Federal University in Rostov-on-Don (YuFU) should have created additional research positions to develop research of fundamental and applied science. In practice, however, between 2007 and 2009 no new positions were created.[15]

Similarities and differences between the IEP, research universities and federal universities are summarized in Figure 4.

[13] I. Fedyukin, I. Frumin, "Rossijskie VUZy-flagmany" [Russian Flagship Universities], *Pro et Contra,* No. 3, May-June 2010, p. 29.
[14] Decree No. 550 of the government of the Russian Federation of 13 July 2009: on the selection of university development programs by call for tender giving rise to the creation of "National Research Universities," <http://mon.gov.ru/dok/prav/obr/5556>.
[15] Statement by Director of the Institute of Physical and Organic Chemistry, SFU Academician V. Minkin, 28th May 2010, <www.ipoc.sfedu.ru/index.php?option=com_content&task=view&id=169&Itemid=37>.

Figure 4

Typology of "new status" universities



Source: Compiled by the author.

However, the leading Western universities, those that come first in global rankings, benefit from no special status. The title of "Research University" is not in the gift of the government: it is a reflection of the activities that they carry out. Research quality is measured according to numerous criteria: amount of funding per researcher; number of publications, citations and international awards (Nobel prizes and Fields medals); labor market demand for graduates and career success of graduates. Research universities are judged against some formal indicators allowing direct comparisons with other universities, but are also expected to conform to some unquantifiable standards, including: prestige, international renown of researchers and efficiency of management systems. Therefore, the formation of a research university is a lengthy process and a result of the interaction of a number of factors.

It should also be taken into account that most foreign research universities own land and real-estate, contributing to their financial independence. Russian research universities are heavily dependent upon budget financing, making their situation precarious. The inadequate legal and regulatory basis only serves to increase this instability.

In fact, the Russian Government's policy of assigning the category "national research" to a number of universities aims to strengthen existing institutions using temporary additional budgetary injections, rather than the progressive growth of research universities. This approach is legitimate but it should be accompanied by a number of other measures. For example, it is necessary to facilitate the recruitment of foreign students and teachers, the creation of endowments and the construction of new campuses. However, there is another approach that may prove more effective. The

state could commit to creating favorable operating conditions for all universities. Then, they could compete for government funds on an equal basis, making additional funding dependant on past successes and research potential. In this case, ultimately, an elite group of universities would emerge as a natural result of their development in a competitive environment and equal opportunities.

Creating new university laboratories under the guidance of leading world scientists

Another measure to strengthen research in universities has been raised by the new *mega-grant* tender, which has caused significant resonance in both Russia and abroad. It will create laboratories in Russian universities headed by leading world scientists. This initiative has only just got underway: the first round of the tender was held in 2010 with results announced in late October.

Universities which win the grant will be allocated 12 billion rubles in subsidies in 2010-2012. Moreover, each university could potentially receive funds for the establishment of several laboratories—there are no formal restrictions. It was planned to finance 80 projects. Each winner would receive funding of 150 million rubles (approximately $5 million) over three years—an unprecedented amount, even for the well funded universities in the US.

In these new laboratories, funds can be spent on new equipment, reagents and other needs. The only limitation is that the director's and staff salaries should not exceed 60% of the total grant. The most significant aspect of the grant is that the strongest scholars are eligible to participate in the competition, regardless of their place of work and residence—it may be Russian scholars, Russian citizens working abroad or foreign scientists. They are assessed purely on their achievements, using formal indicators such as the Hirsch index—calculated from the number of citations and publications of a given researcher. Under the terms of the competition, scientists must stay in Russia for at least 4 months a year.

There are some problematic aspects of the *mega-grant*, which were evident even before its implementation. They are related to the very idea of this competition and may reduce the impact expected from the large amounts of financing invested into this initiative. The main problems identified include:

1. With the overall poor state of scientific infrastructure in universities (in terms of efficiency of equipment use and staffing) it is difficult to establish world-class laboratories.

2. The requirement making a personal presence in Russia mandatory for at least 4 months a year has forced a number of leading international scholars, unable dedicate such a significant period of time to work in Russia, to withdraw from the grant process. In fact, “commuting” was a way for Russian scientists to improve their material wealth during the tough economic conditions of the 1990s. This approach is unsurprisingly not the way to attract “the best of the best.” Two other approaches would

be more adequate: signing a long-term contract with complete relocation to Russia or flexible scheduled visits to Russia, determined in agreement with the Russian university, therefore being free of specific timeframes. As a result, a better solution might have been to create these laboratories not "under the direction" of visiting scholars, but "with their participation."

3. Compared with the extensive and rather rigid set of criteria for the selection process of these projects, and the considerable financial investments planned in the creation of laboratories, the requirements for results look rather lenient (at least one article in any journal after 18 months of work, or at least one patent). Working virtually anywhere, meeting such requirements would not be difficult. In comparison, staff at US national laboratories are required to publish at least three articles per year in peer-reviewed journals.

4. The government has no plans—at least none that have been made public—regarding the future or short-term budget support for laboratories after the three-year grant period comes to an end. At the same time, the timeframe is in fact just two years (2010 cannot be considered, as the results of the first tender were announced in the October) and are not enough to build a complete working science laboratory. The average period worldwide for setting up a laboratory is roughly 5 years: the "standard" time period adopted by the US National Institutes of Health (NIH).

Potential candidates have found the large amounts of funding very attractive: the Ministry received 6 applications per grant, twice as many as the average for Russian grant competition funds and Ministry tenders. However, after an evaluation of the total number of bids, it was decided to award just 40 grants (not 80 as initially planned), and put the remaining grants up for a second call for tender later.[16] The tender has attracted more interest from foreign scientists than representatives of the Russian-speaking diaspora; 35 % versus 22 %[17] of the applications, respectively (Table 2). However, most applications came from Russian scientists: 43%.

Table 2

Distribution of applications for the "mega-grant" and grants awarded based on project manager's origin

Project manager's origin	Percentage of the total number of applications (N=507)	Percentage of the total number of grants (N=40)
Russian scientists	43%	12.5%
Foreign scientists	35%	35%
Foreign scientists from the Russian-speaking diaspora	22%	52.5%

Source: Calculation based on data from the Ministry of Education and Science, <http://mon.gov.ru/press/news/7876/>.

The table above illustrates an interesting result of the call for tender—preference was given to projects under the direction of the Russian-speaking diaspora, these won 52.5% of the grants. Among the

[16] Ministry of Education and Research of the Russian Federation, 29 October 2010, <www.rbc.ru/rbcfreenews/20101029212303.shtml>.
[17] Including 2% from countries of the Community of Independent States.

winners, there were only five projects headed by Russian citizens residing permanently in the country (12.5%). The number of successful proposals from foreign scientists, however, was proportionate to the number of applications.

The distribution grants to specialist fields was reasonably balanced and reflects both the prevailing balance of forces in research areas (projects in the traditionally strong fields of physics, mathematics and mechanics) and the new government priorities (a large number of grants in biology, biotechnology, medicine, numbering 11 grants out of the 40 in total). A single grant was awarded in each of the following fields: astronomy, nuclear energy, chemistry, energy efficiency, as well as "economics, international studies and sociology."

Analysis of the universities that won indicates that, along with a relatively large number of grants being allocated to several leading universities, a number of regional universities without "elite" status were successful (Pushchino State University, Udmurt State University and Bashkir State University). However, the winners from the group of "status" universities were the most numerous: Moscow State University, St. Petersburg State University, Moscow Institute of Physics and Technology (MFTI), the Higher School of Economics, the Tomsk Polytechnic University, the Siberian federal university, etc.

Following the announcement of grant awards, a discussion in the scientific community began on how fairly the choice was made. The examination process was well organized, with two-thirds of the experts involved in the initial project evaluations being scientists from abroad.[18] After examining the candidates, a list of 114 project finalists was produced (with a maximum number of 80 projects for selection). However, that the Council for Grants, which made the final decision, selected only 40 winners without providing a public explanation of its choices provoked considerable criticism. Indeed, in a situation where thirteen applicants competed for each grant (highlighting the intensity of competition), the choice cannot possibly have been made only on the basis of expert evaluations and recommendations. Like other "big projects" there was some element of politics in the choice, favoring projects that will be carried out under the leadership of scientists from the Russian diasporas.

With this program, the differences in funding for these research laboratories and other state-supported structures, like the aforementioned Research Educational Centers (REC), become flagrant. The financing limit, for RECs as stated above, is 15 million rubles over a three-year period, and 150 million rubles for research laboratories under the guidance of more prominent scientists (mega-grant winners). At the same time the requirements for the results of these laboratories are even softer than those for the RECs. Thus, at one extreme, there are thousands of RECs with negligible amounts of funding, and at the other just 40 (to be increased to 80) "world-class" research laboratories. For a large country like Russia, another 80 laboratories are unlikely to lead to any qualitative changes. Therefore, it would have been preferable to increase in the number of grants and reduce their value, as this would have a greater overall effect.

[18] According to the Ministry of Education and Research, 600 foreign scientists were included in the panel of 900 experts to assess projects.

Creating "mirror" laboratories

Other schemes for building world-class laboratories exist, and there are Russian "success stories," which unfortunately have merely remained isolated cases, since the experiences have not been shared. In 2007 so-called "mirror" research laboratories were founded. The first was based at the Nizhny Novgorod Institute of Applied Physics—under the RAS—in partnership with the Nizhny Novgorod State University and scientists from the Russian diaspora.[19] A slightly modified form of this cooperation was then used at Moscow State University.[20]

A "mirror" research laboratory is created in Russia, using an already existing foreign laboratory as a model, and its activities are linked to the foreign work of the original. This has several advantages for researchers: they benefit from experience gained by counterparts abroad, they participate in international projects, it brings opportunities for skills development, the opportunity to work with the latest equipment, allows access to new chemical reagents, and the development of international contacts.

Mirror labs can be created at substantially lower cost than the *mega-grant* laboratories, and they entail no obligation for foreign specialists to stay in Russia. These laboratories can be funded on a parity basis that makes this project even more profitable. They make it easier to organize student exchanges, and improve access to international expertise. It is no coincidence that researchers in the Russian diasporas promote this form of cooperation.[21] The "networked" working practices which inspired the mirror laboratories are today recognized as one of the most efficient ways in which to execute research projects and capitalize upon their results.

Strengthening the material base of universities as a new basis for integration

A new impetus for the development of science in universities has emerged recently, not as a result of specific government actions, but rather as a byproduct of the material improvement of research facilities through the creation of the elite group of universities.

As a result, the balance of forces in Russia's science complex has changed. The best and most modern equipment is no longer to be found only in Academy of Science institutes—as previously was the case. HEEs have equipped themselves with modern resources. However, since the

[19] A. Semyanov, "'Vozvrashchenie mozgov': taktika zerkalnykh laboratoriy" ["Return of the Brains": Tactics of Mirror Laboratories], Open Economy, 18 July 2007, <http://opec.ru/analize_doc.asp?d_no=63767>.

[20] A. Nemova, "Potencial v proekte. MGU i Universitet Madrida sozdaût sovmestnuû naučnuû laboratoriû" [Potential in the Project. MGU and the University of Madrid Create a Joint Research Laboratory], *Search,* No. 31, 3 August 2007, p. 15.

[21] See, for example, an interview with B. Lukyanchuk, a professor of the Singapore Institute of storage: "Megagranty sovmestnym laboratoriyam?" [Mega-grants for Joint Laboratories?] 15 November 2010, <http://strf.ru/material.aspx?CatalogId=221&d_no=34950>.

research conditions in universities have not changed, it appears the only way to effectively use the equipment is through the joint research work with Academy institutes. This cooperation is mutually beneficial: Academy research scientists gain access to new equipment; universities participate in modern research projects, and acquire modern research techniques to pass on to students. Consequently, this has led to an increase in the quality of publications co-written by research institutions and universities, with the participation of undergraduate and graduate students.

An in inventory carried out by the Institute of World Economy and International Relations in 2009-2010 illustrates some of the trends outlined above.[22] The inventory counted almost 400 items of Hi-tech scientific equipment, revealing that equipment at Academy research institutions is generally older than that at universities. Since 2007, 37% of new equipment has been installed at universities and 26% at Academy institutions.

However, the level of equipment usage (usage coefficient) is higher in Academy research institutions because of their more intensive research work compared with universities. In Academy institutions, 40% of equipment is used to 91-100% of normal capacity vs. only 15% in universities. The proportion of equipment below half the norm is 20% in Academy research organizations, and 31% in universities. Use of university equipment by RAS researchers allows these figures to be improved.

Despite their new equipment, universities have not yet reached the output levels of Academy institutions. Academy institutions perform better in terms of the number of publications, presentations at conferences and numbers of patent applications.

Out of all the Russian universities, only two—Moscow State University and St. Petersburg State University—have a global reputation for research. They are the only Russian universities to feature in the Shanghai Top-500 ranking (Moscow State University also figures in the Times Higher Education Supplement's Top-200). It should be noted that university R&D activities are important to the placement in these rankings. The Shanghai ranking is based upon indicators such as the number of Nobel Prizes and other prestigious awards received by teaching staff and graduates of the university, the number of publications in journals like *Nature* and *Science,* as well as various scientific citations indexes. The TES ranking is based on the number of scientific publications over the last decade, the number of times they are cited, as well as their position in the Science Citation Index. Not surprisingly, Russian universities do not perform well against these criteria.

[22] More results are presented in: I. Dezhina, "Innovacionnoe razvitie Rossii v svete teorii 'troynoj spirali'" [Innovative Development of Russia in the Light of the "Triple Helix" Theory] *in* N. Ivanova (ed), *Global'naâ transformaciâ innovacionnyh sistem* [Global Transformation of Innovation Systems], Moscow, Institute of World Economy and International Relations RAS, 2010, p. 86-87.

Conclusion

The development of university research and its integration with the educational process is of great importance to the strengthening of Russia's national innovation system. Given the prevailing separation of teaching and research between universities and the Russian Academy of Sciences, this is a great challenge. The Government decided to resolve this issue through substantial investments in already existing universities. However, the range of measures deployed appears somewhat limited: the government mainly provides additional budget funds for a number of predefined activities and awards different statuses which are accompanied by additional financing. Meanwhile, the incentives for institutional change, which would facilitate the development of science in universities, do not exist.

It is important to change teaching practices and to encourage faculty members to carry out research. The system of university research funding should become more flexible. Internal and external regulatory barriers between education and research need to be removed. The absence of such measures reduces the efficiency of budget spending, as can be seen from the results of innovative educational programs and the early results demonstrated by the federal and national research universities.

In addition, research in HEEs should not be promoted by setting universities in opposition to the RAS institutes: Academy institutes should not be excluded from the most attractive calls for tender. Such measures may ultimately delay the development of research in universities. Previous experience in Russia suggests that cooperation—rather than competition—between universities, Academy institutes and other scientific organizations brings the best results.

Finally, focusing upon the selection of elite universities will inevitably lead to the stratification of higher education: exacerbating the problems of those establishments which have not been granted special status and have not won any of the prestigious calls for tender. This situation may cause the weakening of university science in general. This is why official policy should move towards the development of cooperation between the "elite" universities and the rest, encouraging the joint use of resources, conduct of research projects and training of graduate students.