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Russian Scientists: Where Are They? Where Are They Going? Human Resources and Research Policy in Russia

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Abstract

This article analyses the evolution of human resources in the field of research since the end of the Soviet era, with particular focus on the phenomenon of the ever-increasing age of experts, the divide into the scientific community and the 'brain drain'. Public policy in the area of managing human resources and its results are examined against this backdrop. A series of recommendations is formulated in conclusion.

Russian Scientists: Where Are They? Where Are They Going? Human Resources and Research Policy in Russia

Since the collapse of the USSR, scientific research in Russia has been confronted by structural problems concerning human resources. Three main problems have emerged: the ever-increasing age of researchers, the 'brain drain' and the divide into the scientific community (between the small number of flourishing laboratories and the huge number of scientists who find themselves in a financially precarious position).

Budgetary restrictions and scientific potential

The main reason for the decline in scientific potential is financial. Basically, the end of the Soviet era led to a sharp reduction in the state allocations on research and development (R&D) – the so called federal budget. Unlike their international rivals (which, in developed countries, contribute more to research than the state does), Russian industrial companies have still not begun to make large-scale investment in research (see Table 1). Two macro-economic indicators highlight the lack of development in the Russian research system. The first of these being the total amount of investment in research, all types included, as a percentage of GDP. The second indicator is the proportion of this investment accounted for by industrial companies. Table 1 shows how both of these figures are low in Russia. By way of comparison, spending on research in OECD countries represents, on average, 2% of GDP, and industry accounts for 62.3% of total spending.[1]

Translated by Victoria Bryan.

[1] *OECD Science, Technology and Industry Outlook*, OECD, 2004, p.191-192.

Table 1
The main research funding indicators in Russia

	1995	1998	1999	2001	2003
State funding (federal budget) in $m	3,370	3,690	4,425	5,855	6,996
Amount of state funding (federal budget) as a percentage of GDP	0.54	0.40	0.50	0.54	0.71
Total amount of research funding as a percentage of GDP, all sources included	0.85	0.93	1.06	1.24	1.25
Proportion of the total amount of spending on R&D made by industrial companies, expressed in %	24.1	22.8	22.6	24.8	22.8

Source: *Nauka Rossii v cifrah: 1996* [Russian science in figures: 1996], statistical handbook, Moscow, CISN, 1996, p.85 ; *Nauka Rossii v cifrah: 2004* [Russian science in figures: 2004], statistical handbook, Moscow, CISN, 2004, p. 70, 71, 75.

However, these official statistics should be considered with caution. The methods used for statistical calculations concur with international standards only by form, not by substance. For example, the figures for industrial investment are likely to be underestimated as information from industrial companies was not obtained in a systematic way, despite the fact that some of these companies invest widely in targeted areas of research. At the moment, for example, companies such as *Rail Russia*, *RAO EES* or *Gazprom* spend approximately 15bn roubles (equivalent to around 428m euros) on research every year.[2] This is equivalent to approximately one-third of the total state funding allocated to civil research in 2004. A further example is that the amount spent on research and development by the company *Norilsky Nikel* is 2.5 times the amount spent by the Moscow State University (MGU).[3] Similar statistical problems are encountered when trying to evaluate the level of development in the sector of innovative start-ups. This forms a major indicator for judging the efficiency of research both in terms of a value-adding service as well as in terms of additional career prospects for researchers. Currently, the number of small innovative start-ups remains unknown.

However, these difficulties should not distract from the rapid reduction in the amount of state funding, which has led to a sharp fall in the number of researchers: whereas there were 130 researchers[4] per 10,000 working people in 1989, this number had fallen to 60 by 1995. As shown in Table 2, this figure has stabilised at 75 over the course of the past few years.

[2] 'Idejnye torgi' [Idealogical Bargaining], *Rossijskaja Gazeta*, 23 January 2004.
[3] *Poisk*, n°2-3, 21 January 2005, p.8.
[4] The term 'researchers' in the vocabulary of statistical methodology is defined as 'people that carry out scientific research and studies in a professional manner and that directly participate in the creation of new knowledge, products, procedures, techniques and systems, as well as those managing this type of activity.' This category therefore includes the administrative staff that directly participate in the management of the research process (including those in charge of research bodies and units). Goskomstat, *Instrukciâ po zapolneniû form federal'nogo gosudarstvennogo statističeskogo nablûdeniâ*

Table 2
Changes in the number of personnel involved in R&D

Year	Total (head count)	Change (% in comparison with the previous year)	Researchers (head count)	Change (% in comparison with the previous year)	Number of researchers per 10,000 economically active population
1998	855,190	-8.5	416,958	-8.4	77
1999	872,363	+2.0	420,212	+0.8	78
2000	887,729	+1.8	425,954	+1.4	79
2001	885,568	-0.2	422,176	-0.9	78
2002	870,878	-1.7	414,676	-1.8	75
2003	858,470	-1.4	409,775	-1.2	75

Source **:** *Nauka Rossii v cifrah : 2004* [Russian science in figures: 2004], statistical handbook, Moscow, CISN, 2004, p.46.

Age and sources of income of researchers

Over the course of the past few years, the percentage of young researchers has increased. However, this improvement must not overshadow the fall in the number of 'intermediate level' researchers, aged between 30 and 39 years (Table 3).

Table 3
Age ranges of Russian researchers (in %)

Year	Under 29	30-39	40-49	50-59	60 and over	Total
1994	9.2	24.0	31.7	26.1	9.0	100
1998	7.7	18.1	28.3	27.9	18.0	100
2000	10.6	15.6	26.1	26.9	20.7	100
2002	13.5	13.8	23.9	27.0	21.8	100

Source **:** *Naučnyj potencial i tehničeskij uroven' proizvodstva* [Scientific potential and the technical level of production], RF Ministry of Education and Research, Moscow, ed.RUDN, 2004, p.22.

This is accompanied by a fall in the number of researchers aged between 40 and 49. Whereas the total number of researchers dropped by 0.5% between 1998 and 2002, the number of researchers aged between 30 and 39 plummeted by 25%, while the number of those aged between 40 and 49 fell by 16%. On the other hand, the number of researchers aged 60 and above increased by 20.4%. The most worrying situation is seen at the research institutes that are part of the Academy of Sciences, where, according to internal statistics, the average age of researchers there is now nearly five years higher than the overall average.

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za vypolneniem naučnyh issledovanij i razrabotok [Guide to filling out federal statistic survey

These statistics point to the fact that young people stay in research until they find a better-paid job or leave the country to go abroad.

At the same time, the facts show that the number of graduates wishing to get a PhD (the so called 'candidat nauk'[5] in Russian) is steadily rising (Table 4). These statistics appear encouraging in terms of the potential to renew the ranks of experts, but this conclusion requires discussion for two main reasons.

Table 4
Number of people enrolled in doctoral studies and having finished their doctoral studies

	1995	1998	1999	2000	2001	2002	2003
Number of people enrolled in doctoral studies	62,317	98,355	107,031	117,714	128,420	136,242	140,741
Number of people having finished their doctoral studies	11,369	17,972	21,982	24,828	25,696	28,101	30,799
The percentage of students having finished their doctoral studies compared to the numbers enrolled in doctoral studies, in %	18,2	18,2	20,5	21,1	20,0	20,6	21,9

Sources : *Nauka Rossii v cifrah : 2000* [Russian science in figures: 2000], statistical handbook, Moscow, CISN, 2000, p.23 ; *Nauka Rossii v cifrah : 2004* [Russian science in figures: 2004], statistical handbook, Moscow, CISN, 2004, p.36.

Firstly, with a proportion of 1/5, the number of people having finished their doctoral studies remains low in comparison with the number of those enrolled. Furthermore, among those who complete doctoral studies, only 25% have their viva.[6]

Secondly, the increase in the number of doctoral students and young PhD students does not necessarily mean an increased interest in science as a career. Doctoral studies in Russia fulfil several functions: they provide a way of avoiding military service and gaining a scientific title that can also be used in the business sector. According to our research, only 20% of PhD students intend to follow a scientific career once they have completed their studies. Among these, more than one-third hopes to work abroad.[7]

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questionnaries in the field of R&D], 2002, p.74.

[5] In the Russian system, the title of PhD is awarded to someone who has completed eight years of study at a higher education institute. The Russian PhD is awarded after three years of study at an 'aspirantura' (post-graduate school of study) and the successful completion of a thesis. The title opens the door to all types of positions in the fields of teaching and research.

[6] *Source*: statistical handbook *Nauka Rossii v cifrah*, editions quoted. For the years 1998-2003, the average percentage of people having completed a viva at the end of their doctoral studies made up 26% of the total number of people that finished their doctoral studies.

For young researchers, the financial issue is decisive: the relatively high level of this 'basic wage' varies between regions, but on average works out at between $300 and $500 per month. At the same time, as shown by a recent study by the Institute for History of Natural Science and Technology, which is part of the Russian Academy of Sciences, just 5% of researchers enjoy similar income to those working in the business sector ($500 and up).[8] It is mainly researchers aged between 35 and 50 that are the most well-paid.

The emergence of a small number of scientists that are financially comfortable is the reason behind the divide into the scientific community.

This category of 'new Russian researchers'[9] is made up of the following people:

1. Scientists benefiting from foreign funding as well as those receiving commissions from foreign companies and universities. This group is currently growing thanks to the development of outsourcing, particularly in the areas of information technology and applied natural sciences;
2. Directors of research institutes and top-level managers;
3. 'Commercial researchers', who, alongside their scientific work, embark on innovative business enterprises;
4. Consultants and analysts involved in expert work for different governmental and political bodies (this is mainly true of those involved in social sciences and humanities);
5. Some scientists, who have chosen to live and work permanently as 'pendular migrants'. On average, these researchers spend six months abroad every year.

These sub-groups can overlap each other.

Researchers who do not belong to this category have a relatively low income: around 70% of scientists consider themselves to be not very well-off (the remaining 30% class themselves as reasonably well-off). A telling statistic is that 14% of researchers live exclusively off their salary or pension. Additional income is mainly gained through teaching or other research

[7] I.Dežina, 'Molodež v nauke' [Young people in science], *Sociologičeskij žurnal*, 2003, n°1, p.71-87.
[8] This survey was carried out in summer 2003 using a sample group of 786 people in different regions of Russia. A.Ûrevič, I.Capenko, A.Prihid'ko, 'Skol'ko i kak zarabatyvaût naši učenye?' [How much and in what ways are our researchers earning?], *Naukovedenie*, 2004, n°1, p.58.
[9] See, for example, A.Ûrevič, 'Neravnoe ravenstvo: rassloenie rossijskogo naučnogo soobŝestva' [An unequal equality: the divide in the Russian scientific community], *Naukovedenie*, 2002, n°3, p.70-71; I.Egorov. 'Perspectives on the Scientific Systems of the Post-Soviet States: A Pessimistic View', *Prometheus*, vol. 20, n°1, 2002, p.65-66.

activities, such as financing from foundations or consultancy work. The low basic wage in the public sector, to which 70% of all scientific bodies in Russia belong, forces scientists into a constant search for other forms of income, including pseudo-scientific work. The notion of the 'scientific day labourer' is becoming increasingly widespread – in order to raise their earnings, researchers carry out several short-term projects (lasting between one month and a year) simultaneously. As these projects compromise their main research topic, this type of work leads to a loss of scientific productivity. Another important figure is that the percentage of scientific publications published by Russian authors has dropped from 3.6% to 2.4%.[10]

Despite there now being more sources of income open to scientists, 44% of those asked said that, over the past five years, their financial situation had barely improved. However, 33% did say that their situation had improved. 60% of researchers said that they did not expect a significant raise in their income over the next few years, a prospect that will hardly render the career an attractive choice for young scientists.[11]

Working conditions

Our research has also highlighted the importance of working conditions in making a career in science an attractive option.[12] Amongst MSc students, two factors had proved disappointing: the outdated equipment and the lack of stimulating research projects. These criticisms were even more prominent amongst PhD research students and young scientists, and therefore play a role in deterring some of them away from research or encouraging them to go abroad. From a student's point of view, a certain sense of 'piety' is still associated with science and this can sometimes lead to a desire for emigration. On the other hand, the desire to emigrate is noticeably more marked amongst PhD research students.

[10] B.Saltykov, 'Proektirovanie budu$ego rossijskoj fundamental'noj nauki' [Predictions for the fundamental future of Russian science], www.opec.ru/point_doc.asp?tmpl=point_doc_print&d_no=53827

[11] Surveys carried out in 2000-20001 and in 2003 came to virtually the same conclusions. See, for example, S.Kugel, 'Adaptacia rossijskih učenyh k izmenâû$imsâ social'no-ekonomičeskim usloviâm' [Russian scientists and how they have adapted to socio-economic changes], *Naukovedenie*, 2002, n°1, p.11; A.Ûrevič, I.Capenko, A.Prihid'ko, 'Skol'ko i kak zarabatyvaût naši učenye?', op.cit., p.69.

[12] Surveys carried out under the direction of the author in 2001-2002 in 21 regions of Russia revealed the main reasons why research is not attractive enough for young people. The surveys involved young students, research students (from all disciplines and levels) and researchers in higher education establishments: 1,400 students, 450 research students and 1,200 young researchers were questioned.

The perception of research as a 'temporary option' remains widespread. Young scientists are particularly concerned by the level of research in their country. There is another obstacle that blocks their progression in a scientific career – the lack of structural flexibility in organisations. This rigidity can be seen in the fact that lists of permanent staff members have been closed for several years now. The possibilities for young researchers and PhD students to gain a permanent post in an institution or a chair in a university are few and far between, particularly in capital cities. Furthermore, the post-doc system that can be found in all developed countries is virtually non-existent in Russia. In such conditions, it is hardly a surprise that one young scientist in four (aged under 30 years old) wants to work abroad. It is vitally important to be able to offer these young scientists the possibility of career development in terms of the duties available to them (laboratory supervisor, research office, etc.).

Despite these structural difficulties, a change in attitudes has emerged from our research – for young scientists, research remains not only a stimulating and creative job, but is also a way of earning a reasonable living, as long as it is possible to take part in major national and international projects.

The 'brain drain': myths and realities

In 2004, the theme of the 'brain drain' returned to the public eye. In particular, the debate centred on the measures to take to stem the flow. The media tried to put a figure on it, declaring that every specialist that goes abroad costs the country between $200,000 and $250,000. The 'brain drain' is estimated to cost Russia $25bn every year. Other worrying figures were also published by the media, such as the statistic that 60% of international prize winners leave to go abroad. These figures should be used with caution and it should also not be forgotten that the 'brain drain' makes a snappy slogan for a scientific community that is always looking for funding.

The extent of the 'brain drain' is probably exaggerated. However, the issue of the 'internal brain drain' is taking on worrying proportions. Research carried out in the mid-1990s shows that for every researcher moving abroad, ten left the scientific community to move into other

areas.[13] As this 'internal exodus' has no political consequences and, because it provides other sectors of the economy with highly qualified people, can not be considered as a negative trend in its own right, this type of emigration is rarely taken into account, even though it involves far greater numbers.

Despite these points, the processes involved in the 'brain drain' must not be underestimated. Over the past seven years, *the emigration of young people* has accounted for the majority of people leaving the country. This does not only affect the structure of the human resources in the area of research, but also means that the most talented and promising researchers could be lost. Surveys carried out in 2003 amongst students at the MGU (Moscow State University)[14] show that, of those considering a career in science, 56% see themselves working in Russia. It is necessary to state that 10% of biologists, 11% of physicists and 13% of chemists receive offers from overseas before their course has finished. Surveys carried out amongst young researchers working in research institutions in Moscow paint a similar picture – in 2003, 44% of those questioned were planning to go abroad on professional trips and 7% of these said that they intended to leave permanently.[15] As a general rule, in this category of young people, it is the most talented and active researchers that leave. Furthermore, the level of emigration is higher among those taking part in programmes and competitions that have been organised by foreign foundations.

The Russian scientific diaspora that is found overseas is playing an ever-increasing role in encouraging emigration. Once they have succeeded in becoming integrated into foreign laboratories, Russian scientists support their compatriots by helping them to find funding or contracts and also become head-hunters, identifying the best researchers in order to invite them to work in their laboratories. The extent of this practice is not known; it is thought to be fairly widespread in the sense that the former students and employees of well-known institutes try to maintain good links with their *alma mater.* A typical example is that of the American company IPG Photonics, which is run by a scientist from Russia. Since 1996, the company has funded a chair at the Moscow Physico-Technical Institute, which trains experts for IPG. The company provides students and teachers with additional funds on top of their

[13] I.Dežina, 'Utečka umov' iz postsovetskoj Rossii : evoluciâ âvleniâ i ego ocenok' ['The brain drain' in post-Soviet Russia: development and perception of the phenomenon], *Naukovedenie*, 2002, n°3, p.25-56.
[14] E.Nekipelova, L.Ledeneva, 'Russkij student na eksport' [The Russian student for export], *Inostranec*, n°8, 11.03.2003.
[15] E.Nekipelova, L.Ledeneva, 'Ohota na umy: proigrannyj raund' [The hunt for intelligence: a lost cause], *Poisk*, 14.11.2003.

grants and salaries, finances the purchase of equipment and recruits young graduates at the end of their studies for work abroad.[16]

Migration policy in the countries that receive the most immigrants also encourages people to leave Russia. The development of legislation on immigration in countries such as Great Britain, Germany, Canada and New Zealand plays a role in attracting qualified experts to their shores, in particular, PhD research students, post-docs and also students.[17] Among the main countries of reception, it is only the United States that has recently begun to implement a protectionist policy by means of reducing the number of work visas allocated to foreign researchers. The number of foreign nationals with scientific qualifications therefore fell by 65% in 2004.[18] To a certain extent, it is possible to say that this policy limits the emigration of Russian researchers because, according to a survey carried out in 2002, 28.7% of researchers leaving to work abroad were going to the United States.[19]

Alongside this type of emigration, which mainly involves young scientists, it is also necessary to highlight examples of entire laboratories or teams of researchers that have left. This trend, which was very widespread at the start of the 1990s, is currently attracting media attention. For example, in 2004, the director of the Institute for Microprocessing Systems became the head of a branch of the American company Intel, taking with him an entire team.[20] This type of move affects an entire area of research as it leads to major losses in terms of intellectual property.

This overall situation must be put into perspective. In some research centres, although there are not many of them, the 'brain drain' is decreasing, particularly in the following fields: biophysics, molecular biology, biotechnology, new materials etc. In certain research bodies – the RAN Institute of Molecular Biology, the Siberian branch of the RAN Institute of Catalysis or the Institute of Experimental and Theoretical Physics – a range of measures has been implemented in order to enable young people to remain in research: a steady flow of public funding, as well as funding from overseas sources are guaranteed; close links with research

[16] N.Maksimov, 'Otkrytie zakazyvali?' [Have you ordered a scientific discovery?], *Russkij Newsweek*, 06.12-12.12.2004, p.60.
[17] *OECD Science, Technology and Industry Outlook,* OECD, 2004, p.79-80.
[18] *Business Week*, 4.10.2004, p.62.
[19] Other countries which attract Russian researchers are: Germany (19%), France (6.5%) and Great Britain (4.6%). The four countries (with the United States) receive around 60% of all Russian researchers working abroad. *Nauka Rossii v cifrah : 2003* [Russian science in figures: 2003], statistical handbook, Moscou, CISN, 2003, p.67.
[20] S.Leskov, 'Boris Babaân ušel na Zapad so vsej komandoj' [Boris Babayan leaves for the West complete with his entire team], *Izvestiâ*, 24.12.2004, p.18.

centres abroad have been established; scientific equipment is regularly updated and efficient career development processes have been set up for young researchers. These measures have helped reduce the number of people leaving for overseas.

Does a government human resource policy exist?

For several years now, the number of public measures concerning the management of human resources has been on the rise. These measures are targeted nearly exclusively at young researchers (under 33-35 years old) and are made up of small subsidies, grants, funding and bonuses (generally not more than $100-$200 per month). As shown by recent experience, official statistics and by our own research, the efforts made to provide relatively modest financial aid are not having a great impact on the overall situation.

In 2003, a wide-ranging attempt was made to solve the problem of human resources. The government, under the auspices of the Ministry for Industry, Science and Technology[21], drew up an extensive list of measures designed to protect human potential in the fields of science and technology. A special federal programme entitled 'Scientific experts in the Russian Federation' was also implemented. Designed to be carried out between 2004 and 2009, its aim was to serve as a basis for the implementation of a human resource management system. The aim of the programme was to ensure the 'preservation' of the most productive scientific experts and ensure that the needs of young researchers were met as well as 'reduce the level of emigration or exodus' to other fields. In order to stop the flow of scientists out of the country, it was planned to 'strengthen control on the establishment of international cooperation agreements in the area of exchange between researchers and specialists' and to 'gradually make doctoral and post-doctoral studies free for those students who agree to work in the public sector of the national economy for five years after the completion of their studies'.[22] The project envisaged, among other things, to provide several forms of financial aid (grants, bonuses) in order to encourage young people, as well as support the main scientific institutes and those researchers working on priority subjects. The implementation of a system of mortgage credits for the purchase of accommodation, from which staff working in the public sector of research could benefit, was also suggested.

[21] Since March 2004 – The Ministry for Education and Science of the Russian Federation.
[22] *Mery po sohraneniû kadrovogo potenciala naučno-tehničeskogo kompleksa. Koncepciâ. Proekt*. [Measures to be taken to maintain the human potential of the scientific and technological fields.

In February 2004, the issue of human resources in the technological and scientific sector of the country was the focus point of a meeting of the Council for Science and High Technologies that was attended by the President of the Russian Federation, who was due to decide on the implementation of the 'Russian Scientific Experts' programme. The decree of the President on 'State aid measures for employees of bodies belonging to the complex area of the defence of the Russian Federation' was adopted following the efforts of this organisation. As of 1 March 2004, approximately 400 researchers working in organisations that received public contracts in the military sector have benefited from annual grant of 20,000 roubles per month. This measure did not incite any major reaction within the scientific community as it did not have an effect on the overall situation. Solving the overall problems of human resources has in effect been reduced to one measure that has been used for a long time: the selective and provisional increase of wages for certain groups of people.

A distinction must be made between the 'brain drain' and the replenishment of staff. Indeed, it cannot be denied that the government is not following any specific policies to attract highly qualified foreigners to Russia in order to balance out, even partially, the numbers of Russian researchers that go abroad or move into other sectors of the economy. However, the experiences of other countries show that policies aimed at certain groups of immigrants can be successful. Currently, there are just a few isolated examples of successful measures taken at a regional level in order to attract researchers from the CIS. For example, the arrival of researchers from countries in central Asia has given new impetus to the development of human sciences (at Velikij Novgorod and Severodvinsk), of Earth sciences (at Arkhangelsk) and of biology (at Omsk). Universities and reception institutes have helped the new arrivals with administrative problems. The arrival of qualified experts from these countries boosts scientific activity and has a positive influence on the social atmosphere of small towns.

What can be done?

Despite a slowdown in the internal and external 'brain drain' and despite positive changes in the area of research funding, human resources remains one of the crucial issues for the field of science. For the time being, the measures taken have a limited effect due to their local and fragmentary nature (small increase in pay, grants for certain categories).

Conception. Project], Council for Science and High Technologies with the President of the RF, Moscow 2003.

Within this context, it is necessary to combine general measures and measures designed specifically to aid researchers. The following general steps should be taken:

1. *By changing legislation in order to regulate and promote public private partnerships, industrial companies should be encouraged to invest more in research*;
2. *Research equipment, including that found in universities, should be updated because outdated equipment is a major 'deterrent'*;
3. *Mobility between the private and public research sectors should be promoted*.

The following are the targeted measures that should be implemented:

1. *A post-doc system should be introduced into universities and research bodies*;
2. *Measures should be introduced for the social protection and welfare of researchers of retirement age.* This would indirectly open up career prospects to young researchers, an decisive factor in 'keeping' them in this field ;
3. *Immigration of Russian-speaking specialists from the countries of the CIS should be promoted; selection criteria and conditions for qualified specialists from neighbouring countries should be introduced into Russian migration policy*.

Although not in any way exhaustive, these measures would enable the State to significantly improve scientific resources in the country.

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