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# Academic mobility of Russian scientists: from "brain drain" to "brain circulation" model

Tamara K. Rostovskaya<sup>1</sup>, Elena E. Pismennaya<sup>1</sup>, Vera I. Skorobogatova<sup>2</sup>

<sup>1</sup> Institute of Socio-Political Research under the Russian Academy of Sciences

 6 Fotievoy St., bldg. 1, Moscow, 119333, Russian Federation

 <sup>2</sup> FSBI "Glavexpertsentr" of the Federal Service for Supervision in Education and Science

 6 Leninsky Ave., bldg. 3, Moscow, 119049, Russian Federation

**Abstract.** Academic mobility is one of the key directions of development of intellectual potential and realization of professional opportunities of both youth and highly qualified specialists, scientists and teachers. This category of the population is the intellectual potential of the country, able to carry out an "innovative breakthrough" of the economy, able to act as a mechanism for strengthening the integration processes in the Eurasian space (within the EAEU and SCO), as well as to become a certain reserve for the demographic development of some Russian regions.

The term "circulation of minds" is defined, which has become increasingly used in relation to the emigration of specialists from Russia. The circulation of minds implies that the migration of highly skilled professionals and scientists follows the movement of capital and projects, is temporary and returnable. The concept of "academic mobility" is specified and its key characteristics are given.

The evaluation of the implementation of international programs to promote academic mobility, including such programs as Erasmus Mundus, DAAD, Tempus, Fulbright Program, etc., which allow participating countries to obtain positive socio-economic, scientific and demographic effects. Unfortunately, this potential of educational migration is not fully realized in Russia.

In addition, the Russian science lacks the necessary amount of scientific research on the problems of academic mobility, which is largely due to the negative "color" of educational migration in the country, due to the significant attention to the problem of "brain drain". Nevertheless, in our opinion, Russia has enormous unrealized potential and unique opportunities for the development of academic mobility.

In conclusion, there are proposals for the formation of Russia's policy in relation to the development of academic mobility, maintaining a positive trend to attract highly skilled migrants from near and far abroad, but also for the further development of forms of academic mobility.

**Keywords:** Russian scientists, academic mobility, the scale of academic mobility, the term "circulation of minds", the Russian scientific diaspora, the term "circulation of minds", intellectual potential

#### Introduction

In modern conditions, academic mobility is one of the key directions of intellectual potential development and realization of professional opportunities for young people and for highly qualified specialists, scientists and teachers.

In the scientific literature of recent years there is a view that the process of intensive migration of highly qualified specialists is a global trend due to globalization.

The term "circulation of minds" is appeared and has become increasingly used in relation to the emigration of specialists from Russia. The circulation of minds means that the migration of highly qualified specialists and scientists, which follows the movement of capital and projects, is temporary and returnable. From the point of view of migration theory, it can be assumed that in this case the factors of "attraction" in the receiving countries prevail from the factors of "pushing" in the outflow countries. Of course, the classic example is the migration of scientists from Western Europe to the United States. According to research by the Open Economy Foundation, every year 1.4 million people with higher education leave the UK and 817.000 people leave Germany to work in the US and other countries. In this situation, it is unlikely that European scientists leave their University and laboratory because of the small salary at home. Most likely, they are attracting by a set of the best conditions in the United States (material, organizational, career), which have the active (and sometimes just aggressive) policy of attracting leading minds in their centers, universities and laboratories

A number of countries have already successfully implemented many programs to promote academic mobility, including Erasmus Mundus, DAAD, Tempus, Fulbright, etc. As a rule, the implementation of such programs allows countries-participants to obtain positive socio-economic, scientific and demographic effects. Unfortunately, this potential of educational migration is not fully realized in Russia. In addition, the Russian science has lack of the necessary amount of scientific research regarding the problems of academic mobility, which is largely links to the negative "color" of educational migration in the country, due to the significant attention to the problem of "brain drain". Nevertheless, in our opinion, Russia has enormous unrealized potential and unique opportunities for the development of academic mobility.

#### Methods and materials

The study used general logical and theoretical scientific methods: analysis, system method, structural and functional method. The theoretical basis of the study is the work of domestic authors.

#### Literature review

Studies of academic mobility have received high relevance in Russia, in particular it is necessary to note the work of V. I. Bogoslovsky (Development of academic mobility in multi-level University education: method. recommendations for teachers. Saint Petersburg: RGPU Publ., 2017), devoted to the consideration of the positive effects of academic mobility; A. Gromov (Academic mobility of foreign students in Russia. 2016. No. 7. Pp. 1—15), devoted to the study of the conditions for the development of academic mobility and effective use of educational resources.

Private interest is the work of N. Brinjova (Academic mobility of students as a factor in the development of the process of internationalization of education. Saint Petersburg: EDF, 2017), examining academic mobility as a factor of development research capacity, as well as a monograph of J. J. Klementovichusa (Academic mobility in the framework of the Bologna process: textbook. Saint Petersburg: EDF, 2015), explores these effects

academic mobility improving the quality of education, intercultural exchange, formation of the information society, etc.

However, in these domestic works practically do not study the legal mechanisms of regulation of academic mobility, including in the context of the formation of effective organizational and legal instruments to support the return of domestic scientists and encourage the involvement of foreign scientists, graduate students and students in Russia.

## The scale assessment of academic mobility in Russia

The statistical accounting of educational migration in Russia as a whole has significant flaws, which have been described in detail in various articles [Ryazantsev S.V., 2016; Iontsev V. A., 2016]. Let us dwell on the characteristics of statistical information sources which are characterizing the process of emigration of highly qualified specialists and scientists from the Russian Federation.

The first source — is a Federal State Statistics Service (Rosstat) data. The number of emigrants from Russia who have left for permanent residence abroad is reflected in it.

The second source is the data of the Federal Migration Service of Russia with information of the number of Russians who went abroad for temporary employment. These data have been available since 2002.

The information in terms of level of education, with selection of individuals with higher education and those who left the countries "far" abroad is collected in it. However, it was not possible to determine the number of people with a scientific degree on the basis of these statistics. The third source of information is the data of national statistics from foreign countries which have received the main flows of migrants from Russia. The Organization for Economic Cooperation and Development (OECD) annually published this data in the digest "Overview of Migration". The fourth source of information can be considered the expert assessments, which are given by the rectors of universities, directors of academic institutions, trade union leaders, Russian Academy of Sciences, employees of the Ministry of Education and Science of the Russian Federation, employees of international organizations (IOM, ILO, UNESCO), the leaders of the associations of Russian citizens abroad.

It is advisable to consider the scale of academic mobility in the context of migration channels, since there is no single and integral information resource on the scale, causes and structure of emigration in the country.

## Academic mobility of scientists and highly qualified specialists

There are no exact figures reflecting the real scale of academic mobility of scientists and specialists from Russia in official statistics. This is largely due to the registration of only legal trips to permanent residence and the lack of registration of such channels for exit as temporary employment contracts, tourism, educational invitations, etc. In 2002, the chairman of the Trade Unions of the Russian Academy of Sciences V. Kalinushkin noted that since 1992 from 500 to 800 thousand scientists have left Russia. Besides, according to him, everythird development of Microsoft Corporation falls on programmers—natives of Russia. According to the US National Science Foundation, since 1990 about

70—80 % of the total number of mathematicians, 50 % of theoretical physicists and other highly qualified specialists of the world level have left Russia. According to the rector of Moscow State University V. Sadovnichy, Russia lost about 1/3 of its intellectual potential in the 1990s. Only from MSU about 20 % of all professors and teachers have left. At the moment, for example, more than 10 thousand people live in California are the russian-speaking scientists. Where in 2002 a special Union — "Association of Russian-speaking professionals of Silicon valley was even created".

During the period from 2002 to 2010, the number of emigrants with higher education who left for permanent residence decreased by almost 2 times, and, conversely, the number of those who left for temporary employment increased by 2 times. This indicates that the channels of emigration of Russian skilled resources have been transformed. Emigration formally ("de jure") becomes more temporary than permanent because people retain their homes, registration and citizenship at home. However, "de facto" many retain this connection only to communicate with relatives. Still, the chance to bring home the emigrants with higher education under certain conditions is possible. First of all, it is necessary to eliminate the "push" factors of emigration, creating normal conditions for scientists who work in Russia to return those who have already left and not to lose those who can leave in the future. Recently, a lot has been done in this area in Russia.

In 2011—2013 the authors conducted a sociological study among Russian-speaking specialists working abroad, which allowed to identify at least seven forms (channels) of academic mobility of scientific personnel from Russia for the systematic study of the problem of emigration of scientists and highly qualified specialists

The first channel is a purposeful emigration of highly qualified specialists and scientists for permanent residence abroad with advance or subsequent job searching. This form of emigration prevailed at the beginning of the 1990s, although it remains in a certain amount till this day. Interviews show that some professionals are purposefully looking for an employer abroad, using a variety of connections, contacts, Internet, employment agencies abroad and immigration.

Example 1. Russian programmer Alexander, born in 1975, lives with his family (wife and child) in Sydney (Australia). In Russia he lived in the regional center, graduated from the faculty of physics and mathematics, defended his thesis, worked at the University as a teacher of computer science. Purposefully searched through the Internet and employment agencies for working abroad. In 2001, he received an invitation to work in an American computer company. However, after the terrorist attack of September 11, 2001, the procedure of registration for departure to the United States "slowed down". He has turned to the immigration agency and paid around \$ 100 and filled out the questionnaire. Passed the selection for immigration to Australia. In may 2002, with his family he was summoned to the Australian Embassy in Moscow, where he underwent a medical examination and received permission to enter Australia. In February 2003 Alexander went to Australia alone, later his wife Polina and her son left. At first, Alexander worked as a programmer in Melbourne on computer courses for immigrants and had a temporary job on a grant at the university, then in the Internet club. Then about 4 months didn't work at all. Then Alexander posted his resume on the Internet and received an offer from a travel company in Sydney and was hired as a programmer. The family had to move to Sydney.

The second channel is a labor emigration under temporary contracts, which are gradually transformed into a residence permit or citizenship of the host country. According to approximate estimates, 70—80 % of Russian scientists who are working abroad have temporary contracts (3, p. 22). As a rule, in this case, people at the time of departure do not put "at the forefront" the desire to stay forever in the country of residence, and are intended to work for some time with the subsequent return to their homeland. However, the circumstances and peculiarities of their work push them to permanent residence of the host country.

Example 2. Vladimir Ivanovich is a doctor of science from Saint Petersburg. He has received his first temporary contract for work in Japan as a teacher of the University in Sapporo for 3 years. Then the contract was extended for 5 years. Well adapted in Japan he learned Japanese and is fluent in it. He has a constant rate of Professor. He is satisfied with wages, working conditions, lifestyle in Japan. Currently, he is a well-known scientist in Japan and engaged in economic analysis. But his Russian citizenship is retained. However, he does not want to return to Russia.

The third channel is an emigration through internships and postdoctoral programs, which many universities of the world have to accept leading scientists and specialists in certain fields and areas of research.

**Example 3.** Michael, PhD, political scientist, originally from Siberia. First time went in the United States through the Fulbright program. He pass a contest and receive a probation. The host was the University of San Diego. After completion of the internship program he was invited to work under a temporary contract. He was married to a US citizen. After the completion of the temporary contract, he received a permanent position. He engaged in research in the field of political science, lectures. He is well adapted to the American environment. He is fluent in English. He loves the climate in California and its lifestyle. He has the ability to travel. For 1-2 years there is an opportunity for him to get a grant and not to teach a lot of lectures and sometimes he use it. In Russia, of course, he did not have such opportunities.

The fourth channel is an emigration with a predominance of family reasons with the further employment in science, including the case of marriage with citizens of the host country. For the most part, this channel of emigration is more typical for women. Here are the most typical examples.

Example 4. Natalia Ivanovna, philologist, teacher of Russian language. At the time, she married her classmate — a citizen of Vietnam. She moved together with him to permanent residence in Vietnam. She has two daughters. She works as a teacher of Russian at the University in Hanoi. She likes Vietnam and Vietnamese culture. She speaks Vietnamese fluent and has many Vietnamese friends. She maintains close contacts with the Russian house in Hanoi — an institution engaged in the promotion and promotion of the Russian language and Russian culture. She organizes often exhibitions, lectures, events.

The fifth channel is the transition to science from another sphere, which occurred after emigration to the host country. This is a fairly complex option for intellectual emigration fixation. However, interviews have shown that this method takes place. We have two examples.

**Example 5.** Olga, originally from Karelia. She graduated from the faculty of foreign languages at the University in Petrozavodsk. She is fluent in Finnish and English languages.

She came to work in Finland as an interpreter and then she got a position at the University in a small town in the middle of the country. Currently she works as a researcher in the field of sociology and conducts organizational work on research projects. She received Finnish citizenship, but retains the Russian. Often travels in Karelia where live her relatives. Her mother was moved to Finland. She is perfectly adapted in Finland and is not going to return to Russia. However, she has active scientific contacts with colleagues in Russia, including Moscow, Saint Petersburg, Petrozavodsk. Many of her projects and studies and researches are related to Russia.

## Russian scientific diaspora as a result of academic mobility

The emigration of scientists and specialists from Russia led to the formation of a large Russian scientific diaspora.

As I. Dezhina notes, "the core of the Russian scientific diaspora is contracted researchers in the natural sciences, and its personal composition is variable". It excludes from its composition those "who have completely assimilated and severed all ties with Russia and with their compatriots, as well as those who, maintaining ties with Russian-speaking colleagues abroad, and do not have and do not want to have any relations with Russia". We agree with the first part of the definition proposed by I. Dezhina regarding the assimilation processes among scientists. However, do not agree that from the Russian scientific diaspora, it is necessary to exclude those who communicate only with compatriots, and not maintaining contacts in Russia. We believe that communication with compatriots, even those living abroad, is already evidence of involvement in the diaspora and indirect contacts with Russia. Therefore, our definition is based on a broader interpretation.

About 100—150 thousand people fall under our definition, it is this part of the emigrants from Russia that can be attributed to the Russian scientific diaspora. This estimate is more significant than that given by S. Yegerev, who wrote about the maximum number of the diaspora of 20—30 thousand people. But our estimations are significantly lower than 800 thousand or even 1.5 million people — scientists from Russia. Most likely, the latter figure is related to the overall scale of emigration than to the Russian scientific diaspora.

The study showed that the Russian scientific diaspora is mainly concentrated in the United States. According to expert estimates, 70 % of Russian researchers work in the United States. According to our calculations, based on Russian statistics for 2002—2020. more than 17 thousand people from Russia with higher education emigrated to the USA, including 74 doctors of science and candidates. Taking into account the correction factor for American statistics, in reality, this figure may be about 120—150 thousand people for the period 1990—2010. Many specialists from Russia come to the United States on temporary work visas, however, as a rule, within 1—2 years these visas are transformed into residence permits in the United States. About 40 % of all Americans born outside the United States have a master's or doctoral degree. This emphasizes that in the country the role of immigration in the inflow of highly qualified specialists is very large.

According to research studies of I.Dezhina, more than 40 % of people with a doctoral degree in the United States are foreigners. The situation differs by branch of science. For example, in technical and computer science, this figure reaches 57 %. The circulation

of foreign scientists by countries of origin who came to the United States shows that the leaders are Chinese (22 %), Indians (14 %), and British (7 %). Immigrants from the countries of the former USSR make up 6 %, from Canada, Germany and South Korea (4 % each), Iran and Japan (2 % each).

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According to a study conducted by Russian Newsweek magazine in 2008, that most of the leading Russian emigrants settled in the United States.

Biologist E.Kunin works at the US National Institute of Health (1st place in the ranking). He is the graduate of the biological faculty of Moscow State University. Explores evolution with the help of computational biology — this is a new science at the junction of biology, mathematics and computer science. One of the most cited biologists in the world. Largely due to his work, it became known how much information can be obtained using computerized analysis of the genome.

The second place in the ranking is taken by a theoretical physicist from Princeton University I. Klebanov, who moved to the United States at the age of 16. Engaged in elementary particle physics, mainly string theory, a model that assumes the existence of not only point particles, but also more complex objects. Aims to create a complete description of such objects.

The third place in the ranking belongs to the Russian chemist from the University of Chicago R. Ismagilov. He is the one of the leaders of microfluidics — a new interdisciplinary science that studies small flows and volumes of liquids. He tries to control the behavior of complex systems in space and time with the help of such flows.

A geologist from the Hawaii Institute of Geophysics and Planetology A.Krot (5th place) — the largest specialist in meteorites, studying their chemical composition, trying to understand the origin of the Solar System, as part of a research group, proved that the ALH 84001 meteorite found in Antarctica that supposedly breakaway from Mars, contrary to the popular hypothesis, contains no traces of life.

A physicist from Harvard University, M. Lukin (6th place) is engaged in fundamental researches, which is necessary for the creation of quantum computers. In 2003 he conducted an experiment that struck the world, during which the ray of light "stopped" for 10—20 microseconds. The photons moved back and forth between the two control rays, but the pulse as a whole remained motionless.

The ninth place in the ranking was taken by Stanford physicist A. Linde — one of the creators of the theory of the inflationary Universe, specifying the Big Bang model. The Linde model assumes that new areas are constantly emerging in the Universe, in which the laws of physics are different.

Among the 40 most famous émigrés from Russia, the list of Russian Newsweek is: biologists R. Mejidov (13th place), A. Gudkov (17th place), A. Kondrashov (22nd place), L. Kruglyak (26th place), S. Shakhnovich (38th place), Yu. Lazebnik (39th place) and

P. Pevzner (40th place); Physics L. Glazman (14th place), B. Altshuler (16th place), A. Polyakov (20th place), L. Levitov (23rd place), A. Vilenkin (25th place), A. Weinstein (28th place), A. Zamolodchikov (32nd place), M. Germenzon (36th place) and A. Abrikosov (37th place); chemist A. Stuchebryuhov (15th place); mathematicians J. Sinai (21st place) and A. Okunkov (34th place).

According to approximate evaluations, over 100 thousand specialists from Russia are currently employed in the field of high technologies in the USA. Russian programmers and specialists in the field of information technology and computer equipment work in US technology parks. For example, every third development of Microsoft Corporation falls on programmers who came from Russia. The main area of residence of Russian highly qualified specialists in the United States is the state of California. The number of Russian technological community in Silicon Valley is 30—50 thousand specialists with higher education. Most Russians are engineers and scientists. Moreover, as experts emphasize, Russians belong to the number of "vital employees". Russian specialists are held to the last, because they are able at the last moment to come up with a solution that can save the company. An American Association of Specialists from Russia ("American Business Association of Russian Expatriates") has been established in Silicon Valley. The goal of the organization is to create a network that helps integrate the members of the Russian diaspora into the American and, more broadly, the global high-tech business.

The second country of reception of Russian highly qualified specialists is Germany. According to Russian statistics to Germany in 2002—2010 emigrated about 40 thousand specialists with higher education, including 140 doctors of science and candidates. Taking into account the correction factor for the national statistics of Germany, this figure in reality ranges from 80 to 120 thousand people and 300—450 people, respectively. A specific feature of Germany is the predominance of foreigners from European countries among foreign scientists. According to I.Dezhina at the Max Planck Institute, the share of Russians accounts for about 5 %, for Chinese, Hindus and Americans — by 4 %. This reflects a rather typical picture in Germany as a whole. By some estimation, there are currently 50,000 Russian programmers and computer technology specialists working in Germany.

The list of the journal "Russian News" also includes mathematicians M. Koncevich from France (11th place) and A. Veselov from Great Britain (33rd place), geologists A. Oganov from Switzerland (12th place), N. Shapiro from France (18th place), J. Poddladchikov from Norway (19th place), T. Gerya from Switzerland (35th place), physicist M. Shaposhnikov from Switzerland

Israel received about 4.5 thousand scientists and specialists with higher education from Russia only in 2002—2010, including 30 doctors of sciences and candidates. With the amendment, this counts to 22—27 thousand and 150—180 people, respectively.

The study shows that the geography of the emigration of highly qualified specialists from Russia has significantly expanded. In the list of countries of emigration appeared the states, which in recent years significantly increased attention to scientific research and increased funding for science. Russian scientists are working in Latin America, Southeast Asia and China, achieving significant success there. For example, in 2005, A. Balkankin, a Russian scientist living in Mexico, received the UNESCO science prize

"for his outstanding achievements in the development of fractal mechanics and their technological applications that contributed to industrial development in his own country and around the world". According to expert evaluation, approximately 30 thousand specialists from the former USSR from different strategic areas (the rocket industry, the nuclear sector, and the production of weapons) work in developing countries.

#### **Conclusions and recommendations**

Traditionally, the process of migration of highly qualified specialists in Russia was considered only through the prism of "brain drain", as an exclusively negative trend. We believe that assessments of the effects of international migration in Russia should be made on the basis of two streams — emigration and immigration. At the expense of the second component, Russia at the present time, as already mentioned above, is compensating for its losses as a result of the "brain drain".

Russia's policy for the near future should be directed not only at maintaining a positive trend in attracting highly skilled migrants from the near and far abroad, but also at further developing forms of academic mobility. The main directions of this policy should be:

- development of a special program in order to stimulate the attraction of highly qualified personnel from the near and far abroad with the possibility of simplifying bureaucratic delays in obtaining citizenship and entering the country, the provision of various benefits and preferences, assistance in employment, etc.;
- creating the necessary conditions for retaining and attracting new specialists and especially young people to Russian science, by providing housing, increasing salaries and scholarships, creating new promising scientific schools and areas, increasing the prestige of scientific activities;
- it is necessary to encourage the development of circulation migration by increasing financial assistance to international scientific projects and programs, stimulating and supporting scientific cooperation between Russian and foreign scientists, and active development of international internship programs for Russian specialists. For example, in the framework of the Presidential Program of Management Training for the Russian Federation aimed at increasing the proportion of highly qualified managers in all sectors of the Russian economy, it is planned to increase the scope of foreign internships for domestic specialists, to strength new production-economic, business and friendly ties with foreign partners and colleagues, and encourage Russian specialists to study foreign languages. The main objective of this program is the annual retraining in Russia and abroad of 5 thousand top and middle managers.

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#### **Bio Note:**

*Tamara K. Rostovskaya*, Doctor of Sociological Sciences, Professor, Deputy Director of Institute of Socio-Political Research of RAS. *Contact information*: e-mail: rostovskaya.tamara@mail.ru

*Elena E. Pismennaya*, Doctor of Sociological Sciences, Institute for Socio-Political Studies, Russian Academy of Sciences. *Contact information*: e-mail: nikitaR@list.ru

*Vera I. Skorobogatova*, Doctor of Law, Associate Professor, Director of the Federal State Budgetary Institute "Glavexpertcentre". *Contact information*: e-mail: skorobogatova\_ve@mail.ru

# Академическая мобильность российских ученых: от модели «утечки умов» к модели «циркуляции мозгов»

## Т.К. Ростовская<sup>1</sup>, Е.Е. Письменная<sup>1</sup>, В.И. Скоробогатова<sup>2</sup>

 $^{1}$  Институт социально-политических исследований Российской академии наук Poccuйская Федерация, 119333, Москва, ул. Фотиевой, д. 6, корп. 1  $^{2}$  ФГБНУ «Главэкспертцентр» Федеральной службы по надзору в сфере образования и науки Poccuйckas Федерация, 119049, Москва, Ленинский p-m, д. 6, p-m, 3

Академическая мобильность является одним из ключевых направлений развития интеллектуального потенциала и реализации профессиональных возможностей как молодежи, так и высококвалифицированных специалистов, ученых и преподавателей. Данная категория населения является интеллектуальным потенциалом страны, способным осуществить «инновационный прорыв» экономики, выступать механизмом укрепления интеграционных процессов в евразийском пространстве (в рамках ЕАЭС и ШОС), а также стать определенным резервом демографического развития некоторых российских регионов.

В ходе исследования определен термин «циркуляция умов», все более активно применяемый в отношении эмиграции специалистов из России. Циркуляция умов подразумевает, что миграция высококвалифицированных специалистов и ученых происходит вслед за движением капитала и проектов, носит временный и возвратный характер. Уточнено понятие «академическая мобильность» и даны ее ключевые характеристики.

Произведена оценка реализации международных программ содействия академической мобильности, включая такие, как Erasmus Mundus, DAAD, Tempus, Fulbright Program и т.д., которые позволяют странам-участникам получать положительные социально-экономические, научные и демографические эффекты. К сожалению, данный потенциал образовательной миграции недостаточно полно реализован в России. Кроме того, в российской науке отсутствует необходимый объем научных исследований проблем академической мобильности, что во многом связано с негативным «окрасом» образовательной миграции в стране, обусловленным значительным вниманием к проблеме «утечки умов». Тем не менее, на наш взгляд, Россия обладает колоссальным нереализованным потенциалом и наличием уникальных возможностей развития академической мобильности.

В заключение даются предложения по формированию политики России в отношении развития академической мобильности, поддержанию положительной тенденции по привлечению высококвалифицированных мигрантов из ближнего и дальнего зарубежья, дальнейшему развитию форм академической мобильности.

**Ключевые слова:** российские ученые, академическая мобильность, масштабы академической мобильности, термин «циркуляция умов», российская научная диаспора, термин «круговорот умов», интеллектуальный потенциал

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#### Сведения об авторах:

*Ростовская Тамара Керимовна*, доктор социологических наук, профессор, заместитель директора по научной работе ИСПИ РАН. *Контактная информация*: e-mail: rostovskaya. tamara@mail.ru

Письменная Елена Евгеньевна, доктор социологических наук, доцент, главный научный сотрудник ИСПИ РАН. Контактная информация: e-mail: nikitaR@list.ru

Скоробогатова Вера Игоревна, кандидат юридических наук, директор ФГБНУ «Главэкспертцентр» Федеральной службы по надзору в сфере образования и науки. Контактная информация: e-mail: skorobogatova ve@mail.ru