

**Vavilova<sup>1,5</sup>, I.B., Isakova<sup>2</sup>, N.B., Oliynyk<sup>3</sup>, M.V., Sayenko<sup>3</sup>, Yu.I., and Troyan<sup>4,5</sup>, V.M.**

<sup>1</sup> Main Astronomical Observatory, the NAS of Ukraine, 27, Akademika Zabolotnogo St., Kyiv, 03143, Ukraine, tel. +38(044) 526-21-47, director@mao.kiev.ua

<sup>2</sup> Dobrov Center for Study of Research and Engineering Potential and History of Science, the NAS of Ukraine, 60, Shevchenko Blvd., Kyiv, 01032, tel. +38(044) 486-95-91, steps@nas.gov.ua

<sup>3</sup> Institute of Sociology, the NAS of Ukraine, 12, Shovkovychna St., Kyiv, 01021, tel. +38(044) 255-71-07, i-soc@i-soc.org.ua

<sup>4</sup> National University of Kyiv-Mohyla Academy, 2, Hryhoriya Skovorody St., Kyiv, 04655, tel. +38(044) 425-60-59, pr@ukma.edu.ua

<sup>5</sup> *Women in Science*, NGO, Kyiv

## INTELLECTUAL EMIGRATION OF UKRAINIAN RESEARCHERS AT THE BEGINNING OF THE 21<sup>ST</sup> CENTURY



*The paper presents the results of a unique project «The Scientific Emigration in Ukraine at the Beginning of the 21st Century» implemented in 1999–2001. This study has remained known for a small group of specialists and not reached the main goal, namely, the development of government policy on intellectual migration. This project is unique due to the complete coverage of problem as the sociological representativeness of research is about 3,000 people engaged in the opinion poll, including senior students of universities, young researchers, chiefs of departments of academic institutions, experts, and representatives of Ukrainian scientific diaspora. The main reasons for scientific emigration, as pointed out by the young generation, are willingness to improve qualifications, to gain experience in the international teams, and to secure family welfare. The main conditions for stopping the intellectual emigration in Ukraine are the creation of innovative research infrastructure, the enhancement of prestige of researcher, the possibility to publish research results in high impact journals, and realization of personal potential in profession and career. The authors have discussed ways to address this problem in the recipient and in the donor countries of scientific migration and offered a strategy for retrieval of young researchers to Ukraine. The results of the present project are assumed to be a starting point for a new sociological study to understand the position of students and young researchers in new political and socio-humanistic reality of Ukraine.*

*Keywords:* intellectual migration, brain drain, brain circulation, sociological poll, and educational systems.

In the late 20<sup>th</sup> century, we live in a society based on new knowledge when both economic and social development greatly depends on mastering and applying various forms of knowledge. This conclusion of the European Commission [19] is fully consistent with the results of Strategic Studies of think-tanks around the globe. For this reason the development of organizational measures aimed at mobilizing human and financial resources in science and technology is an extremely important component of sustainable economic development in the 21<sup>st</sup> century.

Intellectual emigration is multifaceted problem with both adverse and favorable effects, which requires careful analysis and special political measures in the field of science. The intellectual emigration has two main forms: firstly, scholars and experts who leave donor countries, and secondly, graduates and postgraduate students who do not return from recipient countries after defense of PhD theses [32–38].

At all times, the pursuit of education and knowledge and understanding of their importance are distinctive features of Ukrainian mindset and culture, but the creative potential of our scholars is fulfilled in foreign states. Ukraine has been facing the

problem of highly qualified scientific personnel long since the time of Soviet Union, when for decades, young brilliantly gifted people were mobilized to the most reputable universities and R&D institutions located in Russia. In recent years, the scholars have changed migration vector to Europe, USA, Canada, and Israel. Due to emigration policy of advanced economies, on the one hand, and for reasons of political transformations that occurred in the former socialist and CIS countries arising from a powerful scientific and technical state of the USSR, on the other hand, in the early 21<sup>st</sup> century, the scientific emigration has reached its peak. In fact, Ukraine has provided intellectual assistance to all advanced economies, and now faces a challenge to develop organizational measures for mobilizing the human and financial resources to its own science.

It should be noted that the brain drain is inherent in almost all transition economies, especially, those who are not able to provide appropriate job places for higher educated specialists. These countries become intellectual donors, as majority of their higher educated professionals emigrates to more affluent countries [31]. The reasons for brain drain are not only of economic nature, often the most important factor is opportunities for professional career [28, 29, 35]. It is also important that the recipient countries attract and provide financial support for education of foreign students and their further employment. Today the most powerful intellectual recipient, including for Ukraine, is the USA. In the scientific and technical sector of the US economy is now more than 30% of immigrants with doctorates, and, in particular, only in 1995 the universities of the country admitted about 100 thousand foreign students for training in basic and applied sciences.

The state of Ukrainian science at the beginning of the 21<sup>st</sup> century is characterized by a number of problems that make joining the global research community uncertain unless they are duly addressed. One of the most crucial problems is engagement of highly qualified staff to research insofar, as a result of economic transformations and migration scholars, the scientific potential of the

country has undergone both quantitative and qualitative changes. For reference, according to data of the State Statistics Committee of Ukraine, as of 2000, the average age of DSc was 59 (in 1991, 55), that of CSc was 51 (in 1991, 47). Over the last decade, the number of researchers declined by half. Thirty per cent of researchers actually is working for overseas customers. Hidden unemployment has increased, the number of DSc and CSc in R&D institutes has been showing a downward trend. In general, increase in this factor is provided by universities and R&D institutes of the NAS of Ukraine. However, the fact that research in many universities is carried out on obsolete equipment leads to further deterioration of the quality of scientific potential.

In 1990–2001, the emigration in the scholarly research system of Ukraine was developing in several stages corresponding to the phases of transformation of R&D system of Ukraine [13,17]. In general, they can be described as follows:

- ✦ 1988–1991: the perestroika entailed democratization of R&D sphere and lifted the «iron curtain». The first wave of intellectual emigration to the West consisted mostly of dissidents (or those who got the status of refugee for other reasons) and young researchers who won scholarships to study or to participate in R&D programs.
- ✦ 1991–1993: the emergence of independent R&D sphere of Ukraine coincided with the economic crisis that entailed a decrease in funding of science, loss of its prestige, and the appearance of new, more attractive areas. Both domestic and foreign emigration of scientific personnel reached its maximum (in 1992, science lost a sixth of the research staff).
- ✦ 1994–1999: deepening economic crisis and stagnation of transformations in science, a new wave of emigration, aging of research staff.
- ✦ 1999–2001: adoption of several important laws and measures towards changing the government policy in the field of science.

The current poor funding of science and provision of researchers with resource and information

support have aggravated the crisis in the R&D field, including the intellectual emigration from Ukraine. Therefore, the problem discussed in this outlook is extremely important. In 1999, the author's team initiated the project «*Ukrainian Scholars Abroad: Accomplishments, Prospects for Cooperation and Comeback*» and created the first contact network to study the views and concerns of the scholars. As a result of the project, the Ministry of Education was recommended to create a respective department and to adopt a program for cooperation with the scientific diaspora, which would include an invitation of expatriates to give lectures, to develop joint research projects, and to participate in competitions for positions at Ukrainian universities and institutes in order to strengthen the research and education human resources in Ukraine, etc. Given the project results, in the early 2000s, the Ukrainian Committee for Science and Culture of the NAS of Ukraine (SCS), the Dobrov Center for the Study of Scientific and Technical Potential and History of Sciences of the NAS of Ukraine, and the Institute of Sociology of the NAS of Ukraine conducted a comprehensive study of the causes and ways of intellectual emigration of Ukrainian scientists, as well as elaborated recommendations based on generalized experience of solving this problem and implementing reforms of scientific sector in other countries [8, 21].

The most recent period in Ukraine is characterized by new challenges, primarily, caused by the aggression of Russia, the annexation of the Crimea and the outbreak of war in Donbass. In addition to heavy casualties and economic losses, these events have adversely affected the state of R&D potential, insofar as a part of it remained in the occupied territories, and more than 25 universities and academic institutions were forced to move to regions controlled by Ukraine having lost their resource base and accomplishments [10]. It should be noted that the mentioned situation has caused a resonant response among the Ukrainian and the international scholarly research diaspora. In particular, a working group of Ukrainian and U.S. physicists consisting of expats and displaced residents from Donbass. The planned joint actions foresee the pre-

paration and presentation of projects for the reform of science and higher education in Ukraine, development of innovation, organization and conduct of webinars, online seminars, lectures and so on. This cooperation was initiated by famous American physicist of Ukrainian origin J. Gamota [22].

The German diaspora also shows a trend towards strengthening cooperation with Ukraine in the sphere of education and science. Upon initiative of researchers of Ukrainian origin who live and work in Germany, a conference of the German-Ukrainian Academic Cooperation was held in January 2016. The conference was organized by the German Academic Exchange Service (DAAD), Alexander von Humboldt Foundation and the German Research Society (DFG) under support of the Federal Ministries of Foreign Affairs and of Education and Research. At this forum, the Ukrainian Academic International Network was established to promote bilateral and international scientific cooperation with Ukraine, to facilitate its integration into the European Research Area, to disseminate knowledge of Ukrainian educational and R&D systems, and to form a group of international experts for providing assistance in reforms and support for young researchers, etc. [24]. Great organizational job for the preparation of meeting and the functioning of network has been done by Dr. O. Seumenicht who works at the Max Delbrück Center for Molecular Medicine of Helmholtz Association in Berlin. The Network Bulletin contains the contact addresses of Ukrainian researchers in various regions of Germany and extensive information on numerous conferences and competitions, including the competition for Ukrainian-German joint research projects to be implemented in 2017–2018, the protocol on which was signed at the meeting of the bilateral commission on scientific and technical cooperation between Ukraine and Germany in July 2016.

In 2017, the NAS of Ukraine on the initiative of the CSC and the Dobrov Center plans to carry out a large-scale study of intellectual emigration using methods of sociological analysis developed at the Institute of Sociology [21] and the Dobrov Center (for more detailed information on the analysis

of sociological research of young scientists of the NAS of Ukraine see [23, 26, 27], on the analysis of age structure of academic staff in Ukraine [25]). The presentation of results of our project implemented in 2000–2001, which have not been previously published in professional journals, is aimed at drawing attention to the pressing problem of brain drain of scholarly research personnel. It has to be the starting point for a new research in order to understand the orientation of students and young researchers of Ukraine in new political, social, and humanitarian environment and to develop an appropriate government policy on intellectual migration.

**1. SCIENTIFIC EMIGRATION  
IN UKRAINE IN 2000–2001:  
COMPARATIVE AND SOCIOLOGICAL ASPECTS**

**1.1. Description of Ukraine’s R&D Potential  
and Scientific Emigration Based on Data  
of the State Statistics Committee of Ukraine (SSCU)  
for 1991–2001**

At the end of 2000, in Ukraine, about 193 thousand employees were engaged in R&D activities at 1.5 thousand R&D organizations. The sharpest reduction of research staff in 1991–2000 (2.5 times) was reported for the industrial and educational sectors, while in the academic sector the research personnel decreased 1.7 times. Consequently, the sectoral structure of researchers changed: in 1991, the shares of industrial, academic, educational, and factory sectors made up 67%, 18%, 8%, and 7%, respectively. In 2000 (given a twice decrease in

the total amount of researchers as compared with 1991), the structure was as follows: the industrial sector 61%, the academic sector 24%, the educational sector 8%, and the factory sector 7%.

The number of high-qualified personnel, DSc and CSc, remained almost fixed, with its share in the R&D works accounting for nearly 29%. In total, at the beginning of the 21st century, about 70 thousand high-qualified researchers were working in various economic industries, with 70% of them directly engaged in R&D works (Table 1).

More than half (54%) of DSc and CSc involved in R&D activities worked at higher education establishments, almost a third (28%) was employed at academic institutions, and the rest (18%) were recruited in the factory and industrial sectors. While the general employment in the R&D showed a downward trend, the share of holders of academic degrees (total CSc and DSc) grew. Thus, in 1999, their share in the number of full-time employees accounted for 11.8%, in 1999; 11.3%, in 1998; 10.7%, in 1997; and only 7%, in 1991. However, in 1999, the number of CSc decreased by 4.5% as compared with 1998, and for the period of 1991–1999 it fell by one third. At the same time, the number of DSc increased from 3.1 thousand, in 1991, to 4.1 thousand, in 1999.

Despite the reduction in R&D personnel, in the late 20<sup>th</sup> century, the saturation of Ukraine’s economy with researchers remained at the level of the advanced economies (Table 2). Some positive changes were reported as the outflow of employees from R&D activities slowed down: in

*Table 1*

**Number of Personnel of R&D Institutions in Ukraine, thousand employees**

Employees	1991	1993	1995	1997	1998	1999	1999/1991, %
Full-time employees, including	449.8	345.8	293.1	233.3	214.9	199.4	44.3
Engaged in R&D works,	295.0	222.1	179.8	142.5	133.4	126.0	42.7
DSc (Doctor of Science)	3.5	4.0	4.1	4.3	4.5	4.1	132.3
CSc (Candidate of Science)	27.9	26.0	22.9	20.6	19.8	19.0	68.1
Engaged in R&D works, as a second job	36.1	39.2	41.7	46.8	48.8	48.4	134.0

*Source:* The State Statistics Committee of Ukraine, 2000

1993–2000, the reduction in R&D personnel decreased from 9.2 to 3.7%.

The main reason for the brain drain from the R&D activities was unstable operation of research organizations, which led to various forms of hidden unemployment, such as reduced working

week or day, unpaid leave and so on. This situation concerned more than half of researchers, mostly young researchers and postgraduates. Many researchers were engaged in the educational sector as second job; in 1991–1999, their number increased 1.5 times and amounted to about 48 thousand.

The most unfavorable changes occurred in the qualitative composition of the R&D staff, namely:

- ✦ The share of academic degree holders directly engaged in R&D decreased;
- ✦ The number of academic councils unreasonably increased, as in 2002, about 660 were recorded, which did not contribute to the scientific quality of academic degrees and titles awarded;
- ✦ The R&D personnel in the industrial sector significantly decreased, which hampered the development of innovation economy;
- ✦ Critical deterioration of the age structure of academic staff. The academic degree holders were structured by age as follows: 16% under

Table 2

**Saturation of Economy with Scientific Personnel in Various Countries (2000)**

Country	Number of scholars and researchers per 10 thousands of employed population	
	Number of scholars	Number of researchers
Germany	120	58
United Kingdom	98	54
Denmark	95	47
Austria	66	34
Ukraine	55	41

Table 3

**Number of DSc Who Emigrated from Ukraine (1991–1999)**

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total	1999/1991, %
Australia	0	2	0	0	0	1	1	0	2	6	1.2
Azerbaijan	1	0	0	1	0	0	0	0	0	2	0.4
Belarus	1	1	1	3	0	0	1	0	0	7	1.4
Canada	0	3	1	1	0	3	3	0	1	12	2.4
Czech Republic	0	1	1	0	0	0	0	0	0	2	0.4
Germany	0	2	2	3	3	8	4	2	10	34	6.8
Hungary	0	1	1	0	0	1	0	0	0	3	0.6
Israel	11	4	3	6	10	10	2	2	2	50	10
Moldova	1	0	1	1	3	0	0	0	0	6	1.2
Romania	1	0	0	0	0	0	0	0	0	1	0.2
Russia	8	13	27	47	20	35	22	6	6	184	36.9
Tajikistan	2	0	0	0	0	0	0	0	0	2	0.4
USA	13	28	22	23	19	15	13	6	6	145	29.1
Uzbekistan	0	1	0	0	0	0	0	0	0	1	0.2
Others	0	2	10	4	4	10	5	3	5	43	8.6
Total	39	57	68	90	59	83	51	19	32	498	—
% of the total number of scientists and scholars in Ukraine	1.1	1.5	1.7	2.2	1.4	2.0	1.2	0.4	0.8	—	—

Source: The State Statistics Committee of Ukraine, 2000

40 years, 31% 41–50 years, and 22% 50–60 years. The age structure of DSc was even worse: 3% under 40 years, 26% retirement age (56–60 years), and 29% 61–70 years.

Since 1991, SSCU has been providing information on the emigration of DSc. According to it, in 1991–1999, 498 DSc emigrated; 40% of them was specialized in biological and medical sciences, 50% in physics, mathematics, and engineering science. In general, as one can see from Tables 3 and 4, in 1991–1999, 184 DSc emigrated to Russia, 18 to other CIS countries, 50 to Israel, 34 to Germany, 145 to the United States. In 1996–1999, 134 CSc left Ukraine to settle in Russia, 59 in Israel, 70 in Germany, and 136 in the United States.

In 1998, a decline in the scientific emigration was reported as 117 DSc and CSc moved overseas, which was 1.5 times less than in 1997 and 2.3 less than in 1996. One third of emigrates was younger than 40 years; 35% had an age of 41–50 years. The majority of them was specialized in physics, mathematics, and engineering science (24% of the total), in biology (17.1%), and in medical sciences (6.8%). Among these 117 DSc and CSc 40% was

employed at the institutions of the Ministry of Education and 30% at the NAS of Ukraine. In 1996–1999, according to the SSCU data, about 700 DSc and CSc left Ukraine, with a quarter of them being promising scholars and scientists younger than 40 years and third of them having an age of 41–50 years. In particular, in 1997–1999, 433 DSc and CSc moved overseas, including 24% to Russia, 25% to the USA, and 14% to Germany. A downward trend in emigration lasted 1996–1998, however, in 1999, a new wave of emigration was reported as it grew by 16.2% as compared with 1998.

Thus, the state of Ukrainian science in the 1990s, according to the SSCU, was characterized by negative trends such as aging and intensive emigration of high-qualified and young R&D personnel from Ukraine. Unless the situation changes for the better, in the future, Ukraine will not only fall behind in acquiring new knowledge and creating new technologies, but also will face a critical decrease in the contingent of professionals able to absorb new knowledge and to ensure an appropriate level of education in Ukraine [6].

**1.2. Analysis of Research of Brain Drain Problem Based on the Poll of Directors of Institutions of the NAS of Ukraine and the Ministry of Education and Science of Ukraine**

The authors hereof, with assistance of the Ukrainian Committee for Science and Culture of the NAS of Ukraine, sent a letter of request to the directors of 84 institutions of the NAS of Ukraine, the Ministry of Education and Science (MES) of Ukraine, and the Ukrainian Academy of Agrarian Sciences (UAAS) to provide information about scientific emigration in 1991–1999 for gathering statistical data on outflow of researchers from the academic and the educational sectors of Ukraine; for identifying the status of hidden emigration (some researchers who left Ukraine for long-term business trips and have overstayed abroad remain passport holders of Ukraine, but at the same time have got permanent residence permits in other countries); and for establishing contacts with Ukrainian scholars who work abroad and involving them in the poll.

*Table 4*

**Number of CSc Who Emigrated from Ukraine (1996–1999)**

Country/Year	1996	1997	1998	1999	Total	%
Austria	1	1	0	1	3	0.6
Canada	16	5	4	10	35	6.8
Germany	17	18	13	22	70	13.6
Hungary	2	0	0	2	4	0.8
Israel	23	12	10	14	59	11.5
Poland	1	3	2	1	7	1.4
Russia	63	36	23	12	134	26.1
USA	42	33	37	24	136	26.4
Others	19	21	9	18	67	13
Total	184	129	98	104	515	—
% of the total number of scientists and scholars in Ukraine	0.8	0.6	0.5	0.5	—	—

Source: The State Statistics Committee of Ukraine, 2000

The responses came from 53 institutions belonging to:

- ✦ Departments of the NAS of Ukraine (mathematics, computer science, mechanics, physics and astronomy, earth sciences, physical and engineering problems of materials science, physical and engineering problems of energy, chemistry, molecular biology, biochemistry, experimental and clinical physiology, general biology, economics, history, philosophy and law, literature, language and arts);
- ✦ Higher education institutions of the MES of Ukraine (the Kyiv National Economic University, the Taras Shevchenko National University of Kyiv, the *Kyiv Polytechnic Institute* National Technical University of Ukraine, the Mechnikov National University of Odesa, the *Lviv Polytechnica* National University, the Ivan Franko National University of Lviv, and the Lviv Academy of Veterinary Medicine).

Table 5

**Structure of Scholars by Country of Emigration Based on Responses of Organizations of the NAS of Ukraine and the MES of Ukraine**

Country	Number of migrants	Country	Number of migrants
USA	221	Finland	3
Germany	59	Turkey	3
UK	26	Belgium	3
Unknown country	21	Hungary	3
Canada	18	China	2
Israel	16	Switzerland	2
Austria	15	Denmark	2
France	15	Brunei	1
Sweden	12	Greece	1
Russia	11	Spain	1
Poland	7	Singapore	1
Australia	6	Italy	1
Japan	6	Colombia	1
Mexico	6	Portugal	1
Czech Republic	6	Slovakia	1
New Zealand	4	Norway	1
Netherlands	4	Yugoslavia	1
Taiwan	3		

Source: results of authors

According to this poll, no migration of researchers was reported for the following institutions of the NAS of Ukraine: the Potebnia Institute of Linguistics, the Koretskyi Institute of State and Law, the Institute of Sociology, the Institute of Hydrobiology, the National Botanical Garden, the Paton Institute of Electric Welding, the Dumanskyi Institute of Colloid and Water Chemistry, the Institute of Economics, the Institute of Ethnology, and the Kovalevsky Institute of Biology of the Southern Seas, as well as for the Kyiv National Economic University, the Lviv Academy of Veterinary Medicine, and the Institute of Soil and Agrarian Chemistry of the UAAS.

Insofar as some directors provided information on scientific emigration in 1991–2000 without breakdown by year of emigration, while a part of them gave incomplete information, the statistical data showed below were summarized for the whole period of 1991–1999 (Tables 5 and 6).

Hence, based on the poll of 40 establishments, the total number of researchers who left Ukraine reached 483, including 123 women and 360 men. The structure by qualification was as follows: 60 DSc, 399 CSc, 4 postgraduates, and 20 engineers. Among the 123 female researchers there were 10 DSc, 108 CSc, and 5 engineers. Among the 360 male researchers there were 50 DSc (including 4

Table 6

**Number of DSc and CSc who Emigrated to the Countries of Largest Emigration Based on Responses of Organizations of the NAS of Ukraine and the MES of Ukraine**

Country of Largest Emigration	DSc	CSc	Total
USA	16	196	221
EU (except for Germany)	15	112	136
Germany	5	47	59
Eastern Europe	5	8	17
Israel	4	10	16
Russia	9	2	11

Source: results of authors

Full Members and Corresponding Members of the NAS of Ukraine), 291 CSc, 4 postgraduates, and 15 engineers. Table 5 shows the data on countries to which Ukrainian researchers emigrated, while Table 6 contains data on the emigration of high-qualified scholars.

It should be noted that those researchers worked basically in biological and medical sciences (46%), physics, mathematics and engineering science (37%), and in chemistry (12%). Most of them worked on problems of mathematical analysis, solid state physics, semiconductor physics, nuclear physics, theoretical physics, marine hydrophysics, organic chemistry, structural mechanics, and computer science. Among biologists, the largest shares belonged to molecular and cellular biology, physiology, and biochemistry.

### **1.3. Research and Social Aspirations of Senior Students of Universities and Young Researchers of the NAS of Ukraine**

The contingent of researchers at R&D institutions in Ukraine, especially those of the NAS of Ukraine, consists mainly of 40 – 50 years old personnel and, therefore, requires rejuvenation. This situation is aggravated by annual outflow of young researchers abroad. Therefore, to assess the prospects for migration problem it is extremely important to study the research and social aspirations of senior students of universities and young researchers of the NAS of Ukraine, especially their intentions to work abroad. Such a study has been carried out by the authors hereof together with the Center for Social Expertise of the Institute of Sociology of the NAS of Ukraine, under support of the MES of Ukraine. To reach the objectives of the study the authors have developed 3 types of questionnaire:

- 1) For the senior students of universities;
- 2) For the young researchers (under 35 years) and postgraduates of the NAS institutes;
- 3) For the directors and deputy directors (scientific secretaries) of the institutes<sup>1</sup>.

<sup>1</sup> Results of sociological poll of Directors and Deputy Directors are given in Section 1.4.

Two thousand five hundred questionnaires were sent to the 4<sup>th</sup> – 5<sup>th</sup> year students of national universities of Odesa, Dnipropetrovsk, Donetsk, Kharkiv, Lviv, Ivano-Frankivsk, Uzhgorod, Zaporizhia, Chernivtsi Oblasts and to the Taurica National University, the Sumy State University, the Taras Shevchenko National University of Kyiv, the *Kyiv Polytechnic Institute* NTUU, and the *Kyiv-Mohyla Academy* National University.

One thousand six hundred and sixty-six questionnaires were received back from the following universities: the National University of Dnipropetrovsk, the Kharkiv National University, *Kyiv Polytechnic Institute* NTUU, the *Kyiv-Mohyla Academy* National University, the Taras Shevchenko National University of Kyiv, the National University of Chernivtsi, the Stefanik Carpathian University, the University of Donetsk, the National University of Lviv, the National University of Odesa, and from the Sumy State University. Totally, the survey covered 25 higher education establishments.

The young researchers were interviewed at 37 institutes of the NAS of Ukraine. Out of the 370 questionnaires sent out to the postgraduates and young researchers, 226 questionnaires were got back. Based on a preliminary analysis of the questionnaire, the authors divided all respondents into the students and the young researchers, depending on their status, and into the «emigrants» (those who have intention to work abroad) and the «rooted» (those who are expected to stay in Ukraine), depending on intentions. In Tables below, they are marked by letters «E» and «R», respectively.

According to the survey, the young researchers have a much higher computer literacy index (0.64) against the students (0.48) (Table 7). The «Emigrant» young researchers and students have a higher index of computer literacy (0.72 and 0.54, respectively) than the «Rooted» ones (0.63 and 0.45, respectively). The young researchers have a better access to Internet (0.50) as compared with the students (0.30). In this aspect, the «Emigrants» dominate over the «Rooted» among both the young researchers and the students (Table 8).



The respondents speak one or several of the three major languages: English, German, and French, with most of them speaking English (Table 9). Given this and the obvious fact that English is language of international communication, the authors made analysis for this foreign language. The young researchers know English better by the students (0.60 and 0.56, respectively). However, the students have enough time to improve language proficiency. The difference between the «Emigrants» and the «Rooted» is insignificant.

Concerning the family welfare, the students live in families with higher income (0.47) as compared with the young researchers (0.30) (Table 10). This seems to indicate that, in the recent years, children from wealthy families have had more chances to receive higher education and qualifications, including in private schools. In this respect, the «Emigrants» do not differ from the «Rooted».

The young researchers do not plan life for a much longer horizon as compared with the students (270 days and 230 days, respectively). The «Emigrants» foresee over a greater expanse of

Table 7

**Computer Literacy**

Qualitative scale	Quantitative scale	Students			Young researchers		
		Total	E	R	Total	E	R
1. Illiterate	0	8	5	9	0	—	—
2. Typing, playing games	0.2	24	22	27	3	0	4
3. User of standard programs	0.5	40	38	42	55	58	53
4. Advanced user	0.8	20	24	17	36	36	36
5. Qualified programmer	1.0	8	11	5	6	6	7
Computer literacy index (from 0 to 1)	—	0.48	0.54	0.45	0.64	0.72	0.63

Note. E – «emigrants» – going to work abroad; R – «rooted» – going to stay in Ukraine. Source: results of authors

Table 8

**Accessibility of Internet**

Qualitative scale	Quantitative scale	Students			Young researchers		
		Total	E	R	Total	E	R
1. No access	0	39	32	44	19	9	24
2. Very seldom	0.2	21	19	21	14	15	14
3. Limited access	0.5	28	30	28	42	51	37
4. Unlimited access	1.0	12	19	8	25	25	25
Accessibility index (0–1)	—	0.30	0.38	0.26	0.50	0.54	0.46

Source: results of authors

Table 9

**English Skills**

Qualitative scale	Quantitative scale	Students			Young researchers		
		Total	E	R	Total	E	R
1. Not speak	0	7	3	9	14	12	14
2. With dictionary	0.4	51	43	56	26	17	30
3. Fluent	0.8	32	38	28	50	65	45
4. Proficient	1.0	10	16	7	10	6	11
Skill level (0–1)	—	0.56	0.64	0.52	0.60	0.65	0.57

Source: results of authors

Table 10

**Wellbeing**

Qualitative scale	Quantitative scale	Students			Young researchers		
		Total	E	R	Total	E	R
1. Miserable	0.1	0.6	1	0.1	3	8	2
2. Poor	0.2	17	14	17	44	47	43
3. Medium	0.5	76	79	78	52	45	53
4. Wealthy	0.8	6	5	6	1	0	2
5. Rich	1.0	0.4	0.4	0.9	0	0	0
Wellbeing index (0–1)	—	0.47	0.47	0.48	0.32	0.30	0.37

Source: results of authors

time than the «Rooted» among both the young researchers and the students as their life planning horizon is longer by 50–60 days (Table 11). The status and experience give advantages to the young researchers over the students in terms of contacts with foreign colleagues (0.41 and 0.18, respectively). However, it is worth noting as positive fact that 36% of the 4<sup>th</sup> – 5<sup>th</sup> year students have already established relations with foreign counterparts (Table 12). The «Emigrants»

have a significantly higher index of contacts by 0.13 – 0.16 or 1.5–2 times as compared with the «Rooted».

Temporary work abroad is useful for both the researchers and for Ukraine as a whole, but only if the researchers return to Ukraine it enhances the national intellectual potential. Index of focus on changing the country of residence of the students is 0.37. It is much higher than that of the young researchers (0.18) (Table 13). In terms of % age, 56% of the students is going to leave Ukraine against 25% of the young researchers who have the same intentions. So, the younger generation has a higher level of mobility, and provided they continue as researchers the probability of emigration will increase.

The purposes of moving abroad for the students and the young researchers differ (Table 14). Among the students, the group of financial factors dominates (63%), while the professional interest has a share of only 37%; 7% of the students agrees to do whatever job if it is well paid. The young researchers show a diametrically opposite motivation: 63% of them is going to move abroad for training, new experience, and engagement in research that is relevant to them, and finally, for

Life Planning Horizons

Table 11

Qualitative scale	Quantitative scale	Students			Young researchers		
		Total	E	R	Total	E	R
1. No planning	0	14	9	17	13	11	12
2. One day	1	6	5	6	3	4	3
3. Several days	3	16	17	15	10	7	10
4. Week	7	17	15	17	11	5	14
5. Month	30	13	14	13	14	16	14
6. Half-year	180	11	12	9	18	16	19
7. Year	360	9	11	9	19	26	17
8. Several years	1000	11	14	11	8	11	7
9. Over 5 years	2000	3	3	3	4	4	4
Average horizon	—	230	270	220	270	280	210

Source: results of authors

Relations with Foreign Colleagues

Table 12

Qualitative scale	Quantitative scale	Students			Young researchers		
		Total	E	R	Total	E	R
1. No relations	0,1	76	64	22	56	41	60
2. Conflict	0,2	3	5	2	1	4	1
3. Indifferent	0,5	7	10	5	9	9	8
4. Satisfactory	1,0	14	21	11	36	46	31
Contact tightness index (0 – 1)	—	0.18	0.27	0.14	0.41	0.51	0.35

Source: results of authors

Intentions to Change the Country of Residence

Table 13

Qualitative scale	Quantitative scale	Students			Young researchers		
		Total	E	R	Total	E	R
1. Will stay in Ukraine	0	44	0	100	75	—	93
2. Have not decided yet	0.5	30	—	—	0	94	—
3. Will go abroad for a certain time	0.8	20	76	—	24	—	7
4. Will emigrate	1	6	24	—	1	6	—
Emigration intention index (0 – 1)	—	0.37	0.85	0.00	0.18	0.53	0.06

Source: results of authors

Table 14

**Purpose of Moving Abroad (%)**

Qualitative scale	Students			Young researchers		
	Total	E	R	Total	E	R
1. To improve qualification and to gain new experience	28	23	34	44	41	46
2. To do research that cannot be done in Ukraine	6	6	6	14	9	17
3. To gain authority in international science	3	2	3	5	4	5
4. To earn money to improve wellbeing	56	64	51	36	44	31
5. To work at any well-paid position	7	5	6	1	2	1

Source: results of authors

the acquisition of prestige in the international scientific community. Only 37% of them are guided by material comfort considerations.

**1.4. Attitude of Directors of Institutes of the NAS of Ukraine Towards Scientific Emigration**

It was very important to study the attitude and estimates of scientific emigration with the directors of R&D institutions of the NAS of Ukraine. To this end, directors of 37 academic institutes that represented all areas of Ukrainian science were selected as experts to be polled. Out of the 84 questionnaires sent out to the directors 49 were received back. The results of polling the directors of academic institutions with respect to their attitude towards the problem of scientific emigration conducted in June and July 2001 are given below.

Despite an extremely poor funding of Ukrainian science from the state budget and all statements of the scientific community about decay of Ukrainian science the experts appreciated the current level of its development rather positively (Table 15) and gave an average rating of 8.5 points against 10 points assigned to the global

development of science. It is important that almost half of institutes (47%) scored the level of Ukraine's science 9–10 points, and 31% compared it to the world level.

According to the experts, the reputation of Ukrainian scientific institutions represented by them is quite high: 76% of them is known in the scientific world, and 16% is recognized as leading ones (Table 16). The assessment of material support of research process are presented in Table 17. According to the experts, the average index of provision of academic institutes with facilities required for R&D activities and life is 0.64.

The most accessible is to publish research results (0.91). Freedom of choice of research topic also has a very high index (0.83). The leaders of academic institutes, who have successfully made their careers, believe that this is quite accessible to other scientists (0.73). The experts also believe that their colleagues have good opportunities for establishing relations with foreign colleagues (0.67) and access to Internet (0.63).

Interestingly, that the directors score the accessibility of Internet slightly higher than the young researchers working in those institutes:

Table 15

**Scientific Development of R&D Institute (from 0 to 10, where 10 corresponds to the world level)**

Structure (%) of scoring based on the scale from 0 to 10							Average score, points
Score	«5»	«6»	«7»	«8»	«9»	«10»	
%	8	4	12	29	16	31	8.5

Source: results of authors

Table 16

**Reputation of R&D Institutes of Ukraine**

Structure	Qualitative scale		
	Ordinary	Well-Known	Leading
%	8	76	16

Source: results of authors

0.63 and 0.50, respectively. The participation in international conferences, especially outside Ukraine, is cost intensive, therefore, it has a low index (0.47). The lowest score is assigned to social

benefits for employees (0.26), which reflects the overall poverty in Ukraine.

Only 4% of institutes does not participate in international projects, 8% is involved at the level

*Table 17*

**Provision of Scholars with Certain Vital Facilities**

Opportunity	Qualitative scale of provision with facilities				Index
	Unavailable	From time to time	Partially	Entirely	
1. To publish results of research	—	—	18	82	0.91
2. To work on selected problem	—	4	29	68	0.83
3. To be promoted	2	9	36	53	0.73
4. To establish contacts with foreign colleagues	2	11	46	41	0.67
5. To have access to Internet	—	11	56	33	0.63
6. To participate in international conferences	4	35	42	19	0.47
7. To have social security	32	32	32	4	0.26
Quantitative scale 0 – 1	0	0,2	0,5	1	—
Average index provision	—	—	—	—	0.64

*Source:* results of authors

*Table 18*

**Engagement of R&D Institutes in International Projects**

Structure	Engagement in project			
	No projects	Separate researchers	Separate groups of researchers	Full engagement of institute
%	4	8	78	10

*Source:* results of authors

*Table 19*

**International Activities in 2000**

Type of international activity	Number of employees	
	Total for sample	On average per institute
1. Have participated in international conferences outside Ukraine	800	32
2. Have gone abroad temporarily (for period of up to 1 year)	300	12
3. Have gone abroad temporarily (for period of more than 1 year)	200	8
4. Have emigrated	40	2
5. Have been abroad, total	540	22

*Source:* results of authors

of separate researchers, while in most institutes (78%) international cooperation is realized at the level of groups of researchers. The most extensive form of international scientific cooperation involving the whole institute is reported for only 10% (Table 18). In 2000, 800 Ukrainian researchers from the institutes participated in international conferences outside Ukraine. On average, it corresponds to 32 researchers per institute (Table 19).

In 2000, an average of 22 researchers per institute worked abroad, including 2 ones who moved

abroad 2 persons on permanent basis, 8 ones worked abroad temporarily for a period more than a year, and 12 for a period less than a year.

The majority of experts (67%) believes that the most effective ways of cooperation with Ukrainian researchers working abroad is «joint projects in priority areas» (Table 20). This is logical. Firstly, in this way, they can improve the financial status of Ukrainian science at the expense of foreign and international funds. Secondly, international cooperation enables support of Ukrainian science worldwide. All other options are supported by less than 15% each and are variations of the preceding options.

The most experts (93%) believe that to stop emigration it is necessary to take measures of material nature – money is the decisive factor (Table 21). Interestingly, that 5% of the experts supports authoritarian method «to ban the scholars from leaving Ukraine like it was in the Soviet Union», whereas 2% is very liberal-minded («should not stop them»). The list of measures proposed by the experts repeats the situation

Table 20

**Cooperation with Young Researchers Who Are Temporarily Working Abroad or Have Emigrated**

Measures	%
1. To implement joint projects in priority directions	67
2. To create conditions for raising interest of researchers	13
3. To invite to Ukraine for establishing contacts	8
4. To invite to Ukraine for participation in conferences	5
5. To develop science and to raise its attractiveness	5
6. To communicate via Internet	3

Source: results of authors

Table 21

**Measures To Be Taken To Stop Emigration of Young Researchers (according to the experts)**

Measure	%
To raise prestige and salary of scholars	47
To improve the resource base of research	26
To raise quality of life in all aspects	17
To increase funding of science up to the European standards	5
To ban the scholars from leaving Ukraine (like in the USSR)	5
Not to stop	2

Source: results of authors

Table 22

**Measures To Be Taken To Bring Young researchers Back to Ukraine (according to experts)**

Measure	%
1. To create favorable working conditions and to pay good salary	35
2. To create favorable conditions for research, wellbeing, and social security	22
3. To provide the scholars with modern equipment and materials	12
4. To offer comfortable dwelling and high salary	8
5. To increase funding of science	8
6. Not to bring back	5
7. To provide opportunities for realization of personal potential	3
8. If situation in Ukraine stabilizes they come back without any special measures	2

Source: results of authors

completely, as 90% proposes to raise funding of science and to improve resource and material base (Table 22).

## **2. EXPERIENCE IN SOLVING A PROBLEM OF SCIENTIFIC EMIGRATION TO OTHER COUNTRIES**

To explore the ways of solving the problem of research emigration in the countries like Ukraine being in the state of political and economic transformation, the authors worked through the publications, Web page content and information provided by the embassies of many countries. Synthesis of these materials has been provided in this section.

In *Poland*, significant efforts have been made to maintain a skilled workforce in the country, especially the professionals who work in the priority areas of research [4–5]. In addition, Poland tries to make maximal use of scientists who had left to work abroad earlier. It should be noted that the Polish scientists (in particular, just like the Hungarian ones) had more opportunities to work on the offshore contracts even under the socialist regime. It is known that the Polish scientists were going to work abroad since 1970, therefore, setting up the working contacts with the Polish researchers-emigrants is regarded by the Polish government as a promising way to reduce the negative effects of departure of scientists abroad. The Polish researchers-emigrants do not lose the ties with their colleagues in Poland. Thus, according to the survey, 93 % of the surveyed emigrants said that they maintained the professional contacts with the Polish scientific community. The most common are such types of contacts as periodic trips to the scientific institutions (80%), lectures or participation in the conferences (74%), a significant portion of respondents (64%) are invited by the colleagues from Poland to their institutions abroad. It is important to note that three quarters of respondents thought about the possibility of returning to Poland, but did not make practical steps. The main obstacles to return, according to estimates of respondents, are relatively

low wages (53%), inability to carry out research in Poland at a high level (38%), difficulty in finding job for the husband/wife and school for children (about 34%) [5].

Based on the research, the Polish experts have concluded that solving the problem of departure of scientists is connected not only with the extensive improvements of the scientific work, but also with the system of science and education, in general. The measures which, in opinion of the Polish colleagues, would help to improve the situation in this area are given below:

- ✦ construction of new buildings and improving the facilities and resources of state universities, including up-to-date equipment for research, computer networks and libraries;
- ✦ improving the funding and working conditions for the faculty members of state universities;
- ✦ reorganization of the education system in the universities by introducing a three-stage scheme: 3-year licensee, 2-year Master's program and 3-year postgraduate study for a doctor of sciences in the presence of teaching staff of higher qualification;
- ✦ flexible training system which makes it possible to study disciplines in different faculties;
- ✦ introduction of financial incentives to attract scientists of the Academy of Sciences for the postgraduate training and teaching at the universities;
- ✦ change in the system of awarding a doctorate degree, including the involvement with this purpose of scholars from other universities and foreign scientists; in the future it is recommended to switch to the European doctoral programs;
- ✦ strengthening the universities in the regions [5].

In *Hungary*, as well as in other post-socialist countries, in the nineties the fundamental changes came to a head in the official policy regarding the science. As a rule, creatively active and talented scientists in their perception of the world are cosmopolitan and individualists, and they need to communicate with their foreign colleagues and need the teamwork in the foreign scientific

centers. However, there are external (in relation to the scientific activities) factors which inevitably pushed the scientists to return home. In opinion of the Hungarian researchers, the country should be ready for the return of scientists creating for them the necessary working conditions and a favorable atmosphere for the research. In this case, the donor countries will not bear the direct intellectual losses in the long run. During the period from 1986 to 1992, the Hungarian Academy of Sciences in cooperation with the international organizations participated in nearly 800 different international programs, 33% of which were held directly in Hungary. In 1992, Hungary's joining to such programs as EUREKA allowed to «internationalize» the scientific process and significantly intensify the scientific cooperation with the EU countries. The Hungarian scientists have high hopes for the international scientific cooperation, and those of them who are involved in the international research projects working partly at home and partly abroad have much less desire to emigrate. Hungary maintains the contacts with the emigrant professors and asks them to accept young scientists and post-graduates for training. Despite the risk that some of these scholars remain in other countries, nevertheless, the rest will return home enriched with the knowledge and contacts with the foreign colleagues [2, 3].

*Romania* follows the similar policies to prevent departure of scientists abroad. During the transformation the research centers became independent and were able to establish the direct contacts with the national research centers in other countries to conduct training and exchange of professors and researchers. Some government transactions and contracts complement the activities of independent scientific centers. As part of various government programs for the period of 1990–1992 more than 150 Romanian lecturers and professors worked abroad, about 285 scientists were in the short-term scientific missions in Germany, Spain, France, Italy, according to the TEMPUS program, more than 50 students stud-

ied abroad. In addition, Romania established a special fund to support science in the country, especially the fundamental studies [2].

TUBITAK Organization of scientific and technological research is actively working in *Turkey* according to the TOKTEN program, whose aim is the extensive use of experience and knowledge of Turkish scientists working abroad. This program is being implemented with the participation of Turkey Government and by the UN initiative. It promotes the long-term development of science in Turkey, supports the exchange of scientists and experts, citizens of Turkey or of Turkish origin, to provide advice to the scientific institutions and institutions of public and private sector of the economy. These scientists convey their knowledge and skills and contribute to the strengthening of cooperation between the Turkish and the international organizations.

In opinion of the Bulgarian researchers, it is necessary to limit the departure of scientists, but, however, to encourage the mobility of scientists. Achievement of these two interrelated goals can be possible under the following conditions [1]:

- ✦ Active participation of Bulgaria in the programs and projects of the European Community, including EUREKA program for the Competitive Technology, TEMPUS program and so on; the expansion of contacts and the establishment of the national institutions to cooperate with the EU programs like FAST and MONITOR for the assessment of technologies; SPRINT and COMET for the development of industry and education, etc.
- ✦ Analysis, evaluation and coordination of the country's participation in the international governmental and non-governmental organizations in the field of industry and technology, especially in the UN organizations such as UNDP, UNESCO and UNIDO, as well as in the relevant professional organizations.
- ✦ Development of strategies and policies for cooperation in technology and industry and involving the technologies from the developed countries.

✦ Further democratization of the country, adoption of liberal labor laws and its guarantees for an individual. All this is a powerful argument for the return of the Bulgarian scientists to their home [1].

In the recent years, the appropriate infrastructure and legal framework of public regulation of intellectual migration processes began to develop in *Belarus*. The most important step in this direction was the creation of the State Committee on Science and Technology, the State Migration Service (now the Committee on Migration of the Ministry of Labor of Belarus), as well as the adoption of State migration program for 1998–2000.

For an objective assessment of the movement of scientific and teaching staff of Belarus, including foreign intellectual migration, it was proposed to create a forward-looking predictive system of tracking these processes. Monitoring of intellectual migration processes should be based on the following principles [7]:

- ✦ The principle of permanent monitoring of intellectual migration processes. In order to implement this principle it is necessary to determine the frequency or periodicity of gathering the necessary information to analyze and evaluate the changes occurring in the scientific and technical sphere of the country. For monitoring of intellectual migration processes it is useful to introduce monitoring with the annual periodicity.
- ✦ The principle of combining 3 monitoring components (analysis, expectations, recommendation). The analysis involves the processing of state and departmental statistical information on the processes of internal and external intellectual migration, as well as the survey data of basic scientific organizations and universities of the republic performed with a help of monitoring tools (monitoring of statistical forms, questionnaires, interviews of experts). Expectations give an idea of the possible development of intellectual migration processes in the short or medium-term outlook under the various probable combination of socio-economic conditions of their occurrence. The recommen-

dations include the measures for the necessary actions of governing bodies which determine all the parties of state regulation of intellectual migration, as well as its improvement.

- ✦ The principle of development of monitoring of intellectual migration processes means the continuous improvement of its methodical base, raising of reliability of statistical and sociological data, the development of mathematical base of data processing, methods of conducting the sociological surveys. Obviously, in order to begin monitoring of intellectual migration it is necessary to create a data center with research groups capable to implement in practice the system principles and objectives of the monitoring study. By resolution of Council of Ministers of Belarus a Center of migration monitoring of research and research and teaching staff was created as a structural unit of the Institute of Sociology of NAS of Belarus [6].

The NAS of Belarus cooperation with the research centers and organizations in other countries took place according to the inter-academic and inter-institute agreements. Geography of scientific cooperation of the Academy's scientists is wide enough and covers 64 countries. In 1998, the NASB institutions performed 235 agreements and contracts with the foreign academic institutions, companies and organizations. In particular, today, within the INTAS program with the participation of Belarusian and foreign scientists 63 out of 110 international projects are being performed by the members of the Academy. In 1998, within the framework of INTAS, first, a special competition was held for Belarus [6]. During the period of 1996–1998, more than 2.2 thousand visits of scientists associated with the contractual duties and foreign grants were recorded in the research institutes and universities.

### **3. INTELLECTUAL EMIGRATION FROM THE DONOR COUNTRIES**

According to statistics from the US government, every fourth scientist with an academic degree who works in the country is either a foreigner or born outside the United States and later be-



came an American citizen. In particular, only for the period of 1988–1996, more than 55 thousand students from the largest Asian and European countries, Canada and Mexico, received scientific degrees in the USA. One reason for the presence of such a large number of foreign students in the USA is a feature typical for the native Americans who avoid specialties, where their efforts for performing work is higher than a level of wages. From this point of view, the scientific work that requires a significant amount of time and efforts does not attract the Native Americans. This means that these are just foreign scholars guarantee the superpower forward positions in the world science, and among the most intelligent donor countries to the United States, along with the Latin America, the Eastern Europe, India, China, are also the United Kingdom, Germany and Canada.

The USA is a scientific mecca of the world, since the government of this country is not only investing more in research than any other country (3% of GDP), but also gives the scientists unlimited freedom to realize their creative potential. Thus, the US is a leader in many fields of science, in particular, none but medical scientists who live in the US, received two-thirds of all Nobel Prizes (since 1920). The efficiency of research is defined by the following factors: publications in the leading scientific journals; the number of so-called «hot» items (with priority results); listing of 250 authors who have received priority results; number of patents; membership in the National Academy of Sciences and Academy of Engineering; innovative projects. In the area of physical and mathematical sciences almost two-thirds of scientists of higher qualifications are of non-American origin, biomedical sciences are 30%. Thus, for a long time the US receives a significant income from the investments in education made by other countries, causing thereby the damage to these countries. According to the data of Brooking Institution only for the period of 1950–1975 the scientific work of foreign experts in the US allowed to receive the income of USD 8.6 billion annually. During the nineties the law was passed that allowed to pro-

vide 65 thousand visas to the skilled foreign professionals. In early May, 1998, this quota increased, and the Senate allowed to receive the additional thirty thousand foreign specialists. For the period of 1999–2003, the annual quota made up 115 thousand foreign experts. The main motivation for this decision was an urgent need for the US economy in the specialists who work, primarily, in the fields of information technology, computer engineering and biomedical sciences [29, 30].

In Germany and the UK the investments in science account for 2.4% and 1.8% of GDP, respectively. The German government plans to double spending on science prior to 2004 and, thus, to prevent the scientific emigration in its country. The UK plans to conduct the similar increase prior to 2008. The problem of departure of scientists from these countries is also quite acute. For example, the number of foreign professionals who received academic degree in the US (in % to the total number of scientists being the natives of the country) is as follows: 85.5% in China, 79.1% in India, 69.3% in Great Britain, 55.7% in Germany, 55.4% in Canada and 36.1% in South Korea. «Several decades ago, the emigration of highly skilled professionals to the United States was viewed only as a one-way movement which seized «the best and brightest» scientists. Now, this movement is viewed in terms of «brains circulation», that is, as an opportunity for the scientists to return to their Homeland where they will be granted benefits for a job [18, 20].

As noted in [12, 15], in the European countries, in fact, there are two directions of scientific migration to the United States. The first area is associated with the migration of young scientists (graduate and doctoral candidates) who after studying in the US are building their professional scientific career. The second area is researchers of a private sector who migrate as employees of international corporations. Herewith, there is no adequate scientific potential inflow from the United States to the countries of the European Union. The author reasonably points out that the benefits of such outflow is only in such case if having obtained high qualifications, experience, international coopera-

tion experience and having enriched the world science, these scientists return to their home countries to continue their careers. To solve the problem the author proposes to expand the legal rights of non-residents of the European countries, scientists of high professional level for obtaining a permission to work, since due to solving this issue in recent years, the United States have enriched with a significant number of scientists-migrants. The European Union still holds the view that because of this the opportunity to get a job for the residents of their countries will decrease. However, the effect of resistance to the market globalization of scientific and technical personnel is just the opposite. As you know, the legalization of such authorization in the United States has not led to «discrimination» of the US scientists.

For information: 100 thousand non-residents of the US received the diplomas of American universities in 1995; in 1996, 75225 persons received the right to permanent residence in the United States (of which 20-30% being the Europeans). More than half of all Europeans, who had completed the post-doctoral studies in the US, remained to work in this country. Out of all the Europeans who defended their theses in the US, in 1995, 19.5% scientists naturalized their status, and 13.3% became the US citizens.

One of the last measures to improve scientific staff potential in Germany is a «Green Card» federal program for the professionals in the information technology, announced in 2000. The program was initiated by the German companies, and it was planned to implement it in three years. Under this program 20 thousand foreign experts may be hired in different institutions in Germany, and herewith, the family members of these specialists will be ensured with the social support.

Back in the early 90s, the «Save British Science» group initiated the active discussions on the scientific issues of emigration which faced the most prestigious universities in the UK. Among the recommendations to improve the situation, the team of researchers proposed to radically change the structure of science and substantially increase the

financial support for young scientists. In 2000, at the annual festival of the British Association for the Promotion of Science, the Science Minister in his speech said that the government together with the Wolfson Foundation established a fund with a budget of 5.8 million pounds annually for the return of highly qualified specialists of Great Britain to their Homeland. Besides, the Royal Society conducts the statistical research and tracks a scientific career of prominent scientists, members of this Society who work abroad. According to this study, only 16% members of Society worked abroad in 1969, and 26% in 2000 [18].

The European Commission notes that the European countries have not kept pace with the US and Japan both by indicator of investments in science, and by the number of academic personnel, and believes that reasons for this are the isolation of research systems in Europe, as well as insufficient cooperation at the regional and European level [19] and insufficient promotion of private investments in science. To speed up the solution of this problem, the European Commission proposes to implement a number of measures, including:

- ✦ Creation of a network of international research centers in Europe and virtual centers that could use modern interactive means of communication; the creation of new international research centers will allow the best scientists and engineers from different countries to more efficiently discover their talents and earn a high salary for the work;
- ✦ The creation of such centers can help in solving another problem. Namely, since to get a job in other country for most scientists, middle-aged and older, decisive are the availability of better conditions for work and realization of their creative «I» and reputation in the scientific world rankings, then «concentration» of these scientists in such centers will become attractive for the talented young scientists;
- ✦ Introduction of a number of legal (soft / tax) measures for private companies and businesses interested to invest in the advanced development of such centers;

- ✦ Strengthening of coordination of the national and European research to prevent duplication;
- ✦ Promotion of investments in the innovations;
- ✦ Increased mobility of research and the introduction of a single «European standard» of academic career.
- ✦ Incorporation of scientific and professional associations of the Western and Eastern Europe.

### CONCLUSIONS

Ukraine, like any other country in the world, should maintain a critical mass of intellectual potential of the nation by creating the favorable conditions for the scientists, rise in the assurance level of scientific research and funding, create conditions for the talented people in Ukraine and return the students and young scientists from exile. From organizational standpoint it requires accounting and statistics on this issue and maintaining the contacts with the Ukrainian scientific diaspora abroad. A promising direction is creating the demand for the results of scientific work within the country, including the development of venture capital, increase in the innovation activity of domestic enterprises, activation of non-governmental public organizations to support scientists and innovative small businesses [9, 11, 14]. As a result of targeted scientific policy and initiatives of the scientific community Ukraine has to move from the category of donor countries to the category of countries-recipients of intelligence.

According to the results of research and opinion polls, we can conclude that solving the problem of return migration of young researchers and students is connected with a radical improvement not only of scientific work conditions, but the whole of the national innovation system of Ukraine. The strategy of returning the young scientists to Ukraine should include the implementation of the following measures:

- ✦ Increase in funding the science that will allow to enhance the prestige of scientific work, the attractiveness of scientific activities for young people, to increase the financial support of young scientists, to create favorable conditions for scientific work (funding, equipment, scientific environment, information, etc.);
- ✦ Accounting of the Ukrainian students and young scientists abroad and maintaining the contacts and joint research projects with the students and young scientists abroad, which will make it possible to use the potential of the young Ukrainian scientists in the interests of Ukraine without their physical return;
- ✦ Revitalization of activities of public research organizations, including the youth, private universities and research centers to ensure the return migration;
- ✦ Expansion of international scientific cooperation and integration into the European Research Area considered as a means of returning the young scientists;
- ✦ Conducting the research of problem, organization of national and international forums to monitor and discuss the problem of the return of young scientists to Ukraine with the obligatory participation of the mass media.

Analyzing the situation of intellectual emigration (and return) of young people in the recent years, it should be noted that the most promising strategy for the active participation, based on the fact that the state assumes the role of coordinator and regulator of this process, is the most appropriate task today.

### REFERENCES

1. Pushkarov D. (1993). *The Brain Drain from Bulgarian Science*. In: Proceedings of the International Seminar on «Brain Drain Issues in Europe», UNESCO-ROSTE. 25–27 April, Technical Report #15.
2. Brain Drain in Russia: *Problems, Perspectives and Ways of Regulation* (1994). In: Brain Drain Issues in Europe: Cases of Russia and Ukraine, UNESCO Regional Office for Science and Technology for Europe, Technical Report # 18.
3. Vizi E. S. (1993). Reversing the Brain Drain from Eastern European Countries: The «Push» and «Pull» Factors. *Technology in Society*, Vol. 15, pp. 101–109.
4. Hryniewicz J., Jalowiecki B., Mync A. (1992). *The Brain Drain in Poland*. University of Warsaw, 118 P.
5. Hryniewicz J., Jalowiecki B., Mync A. (1997). *The Brain Drain from Sciences and Universities in Poland: 1994–1996*. University of Warsaw, 94 P.

6. Artyukhin M. I. (2000). Intellectual migration as aspect of state regulation. *Science and Science of Science*, No 4, p. 54.
7. *Brain Drain – The Emigration of Scientists from Relevant Parts of the NIS* (1997). Scientific Report, INTAS Project 93–684, ICCR, Vienna.
8. Ikonnikov O. A. (1993). *Migration of scientists from Russia*. Moscow, 33 P.
9. Klochko Y. and Isakova N. (1993) Intellectual Migration: A View from Ukraine, *Science and Public Policy*, Vol. 20, No 6, December, pp. 405–409.
10. Troyan V., Taran N. Ukraïnska naukova diaspora: novi vyklyky. *Ukraïnoznachyy al'manah*. 2016. V 19. P. 90–94
11. *Report on the Ukrainian National Study on Intellectual Migration* (1994). In: Brain Drain Issues in Europe: Cases of Russia and Ukraine, UNESCO Regional Office for Science and Technology for Europe, Technical Report # 18.
12. Carante G. (1993). *The Scientific International Organizations and Their Contribution to the Brain Drain Issues*. In: Proceedings of the International Seminar on «Brain Drain Issues in Europe», UNESCO-ROSTE. 25–27 April, 1993, Technical Report #15.
13. Yatskiv Ya., Malyts'kyj B., Bublyk S. Transformacija naukovoï systemy Ukraïny protjagom 90-h rokiv XX stolittja: period perehodu do rynku. *Nauka. innov.* 2016, 12(6): 6–14 [in Ukrainian].
14. Naukova ta innovacijna dijal'nist' v Ukraïni (1999 ta 2000). Statystychni dani. Derzhavnyj komitet statystyky Ukraïny. Artiukhovskaya N. I. (2000). CRDF Activities with Ukraine. In: Proceedings of the Int. Conf. «Astronomy in Ukraine – 2000 and beyond (impact of international cooperation)», *Kinematics and Phys. of Celestial Bodies*, Suppl. Ser., p. 3–7 [in Ukrainian].
15. Mahroum S. (2000). *Europe and Challenge of the Brain Drain*. JPTS Report, no 29.
16. International Mobility of Scientists and Engineers to the United States – Brain Drain or Brain Circulation (1998), NSF Directorate for Social, *Behavioral and Economic Sciences*, 98–316.
17. *Naukovo-tehničnyj potencial Ukraïny: stan, problemy, perspektyvy* (2000). Ministerstvo osvity i nauky Ukraïny, NAN Ukraïny, Centr doslidzhennja naukovo-tehničnogo potencialu ta istorii' nauky im. G.M. Dobrova, 63 S.
18. Plugging the British Brain Drain – The British government is developing incentives to retain top scientists at home (2000). HMS Beagle, *The BioMedNet Magazine*, issue 92 [in Ukrainian].
19. *Towards a European Research Area* (2000). Luxembourg: Office for Official Publications of the European Communities, 41 P.
20. *The Role of the International Organizations in the development of a Common European Scientific and Technological Area* (2001). Materials of Int. Symp., Kyiv, 22–25 Sept., 2001.
21. Vavylova I., Isakova N., Olijnyk M. ta in. Naukova emigracija v Ukraïni uprodovzh 1991-2000. porivnjaľnyj ta sociologičnyj aspekty. *Informacijnyj bjuleten' Ukraïns'kogo Mižnarodnogo komitetu z pytan' nauky ta kul'tury pry Nacional'nij Akademii' nauk Ukraïny*. 2002. No 14. S.19–52.
22. Bilogolovs'kyj M. Ekstrenna dopomoga učenym-pere-selencjam. *Dzerkalo tyzhnja*. 2015. No 24 [in Ukrainian].
23. Zhabin S.O., Kaz'mina O.P., Vashulenko O.S., Sosnov O.S. Analiz danyh sociologičnogo doslidzhennja molodyh včenyh NAN Ukraïny u 2015. *Nauka ta naukoznavstvo*. 2016. No 2. S. 62–75 [in Ukrainian].
24. *The UKRAINE Network Newsletter 5 July – August 2016*.
25. Popovych O.S., Kostrytsa O.P. Vikova struktura naukoľvyh kadriv jak faktor zhyttjezdadnosti naukovoï systemy Ukraïny. *Nauka innov.* 2016. 12(2): 5–11 [in Ukrainian].
26. Savel'ev A.A., Malyckyj B.A., Onopryenko V.Y. Molodezh' v nauke. 1990-e godi: socyologičeske yssledovanye. *CDPYNAN Ukrayni*, 2000. 48 s. [in Ukrainian].
27. Vashulenko O.S. Molodi naukovci NAN Ukraïny: stan ta perspektyvy. *Nauka ta naukoznavstvo*. 2004. No 2. S. 34–41 [in Russian].
28. Parkhomenko N. Problems of intellectual migration of Ukraine. *Ukrainian Studies*. 2014. 17. p. 37–39 [in Ukrainian].
29. *Intellectual Migration and Cultural Transformation. Refugees from National Socialism in the English-Speaking World*. Editors: Timms Edward, Hughes Jon. Springer, 2003.
30. *The Impact of the Intellectual Migration on the United States and Eastern Europe / The Nobel Prize Winners in Science by Eric Weiss*. – <http://www.vanderbilt.edu/AnS/physics/brau/H182/Term%20Papers/Eric%20Weiss.html>
31. Dodani S., E La Porte R. Brain drain from developing countries: how can brain drain be converted into wisdom gain? *J.R. Soc. Med.* 2005. Nov. 98(11). p. 487–491. doi: 10.1258/jrsm.98.11.487
32. <https://www.quora.com/What-are-the-advantages-and-disadvantages-of-brain-drain>
33. <https://www.ukessays.com/essays/economics/the-side-effect-of-brain-drain-in-globalisation-economics-essay.php>
34. <http://www.migrationpolicy.org/topics/brain-drain-brain-gain>
35. Laliashvili Z. *Expectations and realities of brain drain from Georgia*. [https://msed.vse.cz/files/2012/Laliashvili\\_2012.pdf](https://msed.vse.cz/files/2012/Laliashvili_2012.pdf)
36. [http://oecdobserver.org/news/archivestory.php/aid/673/The\\_brain\\_drain:\\_Old\\_myths,\\_new\\_realities.html](http://oecdobserver.org/news/archivestory.php/aid/673/The_brain_drain:_Old_myths,_new_realities.html)
37. Saxenian Anna Lee. *Brain Circulation: How High-Skill Immigration Makes Everyone Better Off*. Brookings, December 1, 2002. <https://www.brookings.edu/articles/brain-circulation-how-high-skill-immigration-makes-everyone-better-off/>
38. <http://one-europe.info/brain-drain-eu>

I.B. Вавилова<sup>1,5</sup>, Н.Б. Ісакова<sup>2</sup>, М.В. Олійник<sup>3</sup>,  
Ю.І. Саєнко<sup>3</sup>, В.М. Троян<sup>4,5</sup>

<sup>1</sup> Головна астрономічна обсерваторія НАН України,  
вул. Академіка Заболотного, 27, Київ, МСП, 03680,  
тел. +38(044) 526-21-47, director@mao.kiev.ua

<sup>2</sup> Державна установа «Інститут досліджень  
науково-технічного потенціалу та історії науки  
ім. Г.М. Доброва НАН України»,  
бульв. Шевченка, 60, Київ-32, 01032,  
+38(044) 486-95-91, steps@nas.gov.ua

<sup>3</sup> Інститут соціології НАН України,  
вул. Шовковична, 12, Київ-21, 01021,  
+38(044) 255-71-07, i-soc@i-soc.org.ua

<sup>4</sup> Національний університет  
«Києво-Могилянська академія»,  
вул. Григорія Сковороди, 2, Київ, 04655,  
тел. +38(044) 425-60-59, pr@ukma.edu.ua

<sup>5</sup> Громадська організація «Жінки в науці», Київ

#### ИНТЕЛЛЕКТУАЛЬНАЯ ЭМИГРАЦИЯ УКРАИНСКИХ УЧЕНЫХ НА ПОЧАТКУ XXI СТОЛІТТЯ

Метою статті є оприлюднення результатів унікального проекту «Наукова еміграція в Україні на початку XXI століття», проведеного в 1999–2001 роках. Це дослідження залишилося відомим вузькому колу фахівців, як і не досягло головного — вироблення державної політики з питань інтелектуальної міграції. Унікальність цього проекту полягає в повноті охоплення проблеми, а саме, соціологічній репрезентативності — в анкетуванні взяли участь близько 3000 осіб, серед яких студенти старших курсів університетів України, молоді вчені НАН України, керівники відділів наукових установ, експерти, представники наукової української діаспори. Основними цілями виїзду за кордон були названі підвищення кваліфікації та набуття досвіду роботи в міжнародних проектах, підвищення добробуту свого і сім'ї. Серед основних умов зупинки інтелектуальної еміграції в Україні — забезпеченість наукових досліджень інноваційною інфраструктурою, підвищення престижності професії науковця, можливість публікуватися в журналах з високим імпаکت-фактором, самореалізація. Автори статті обговорюють шляхи вирішення цієї проблеми в країнах-реципієнтах і країнах-донорах наукової міграції, пропонують заходи до стратегії повернення наукової молоді в Україні і вважають, що результати представленого проекту повинні послужити відправною точкою для нового соціологічного дослідження, щоб зрозуміти орієнтири студентів і молодих вчених у нових політичних і соціогуманістичних вимірах України.

*Ключові слова:* наукова еміграція, інтелектуальна еміграція, соціологічне дослідження.

I.B. Вавилова<sup>1,5</sup>, Н.Б. Ісакова<sup>2</sup>, М.В. Олейник<sup>3</sup>,  
Ю.И. Саенко<sup>3</sup>, В.М. Троян<sup>4,5</sup>

<sup>1</sup> Главная астрономическая обсерватория НАН Украины,  
ул. Академика Заболотного, 27, Киев, МСП, 03680,  
тел. +38 (044) 526-21-47, director@mao.kiev.ua

<sup>2</sup> Государственное учреждение «Институт исследований  
научно-технического потенциала и истории науки  
им. Г.М. Доброва НАН Украины»,  
ул. Шевченка, 60, Киев-32, 01032,  
+38 (044) 486-95-91, steps@nas.gov.ua

<sup>3</sup> Институт социологии НАН Украины,  
ул. Шелковичная, 12, Киев-21, 01021,  
+38 (044) 255-71-07, i-soc@i-soc.org.ua

<sup>4</sup> Национальный университет «Киево-Могилянская академия»,  
ул. Григория Сковороды, 2, Киев, 04655,  
тел. +38 (044) 425-60-59, pr@ukma.edu.ua

<sup>5</sup> Общественная организация «Женщины в науке», Киев

#### ИНТЕЛЛЕКТУАЛЬНАЯ ЭМИГРАЦИЯ УКРАИНСКИХ УЧЕНЫХ В НАЧАЛЕ XX ВЕКА

Целью статьи является обнародование результатов уникального проекта «Научная эмиграция в Украине в начале XXI столетия», проведенного в 1999–2001 годах. Это исследование, оставаясь известным узкому кругу специалистов, так и не достигло главного — выработки государственной политики по вопросам интеллектуальной миграции. Уникальность этого проекта заключается в полноте охвата проблемы, а именно в социологической репрезентативности — в анкетировании приняли участие около 3000 человек, среди которых были студенты старших курсов университетов Украины, молодые ученые НАН Украины, руководители отделов научных учреждений, эксперты, представители научной украинской диаспоры.

Основными целями выезда украинских ученых за границу были названы повышение квалификации и обретение опыта работы в международных проектах, а также повышение благосостояния, своего и своей семьи. Основными условиями приостановки интеллектуальной эмиграции в Украине считается обеспеченность научных исследований инновационной инфраструктурой, повышение престижности профессии научного работника, возможность публиковаться в журналах с высоким импакт-фактором, самореализация. Авторы статьи обсуждают пути решения этой проблемы в странах-реципиентах и странах-донорах научной миграции, предлагают мероприятия по возвращению научной молодежи в Украину и считают, что результаты представленного проекта должны послужить отправной точкой для нового социологического исследования, чтобы понять ориентиры студентов и молодых ученых в новых политических и социогуманитарных измерениях Украины.

*Ключевые слова:* научная эмиграция, интеллектуальная эмиграция, социологическое исследование.

Received 10.11.16