
**Доповіді на Міжнародній науково-практичній конференції
«Грантова підтримка досліджень та нових технологій – 2015»**

1–2 жовтня 2015 р. у м. Києві відбулась Міжнародна науково-практична конференція «Грантова підтримка досліджень та нових технологій – 2015» (“Granting of Research and New Technologies – 2015”, GRANT – 2015), організована Державним фондом фундаментальних досліджень України. Метою конференції було розроблення підходів до удосконалення грантового (конкурсного) фінансування науки на основі світового досвіду. Основними темами для обговорення були:

- способи залучення коштів для фінансування фундаментальних досліджень;
- проведення експертизи наукових проектів та визначення спільних пріоритетів;
- правове поле міжнародної фінансової підтримки фундаментальних досліджень.

На конференцію були запрошені представники фондів підтримки науки, представники органів, відповідальних за прийняття рішень у науковій сфері, науковці, представники міжнародних наукових об’єднань і громадських організацій. Загалом у конференції взяли участь 100 фахівців, які представляли Німеччину, Польщу, Францію, Литву, Естонію та Україну.

У результаті роботи конференції було розроблено рекомендації стосовно підвищення ефективності діяльності фондів підтримки науки в пострадянських країнах, насамперед фондів фундаментальних досліджень, які мають стати основою дорожньої карти побудови ефективної грантової системи фінансування науки.

Конференція проходила у формі пленарного засідання та обговорення в рамках круглих столів.

Круглий стіл 1. «Інноваційна спрямованість науково-технічних проектів – міф чи реальність?»

Круглий стіл 2. «Джерела фінансового забезпечення фундаментальних досліджень. Досвід провідних країн світу».

Круглий стіл 3. «Експертиза наукових проектів – пошук оптимальної схеми».

Круглий стіл 4. «Наукометрія – оцінка результативності чи спекуляції на кількості».

В цьому та наступному випусках журналу публікуються вибрані виступи, які оформлені у вигляді статей та підготовлені англійською (робочою) мовою конференції.

UDC 001.38

B. A. Malitsky

Foreign Grant Support for Projects in the Context of R&D Structure and Performance in Ukraine

Information about peculiarities and trends of grant form of R&D financing in Ukraine is given. It is emphasized that it was developing in Ukraine along with rapid decline in R&D financing, which entailed mainly “utilitarian” view of foreign grants, although they should be regarded as, first and foremost, as an effective means for internationalization of the national R&D system. Main reasons for intensification of grant form of foreign support to national R&D are highlighted. Factors determining participation of Ukrainian researchers in international projects with grant financing are outlined: the performance of domestic research potential and the thematic conformity of R&D conducted in Ukraine and beyond Ukraine. Estimates on publication activity of Ukrainian researchers, derived using domestic and international databases, and results

© B. A. Malitsky, 2015

of a comparative analysis of the publication activity of researchers from Ukraine and selected European countries are given. The problem of grant R&D financing inside Ukraine is discussed.

Keywords: *grant, research and development (R&D), R&D financing, R&D potential, publication activity, database "Ukrainika naukova", database Scopus, grant form of R&D support.*

1. The notion of foreign grant in the field of research became well known in Ukraine more than 20 years ago. At the beginning, grant support was used in the framework of the international organization "Ukrainian Science & Technology Center" established in 1994 by Ukraine, Canada, the U. S. and Sweden. The notion of grant became even more widespread due to the work of the well known Soros Foundation. But this notion was not being established smoothly in the administrative practices. The attempts were made to tax grants and impose the administrative control over grant programs. The grant form of R&D funding in Ukraine has largely remained the one of external origin in Ukraine; its domestic sources are still of minor significance due to the shortage of funds.

2. Grants are usually provided by grantors in form of financial resources allocated on competitive basis to physical persons, R&D teams or organizations for concrete projects. The advantage of a grant compared with a loan is that the former need not be returned, although it requires reporting on good results and strict fulfillment of financing requirements. The meaning of a grant is in a way comparable with one of an order (a contract). Grants and R&D contracts have essential impact on change in the thematic profile of R&D, bringing it in conformity with the global tendencies. This is especially important bearing in mind the prevalence of institutional R&D financing in the Ukrainian R&D. The strong effect of grant financing for changing thematic profile of R&D can be seen in new EU members from the Eastern Europe, where the R&D themes could adapt to the European profile in a short time.

3. Because a grant is given on the basis of competitive selection of projects, applicants need to demonstrate high level of research results and strong capacities for project implementation. Also, grants involve other conditions making grant process labor consuming and sophisticated. In fact, skills and competencies involved in grant process

have become a kind of profession. Probably, due to lack of such experiences with Ukrainian researchers, especially lack of confidence in winning a competition, and sometime their reluctance to spend time for this process, their participation in international grant competitions still remains quite low and fails to match their creative capacities, **although the numbers of grants received by Ukrainian researchers and organizations from international foundations over the latest 10 years have increased. In 2012, 1855 grants were received, which is nearly 300 grants more than in 2008. The leading position by the number of grants is with the HEE sector accounting for 2/3 of the total number of grants.**

4. Another peculiarity of Ukrainian grant receivers is their unchanging composition, which raises several problems of humanitarian and moral dimension. The prevailing mood with the researchers belonging "grant receivers" category is praising the Western science and implicitly critical view of the domestic science. One fresh example is the opinion of Dr. Igor Zozulenko, a grant receiver working now in a Sweden university, cited in the Ukrainian mass media. His "medical" diagnosis to the Ukrainian R&D is that "the patient is rather dead than alive". Unfortunately, judgments like this can often be heard from many Ukrainian researchers who have changed research work for political or administrative one. It is obvious that the performance of real research, and not the one serving the needs of political power, can only be judged by one's own engagement in this real research. As follows from scientometric analyses, a major part of candidates and doctors of sciences coming to political power offices in Ukraine, including top ones, have no high-rank research publications.

5. It is true that ill-conceived reforms and the state policy explicitly hostile to R&D, implemented by Ukrainian governments over years, have exhausted creative capacities, public merit and trial facilities of the Ukrainian R&D. It is now

in the chronic crisis. While the global R&D can be referred as the one undergoing the crisis of growth, considering the growing numbers of researchers, growing R&D investments, growing and diversifying institutional forms of R&D, and this crisis is associated with its transition to a new phase scientific progress, the crisis in the Ukrainian R&D is the crisis of decline. It originates from the rapidly shrinking R&D

capacity of the domestic industry, de-technologization and even considerable de-industrialization of the Ukrainian economy. These conditions entailed rapid shrinkage in the domestic demand for R&D resulted in the decreasing figures of R&D financing (see Figure 1), R&D personnel, R&D institutions; this decreasing tendency continued over nearly quarter of the century and still being on.

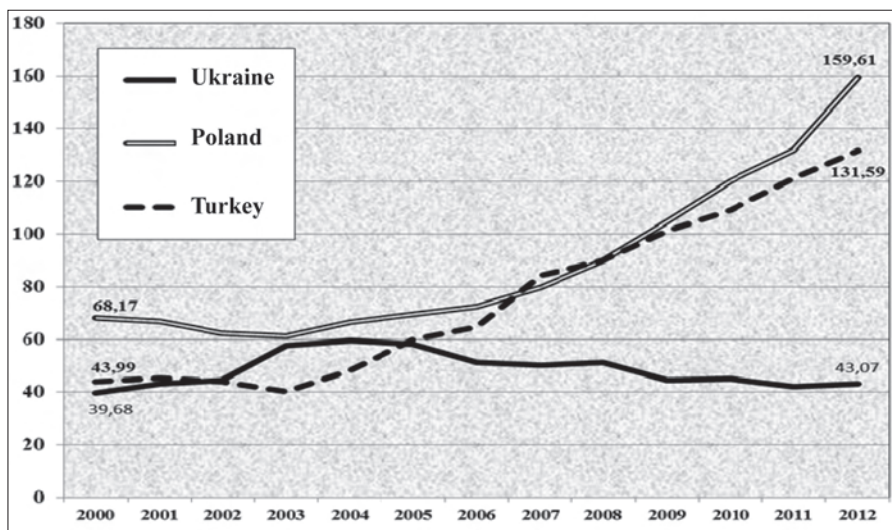


Figure 1. R&D financing per capita in Ukraine, Poland, Turkey, PPP, constant prices of 2000, USD

Source: computations of Dr. I. A. Bulkin by data from OECD database

Only in this year (2015) the number of R&D institutions has fallen by 90, the R&D employment reduced by 8,000 persons; yet even further reduction of R&D employment is expected by the end of this year as part of the government measures on the so called “optimization” of budgetary expenditures. The National Academy of Sciences of Ukraine is expected to shrink by about 8,000 employees. Ukraine has fallen to the bottom line in Europe by number of researchers per 1,000 of population. But Ukraine leads many countries by numbers of public order and security officials and clerics. In fact, Ukraine, an R&D intensive republic in recent past, has turned into a repressive and clerical country.

6. Although politically and socially marginalized, Ukrainian R&D, as a system with high capabilities for self-organization,

could preserve rather high capacities in a number of R&D fields.

6.1. The Ukrainian R&D has not lost the capacity to produce results of international merit in the following fields:

- ❖ selected advanced sections of mathematics and theoretical physics;
- ❖ research of nanostructures and development of nanotechnologies;
- ❖ radio physics of millimeter and sub-millimeter range;
- ❖ immune biotechnology, biocensors and molecular diagnostics;
- ❖ biotechnology of plants and biophysics, technologies of biodegradation;
- ❖ cryobiology and cryomedicine;
- ❖ neuroscience, including neurophysiology;
- ❖ informatics;

- ❖ micro- and optoelectronics;
- ❖ aerospace technologies;
- ❖ other fields of physics, chemistry, biology.

6.2. Ukraine has preserved the highly performing R&D capacities of material science in the following fields:

- ❖ control of the process of structure formation and formation of properties of construction and instrumental materials and their welding;
- ❖ development of technologies for production of functional (including scintillating) materials for electronics, laser and diagnostic devices;
- ❖ development of advanced composite materials and studies of mechanical properties of sophisticated constructions and systems, built on their basis;

- ❖ development of technologies for production of synthetic diamonds and other super hard materials, and tools on their basis.

6.3. A number of domestic developments could be globally competitive given certain conditions, including:

- ❖ technology and the equipment for welding of living tissues in surgery operations;
- ❖ polyorgansiloxan adsorbents;
- ❖ domestic antibiotics – cyclosporines;
- ❖ titanium alloys produced by domestic technologies;
- ❖ domestically produced super hard materials and tools on their basis etc.

7. The viability of the Ukrainian R&D can be measured by more robust indicator, the investment in the Ukrainian military R&D. The dynamics of these foreign contracts in 2001–2013 is shown in Table 1.

Table 1

Foreign investment in the Ukrainian military R&D, %

	2001	2005	2010	2011	2012	2013
Foreign investment in the Ukrainian military R&D	27.0	39.5	77.1	78.2	57.5	47.9

Although the share of foreign contracts has reduced in the recent period, the above figures are nevertheless very high even for countries with highly developed R&D. These figures refute the unjustified attacks coming from some political officials, political persons or various pseudo-experts of the Ukrainian R&D, which give misleading assessments of its capacities in an attempt to discredit the national scientific community working (more often quite effectively) in hard conditions. Thus, the globally recognized design bureau “Yuzhnoye” returns 60 UAH to the budget per the invested 1 UAH. It is the result of doing foreign contracts, including ones from European and American countries, including the U. S.

8. Another peculiar point with regard to foreign grants in Ukraine is that grants are essentially looked at with utilitarian intention to have additional financing that may sometimes be larger than the domestic one. But apart from this, a foreign grant offers an effective means to push

integration of national research systems in the single global and regional research area. There are several key factors behind the necessity for expanding the international science and technology cooperation, which predetermines the expansion of grant form as a means of R&D support from abroad.

First, there has been globally increasing awareness that all the countries have to share the responsibility for decisions of complex, large-scale and global scientific problems. This refers to problems such as global climate change, control over spread of infection deceases, studies of root causes of terrorism and its prevention, which cannot be fought a lone hand.

Second, the occurrence of more and more large-scale fundamental and multidimensional problems that can be more effectively dealt with trough combining national research capacities. Problems like research of human genome, research of micro- and macroworld, exploration of space, development of information and

communication systems can only be solved by international research capacities.

Third, in R&D, like is extraction of minerals, generation of each portion of new knowledge requires the increasing costs that cannot be afforded by one country, if even a very rich one. This tendency was emphasized by a distinguished Ukrainian researcher of science, Gennadiy Dobrov, who highlighted this problem in his bestseller book "Science about Science". The humanity has witnessed many evidences that this tendency was strengthening. The European Large Hadron Collider, genetic research, international space station, explorations of new space objects, thermonuclear energy and other high cost projects involve the research based on broader international cooperation of national researchers with use of grant form for R&D support.

9. The extent of participation of Ukrainian researchers in such international projects depends, first and foremost, on the performance of the national R&D system and on the relevance of the thematic profile of the Ukrainian R&D system to the thematic profiles at European and global level. The thematic profile can be evaluated by various methods. One of these involves structuring of publications by thematic heading. In Ukraine this method is used in database "Ukrainika naukova". Figure 2 shows the latest data on the publication activity of Ukrainian researchers in 21 research fields. As can be seen in the chart, the publication activity of Ukrainian researchers is dominated by economic sciences, with essential contribution coming from medical sciences, studies of culture, education, science policy studies.

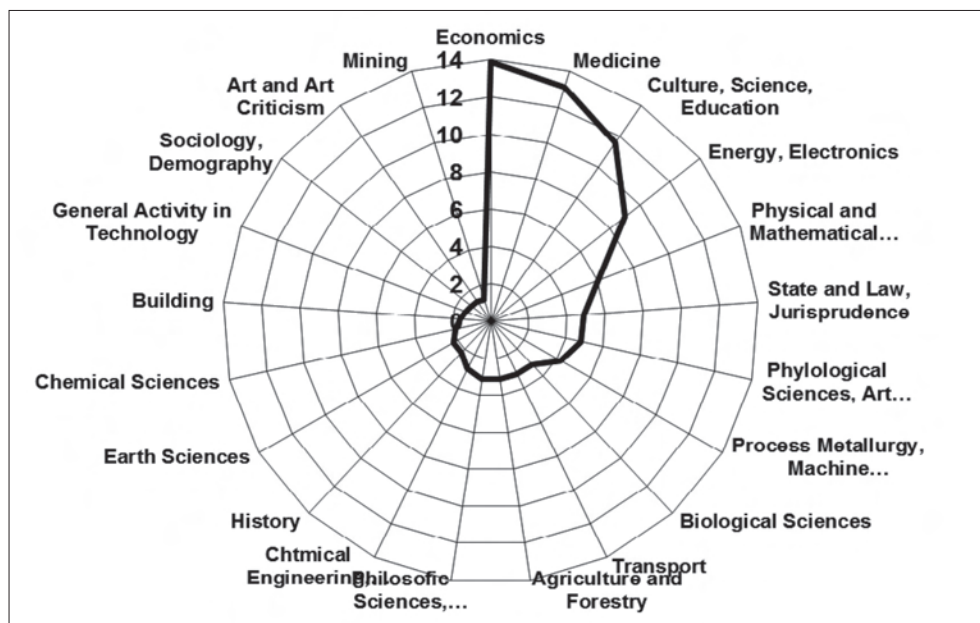


Figure 2. Publication activity of Ukrainian researchers by thematic headings of "Ukrainika naukova" database

Source: constructed by A. Koretsky by use of database "Ukrainika naukova"

In total, social sciences and humanities account for 44% of the total publications in "Ukrainika naukova" database. In spite of the constantly increasing number researchers in social sciences and humanities and the vice

versa trend in natural and technical sciences, the share of the former in the total number of researchers still remains lower than their share in the total publications, meaning that researchers in social sciences and

humanities write more than, say, physicists, mathematicians, biologists or chemists.

The situation will, however, be reverse when we proceed to the international database. Thus, in Scopus database Ukrainian researchers in social sciences and humanities

account for less than 3% of the registered documents, although their share in “Ukrainika naukova”, as mentioned above, is larger than 44%. In natural sciences, Ukrainian researchers in physics and astronomy account for nearly 26% (see Table 2).

Table 2

Comparison of the shares of publications by Ukrainian authors in databases Scopus and “Ukrainika naukova”

Field	Share of publications in database, %	
	“Ukrainika naukova”	Scopus
Social sciences and humanities	44	3
Physics and astronomy	3	26

This comparison may seem to be not sufficiently correct because of various conditions or possibilities for registration in international databases on social sciences and humanities. Specialists from our Institute have emphasized that peculiarities of data compilation in various databases or relatively small numbers of Ukrainian publications counted in specific databases may have negative effects for the above mentioned indicators. Yet, cooperation of Ukrainian researchers with foreign colleagues, their active participation in joint R&D, in seeking for foreign grants obviously have a positive effect for their representation in databases.

Dr. V. P. Rybachuk, our leading researcher in the scientometric field, jointly with Dr. Galina Kwist from Gent University (Belgium), has shown that collaborative publications of Ukrainian and foreign authors enhance the opportunity for Ukrainians to be registered in whatever international database. Also, they have identified six countries with which Ukrainian researchers have the largest numbers of collaborative publications. These are (in ranking order): Germany, Poland, France, the U. K., Italy and Spain. The ranking rows of countries derived from the analysis of Scopus and Scirus databases, have rather good correlation and can be used for bibliometric monitoring of the international scientific cooperation of Ukrainian researchers, especially in studying the potentials for increasing the grant activity of Ukrainian researchers.

10. It should be remembered that in spite of a thematic change in R&D and a change in the disciplinary structure of the Ukrainian R&D, the disciplinary structure of the latter is still essentially distinct from the European one. The following profile occurs when Scopus database is used for comparison of the disciplinary structure of publications in EU-27 and Ukraine (see Figure 3).

As can be seen from Figure 3, technical disciplines, especially physics and astronomy, are prevalent in Ukraine, which is a clear evidence of high performance of these disciplines in Ukraine. Yet, comparison of disciplinary restructuring of publications in EU and Ukraine according to Scopus data base would be very important. Regarding EU, the growing number of documents occurs in “medicine”: in 2014, these publications accounted for more than 18% of the total number of publications registered in Scopus database. Ukraine, however, lags in this discipline tenfold behind Italy, France, Germany, the U. K., Poland, and manifold behind Slovakia, Romania or Hungary. The essential reason behind this lag is that the Ukrainian medical R&D with its excellent professionals lacks advanced trial and experimental facilities to do domestic R&D.

11. Out-dated or even ruined trial and experimental facilities, manifold reduction of R&D personnel, shortage of funds for R&D and other signs of crisis in the Ukrainian R&D obviously have negative effects for its performance, including the publication

activity. The Scopus database shows that while in 1996 Ukraine was ahead of countries like Greece, Portugal, Czech Republic,

Romania or Ireland by the publication activity, in the subsequent years it was far behind them (see Figure 4).

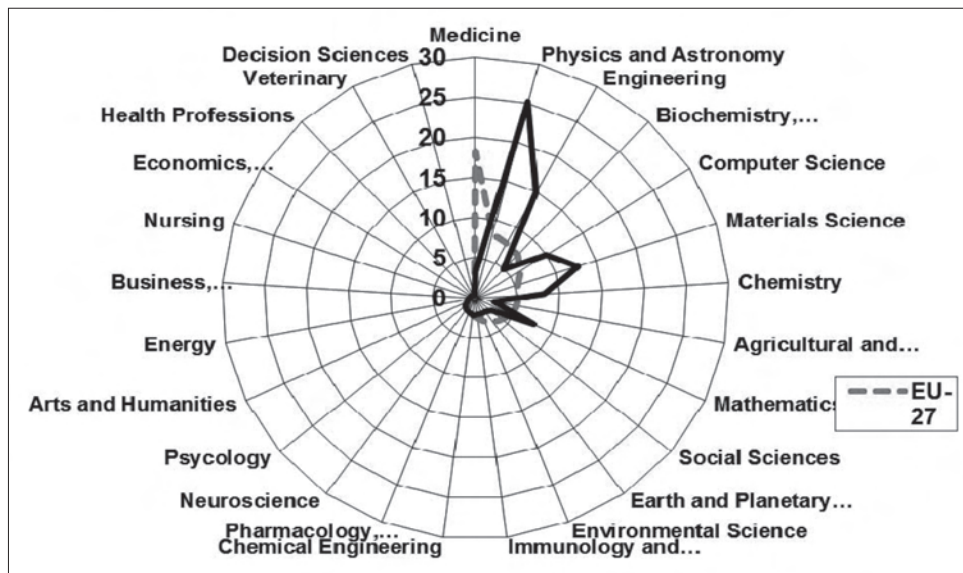


Figure 3. Disciplinary structure of publications in EU-27 and Ukraine, 2014, %
 Source: constructed by A. Koretsky by use of Scopus database

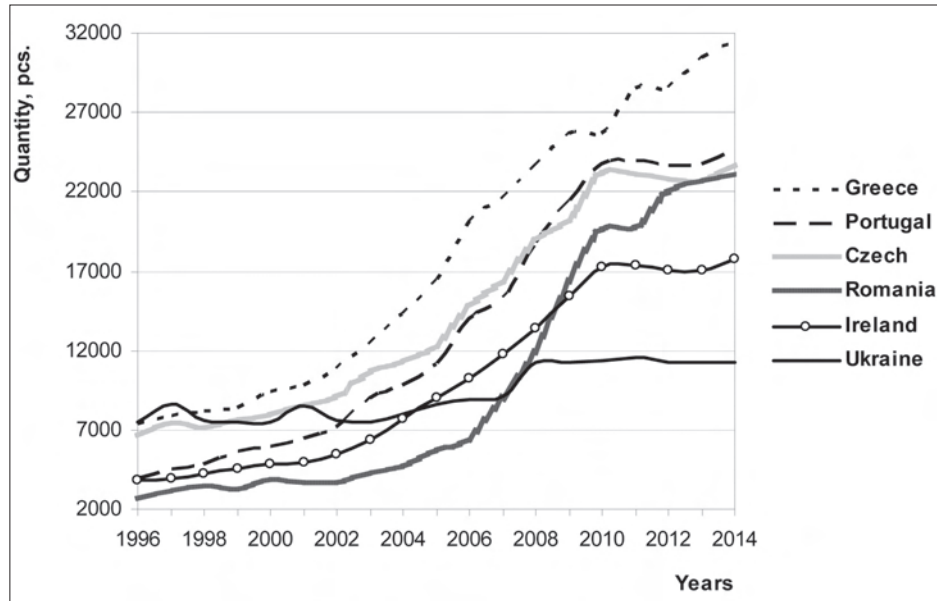


Figure 4. Publication activity of Ukraine, Greece, Portugal, Czech Republic, Romania and Ireland by Scopus database, 1996–2014
 Source: constructed by A. Koretsky by use of Scopus database

12. The chart given in Figure 4 shows a dismaying trend regarding the gap between Ukraine and others. It should be stressed, however, that the number of publications of Ukrainian researchers by Scopus database, if considered per 1,000,000 USD of R&D expenditures, has not, in fact, decreased (4.51 documents per 1,000,000 USD in 2014), but has been sometimes even higher than the EU average or the figures for countries like Denmark, Sweden, France, Finland, Austria or Germany. It could be assumed that if the R&D financing in Ukraine matched the legally fixed level (1.7% of GDP), the figure would match the one for Poland, Lithuania, Latvia or Estonia (8.28–7.2 documents per 1,000,000 USD).

13. I believe that another important problem exists in grant support for Ukrainian researchers. It should be emphasized because the raging military separatism and its support by Russia make Ukraine extremely vulnerable from defense point. It should be noted that on the eve of independency Ukraine was the third nuclear power in the world and accommodated huge military and industrial complex (MIC) employing more than 40% of the domestic researchers.

Yet, the subsequent years witnessed ill-conceived policies regarding MIC conversion. The high tech segment of the industrial R&D in Ukraine was razed to the ground by various ways, including international science & technology cooperation. If these actions are seen from economic perspective, it should be reminded that on the eve of independence Ukraine was a large-scale participant of the global market of armaments, with annual exports worth 2,000,000 USD. These losses could not be ever compensated by foreign support of domestic researchers, provided to them with other purposes (that have nothing common with support to domestic MIC).

It is well known that the purpose of the abovementioned Ukrainian Science & Technology Center (USTC) was in providing grant support for the domestic researchers working in MIC. The foreign sponsors deserve gratitude as they helped the researchers survive in the hard economic conditions of 90s. However, the material aid received by Ukraine through USTC is incomparable

with the immediate material losses and subsequent human losses of Ukraine, caused by conversion of MIC and by the ineffective national science & technology policy.

Ukraine adopted the Charter on Special Partnership Relations with NATO in 1997, and the State Program of Ukraine – NATO Partnership for 2001–2004. Nearly 13,000 of Ukrainian specialists took part in international research projects sponsored by NATO on grant line over this time. The cooperation with NATO in the research field has been on since then. In the last 2 years, 4 scientific and practical conferences jointly with NATO were held in Ukraine.

Unfortunately, this huge potential of international science & technology cooperation has been underused for national security purposes, including R&D support for adaptation of the domestic MIC to NATO standards, use of foreign achievements in domestic manufacturing of advanced armaments, strengthening of Ukraine's positions at the global market of armaments.

14. In the conclusion I would like to mention the problem of domestic grant support to R&D in Ukraine. This form of R&D support in Ukraine is mainly the responsibility of the State Foundation for Basic Research (SFBR). But it is well known that its financial capacities do not meet any real need of the domestic R&D. Apart from the financial deficit, the SFBR is constrained by bureaucratic pressures. There has been an attempt of creating a new super-foundation that is supposed to become more solvent financially and take on the funds managed now by domestic Academies of Sciences. However, the problem cannot be tackled by this step, because the problem goes beyond the SFBR competence. Instead of one foundation for R&D support, Ukraine needs dozens of them, with the variety of support forms. These foundations need to accumulate funds to sponsor the projects capable to solve large-scale scientific problems, including projects with invited foreign researchers.

As regards the SFBR, it has vitally important role, as it has the capacities to optimize the thematic structure of the domestic R&D through grant system by unfixing the established thematic

conservatism immanent in the institutional R&D financing. Also, the SFBR is needed to support young researchers, especially ones with defended dissertations. They need to be supported financially in several subsequent years once the dissertation is defended, to be able, above all, to develop their research and publish in distinguished international journals, to go to internship in foreign research centers. Ukraine needs to do so in order to prevent the increasing outflow of

young researchers from domestic R&D to other sectors or to foreign research centers.

Many questions have been raised about objectivity of grant competitions. But it depends on the real financial capacities of each foundation. The trend has always been the same: the lesser are the foundation's capacities, the more problematic is the objectivity. I hope that the capacities of SFBR will meet the needs of Ukrainian researchers.

Одержано 16.09.2015

Б. А. Малицкий

Зарубіжна грантова підтримка проектів у контексті структури та стану досліджень в Україні

Наведено інформацію про особливості та тенденції грантової форми фінансування в Україні. Підкреслено, що вона розвивалась в Україні на тлі різкого зниження витрат на науку, що визначило в основному «утилітарне» ставлення до зарубіжних грантів, хоча їх насамперед необхідно розглядати як ефективний засіб інтернаціоналізації національної наукової системи. Наведено основні причини активізації грантової форми зарубіжної підтримки національних НДДКР. Розкрито фактори, що визначають ступінь участі українських вчених у міжнародних проектах з грантовим фінансуванням: рівень розвитку наукового потенціалу країни та відповідність між тематичним профілем досліджень в Україні та світі. Наведено оцінки публікаційної активності українських учених на основі вітчизняної та міжнародної баз даних, а також результати порівняльного аналізу публікаційної активності вчених України та деяких європейських країн. Висвітлено проблему розвитку грантової форми підтримки НДДКР у середині України.

Ключові слова: *грант, фінансування науки, науково-дослідницькі та дослідно-конструкторські роботи (НДДКР), науковий потенціал, публікаційна активність, БД «Україніка наукова», БД Scopus, грантова форма підтримки НДДКР.*

Б. А. Малицкий

Зарубежная грантовая поддержка проектов в контексте структуры и состояния исследований в Украине

Приведена информация об особенностях и тенденциях грантовой формы финансирования науки в Украине. Подчеркнуто, что она развивалась в Украине на фоне резкого снижения расходов на науку, что предопределило в основном «утилитарное» отношение к зарубежным грантам, хотя их прежде всего необходимо рассматривать как эффективное средство интернационализации национальной научной системы. Приведены основные причины активизации грантовой формы зарубежной поддержки национальных НИОКР. Раскрыты факторы, определяющие степень участия украинских ученых в международных проектах с грантовым финансированием: уровень развития научного потенциала страны и соответствие между тематическим профилем исследований в Украине и мире. Приведены оценки публикационной активности украинских ученых на основе отечественной и международной баз данных, а также результаты сравнительного анализа публикационной активности ученых Украины и некоторых европейских стран. Освещена проблема развития грантовой формы поддержки НИОКР внутри Украины.

Ключевые слова: *грант, финансирование науки, научно-исследовательские и опытно-конструкторские работы (НИОКР), научный потенциал, публикационная активность, БД «Україніка наукова», БД Scopus, грантовая форма поддержки НИОКР.*