

Alla Potapova, Taras Pohrebskyi, Gennadii Golub, Nadia Tkachuk

Lesya Ukrainka Volyn National University, The Department of Economic and Social Geography, Potapova str. 9,
43021 Lutsk, Ukraine; email: potapova.alla@vnu.edu.ua; pogrebskyi.taras@vnu.edu.ua;
golub.gennadiy@vnu.edu.ua; Tkachuk.Nadiia@vnu.edu.ua

Territorial organization and main areas of scientific activity of society

Potapova A., Pogrebskij T., Golub G., Tkaczuk N. **Organizacja przestrzenna i główne sfery działalności naukowej społeczeństwa.** Przeanalizowano cechy społeczno-geograficzne przestrzennej organizacji działalności naukowej społeczeństwa. Wydzielono podstawowe grupy państw pod względem poziomu rozwoju nauki i techniki. Dokonano klasyfikacji badań naukowych. Określono czynniki społeczno-geograficzne, które sprzyjają rozwojowi nauki.

Потапова А., Погребский Т., Голуб Г., Ткачук Н. **Территориальная организация и основные сферы научной деятельности общества.** Проанализированы общественно-географические особенности территориальной организации научной деятельности общества. Выделены основные группы стран в зависимости от уровня развития науки и техники. Рассмотрена классификация научных исследований. Выделены общественно-географические факторы, способствующие развитию науки.

Потапова А., Погребський Т., Голуб Г., Ткачук Н. **Територіальна організація та основні сфери наукової діяльності суспільства.** Проаналізовано суспільно-географічні особливості територіальної організації наукової діяльності суспільства. Виділено основні групи країн, залежно від рівня розвитку науки і техніки. Розглянута класифікація наукових досліджень. Виокремлено суспільно-географічні чинники, що сприяють розвитку науки.

Key words: territorial organization of science, functional types of science, scientific research, socio-geographic features, human potential

Słowa kluczowe: przestrzenna organizacja nauki, typy funkcjonalne nauki, badania naukowe, cechy społeczno-geograficzne, potencjał ludzki

Ключевые слова: территориальная организация науки, функциональные виды науки, научные исследования, общественно-географические особенности, человеческий потенциал

Ключові слова: територіальна організація науки, функціональні види науки, наукові дослідження, суспільно-географічні особливості, людський потенціал

Abstract

Socio-geographic features of the territorial organization of scientific activity of the society are analyzed. The main groups of countries are distinguished, depending on the level of development of science and technology. The classification of scientific research is considered. So-

cio-geographical factors contributing to the development of science are singled out.

Formulation of the problem

The territorial organization of science studies its sectoral structure and location of leading research centers and institutions, their relationship with the economy and higher educational in-

stitutions. These questions and a number of others, namely: about the educational complex, national educational complex of Ukraine, reforming education in Ukraine; the complication of the object and subject of research in science, the rapid pace of development of science and technology and information technologies on a global scale; affirmation of the democratic essence of the process of intellectualization; national ideals and universal values; the need for the formation of cultural and intellectual human potential as the highest value of the nation is considered in the textbooks of Y. Oliynyk, A. Stepanenko, A. Horikhov; journal publications by L. Voropai, L. Melko, T. Shparaga, V. Stetsky and others.

Analysis of scientific research on this problem

Ya. Oliynyk, A. Stepanenko (ОЛІЙНИК, СТЕПАНЕНКО, 2000) note that the UN and UNESCO recommendations on statistics of science and technology can serve as a basis for the unification of national classifications of the branches of science. They draw attention to the fact that scientific research is divided into 5 large spheres of science and technology: industrial and precise, engineering and technical, medical, agricultural, social and humanitarian. This classification generally reflects the disciplinary structure of modern scientific knowledge, which is used in UNESCO statistical publications when assessing the scientific potential of countries and the entire world community.

Today, the question of the role of science and its territorial organization is relevant and requires further research.

The purpose of this article

The purpose of this article is to systematize the findings regarding the main areas of scientific activity and the territorial organization of science and to identify factors that affect on the concentration of different sectors of science.

Research methodology

The materials of Ya. Oliynyk, A. Stepanenko, A. Horikhov, L. Voropai, L. Melko, T. Shparaga, V. Stetskyi were used during the research. There are many methods of classification of scientific research proposed in the literature, but most of them distinguish between fundamental and applied research, as well as scientific and technical developments.

Results of the research

The decisive criteria for the relation of this or that work to one of the mentioned types of scientific research and development are the purpose, the nature of the results (the degree of connection with practice). Fundamental research includes scientific research aimed at obtaining new knowledge about the objective laws of the development of nature, society and thinking. The final result of fundamental research is information about discovered laws, new theories, hypotheses, methods recorded in scientific publications, reports, reports and etc. In addition to free (pure) fundamental research, targeted fundamental research focused on theoretical solutions to certain problems and exploratory research related to the determination of methods and spheres of practical use of fundamental scientific ideas are distinguished. Although fundamental research is characterized by a low probability of obtaining a positive result (5–10%) and a long time between the birth of an idea and its implementation in concrete developments, they radically influence the development of productive forces and society as a whole, and have a colossal effect. Applied research is scientific development aimed at acquiring new knowledge to solve specific practical problems. They are carried out either to develop the results of fundamental research with the aim of their practical application, or to determine new methods and means of achieving a certain goal, embodied in inventions, methods, scientific recommendations, instructions, etc. The probabi-

lity of obtaining positive results at this stage reaches 80%, while the appearance of results of a fundamental nature is possible. Scientific and technical developments are aimed at the creation of new materials, products, technological processes, methods of organizing production, labor or their improvement. In general, they are characterized by an almost one hundred percent probability of a positive result.

In all developed countries, science is a priority industry. And although there are relatively few people employed in science around the world (approximately 6 million people), in many countries with strong scientific potential, a lot of people work in it.

The rapid pace of development of science and technology, information technologies contributed to the fact that the achievements of scientific activity in recent decades have been transformed into a new type of resource – an intellectual (informational) resource. In terms of value, it is equal to traditional material resources of previous years – land, minerals, forest, recreation, etc. The role of intellectual resources is constantly growing, and the demand for it is constantly increasing in countries with different levels of development. Thus, in economically developed countries, science is a full-fledged branch of the national economy. The consequences of scientific and research developments are not amenable to general quantitative and qualitative assessments, but in the market economy this is determined. An important indicator of scientific and technical potential is the country's position on the world market of patents and licenses. Almost 90% of the world circulation of patents and licenses is accounted for by ten industrially developed countries – the USA, Japan and Western European countries. For example, Japan has created a fund for the development of innovations in universities in the amount of 82 billion dollars.

In the ranking of the World Intellectual Property Organization (WIPO) for the year 2020 of the countries of the world by the number of patents Japan ranks third place after China and the USA. A total of 307969 applications,

including 245372 applications by residents and 62597 by non-residents (*Рейтинг стран мира...*). According to the *Global Innovation Index 2022*, the largest concentration of patents and scientific publications in the world is provided by the scientific and technological clusters of Asia and the USA. The leadership in the rating is held by the Tokyo-Yokohama cluster.

The transformation of science into a productive force is the basis of investment progress, the essence of which is the emergence, development and spread of scientific and technical innovations in various spheres of human activity. Innovations are divided into scientific and technical innovations (i.e. means of human activity created by man) and social or cultural innovations (i.e. new values, goals, needs or guidelines in society). Innovations spread not only in time, but also in space. Depending on the level of development of science and technology and the extent of their implementation in economic practice, 4 types of countries are distinguished:

- countries with highly developed science and technology, which implement achievements in the economy on a large scale (USA, Japan and Western Europe);
- countries with highly developed science and technology, but those that slowly introduce scientific discoveries and technical inventions into the economy (Ukraine, Baltic countries, Czech Republic, etc.);
- countries with underdeveloped science and technology, but those that intensively master imported scientific and technical achievements (South Korea, Taiwan, Singapore, Hong Kong, Brazil);
- lagging in science and technology (developing countries).

Thus, in modern science, the research costs of providing them with equipment, apparatus, devices, and information are continuously increasing. The technical equipment of the work of scientists in developed countries has also become high, as well as in industry, which requires very large investments. In the world's leading countries, total allocations for research

and development reach 2–3% of gross national product (GDP). Only economically developed countries can afford such large expenses for science (ПОТАПОВА, 2022).

The placement of science is understood as the process of territorial localization of a network of scientific institutions, organizations and enterprises serving scientific and technical activities. Expedient building up of their cumulative potential in accordance with priorities and prospects, problems of science and technology. Placement of science involves, first of all, localization of science resources – personnel, financial, material, creation of scientific schools, research organizations, practical use of scientific results. The intensive development of science in space is connected, first of all, with its formation as a branch of the national economy, closely integrated with other branches of production. The placement of various types of science is marked by specific features. As known, three functional types of science are distinguished: academic – the sector that determines the general laws of the development of society and nature and conducts research on the problems of natural, technical and social sciences; branch or applied sector, the main tasks of which are the development and implementation of the results of scientific research in the economy, increasing the efficiency of production and the quality of products; the science sector of higher educational institutions, which is engaged in personnel training, research into the main problems of science. The centers of maximum concentration of various sectors of science are preserved (they are usually located in large cities), but each of them has a specific localization, which results from the goals and objectives of their development.

The academic sector of science, and especially its fundamental directions, are less directly related to production, but are more sensitive to the socio-cultural and informational environment, and are based mainly in a small number of the largest cities, as well as significant socio-economic and cultural centers of the country. They are placed regardless of the presence

of production enterprises, but taking into account the relationships with higher educational institutions of humanitarian and natural science profiles. It should be noted that fundamental research can also develop in provincial universities, in particular, in small old university towns. The branch sector of science, which carries out applied research is directly related to production activities. Its placement depends on the localization of the industries it serves. Therefore, institutions of the branch sector of science are concentrated in the centers of economic districts, within which this branch is concentrated, or in large cities and metropolitan centers.

The location of higher educational institutions, whose task is to train qualified personnel, primarily for the branches of the economy of this region, is closely related to the development of the economy and the settlement system (NIEMETS et al., 2014). The concentration of these institutions, which have a powerful scientific and educational potential, an experimental and production base, is especially large, characteristic of the largest cities and metropolitan centers. University cities such as Cambridge and Oxford in the UK are widely known. Cities of different categories and populations have unequal conditions for the organization of scientific activities. At the same time, it should be taken into account that the creation of scientific centers in cities that did not have them before requires a certain, rather long period for their acclimatization. The experience of creating scientific institutions in new cities shows that the adaptation period of such institutions is approximately 10–15 years, during which the normal process of functioning of scientific centers is carried out (ПОТАПОВА et al., 2022).

The most favorable conditions for the development of science are large cities, which are characterized by multifunctionality, a powerful production and technical base and information infrastructure, a high level of education and culture of the population, and the intensity of scientific communication (NIEMETS et al., 2016). They have a developed social infrastruc-

ture, concentrated universities and institutes, administrative and cultural institutions, an information base. Factors contributing to the development of science in large cities include historically formed scientific and cultural traditions that create a social and intellectual environment for the development of science and the effective organization of scientific activity. An important feature of science is the concentration of the main mass of people employed in its field of allocations for research, the results of scientific works, and the institutions of science themselves in a very large group of states. Three macroregions of science have formed on the planet: North American, European, and Asia-Pacific.

Western Europe is one of the important regions of world science with ancient and deep traditions of research and problems. This explains the very large share of fundamental works in the structure of European science (in some countries they account for up to 55% of allocated funds). European scientists own almost half of all scientific publications in the world, a significant part of discoveries and achievements. Western Europe gave the world more than half of the Nobel laureates, especially Great Britain, Germany, and France. These three states spend the most money on science. Ukraine occupies a prominent place in the development of science in Europe. Ukrainian scientists have achieved a lot in the development of fundamental research in the field of natural, technical and social sciences. They occupy advanced positions in such fields as mathematics, computing, physics of condensed media, chemistry, ceramics, molecular and cellular physiology. The level of Ukrainian research in several of the most important areas of the territory of information technologies, as well as the general methodology of the development of computer information and communication systems, corresponds to world achievements (ПОТАПОВА, КРАСНОПОЛЬСЬКА, БАРСЬКИЙ, 2020; KRASNOPOLSKAJA et al., 2019; ПОТАПОВА et al., 2021a).

Scientists and educators of Volyn region are also actively working on the implementation of the national doctrine of the development of science and education, and this is not easy since the process takes place during the war. However, programs for the systematic reform of education links have been developed and are being gradually implemented, and measures are being taken to provide organizational, methodological, material, technical, and scientific support for educational institutions. Nowadays 16 higher education institutions (13 of them in Lutsk) of various forms of ownership and subordination operate in the territory of the Volyn Region. The existing network provides training of specialists in 29 fields of knowledge. The number of students is growing every year. So, in the 2021/2022 academic year, there were 27181 people, which is 1.36% more than last year. The role and importance of new type institutions is growing. More than 22000 employees work in the field of education and science, including 230 doctors of science, 176 professors, 1315 candidates of science, 982 associate professors, and 15 doctors of philosophy (ПОТАПОВА, 2022; ПОТАПОВА et al., 2021b).

Conclusions

Transformational processes taking place in all spheres of activity and Ukraine's entry into the Bologna Process contribute to correcting the doctrine of the development of science and education. When opening new specialties, it is necessary to take into account the needs of the labor market of the region. These issues will be considered at all levels, starting with the local and ending with the state level, which will contribute to the formation and functioning of the national educational complex of Ukraine.

References

- Олійник Я. Б., Степаненко А. В., 2000: Вступ до соціальної географії: Навч. посіб. Знання, Київ: 204 с.

- Потапова А. Г., 2022: Економічний потенціал регіонів України. Підручник. ПП Іванюк В. П., Луцьк: 415 с.
- Потапова А. Г., Краснопольська Н. В., Барський Ю. М., 2020: Модернізація освітнього комплексу Волинської області: монографія. ПП Іванюк В. П., Луцьк: 118 с.
- Krasnopolskaja N., Potapowa A., Golub G., Pogrebskij T., 2019: Current trends of using scientific potential of Volyn Region. *Acta Geographica Silesiana*, № 13/1 (33). WNoZ UŚ, Sosnowiec: 35–40.
- Niemets L., Melniichuk M., Segida K., Pogrebskyi T., 2016: Demographic situation as an indicator of socio-economic development (on example of Volyn and Kharkiv regions of Ukraine). *Acta Geographica Silesiana*, 22. WNoZ UŚ, Sosnowiec: 43–57.
- Niemets L., Niemets K., Segida K., Pogrebskyi T., 2014: Regional settlement system as a factor of distribution of health care institutions (on example of Volyn region of Ukraine). *Canadian Journal of Science, Education and Culture*, No. 1(5), January-June, vol. II. "Toronto Press", Toronto: 209–215.
- Potapova A., Pohrebskyi T., Golub G., Hlushko S., 2021a: The scientific potential of Volyn Region. *Acta Geographica Silesiana*, № 15/2 (42). INoZ UŚ, Sosnowiec: 27–32.
- Potapova A., Pohrebskyi T., Golub G., Golub V., Hlushko S., 2021b: Regional features of school education in Ukraine. *Acta Geographica Silesiana*, № 15/4 (44). WNoZ UŚ, Sosnowiec: 29–36.
- Potapova A., Pohrebskyi T., Golub G., Golub V., Sosnytska Ya., 2022: Economic potential of Volyn Region. *Acta Geographica Silesiana*, 16/4 (48). INoZ UŚ, Sosnowiec: 29–36.
- Рейтинг стран мира по количеству патентов. URL: <https://gtmarket.ru/ratings/world-patent-ranking>.
- Global Innovation Index 2022. URL: https://www.wipo.int/global_innovation_index/en/2022/index.html.

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