

UDC 53(477.86)

doi: 10.15330/jpnu.10.3.139-144

## ESTABLISHMENT OF PHYSICAL SCIENCE IN PRECARPATHIA: EVENTS AND CHARACTERS

*IVAN HASIUK, SERGII PUDCHENKO, LYUBOV YABLON*

**Abstract.** The question of the development of physical science in the Carpathian region (end of the 18th - beginning of the 21st century) was studied, starting from the Tsar's Royal Gymnasium, organized in 1784, to the creation of a teacher's institute in 1940 in the city of Stanislaviv (Ivano-Frankivsk) and its gradual transformation into Vasyl Stefanyk Precarpathian National University. The role of science education and especially physics in the formation of a cohort of modern specialists, necessary for the restoration of the country and its rapid technological development, is indicated. The progress of physical education in Stanislaviv (Ivano-Frankivsk) and the development of methodological and organizational foundations for the training of future physics teachers is considered against the background of the dramatic historical and political transformations of the region in the period under study. It is shown that the beginning of the development of learning and teaching of physics was already laid in the activities of numerous gymnasium-type educational institutions, which were organized in the city since the 18th century and became training bases for future teachers or scientists, in particular natural sciences. Special attention is focused on the defining role of outstanding characters of scientists and pedagogues-physicists who made a significant contribution to the formation of modern scientific and pedagogical schools and concepts: professors Viktor Dushchenko, Petr Kyrychka, Ivan Kucheruk, Dmytro Freik, Ivan Klymyshyn, Bohdan Ostafiychuk. Despite the initiation and development of scientific directions, Vasyl Stefanyk Precarpathian National University remains an important center for the development of pedagogical ideas and innovations in the field of natural sciences and comprehensively contributes to the improvement of the methodology and didactics of physics at various levels.

**Keywords:** physical education, science, Precarpathia, history, outstanding characters.

*"Wars are not won by generals, wars are won by school teachers and parish priests"*

Otto von Bismarck

### 1. INTRODUCTION

External military aggression by Russia and an unstable internal political situation led to a decrease in the country's economic development. The main role in the restoration and development of the economy of any state is played, first of all, by education and science. An economically developed and powerful innovative Ukraine can be developed in the presence of highly trained specialists in the technical and natural sciences. A significant percentage of the national wealth of developed countries is created by

intellectual resources in the field of high technologies, scientists, researchers, scientists, and university professors. The economically developed countries of the USA, England, Germany, and Japan pay attention to the development of education, science, and technology.

## 2. RESEARCH OBJECTIVE

The current issue of rapid development and adjustment of the production of the necessary weapons and provision of personnel resources can be solved in the presence of highly trained specialists in the technical and natural sciences. For this, it is necessary to raise the educational, educational, and scientific potential of the young generation. The problems that have accumulated in recent years in the training of specialists in the field of natural sciences: physics, mathematics, chemistry, biology, etc. come to the fore in Ukraine, the consequences of which are the steady process of deindustrialization of the Ukrainian economy, the decline in the prestige of engineering work, lack of interest in obtaining complex, scientific knowledge, especially in the physical, mathematical and engineering fields (Martynenko et al., 2011, pp 218-222).

Therefore, the development of the physical and mathematical direction of science and education is extremely important in higher education institutions of Ukraine and, in particular, in the Carpathian region.

## 3. RESULTS AND DISCUSSION

Physical science and education in Precarpathia are closely connected with the institution of higher education where physics is one of the most respected and titled fields - Vasyl Stefanyk Precarpathian National University. Accordingly, the development of physics in the region is considered, comparing it chronologically and in a personalized way with the history of the development of the university. However, it would be unfair not to remind that Stanislaviv (Ivano-Frankivsk) both in the times of Austria-Hungary and in the interwar period of Polish subjugation was an influential place of concentration for ideas of science and enlightenment, the struggle of the Ukrainian intelligentsia for the priority of the native language, culture, political influence of the Ukrainian-centric elite, as well as science (Hrabovets'kiy, 1989). In the absence of higher educational institutions and scientific institutions organized like universities, only in Stanislaviv at the beginning of the 20th century, 5 gymnasiums of different types and subordination were actively operating (Tkachuk). And if most of them were focused on acquiring competencies in the humanitarian sphere, there were institutions where natural science was cultivated; the priority of such institutions was the training of personnel at the level of school teachers, as well as the selection of talented young people for further study in European educational institutions. For example, in 1920, the Higher Real School was organized, later reorganized into a science and mathematics gymnasium, where a separate role was assigned to the study of physics, mechanics, and technologies; training was conducted with the aim of practical application of the acquired knowledge. At the same time, the Imperial Royal Gymnasium, organized in 1784 on the basis of an ex-Jesuit collegium (with German as the language of instruction, in the 20th century – Ukrainian and Polish), can be considered the primary center in which regional physical education and science were born. Two classrooms (laboratories) were organized here - physics and natural science, in which not only training but also some scientific experiments were conducted. Also, an educational meteorological station worked.

With the beginning of the Second World War and the occupation of the region by the Soviet troops, dramatic changes in the life of society affected the field of education as well. Elite educational institutions were liquidated, the professors of which, like a significant part of the intelligentsia, tried to emigrate. The repressive machine of the Stalinist system did not bypass educators, especially representatives of the creative part of society, who did not perceive the new system. Gymnasiums were closed or turned into regular schools. As a result, by the middle of 1940, there was a sharp shortage of

teachers in the Stanislav region, which could not be eliminated even by the invasion of specialists from the east of Ukraine who had been hastily trained in teaching courses, and who were sent to work on so-called "Komsomol permits". In the fall of 1939, 600 teachers worked in schools in Precarpathia. With the implementation of compulsory primary education, the creation of hundreds of incomplete secondary schools and dozens of new secondary schools required several thousand teachers (Fedorchak, 1990, p 118) Already in October 1939, teachers' seminars began to work, but they also could not solve the problems. That is why the local authorities raised with the Ukrainian SSR government the issue of creating a teacher's institute in the regional center - Stanislaviv (since 1962 - the city of Ivano-Frankivsk). Already in January 1940, preparations for its opening began, and the institute itself began to function on March 1, 1940. The first director of the institution was the teacher of pedagogy at the Stanislav Pedagogical School Fedir Plotnytskyi. The institute started its work as a part of three faculties: historical, philological, and physical and mathematical. 900 students studied in-patient, evening, and extramural departments. Mykola Korol was appointed the first dean of the Faculty of Physics and Mathematics, who after the war was entrusted with managing the institute and restoring its work in the difficult conditions of post-war reconstruction (Fedorchak, 1990, p 118).

In the post-war period, special attention of the institute's management was devoted to physical and mathematical education. The fragmentary remains of the physical laboratory equipment were collected, and the newly created institute workshop was put into operation. Many demonstration devices were made by students with their own hands from available materials. In 1945, the first post-war graduation of the Faculty of Physics and Mathematics took place; it was completed by one graduate, Olga Kryvoshey, who received a diploma with honours in the speciality of "secondary school physics teacher" (Hrechuh, 1954).

In 1950, the teachers' institute was reorganized into the Stanislav Pedagogical Institute. The intensification of the development of physical education and science during this period and providing them with a powerful impetus for future progress is closely connected with the arrival in October 1951 of a young graduate of Kyiv State Pedagogical Institute named after M. Gorky Viktor Dushchenko as the head of the physics department. Viktor Pavlovich's activity in Stanislaviv is striking in its multi-vector nature. Here, the foundations were laid and the tasks of future pedagogical research and priorities, professed later by Professor V.P. Dushchenko, were set. The concept of understanding the mandatory use of demonstration and educational experiments in the study of physics was laid, and under his initiative and leadership, a physics laboratory, a laboratory of technical teaching aids, and educational workshops were created. There was close interaction with specialized teachers of the city and region; taking into account the shortage of equipment for physics classrooms in schools, the production of elementary devices by students of the faculty was organized, and their transfer to school teachers for use. On the initiative of Viktor Dushchenko, educational work was well organized, one of the aspects of which was a series of popular science articles, written by him and the teachers of the department, about scientific achievements and scientists in the regional newspaper "Prykarpatska Pravda" (Hrechuh, 1954). Personnel work was properly arranged, permanent methodical and scientific activity of the department's teachers, and preparation and defence of theses were introduced. In the regional newspaper "Prykarpatska Pravda" from January 1954, the director of Stanislav State Pedagogical Institute H. Grechuh reports on the first graduation of 270 students, with a total number of 990 students, and notes that in 1952 the institute had 54 teachers and only six of them had a scientific title, and in 1953 there were already 66 teachers, 12 of them associate professors and candidates of sciences, and many other teachers are preparing and defending theses this year. He especially notes the contribution to the scientific and pedagogical work of the Institute of the Department of Physics under the leadership of V. Dushchenko, which publishes the first issue of the scientific journal of the Institute "Scientific Notes", dedicated to physical and mathematical disciplines (Pudchenko, 2017, pp81-87) Victor Pavlovich worked in Stanislav until August 1955.

The institute gradually established contacts with the leading universities of the republic, which

contributed to the influx of fresh teaching and scientific personnel. The rapid development of the scientific component of the faculty's activity is connected with the arrival of the candidate of physical and mathematical sciences Peter Kyrychka. The need to introduce the latest technologies at the enterprises being built in the region (mainly the military-industrial complex) contributed to the creation and development of the research sector at the institute, the scientific priorities of which from the beginning concerned the physics and technology of ferrites, the production, and properties of magnetic ceramics of various types and appointment. The physical laboratory was gradually equipped with the latest and most informative scientific equipment, some of which were unique even for the country. It was possible to attract such research methods as X-ray spectral and X-ray structural analysis, electronic paramagnetic resonance, Mössbauer spectroscopy, measurement of magnetic parameters of ferrites, and electron microscopy. The results of research obtained at the Ivano-Frankivsk Pedagogical Institute and in cooperation with scientists from leading educational institutions and institutes of the Academy of Sciences were reflected in numerous publications in scientific journals, and monographs, many of which are still relevant in the scientific world. Students were involved in scientific research on a large scale, which contributed to the training of their own highly qualified scientific personnel, who, after studying at graduate schools of other universities and scientific institutions, replenished the scientific and educational communities of institutions in Ivano-Frankivsk and other cities.

Science developed intensively in the pedagogical institute itself. The return from postgraduate studies of the young candidate of physical and mathematical sciences, Dmytro Freik, became the starting point for the initiation of the direction of research in the field of semiconductor materials science and the creation, in the future, of a whole scientific school, which has hundreds of publications, patents, and dozens of protected theses. Students of the scientific school of Professor Dmytro Freik continue to work in theoretical and experimental areas of research on semiconductor materials of different compositions, morphology, and applications. The research direction of thermoelectric semiconductor devices built on nanodispersed semiconductor systems is intensively developing. Professor Freik D.M. the Institute of Physics and Chemistry was organized, the students of the scientific school which continue to solve complex scientific tasks, carry out a number of scientific projects of various types, including international ones.

In 1976, Bohdan Ostafiychuk, a graduate of the Institute of Metallurgy of the Academy of Sciences of Ukraine, candidate of physical and mathematical sciences, started working at the institute as the head of the research sector. He initiated the newest and most promising at that time direction of scientific research into the physical properties of thin magnetic films based on iron-yttrium garnet, created and equipped a unique laboratory, which over time will be reformed into a joint research laboratory of the Precarpathian National University and the Institute of Metallurgy of the National Academy of Sciences of Ukraine and will receive the status of national property. The range of priority areas of research of the scientific school of the corresponding member of the National Academy of Sciences of Ukraine, Doctor of Physical and Mathematical Sciences, Professor Bohdan Ostafiychuk is expanding, scientific work is being filled with new tasks, challenges, and content; young highly qualified scientists join, the laboratory base is replenished with the latest equipment, which makes it possible to implement new projects in the field of nanomaterials and nanosystems research, materials for devices for generating and storing electrical energy, chemical applications, ecology, medicine.

Doctor of Physical and Mathematical Sciences, Professor Ivan Klymyshyn, author of scientific works on radiation space gas dynamics, several monographs, popular scientific books, and topical astronomy textbooks for schools and universities. The figure of Ivan Klymyshyn is especially significant for the university and science of Precarpathia at a time when one of the priority projects of PNU is the joint restoration of the astronomical observatory on Mount Pip Ivan with the institutions of the European Union and the beginning of a new era of astronomical research at the university.

Fruitfully working in the field of fundamental and applied physics, the staff of the Faculty of Physics and Technology remains faithful to the tradition of maintaining a high level of methodical science,

introduced back in the pedagogical institute. Areas related to didactics, and physics teaching methodology have always been highly valued by the team and carried out under the leadership of a whole cohort of methodologists. Here it is necessary to pay tribute to associate professor Hryhoriy Haiduchka, the author of many methodical textbooks and manuals, popular books for students. Under his leadership, an excellently equipped laboratory of physics teaching methods was organized and is functioning in an updated form.

Professor Ivan Kucheruk, student of Viktor Dushchenko, made a huge contribution to the scientific and methodological work. Under his scientific supervision, he defended his Ph.D. thesis on the topic "Comprehensive study of the kinetics of the process of drying typically dispersed bodies by infrared radiation" in 1967. Ivan Kucheruk served as rector of the institute from 1982-1986. Ukrainian-language three-volume textbook on general physics authored by Ivan Kucheruk and Ivan Horbachuk, also a student of Viktor Dushchenko, is still popular among teachers and students of the Faculty of Physics and Technology, and the popularity of the physics specialty during the rectorship of Professor I.M. Kucheruka was so high that the competition for entrants at the Faculty of Physics and Mathematics was one of the highest in the institute.

Methodists of the faculty traditionally focus on teaching physics through the use of experiments in the broadest sense of the term. It is also difficult to overestimate the contribution of associate professors Iryna Luchkiv and Ivanna Brodyn. Halyna Voitkiv, a graduate of the university and post-graduate program of Kyiv National Pedagogical University named after Drahomanov, a candidate of pedagogical sciences, works effectively and fruitfully.

The Faculty of Physics and Technology and the Department of Physics and Teaching Methods are the organizers and experts of various methodological and educational events, closely cooperating with the Precarpathia pedagogical community. Graduates of the physical and pedagogical specialties of the faculty are desirable employees in scientific, industrial, and educational institutions of the region, Ukraine, and abroad.

#### 4. CONCLUSIONS

Thus, one of the most important tasks, which is being intensively considered today, is the improvement of the level of science and mathematics education in the educational institutions of Ukraine. And knowledge of the history of the formation of natural science is an integral part of it. We have presented and systematized historical facts about the formation of natural science in Precarpathia, which are inseparably connected with the creation and growth of Vasyl Stefanyk Precarpathian National University, in particular, the Faculty of Physics and Technology.

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**Ivan Hasiuk**, Doctor of Physical and Mathematical Sciences, Professor, Dean of the Physical and Technical Faculty, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine;

**ORCID ID:** 0000-0001-6410-4640

**Sergii Pudchenko**, Head of the laboratory of a special physical workshop for masters of the National Pedagogical Dragomanov University, Kyiv, Ukraine;

**ORCID ID:** 0000-0003-1236-1762

**Liubov Yablon**, Doctor of Physical and Mathematical Sciences, Professor, Professor of Physics and Teaching Methods Department, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine;

**ORCID ID:** 0000-0003-3186-6969

**Address:** Ivan Hasiuk, Liubov Yablon, Vasyl Stefanyk Precarpathian National University, 57, Shevchenko Str., Ivano-Frankivsk, 76018, Ukraine; Sergii Pudchenko, Kyiv, Ukraine;  
Sergii Pudchenko, 9, National Pedagogical Dragomanov University, Pyrogova Str., 01601 Kyiv, Ukraine.

**E-mail:** ivan.hasiuk@pnu.edu.ua, dirkivc@ukr.net, lyubov.yablon@pnu.edu.ua

**Received:** August 21, 2023; **revised:** August 30, 2023; **accepted:** September 27, 2023; **published:** September 30, 2023.

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Гасюк Іван, Пудченко Сергій, Яблонь Любов. Розвиток фізичної науки на Прикарпатті: події та постаті. *Журнал Прикарпатського університету імені Василя Стефаника*, 10 (3) (2023), 139-144

У статті досліджено питання становлення фізичної науки на Прикарпатті (кінець XVIII – початок XXI століття), починаючи від Царсько-королівської гімназії, організованої у 1784 році, до створення учительського інституту у 1940 р. у м. Станіславові (Івано-Франківськ) та поступове його перетворення у Прикарпатський національний університет імені Василя Стефаника. Окреслено значення природничої освіти та особливо фізики у формуванні когорти сучасних фахівців, необхідних для відновлення країни та її стрімкого технологічного розвитку. Поступ фізичної освіти у Станіславові (Івано-Франківську) та розвиток методологічних і організаційних основ підготовки майбутніх вчителів-фізиків розглядаються на тлі драматичних історико-політичних трансформацій регіону у досліджуваний період. Показано, що початок розвитку навчання та викладання фізики закладено вже у діяльності чисельних навчальних закладів гімназійного типу, які організовувалися у місті ще з 18 століття та ставали базами підготовки майбутніх учителів чи науковців, зокрема природничих дисциплін. Особливу увагу акцентовано на визначальній ролі видатних постатей учених і педагогів-фізиків, що зробили значний внесок у формування сучасних наукових і педагогічних шкіл та концепцій: професорів Віктора Дуценка, Петра Киричка, Івана Кучерука, Дмитра Фреїка, Івана Климишина, Богдана Остафійчука. Попри започаткування та розвиток наукових напрямів, Прикарпатський національний університет імені Василя Стефаника залишається вагомим центром розвитку педагогічних ідей та інновацій у природничій галузі та всебічно сприяє вдосконаленню методології та дидактики фізики на різних рівнях.

**Ключові слова:** фізична освіта, наука, Прикарпаття, історія, видатні постаті.