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World Physics in Ukraine: A Unique Experience of Consolidation of Scientists at Kharkiv Research Center of Physics (in the 1920s–1930s)

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Abstract: The article examines the development of physics research in Ukraine on the example of the Ukrainian Institute of Physics and Technology (UIPT). Founded on the initiative of the eminent physicist Abram Ioffe, the UIPT has gradually become one of the world's leading research institutions. During 1928–1938, many important events took place at the institute, which became markers for the development of physics in Ukraine and the USSR as well as in the world. An experiment on the fission of atomic nucleus using artificially accelerated protons confirmed the validity of the intentions to reorient research towards nuclear physics.

The involvement of foreign specialists in the work of the UIPT contributed to the informal consolidation of scientific thinking in physics. Outstanding physicists of the world such as Boris Podolskyi, Oleksandr Weisberg, Konrad Weiselberg, Friedrich Houtermans, Laszlo Tisza, Fritz Lange, Victor Weisskopf, George Placzek, Paul Dirac, Georgii Gamov, Niels Bohr, Paul Ehrenfest, and others worked here for longer or shorter periods. Niels Bohr, Ivar Waller, Milton S. Plesset, Evan J. Williams, and Leon Rosenfeld made reports at the theoretical conferences of UIPT.

As a result, in the late 1920s and during the 1930s, an informal society of physicists from around the world was formed in Kharkiv. The consolidation of talented scientists has accumulated traditions, centuries of experience, and practical knowledge in the field from many scientific schools around the world.

Keywords: *atomic nucleus fission, international cooperation, nuclear physics, science of Ukraine, scientific consolidation, theoretical physics, Ukrainian Institute of Physics and Technology*

Introduction

At the beginning of the 21st century, despite the general obstacles such as the lack of funding, an outflow of highly qualified specialists and talented young scientists, unique research was carried out in Ukraine, particularly in Kharkiv, at the National Research Center "Kharkiv Institute of Physics and Technology" of the National Academy of Sciences of Ukraine (NRC "KhIPT") and the departments of educational institutions, which implemented joint research projects with foreign experts. The NRC "KhIPT" was founded under the name of the Ukrainian Institute of Physics and Technology (UIPT), and, since 1939, was named the Institute of Physics and Technology of the USSR Academy of Sciences. Studying and reevaluating the experience of consolidating the scientific thought of researchers from different countries to tackle large-scale fundamental projects is certainly useful today. Society's orientation towards "open" science violates the traditional approaches to organizing science, leading to the introduction of new forms of interaction, scientific mobility, and communication. This certainly actualizes the chosen topic.

The origins of scientific research in the field of theoretical and nuclear physics in Ukraine date back almost 100 years, to the first quarter of the 20th century. At this time, an informal community of physicists from different countries emerged in Kharkiv and became the source for the formation of the Ukrainian school of physics in the following years. In 2022, the 90th anniversary of the large-scale event—the fission of the lithium atomic nucleus on October 10, 1932—took place in Kharkiv. For the first time in the USSR, a group of talented scientists at the UIPT—Anton Walter, Georgii Latyshev, Oleksandr Leipunskyi, and Kyrylo Sinelnikov—conducted an experiment which marked the formation of physics in Ukraine in later years. Undoubtedly, these events gave an impetus to the development of nuclear physics in Ukraine, and atomic physics research, conducted in Kharkiv during the 1930s, gradually became part of the development of nuclear physics not only in Ukraine and the USSR but also in the world.

The events related to scientific research in the field of physics in Ukraine in the first half of the 20th century were introduced in several scientific papers. Researchers from Russia and Ukraine, in particular Yurii Khramov, Yurii Raniuk, Volodymyr Tolok, Alla Tanshyna, and Alla Litvinko, who were interested in the history of physics research, have covered various key events, including international relations, and the period of collaboration between the UK and the Soviet Union, in their monographs and publications on the establishment of scientific schools in physics, as well as at significant scientific events.

Several anniversary articles were dedicated to specific events, in particular, the fission of the atomic nucleus by scientists of the UIPT, or the establishing of the institute. Significant for the study of the history of physics in Ukraine is the publication which summarizes declassified documents of Laboratory No. 1 of UIPT, the researchers of which were involved in the nuclear project of the USSR (Dovbnya, 2001). An interesting source for historians of science is the generalized results of interviews with scientists who worked at the UIPT in the 1930s—Victor Weisskopf, Laszlo Tisza, Oleksandr Akhiezer, and a student of the Kharkiv Institute of Mechanical Engineering Kateryna Panina (Raniuk & Freiman, 2010). The historiography of the issue is supplemented by some promotional publications, including a book by Oleksandr Weisberg (2010), devoted to the tragic events of his life. This work, based on the author's memoirs, has literary and artistic orientation, and while it contains some factual errors, it is certainly an important reference source.

It should be emphasized that the historiography of nuclear physics in Ukraine began as late as in the early 2000s. One of the first works is by Yurii Raniuk (2006), in which he summarizes significant facts and presents new documents, previously tagged as "confidential". In the authors' opinion, Raniuk's statement about prioritizing Ukraine in the launch of the course of nuclear physics in the USSR is somewhat controversial. Since 1918, there used to be an influential center for physics research at the Leningrad Institute of Physics and Technology (LIPT), from which the Ural Research Institute separated in 1931. In 1930, the Siberian Institute of Physics and Technology started to operate. But the events that took place in the 1920s and 1930s in Kharkiv were large-scale and require additional attention and more detailed study.

Despite its significant historiography, the peculiarities of the evolution of science in Ukraine during the 1930s, especially the prewar years, remains poorly studied. The beginning of this period was defined by the reaction to industrialization in Ukraine and the first attempts to limit the emigration of Ukrainians, repressions,

and the outflow of foreign scientists abroad. The end of this period coincides with the beginning of hostilities related to the Second World War in the territory of the Soviet Union.

Due to the beginning of the "arms race" between the USSR and the USA after the war, most of the events that preceded it were classified, especially in the 1930s, including the work of the leading physicists. Their archival files have only recently become available to historians of science. A part of the prewar UIPT archives was evacuated to Kazakhstan, and not returned to Kharkiv, which has made it difficult to investigate our research topic.

The article aims to study the peculiarities of research into nuclear physics in the late 1920s–1930s in Ukraine in general and in Kharkiv in particular, to outline the contribution of UIPT scientists to the development of world physics and to study the unique experience of consolidating physicists from different countries.

Development of international scientific cooperation in the early 20th century

At the beginning of the 20th century, scientists enjoyed absolute mobility and freedom of opinions. Of course, the centre of physics research was the Cavendish Laboratory in the UK, but other European countries gradually established their physics laboratories. Many scientists collaborated to some extent with English scientists. This fact certainly influenced the development of physics in the USSR, particularly in Ukraine. The Leningrad Physics Center, the LIPT's laboratories, which was a leading institution in physics research in the Soviet Union for more than ten years, was no exception. In the Russian Empire, the evolution of physics in the early 20th century was much slower than at European schools of physics, in England, and the United States. In addition, the reform of higher education did not contribute to the development of physics. We should also mention the reform of the transformation of universities into institutions of public education, which had a negative impact primarily on physics. That is why the policy of attracting foreign specialists was quite natural. Thanks to the assistance of Abram Ioffe, foreign physicists started to arrive to work at LIPT (Nekliudov & Volobuev, 2001, p. 199).

The contribution of the Austrian and Dutch theoretical physicist Paul Ehrenfest to the development of international scientific cooperation should be emphasized.

Using his authority, he helped scientists from the USSR to establish international relations since the early 1920s. He later facilitated the internships of talented scientists in the leading physics centers in Europe and the world. Thanks to Paul Ehrenfest, the physicist Ivan Obreimov underwent internship at the Leiden Cryogenic Laboratory, where he studied the spectroscopy of crystals at low temperatures. Later, Obreimov established joint research activities with Heike Kamerlingh-Onnes from the Laboratory of Leiden University. A group of scientists conducted experiments with liquid hydrogen and helium, which confirmed Obreimov's hypothesis, became a discovery in physics and gained worldwide recognition (Ehrenfest & Ioffe, 1973, pp. 121–127).

Petro Kapitsa, a student of Abram Ioffe, underwent an internship under Ernest Rutherford in 1921. The topic of his doctoral dissertation, which he defended at Cambridge in 1922, was 'The passage of alpha particles through the matter and methods of magnetic fields obtaining'. Since January 1925, Petro Kapitsa worked as deputy director of the Cavendish Laboratory for Magnetic Research. In 1929, Kapitsa was elected a full member of the Royal Society of London. In November 1930, the Council of the Royal Society decided to allocate £15,000 for the construction of a specialized laboratory in Cambridge specifically for him (Rubinin, 1994, p. 700).

Petro Kapitsa maintained contacts with the USSR and contributed in every way to the international scientific exchange of experience. The monographs by Georgii Gamov, Yakov Frenkel, and Mykola Semenov were published in *The International Series of Monographs in Physics*, a publication of Oxford University, co-edited by Petro Kapitsa. Kapitsa proposed Ernest Rutherford to invite Kyrylo Sinelnikov and Yulii Khariton for an internship at the Cavendish Laboratory, and the latter remained there for more than two years (Kapitsa, 1973, pp. 5–6).

Ambiguous circumstances with theoretical physics in Leningrad in the late 1920s and the decision not to establish a separate Institute of Theoretical Physics forced Georgii Gamov to leave the country. Gamov went to Germany, to the Institute of Theoretical Physics at the University of Gottingen. Then, at the invitation of Niels Bohr, he worked at the Institute of Theoretical Physics of the University of Copenhagen. On the recommendation of Niels Bohr, Gamov was invited to participate in a joint project held at the Cavendish Laboratory under the direction of Rutherford. Along with John Cockcroft and Ernest Walton, he participated in the construction of the lithium core accelerator (Masot-Conde, 2015, p. 53).

Lev Landau was another intern from the Leningrad school of physics to do an internship abroad. From 1929 to 1931, he was on a research trip to continue his education in Germany, Denmark, England, and Switzerland. He attended Max Born seminars in Göttingen, then met Werner Heisenberg in Leipzig, and in Copenhagen worked with Niels Bohr, whom he henceforth regarded as his only teacher. In Cambridge, he met Petro Kapitsa (Danin, 1988, p. 40).

Thus, scientists from the Soviet republics had the opportunity to do internships abroad. In addition, specialists in the field of theoretical, nuclear physics, and astrophysics were invited to cooperate in the USSR. Dnipropetrovsk and Kharkiv Institutes of Physics and Technology have become the central institutions in Ukraine where scientific potential has accumulated. Specialists were provided with appropriate working and living conditions, and significant funding for research. In the early 1930s, many physicists arrived in the USSR, for a number of various reasons, to engage in scientific activities. These were both short-term visits and long-term projects, but all of them were united by a common idea—the opportunity to work and engage in scientific activities with like-minded people (Khramov, Zvonkova & Lugovskyi, 2019, p. 131).

Pooling of the experience of world physics on the basis of the Ukrainian Institute of Physics and Technology

Gradually, in the late 1920s and early 1930s, the USSR underwent a process of institutionalization of science, and rather influential scientific centers of physics were formed. By that time, the need for changes in the organization of scientific activities had became clear. The existing research departments did not fully perform their coordinating and research functions. Based on the European experience, a network of research institutes was created. At the same time, there was no specialized institute or laboratory for nuclear physics research. The opening of the UIPT on May 16, 1928, did not solve this problem. When the institute was founded, it was designed to address cryogenics issues, but as early as in 1931, it was decided that it would repeat the experiments on the fission of the atomic nucleus by artificially accelerated protons, conducted by scientists at Cambridge. Gradually, the following directions of research were developed at UIPT: theoretical physics, low-temperature physics and engineering, nuclear physics and engineering, solid-state physics, and radiophysics (Tolok, 2004, p. 232).

The scientific potential of the newly established institute was quite powerful. There was a whole galaxy of leading specialists in the field of physics who had an experience of internship abroad. They were joined by foreign experts.

A group of LIPT scientists, including Kyrylo Sinelnikov, Georhii Latyshev, Lev Latyshev, Lev Landau, Dmytro Ivanenko, Oleksandr Leipunskyi, and Anton Rozenkevich, joined the professors of Kharkiv University: Andrii Zhelekhovskyi, Abram Slutskin, Dmytro Steinberg, and Mykola Pomazanov (Gutnyk & Tverytnykova, 2021). Well-known physicists—Petro Kapitsa, Dmytro Rozhanskyi, Georgii Gamov, and Paul Ehrenfest—were invited to consult. An English physicist, one of the founders of quantum mechanics, the Nobel Laureate Paul Dirac, was elected an honorary member of the Academic Council of the Institute (Tanshyna, 2018, p. 85).

The USSR's policy of attracting foreign specialists in the early 1930s also had an impact on the UIPT. The first director of the institute, Ivan Obreimov, was involved in attracting foreign physicists. In the spring of 1934, a similar task was given to Oleksandr Leipunskyi, who became the institute's next director. He was in Germany and England to attract physicists to work at the UIPT. We can list the foreign physicists who worked in the institute's various departments during the 1930s and outline their contribution to the formation of theoretical and nuclear physics in the USSR (Ranyuk, 2003, p. 47).

The opportunity to personally communicate and work with Lev Landau prompted the American theoretical physicist, a specialist in quantum electrodynamics and quantum mechanics, Boris Podolskyi to sign a contract with UIPT. Furthermore, he was satisfied with the conditions provided for his scientific activities. Podolskyi worked at UIPT for more than a year, from 1932 to 1933.

Researchers of the UIPT were indeed provided with the best conditions for both scientific activity and living. The design of houses, built using modern construction technologies at the time, took into account the residents' peculiarities. Huge windows that occupied almost the entire wall were designed to the main three-storey building to provide more light. A park with exotic plants was planted on the premises (Frenkel, 1997, pp. 41–42).

In 1931, at the personal invitation of Ivan Obreimov, the Polish-Austrian scientist and a physics teacher at Berlin Technical School, Oleksandr Weisberg was one of the first to visit the Low-Temperature Laboratory (headed by Lev Shubnikov). Later, during the division of the laboratory, Oleksandr Weisberg

supervised the construction of a research station for deep cooling near Kharkiv, where he worked until 1937. The scientist invited to the institute a group of foreign specialists (11 people).

His friend, Romanian doctor of chemistry Conrad Weiselberg came to Kharkiv in 1934, and worked as a consultant and a researcher at UIPT. The German physicist Friedrich Houtermans, together with Ihor Kurchatov, Oleksandr Leipunskyi, and Lev Shubnikov, participated in research in nuclear physics. They were joined by the British physicists Martin and Barbara Ruhemann, and the Hungarian theorist Laszlo Tisza (Pavlenko, Raniuk & Khramov, 1998, pp. 145–167).

In 1934, the German physicist Fritz Lange, who came with the engineer Jürgen Kon-Peters, began working at the institute. Lange was the initiator of the shock voltage laboratory, and served as its head in subsequent years. At the laboratory, scientific topics in nuclear physics were developed under the lead of Fritz Lange. Issues related to the development of methods for obtaining and measuring fast processes; the research of uranium and thorium fission processes; and the study of β-spectrum and γ-ray excitation were considered. In addition, a lot of technical and methodological work was carried out, including the construction of a compact pulse generator and a DC voltage generator per 1 million volts; production of capacitors; and the development of methods for electron acceleration. Since 1935, the UIPT High Voltage Laboratory was headed by the talented German scientist Friedrich Houtermans, who studied nuclear issues (Raniuk, 20067, pp. 221–222).

In 1932, another American physicist, of Austrian descent, Victor Frederic Weisskopf, was invited to the institute. He worked at the UIPT for more than 8 months, then went to the Zurich Institute of Technology and did an internship with Niels Bohr at the University of Copenhagen. In 1936, Victor Weisskopf's second trip to Ukraine took place. He was invited by Petro Kapitsa to become a professor at the University of Kyiv. But the situation in the USSR, in particular at the UIPT, was already tense. This was the beginning of the Great Terror in the USSR. Victor Weisskopf said to Yurii Freiman in an interview: "In 1936, there was already a "terrible purge". For example. We called… And in Moscow, we called friends, Rumer and others… We were all ignored… Because everyone was afraid." In 1937, Weisskopf moved to work in the United States. (Raniuk & Freiman, 2010)

In addition, short-term but highly important visits of foreign physicists to the UIPT should be mentioned. Paul Dirac visited the institute three times, and the American physicist Georg Plachek twice. Georgii Gamov worked at the institute in 1932, before he fled to the United States. In 1934, the Danish physicist Niels Bohr arrived. Paul Ehrenfest came twice. The English physics theorist of German origin Rudolf Peierls arrived. Francis Perrin, professor of theoretical physics, and Jean Perrin, a full member of the French and the Academy of Sciences (Fig. 1) visited the UIPT in 1935 (Tanshyna, 2019).

Figure 1. Francis Perrin (*left*) and Jean Perrin (*center*). From the collection of the Historical Museum of NTU "KhPI".

The community of physicists from all over the world were not only attracted to the UIPT because of the working conditions, but also funding during the organizing of the institute was significant. However, the everyday living conditions were quite modest. In addition, the beginning of the 1930s in Ukraine was marked by a mass famine, and the scientists at UIPT did not escape it either. According to Victor Weisskopf's memoirs, scientists were given a meal once a day. But the government spent a lot of money to purchase the latest equipment, to bring in famous scientists.

Exclusive conferences on theoretical physics in Kharkiv

Among the significant events of this period were also the physics conferences held at the UIPT. These conferences attracted the attention of physicists around the world. Organizing the conferences allowed scientists to interact informally, and learn about innovative achievements in physics. In addition, it stimulated new initiatives and the development of original research. Although these conferences were intended as Union-wide meetings, they were, in fact, international, owing to the attendance of the world's leading physicists.

The First All-Union Conference on Theoretical Physics was held in May 1929. The head of the Department of Theoretical Physics was a well-known theoretical physicist, Dmytro Ivanenko, who made a fundamental contribution to the development of nuclear physics, field theory, and gravity theory. Ivanenko was the initiator of the first theoretical conference in Kharkiv. German scientists, the founders of quantum mechanics, Walter Heinrich Heitler and Pascual Jordan,

Figure 2. The First All-Union Conference on Theoretical Physics, UIPT, Kharkiv, 1929 (Sardanashvili, 2010, p. 258). Among the presenters were Ivan Obreimov, Pascual Jordan, Dmytro Ivanenko, Volodymyr Fock, Lev Landau, Georgii Gamov, Lev Strum, Yurii Krutkov, and Yakov Frenkel.

attended the conference. Georgii Gamov's report was the only one that touched upon the problems of nuclear physics and was devoted to the study of α-decay. It was these developments that brought Georgii Gamov worldwide recognition (Fig. 2) (Sardanashvili, 2010).

Similar conferences were held at UIPT in 1931 and 1934. The conference in 1931 was devoted to theoretical issues of ferromagnetism, quantum theory of electrical conductivity of metals and semiconductors. In addition to specialists from the USSR Igor Tamm, Lev Landau, Matvii Bronstein, the future winner of the Nobel Prize in Physics, the Swiss physicist Felix Bloch attended the conference (Litvinko & Ponomarenko, 2016; Fig. 3).

Figure 3. The Second All-Union Conference on Theoretical Physics, Kharkiv, 1931. From the collections of the Historical Museum of NSC "KhIPT". First row, from left to right: Dmytro Ivanenko, Leon Rosenfeld, Niels Bohr, Lev Landau, Yakov Frenkel, Robert Williams Wood, Igor Tamm; Second row: Yurii Rumer, Victor Ambartsumian, Volodymyr Fock (Raniuk, 2006, p. 180).

Well-known theoretical physicists from the scientific centers of the USSR and foreign scientists, Niels Bohr among others, took part in the 1934 conference (Fig. 4).

Figure 4. The Third All-Union Conference on Theoretical Physics, Kharkiv 1934.

Large-scale scientific projects and achievements

The topic of Niels Bohr's report was 'The causality problems in atomic physics'. The conference focused on theoretical issues of nuclear physics. The topic of the report of the American physicist Milton Spinoza Plesset was devoted to the theory of positrons. Jacques Salomon Hadamard, a mathematician and mechanic and member of the French Academy of Sciences, spoke about the magnetic properties of neutrons. The English physicist Evan J. Williams presented the only report in applied physics about the generalization of experimental data on the study of the propagation of gamma rays through a thin layer of lead. Also Ivar Waller, a specialist in solid-state physics, nuclear physics, quantum electrodynamics, and a member of the Swedish Academy of Sciences, and Leon Rosenfeld, the Belgian theoretical physicist, joined the conference (Odinets, 2019).

The period from 1928 to 1937 was quite fruitful in the work of the institute. In less than ten years, many large-scale events, inventions, and discoveries had taken place, and original approaches and methods of scientific research had been developed. Ivan Obreimov, the first director of the UIPT, invented a means of organically combining basic and applied research. And this despite

the controversy of the leading scientists of the institute (it is no secret that Lev Landau saw the institute's future in the development of theoretical research and hindered the creation of the laboratory, led by Abram Slutskin, where most of the practical tasks were solved) (Tverytnykova *et al.*, 2021). The principles laid down by Ivan Obreimov at the developmental stage of the institute have been preserved. It was during this period that Lev Landau established a scientific school of theoretical physics, which was recognized by the scientific community of the world (Tverytnykova & Gutnyk, 2022).

The achievements of this period included the abovementioned theoretical conferences, which were unique at the time not only in the USSR but also in the entire world. Also important for the development of physical science in the USSR was the launch of a scientific publication in German (sometimes published in English and French), *Physikalische Zeitschrift der Sowjet union* ('Journal of physics of the Soviet Union'), where USSR scientists could publish and, most importantly, inform the international scientific community about the results of their research. In addition, the journal published articles by physicists from around the world: England, France, Germany, the United States, and the Netherlands. The scientific journal was initiated by Oleksandr Weisberg and was published between 1932 and 1938.

The consolidation of outstanding theoretical physicists contributed, firstly, to the formation of a powerful branch of theoretical physics in the UIPT, and secondly, to increasing the level of research in the institutions of the city of Kharkiv. The researchers of the UIPT worked part-time at Kharkiv University, at the electrotechnical, and mechanical-machine-building institutes, where they quickly took leading positions, which had a positive effect on both teaching physics and research (Archives of the NSC "KhIPT", F. R-3993, desc. 1, Case 56, pp. 24–28).

Undoubtedly, a highly remarkable event was the fission of atomic nucleus on the experimental basis at the UIPT, where it was carried out merely six months after a similar experiment was conducted at the oldest physical laboratory in the world—the Cavendish Laboratory. The implementation of the experiment on the fission of the atomic nucleus by artificially accelerated protons confirmed the validity of the intention to reorient scientific research towards nuclear physics (Shulga, 2018).

In addition, the achievements of this period include the work of George Placzek and co-authored with Lev Landau, the quantum description of the combinational

diffusion of heat (the Landau-Placzek formula); Victor Weisskopf's work on the statistical theory of the nucleus, together with Lev Landau and Hans Bethe; Friedrich Houtermans's research on neutron activation of the tantalum nucleus; a study of the energy dependence of neutron absorption; research in the field of neuronal physics by Kyrylo Sinelnikov and Lev Rozenkevich (Archives of the NSC "KhIPT", F. 1, desc. 1–1D, Case 17, pp. 2–5); the theoretical and experimental works of Lev Shubnikov in the field of low-temperature physics (Sukhoterina, 2019); the discovery of ordered and partially-ordered solid solutions by Vadim Gorskyi; and the construction of the first Van de Graaf electrostatic generator, the most powerful in Europe and the world at that time.

Repressions and the disintegration of the global scientific consolidation experience

In the second half of the 1930s, events started to occur at the UIPT, which later led to the destruction of the unique experience of the global consolidation of scientists, and international cooperation was interrupted for many years. The first arrests, which began with the imprisonment of Moisei Korets in 1935, continued to escalate until 1937, and ended in a complete collapse in the summer of 1938, which is today known as the "UIPT case". The fate of those involved in these events varied, and was tragic to a greater or lesser degree (although to what extent can we measure the fate of each person, each family that went through imprisonment, arrest, interrogation). All of them witnessed the general tragedy that lasted for decades. Let us briefly mention the UIPT employees who were affected by those terrible events (Pavlenko, Raniuk & Khramov, 1998).

In April 1936, Eva Stricker, the wife of Oleksandr Weisberg, was arrested (Fig. 5). Eva Stricker was lucky—in 1937, she was allowed to leave the USSR.

The year 1937 became fatal for the activities of the UIPT. Thanks to their British citizenship, Martin and Barbara Ruhemann were able to leave the USSR. Laszlo Tisza managed to leave for France. Friedrich Houtermans and Oleksandr Weisberg were arrested. They were both handed over to the Gestapo in early 1940 and were later in concentration camps (Trischler & Walker, 2010).

In 1937, several leading members of the UIPT were arrested and shot: Lev Shubnikov, Lev Rozenkevich, Vadim Gorskyi, Valentin Fomin (SAKhR, F. P-6452, d. 2, Case 4, p. 34), and Konrad Weiselberg, who had adopted Soviet

Figure 5. Oleksandr Weisberg and Eva Stricker in Kharkiv, 1934 (Volchek, 2019).

citizenship (SAKhR, F. P-6452, desc. 2, Case 6802, p. 68). The arrests and imprisonment affected Yurii Rumer, Ivan Obreimov, Oleksandr Leipunskyi, Lev Landau, and others.

Finally, it should be added that the history of Friedrich Houtermans needs further study, based on the inclusion of new documents. Houtermans was arrested on January 15, 1938, at the customs, while trying to leave the USSR. In 1940, he was deported to Germany. With the outbreak of the Second World War, Houtermans was included in the commission that collected scientific equipment. According to physicists Serhii Frisch and Leonid Piatyhorskyi, Friedrich Houtermans reappeared in occupied Kharkiv, at the UIPT, in the autumn of 1941 in a Luftwaffe officer's uniform, and stayed there for over a month. It is believed that he actually managed to save the institute's unique and valuable equipment. However, proper documentation about this is lacking, or remains classified to this day in Ukrainian archives. At the same time, the fact remains that neither the unique equipment of the UIPT nor its staff were exported to Germany (Frenkel, 1997, p. 129).

The repressions of 1935–1938 in the UIPT had a rather large-scale international resonance. Representatives of the international scientific community, including Albert Einstein, Frédéric Joliot-Curie, Irene Joliot-Curie, Jean Perrin and Petro Kapitsa, defended Kharkiv scientists.

Conclusion

So, of course, in the late 1920s and during the 1930s, an institutional, in the form of the Ukrainian Institute of Physics and Technology, and an informal society of physicists from around the world was formed in Kharkiv. The scientific consolidation of talented scientists has built up traditions, centuries of experience, and practical knowledge in this field of many scientific schools around the world. Institutional development of science is closely linked to economic, scientific, social life, political system, and cultural and historical locus. In the USSR, science became a priority almost for the first time in the 1920s. And the establishing of the UIPT attests to that. The institute received significant funding and support from the authorities. However, the desire for the total control of ideological science led to mass repressions. The death of scientists and the departure of foreign experts had a negative impact on the further development of research in physics, and international relations, creative thinking, and initiative were hampered. Nevertheless, this was a unique experience of the consolidation of world physics thought, which led to the flourishing of nuclear research in Ukraine and gave an impetus to global research, and on which Ukrainian science should be based also in modern conditions of cooperation and dialogue of the international scientific community.

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