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"SCIENTISTS AND WAR" SYMPOSIUM: REFLECTIONS ON THE SCIENTIFIC COLLABORATION OF UKRAINIAN AND ROMANIAN HISTORIANS OF SCIENCE

International scientific cooperation is a crucial factor in advancing knowledge, driving innovation, addressing global civilizational challenges, fostering harmonious social development, shaping humanistic public opinion, and consolidating intellectual resources of countries.

The cooperation between Ukrainian and Romanian historians of science and technology began in 2003, during the participation of Ukrainian and Romanian scientists in the 30th Congress of the International Committee on the History of Science and Technology (ICOHTEC), and continued at subsequent annual ICOHTEC and World congresses, where Ukrainian and Romanian colleagues became ICOHTEC members and delivered reports.

ICOHTEC is an international scholarly society founded in 1968 to unite historians of technology across geopolitical divides. The society fosters global collaboration in the history of technology, promotes interdisciplinary and international research in this field, supports scholars worldwide through collaboration and knowledge exchange, and contributes historical insights to contemporary global challenges.

Historians of science and technology from Dobrov Institute for Scientific and Technological Potential and Science History Studies NAS of Ukraine (Dobrov Institute, Kyiv, Ukraine) and Transylvania University (Brasov, Romania) signed a Cooperation Agreement in 2019, extended in 2025.

Both organizations closely cooperated throughout these years. In 2022 and 2023, researchers from the Dobrov Institute participated in the seminars of Transilvania University of Brasov. In 2019—2025, Romanian colleagues were members of the Organizing Committee and lecturers of the annual International Conference of Young Historians of Sciences, Technology, Educa-

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tion, and Specialists in Kyiv. Details about these events were published in the international scientific journal "Science and Science of Science." [1, 2, 3]

The Ukrainian-Romanian Symposium "Scientists and War" (Dr. Alla Lytvynko was its chairperson), held within the 27th International Congress of History of Science and Technology "Peoples, Places, Exchanges, Circulation" (Dunedin, New Zealand, 29 June — 5 July 2025) was a successful collaborative event. The symposium focused on the realities, outcomes, and social aspects of the research activities in the wartime, with referring to World War I, World War II, and the full-scale Russian-Ukrainian war that broke out on February 24, 2022 (19 participants, 12 proposals, 4 days) [4].

The current war caused economic, social, medical, and environmental problems. Fundamental challenges arise in R&D sector: declining human resources, disruption of science–industry links, destruction of research infrastructures, plummeted funding, suspension of international scientific cooperation, the need for substantial expansion of R&D for defense and security purposes, and the emphasis on strategic economic sectors. Military actions complicate or stop the operation of research institutes, organizations, and enterprises.

In Ukraine, essential priorities of the postwar recovery will be environmental rehabilitation, reconstruction of infrastructure and industry, dissemination of innovative technologies, enhancement of energy-, information-, and cybersecurity, as well as agrarian business, education, environmental research, and elimination of social consequences of military aggression. To fulfill these tasks, it is necessary to analyze and apply researchers' experiences in formulating science and technology development strategies.

The presentation "Ukrainian Military-technological and Socio-Humanitarian Research as a Response to the Russian-Ukrainian War" by DSc *Alla Lytvynko* from Dobrov Institute is based on the analysis and summarization of opinions of researchers from the NAS of Ukraine with regard to the impact of the Russian-Ukrainian war on science and society. These opinions are set out in publications on science and technology, security and defense, and socio-humanitarian issues, elaborating on the historical background, social and

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[1] Helerea, E., & Lytvynko, A. (2022). Evolution of energy policies in the context of the war in Ukraine — a review of the discussions of an online scientific seminar. *Science and Science of Science*, 4 (118), 156—161.

[2] Lytvynko, A., & Helerea, E. (2023). The scientific session "History of science and technology — current concerns". *Science and Science of Science*, 3 (121), 186—196.

[3] Lytvynko, A., & Bessalova, T. (2025). "Science for the Fair Peace in Ukraine": XXX International Scientific Conference of Young Historians of Science, Technology, Education, and Specialists. *Science and Science of Science*, 3 (129), 150—157. https://doi.org/10.15407/sofs2025.03.150

[4] URL: https://innovators.eventsair.com/QuickEventWebsitePortal/ichst2025/program/Agenda/AgendaItemDetail?id=4f08037c-495c-4642-9154-dc138f350da5

cultural dimensions, and risks of this war for Ukraine and the world. In 2014, the Russian Federation annexed the Crimean Peninsula and began aggression in eastern Ukraine. On February 24, 2022, a full-scale invasion of Russian troops began. The war caused the destruction of a significant portion of the research infrastructure, and a significant reduction of science–industry links.

DSc A. Lytvynko touched upon the creation of the first Ukrainian samples of transparent armor that meet NATO standards, an X-band radar station, and a system for detecting unmanned aerial vehicles, as well as camouflage composite coatings, biomaterials for bone tissue restoration, and cryopreservation technologies for blood cells. Regarding humanitarian research she observed that it encompassed analysis of social phenomena and processes caused by war, e.g., the multi-million flow of forced migrants, the destruction of socio-psychological health of the population in parallel with the activation of their mobilization resources. The speaker highlighted volunteer efforts of the NAS of Ukraine focused on support the Armed Forces of Ukraine and the civilians, as well as support to the Academy coming from the international scientific community.

The presentation by Prof. *Elena Helerea* from Transylvania University of Brasov (Romania) "Romanian Scholars in World War I" emphasized the effects of World War I held for Romania. It brought immense damage and destruction, but marked a turning point, culminating in the end of the war and the unification of most Romanian lands. This war made scholarly fields face multiple challenges, changes, and consequences. Education process was partially or totally interrupted in the areas of violent conflict. Universities were affected by destroyed infrastructures and the loss of lecturers and students who had fled from conflict zones or participated in the warfare. Research publications were on steep decline. During this turbulent period, Romanian scholars played a significant role in the events that unfolded.

Prof. E. Helerea's discussion touched upon the ways Romanian scientific personalities influenced the events and decisions of that era, and how the war shaped their discourse. The speaker highlighted prodigious work of scholars and leaders who had navigated the challenges and changes brought about by World War I, thereby making significant contributions to the Romania's history. Prof. E. Helerea demonstrated a profound impact of the war on the education and the scholarly environment, and its long-term consequences. Hence, it is essential to draw attention to these issues, and to find solutions to support scholarly communities affected by any conflict.

Dsc *Elena Tverytnykova* and PhD *Maryna Gutnyk* emphasized in the presentation "National Technical University 'Kharkiv Polytechnic Institute': Science and Education amidst War" that the Russia's military aggression led to adjustments in the research and education work of the NTU Kharkiv Polytechnic Institute. Kharkiv, being geographically close to the borders, saw sig-

nificant disruptions and damage, with a drastic impact on daily life, education processes, and R&D. Some of the university professors and researchers found themselves outside Ukraine and had to adapt to new circumstances. Those who remained faced adverse conditions for conducting R&D. However, the education and research processes at the university gradually resumed. The digitization of educational processes began at the university during the pandemic. The implementation of Office 365 program enabled to employ educational technologies allowing for re-launching educational processes as early as March 2022. R&D continues despite disruptions in electricity supply. With the facilities required for the experimental component damaged, the employment of advanced educational technologies and the experience of leading European institutions allow for the improvement of the education and R&D processes. The participation of professors in the educational project "Open Educational Resources with Ukraine", supported by the DAAD and LUH, has provided an opportunity to further digitalize the educational process. The application of special packages, such as BISON, Zenodo, and e-Doer, will contribute to the digitalization and openness of education, as well as the positioning of Ukrainian researchers in the international scientific community.

PhD *Oksana Zhyvaha* and Dsc *Larysa Ryzhko* (Dobrov Institute) made the presentation "Development of target research programs at the National Academy of Sciences of Ukraine and approaches to evaluation of their results". Discussing this theme, they showed that the evaluation practice in Ukraine dates back from 1960s—1970s. Since 2002, the Academy has allocated the accrued public funds on a target and competitive basis, primarily for financing research projects and advanced developments in areas of critical importance for science and technology, socio-economic, and cultural development of Ukraine.

Because the abovementioned funding schemes were related with the implementation of specific goals set in the programs, procedures for their evaluation were developed accordingly. The epistemological criteria for quality assessment of this knowledge were supplemented by economic, political, cultural, and moral criteria subject to social control. In particular, it involves interactions with potential customers, staff of higher education institutions (HEIs), and public authorities. These interactions are carried out through specially constituted councils, which are a collegial scientific and advisory body charged with management of target programs. The council determines programs' strategy, setting, and implementation, resolves essential issues of programs' resourcing, reviews their status, and evaluates their results. Apart from staff of the NAS of Ukraine, the council includes HEIs staff, directors of industrial companies, and representatives of public authorities. This enables to focus the evaluation on the alignment of results and objectives, and on their future practical value.

Dsc *Vira Gamaliia* and DSc *Svitlana Ruda* from the State University of Infrastructure and Technologies delivered the presentation "Ukrainian micro-

biologists during the World War II", emphasizing that World War II posed a significant challenge to the entire Ukrainian people. Ukrainian microbiologists were among the fighters: scientists from the Institute of Microbiology and Epidemiology, including its director, Petro Marusenko, scientific secretary Petro Vizir, and approximately twenty employees, joined the military. Scientists who remained in the rear helped build defensive structures and, at the workplace, gave all their energy to the needs of the front. As the front approached, the Academy of Sciences of the Soviet Ukraine began evacuating to the deep rear. Scientists from the Institute of Microbiology left Kyiv on July 3, 1941, and arrived in Ufa after a long and tiring journey.

Despite harsh climatic and household conditions, research work was gradually set up. Microbiologists proposed a staphylococcal bacteriophage to combat wound infections, effectively used in clinics and hospitals in Ufa and other settlements of Bashkiria. In early winter 1941, a significant part of the harvest remained under the snow. Following microbiologists' instructions, numerous samples of grain that had overwintered under the snow were analyzed. In this way, thousands of pounds of bread, which turned out to be of good quality, were saved, while stocks deemed unsafe for use in food were destroyed, thereby preventing the spread of septicemia and saving the lives of many people.

Hlib Baranov (postgraduate student) and Dsc *Olena Khramova-Baranova* from Cherkasy State Technological University, speaking about the role of biogas plants in Ukraine's economy during the Russian-Ukrainian War, pointed out that Ukraine needs not only fuel and energy, but also an environmentally friendly future. The role of biogas plants is significant for the Ukrainian economy, as they enable for ecologically safe energy production and contribute to maintaining the domestic energy balance during the Russian-Ukrainian war. Research into the role of biogas plants and their distribution will help address the problems of methane air pollution, the energy crisis in Ukraine, and ensure safe energy production. Currently, Ukraine has about 70 biogas plants, including those being under construction.

Biogas production from solid household waste is one of the most promising areas, because approximately ten million tons of waste are generated in Ukraine every year. Ukraine has a significant bio-resource capacity for biogas production, which, once exploited, will enable to meet 4—7% of the domestic annual energy needs. The capacity of biogas plants can be utilized to restore Ukraine's energy and fuel system. Providing industry and households with gas obtained from waste can give Ukraine an additional economic advantage. Basically, biogas production is expected to improve the macroeconomic, environmental, and energy-sector performance of Ukraine.

PhD *Halyna Doronina* and PhD *Halyna Zvonkova* (Dobrov Institute) delivered the presentation "The development trends and the results of the activities of

The Institute of Radio Astronomy NAS of Ukraine from the beginning of the full-scale Russian invasion to the present day", highlighting the events with impact on the institute's performance and achievements. Despite the war-related challenges and numerous losses caused by the invaders, the institute's researchers could continue working and producing advanced experimental results. The speakers highlighted the institute's international cooperation in the wartime. In particular, the assistance granted by EU partners helped researchers resume their projects. Special emphasis was placed on joint international projects, participation in international conferences, and the establishment of new laboratories where researchers from the Institute of Radio Astronomy were involved. In defiance of the war, the institute continues to carry out applied research, e.g., developments of radio systems and devices for various purposes.

PhD *Tetiana Karmadonova* (Dobrov Institute) delivered the presentation "The role of scientist migration during war in preserving scientific potential and disseminating scientific knowledge", stressing that science is vital to society, especially in the wartime, when it provides solutions to support defense, economic, and humanitarian needs. Armed conflicts heavily hit research communities by causing loss of talent, destruction of infrastructure, and jeopardizing long-term research. Hence, the scientific migration is a crucial factor in preserving intellectual capital and facilitating the dissemination of knowledge worldwide.

Migration during wartime arises from threats to safety and losses of resources, such as laboratories and funding. Meanwhile, international research centers attract scientists by stability and opportunities for professional growth. Despite challenges, migration has benefits: it allows researchers to work in secure environments, fosters innovation, and strengthens global scientific collaboration. However, it also poses issues like brain drain and difficulties with integration, language, and recognition of qualifications. Historically, scientific migrations used to drive the global progress. During World War II, European scientists such as Albert Einstein or Enrico Fermi made significant contributions to U.S. advancements in physics and chemistry. Similarly, Ukrainian scientists displaced by the war with Russia now can find support in foreign countries. International organizations, including UNESCO, provide grants, scholarships, and scientific networks to protect displaced researchers. In the long term, migrant scientists often contribute to rebuilding their home countries by engaging the diaspora and implementing educational and innovative programs. Balancing support for displaced scientists with strengthening the research capacities of affected countries is vital. It follows that migration of scientists during wartime serves as a mechanism for preserving the global scientific progress and a critical resource for rebuilding the research capacities of conflict-affected nations.

PhD *Svitlana Telukha* from National Technical University "Kharkiv Polytechnic Institute" delivered the presentation "The opinions of Ukrainian female

scientists regarding the events of recent years in Ukraine and the world". It builds on analysis of video interviews and questionnaires recorded as part of the projects "Science and scientists in times of extremes" and "Social history of science in crisis periods of the 21st century", providing broad evidence about risks and challenges faced by the Ukrainian R&D in recent years. It was discovered that the main risks for the Ukrainian R&D were the consequences of the pandemic and the beginning of Russia's full-scale military invasion of Ukraine. The author's purpose was to reveal women's views of events and changes through analysis of collected documentary evidence, and to highlight the female perspective in life and science, e.g., risks occurring in recent years; changes caused by the pandemic; patterns of R&D and education activities occurring under the pandemic's impact and their applicability to the wartime; change in the life of female researchers after the beginning of the Russian-Ukrainian war of 2022, and what became a priority for them; what difficulties became the heaviest for them; what helped them maintain their research capacity.

PhD *Ihor Dvorkin* from the National Technical University "Kharkiv Polytechnic Institute" delivered the presentation "The image of World War II during the Russo-Ukrainian war: perception by the Ukrainian state, society, and scientists". The speaker argued that the experience of the Russo-Ukrainian War significantly influenced the perception of World War II events on Ukrainian lands by the Ukrainian authorities, community, and historians. A rethinking of the previous war began after the start of the hybrid war in 2014, giving impulse to de-communization processes. Ideological tropes have been disappearing from the legal space, school textbooks, general discourse, and public memory. The outbreak of the full-scale war in 2022 precipitated a rethinking of the Russia's role and Russian-Ukrainian relations from a historical perspective. Decolonization processes have been on in the Ukrainian discourse, with impact on the perception of World War II, and consequent changes in public memory. The image of Ukraine during World War II is being rediscovered by researchers. Changes are being on in the school curriculum. The data sources for this presentation comprise legal acts, speeches and posts of political figures, public figures, scientists, Ukrainian textbooks and school programs, as well as visual sources.

Discussing the Kharkiv chemists' efforts during World War I, *Gennady Zabuga* (postgraduate student) and PhD *Yuriy Mushkalo* (Dobrov Institute) observe that the outbreak of World War I complicated the operation of educational institutions. In February 1915, Professor Ivan Osipov, a Doctor of Chemistry, was elected director of the Kharkov Institute of Technology. Apart from lecturing, he was responsible for securing additional funds, improving financial conditions of the employees amidst the rising cost of living, and postponing military conscription for students. A Military-Technical Commission was established at the Kharkiv Institute of Technology, to address defense-related issues. The mechanical laboratory and its workshops were read-

justed to wartime needs. The institute was commissioned with the manufacture of military equipment, lathes for turning artillery shells in particular.

The events on the fronts of World War I required an ample supply of medicinal drugs, of which many had been imported, e.g. from Germany. There was an urgent need to establish domestic production of medicinal substances. In April 1916, Prof. I. Osipov participated in a meeting on the production of chemical preparations for military purposes. Given the draft of many men into the army, Prof. I. Osipov, along with like-minded scientists, proposed to establish a women's higher technical educational institution in Kharkiv. In the fall of 1916, the Kharkiv Women's Polytechnic Institute was opened, and Prof. I. Osipov became its director.

The presentation by *Alyona Heza* (Dobrov Institute) and PhD *Catalin Mihai* (Power Inov Energy S.R.L., Braşov, Romania) is devoted to the cyber defense of Ukraine during the martial law imposed since February 24, 2022. The speakers discussed cyber protection, cyberspace, cybercrime, cybersecurity, computer crime, information protection, and Ukrainian developments in these fields in the context of the history of science and technology. The enemy is increasingly attacking Ukrainian official websites, to gather secret information and inflict a devastating blow not only on the battlefield, but Ukraine is a European country with highly performing IT sector, with a strong body of experts in cybersecurity and cyber protection.

Social relations in the information domain, touching upon all the human activities, were discussed. Information attacks by the enemy have a heavy impact on the broad public, information security, and mobile and Internet communication as a whole, but they are effectively repulsed by Ukrainian specialists. A new cyber training service "TRYZUB" designed by Ukrainian researchers, and its attacks on the enemy's satellite communication is a vivid example.

Future cooperation between organizations can include the following activities: creation and implementation of research projects; exchange of PhD students and researchers; organization of seminars, workshops, scientific meetings, and academic lectures on the history of science and technology. They will contribute to professional development of Ukrainian and Romanian colleagues.

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