Belarusian-American Workshop on Scientific and Technical Cooperation: Proceedings of a Workshop--in Brief

DETAILS

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Proceedings of a Workshop

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IN BRIEF

BELARUSIAN-AMERICAN WORKSHOP ON SCIENTIFIC AND TECHNICAL COOPERATION

Proceedings of a Workshop—in Brief

The U.S. National Academies of Sciences, Engineering, and Medicine, in cooperation with the National Academy of Sciences of Belarus (NASB), convened an inter-academy workshop on December 15-16, 2015, in Minsk, Belarus. Six American specialists in outreach activities of universities and more than 20 Belarusian scientists, educators, and government officials participated in the workshop. The goals of the workshop were to identify activities of mutual interest to the Academies and to identify technical areas for cooperation.

Over the course of two days, speakers from the U.S. delegation described how research innovation and new technologies move from laboratories on university campuses to commercial applications. The American specialists addressed these issues from a variety of perspectives, including policy-based (legal, regulatory, and institutional) incentives, and university-based infrastructures designed to support and facilitate technology transfer. Two case studies of technologies developed in the laboratory with commercial applications were presented: 3D MRI CT scanners, and techniques for enhancement of agricultural productivity and profitability. Speakers from the NASB followed two principal themes—research accomplishments of their respective institutes in the fields of engineering, information technologies, material sciences, and agriculture, and new ways to collaborate with scientists in the United States.

RESEARCH ACCOMPLISHMENTS AND CAPACITY OF THE NATIONAL ACADEMY OF SCIENCES OF BELARUS

Academician Vladimir Gusakov, chairman of the NASB Presidium, commented that this workshop involved the third delegation from the United States to the NASB in 18 months. He noted that these visits demonstrated an interest in mutual cooperation between Belarus and the United States, but progress has been slow. He added that there exists a significant potential for developing joint research in areas of mutual interest—8 joint projects were initiated in recent years in cooperation with other U.S. partners, and NASB has agreements and contracts with academies and research centers in 88 other countries.

Academician Sergey Gaponenko, chairman of the Scientific Council of the Belarusian Foundation for Fundamental Research, provided an overview of the NASB's role in research and innovation. The NASB includes more than 113 organizations, 400 members, 90 academicians, 119 corresponding members, 11 foreign members, and 16,000 employees. Eight thousand of those employees are researchers, including 1,700 Ph.D.s and 442 habilitations (post-Ph.D. qualification). Areas of research highlighted by Academician Gaponenko included genetic analysis for medicine and sport medicine-related diagnoses, a space-based system for remote sensing, an unmanned aviation vehicle complex, fertilizers and other agrochemical products, energy-efficient technologies, and arid-land agriculture technologies developed for export.

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Academician Oleg Penyazkov, director of the A.V. Luikov Heat and Mass Transfer Institute, described the research activities within his institute and prospects for international cooperation with the institute. He highlighted research efforts in heat and mass transfer, fluid dynamics, power engineering, and thermal engineering. Project examples included evaporative cooling towers at power generation facilities, plasma fusion, toxic waste recycling with plasma, organic waste recycling using thermolysis, magnetic hyperthermia cancer treatment, and meteorite impact modeling.

Dr. Oleg Smorigo, director of the Powder Metallurgy Institute's Porous Materials Department, discussed prospective areas and mechanisms for cooperation in highly porous cellular materials. Suggested topics of joint interest included composites, ceramics, inspection and certification of materials, bioscaffolds (ocular implants), aerospace component manufacturing, electromagnetic radiation shields, and membranes. Also the Institute is currently engaged in several international projects to develop solar technologies.

Professor Alexandr Tuzikov, general director of the United Institute of Informatics Problems, spoke about cooperation between the NASB and scientific centers in the United States in the field of information technologies. He credited the Institute of Informatics Problems with participating in the formation of ICT policies of the government. Current research areas include ablation in surgery, prediction of protein interaction, robotics, precision agriculture, and remote sensing.

Professor Vladimir Azarenko, academician secretary of the Department of Agricultural Sciences, summarized the state of the agricultural sector in Belarus and described prospective areas for international development. Agriculture represents 8.4 percent of Belarus' GDP, with exports primarily being meat and milk. Twenty-four percent of the population is rural, with 8 percent active in agriculture. He described the economic importance of not growing genetically modified crops (GMOs). GMOs are strictly controlled, and Belarus concentrates on providing non-GMO products to the European market. There are no certified organic farms in the country, but many farms and agricultural enterprises do not use chemical fertilizers or pesticides. Potential areas of collaboration include food security, development of new crops, soil fertility and fertilizers, integrated crop protection, animal breeding, veterinary technology (immunizations and treatments of diseases), fodder production and storage, precision agriculture guided by IT, competitive food production, and food safety.

PERSPECTIVE ON TECHNOLOGY TRANSFER FROM U.S. UNIVERSITIES

Dr. Matthew Hamill, senior vice president of the National Association of College and University Business Officers, chronicled the visits and meetings of two delegations of U.S. officials, held in the fall of 2014 and the spring of 2015, that established the foundation for the workshop. He expressed his appreciation to Chairman Gusakov and senior NASB officials for organizing the workshop and welcoming the U.S. delegation, and he reaffirmed interest in identifying areas for cooperation between scientists and universities in Belarus and the United States.

Dr. Kent Hughes, public policy scholar of The Woodrow Wilson International Center for Scholars, discussed: (a) the role of innovation in U.S. history, and (b) the relationship between academic, government, and non-government institutions. He described the United States in the mid-1800s as land-rich and labor-poor—leading to innovation in agricultural mechanization and technologies. He credited the Hatch Act (1887) and the Adams Act (1906) with creating agricultural experiment stations and the Smith-Lever Act (1914) with the establishment of the agricultural experimental stations and extension system. Working together, agricultural experiment stations and the extension service ensure that U. S. agricultural research is relevant to American farmers. Anti-trust policies in the late 19th and early 20th centuries made innovation the "only way" to gain monopoly rents. He stressed the impact of war and economic challenges in developing the U.S. innovation system. During World War II, science led to the establishment of the National Science Foundation. The Soviet success in launching Sputnik triggered the creation of the National Aeronautics and Space Administration and the Defense Advanced Research Projects Agency (DARPA). The economic challenges of the 1980s led to a series of new policies designed to bring laboratories and university research close to the market.

Dr. Mark Long, president of Long Performance Advisors, stressed the importance and success of the Bayh-Dole Act in the United States in encouraging technology transfer from universities to the commercial sector. Long stated that since the Act's adoption in 1980 there have been 14,000 commercially successful transfers of technology out of U.S. universities. He also shared his experience with Tyumen State University's Technopark, which is working on

technologies related to the gas industry, soil reclamation, and water. Long noted some key challenges in technology commercialization, including valuation of the innovation systems and the restrictive nature of intellectual property agreements. He emphasized the need for extensive market research, and the value in building relationships between universities.

Dr. Anne Dare, a postdoctoral research associate with Purdue University's Innovation for International Development Laboratory, spoke about market-driven innovations that respond to global sustainable development challenges and the concept of appropriate technologies. Purdue faculty researchers are encouraged to translate their research expertise into simple, low cost, easy to maintain, and locally produced innovations through partnerships with development organizations (government, non-government, industry, and research institutions). She described the potential for economic impact associated with translating those technologies into start-ups in low- and middle-income countries and the opportunities for universities to engage in education and research in non-traditional environments. She provided examples of innovations in this area, including: clean cook-stove technologies, crop storage, water treatment, rural transportation, and off-grid energy systems.

Dr. James Oliver, director of the Virtual Reality Applications Center at Iowa State University, presented a case study on university research-based technology transfer, commercialization, and entrepreneurship. He demonstrated the technology he co-developed, which led to the founding of the start-up, BodyViz. This firm offers low cost, easy to use medical visualization, with sales in the medical, education, veterinary, and legal markets. He shared his experience as a faculty entrepreneur and described the services and programs provided by Iowa State University Research Park.

Dr. Steven Pueppke, director of Global and Strategic Initiatives of the College of Agriculture and Natural Resources at Michigan State University, shared his perspective on the commercialization of agricultural technologies in the United States and presented a case study on the commercialization of a precision agriculture technology developed at his university. He identified a reinforcing cycle in agriculture programs at U.S. universities: first, a producer identifies a problem and brings it to the university; second, the university solves the problem, and brings the solution back to the farm; third, a new problem is identified, and the cycle repeats (see Figure 1). Historically, there had not been an expectation of commercialization. He credited the boom in biotechnologies between 1979 and 2009 with bringing to light the commercial potential of agricultural innovations. He provided a case study of a technology and start-up developed at Michigan State University to digitize data from agricultural fields and to provide an optimization plan for managing the application of agricultural inputs for maximum yield.

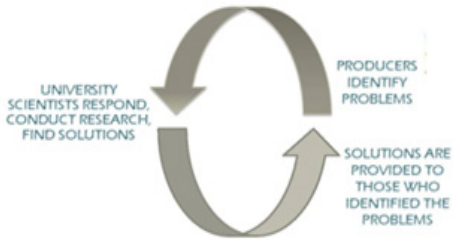

Figure 1. The Land Grant University Model for Innovation and Technology Transfer. Source: Steven Pueppke

DISCUSSION

Workshop Chairs, Matthew Hamill and Sergei Kilin, moderated an open dialogue on the second day of the workshop in order to give workshop participants and observers an opportunity to express their views as to how collaboration could be most productive. Individuals suggested a range of possible activities for future collaboration, including the following:

- To seek opportunities for research collaboration in one or more of the areas of: medical and bioinformatics, earth remote sensing, agriculture and food production, laser technologies, biotechnology, applications for 3D printing, chemistry, and green energy.
- To develop a joint program for training technology transfer staff in the institutes of the NASB.
- To support development of the new BelBioGrad, the National Scientific and Technical Park for pharmacy and biotechnologies being established in Minsk.

There was limited discussion about the policy framework in Belarus that might encourage greater transfer of innovations from the laboratories to the commercial sector. The experience of the United States, which is among the world leaders in the area of commercialization of scientific developments, can be very useful for Belarus.

Several participants observed that barriers to scientific collaboration are not inconsequential but noted that, despite barriers, United States and Belarus scientists do participate in joint research projects. In both countries, faculty must secure their own funding to engage in collaborations since no government programs currently support joint research activities.

A number of participants suggested potential ways to increase collaborative efforts, such as:

- Identifying the specific barriers to scientific collaboration and exploring strategies to address these barriers;
- Identifying the most productive areas for such collaboration;
- Developing programming to support NASB staff charged with marketing technologies for the commercial sector; and
- Supporting the development and launching of BelBioGrad and other business incubators in Belarus.

DISCLAIMER: The Proceedings of a Workshop—in Brief was prepared by **Anne Dare** as a factual proceedings of what occurred at the meeting. The statements made are those of the author or individual meeting participants and do not necessarily represent the views of all meeting participants, the planning committee, or the National Academies of Sciences, Engineering, and Medicine.

REVIEWERS: To ensure that it meets institutional standards for quality and objectivity, this Proceedings of a Workshop—in Brief was reviewed in draft form by **Steven Pueppke**, Michigan State University and **William Colglazier**, AAAS. The review comments and draft manuscript remain confidential to protect the integrity of the process.

PLANNING COMMITTEE: Matthew Hamill (Chair), Senior Vice President, National Association of College and University Business Officers; **Kent Hughes,** Public Policy Scholar, Woodrow Wilson International Center for Scholars; **Steven Pueppke**, Director, Global and Strategic Initiatives, College of Agriculture and Natural Resources, Michigan State University. **STAFF: Glenn Schweitzer**, Study Director; **Anne Dare**, Purdue University; **Gwynne Evans-Lomayesva**, Senior Program Assistant.

MEMBERS OF THE U.S. DELEGATION: Matthew Hamill, National Association of College and University Business Officers**; Steve Pueppke**, Michigan State University; **Kent Hughes**, Woodrow Wilson International Center for Scholars; **James Oliver,** Virtual Reality Applications Center, Iowa State University; **Mark Long**, Long Performance Advisors; **Anne Dare**, Purdue University.

NATIONAL ACADEMY OF SCIENCES OF BELARUS PRESENTERS: Vladimir Gusakov, NASB Presidium; **Sergei Kilin**, NASB Presidium; **Sergey Gaponenko**, Scientific Council of the Belarusian Republic Foundation for Fundamental Research; **Oleg Penyazkov**, A.V. Luikov Heat and Mass Transfer Institute; **Oleg Smorigo**, Powder Metallurgy Institute, Porous Materials Department; **Alexandr Tuzikov**, United Institute of Informatics Problems; **Vladimir Azarenko**, NASB, Department of Agricultural Sciences.

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For additional information regarding the meeting, visit: www.nationalacademies.org/pga/dsc/Belarus/index.htm.

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