

ISTC 2019 ANNUAL REPORT

CELEBRATING 25 YEARS



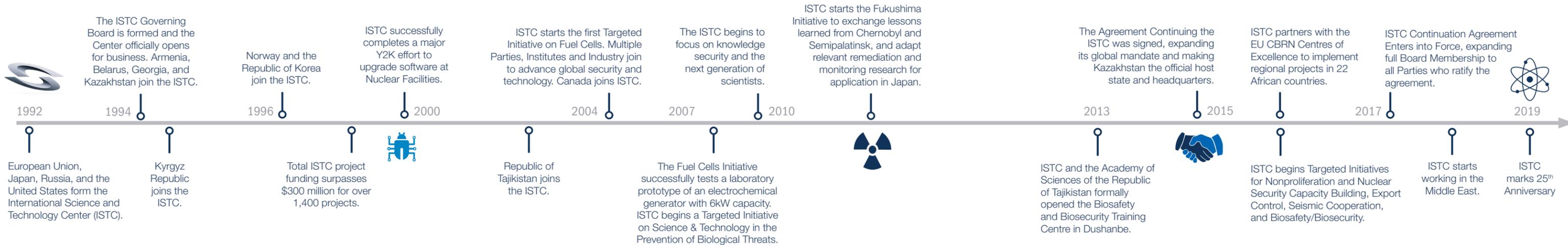
ISTC



МНТЦ

MISSION

To advance global peace and prosperity through cooperative chemical, biological, radiological, and nuclear (CBRN) risk mitigation by supporting civilian science and technology partnerships that address global security threats and advance non-proliferation



ISTC BY THE NUMBERS

\$1.4b
spent on projects and activities since inception

\$566m
paid in research grants since inception

92
Countries have participated in ISTC projects and activities

77k
Scientists who have received grants

3,653
Projects funded, covering a range of technologies

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ISTC FUNDING 1994–2019

PARTY	AMOUNT IN 2019 (USD)	AMOUNT TOTAL
EU	4,396,540	376,494,010
Japan	770,340	84,431,957
USA	3,371,337	692,956,967
Canada		36,547,136
Finland		1,185,960
Sweden		3,831,906
Norway		4,000,639
Korea		7,281,141
Other		12,566,221
Joint Contributions	1,079,218	170,208,325
TOTAL	\$9,617,435	\$1,389,504,262

The ISTC is an intergovernmental global security organization that builds innovative partnerships that mitigate chemical, biological, radiological, nuclear, and emerging threats and promote responsible science and technology.

The ISTC is headquartered in Nur-Sultan, Kazakhstan. There are branch offices in Armenia, Georgia, Kyrgyzstan, and Tajikistan.



Ronald F. Lehman, Ph.D.

STATEMENT OF THE CHAIRMAN OF THE GOVERNING BOARD

As the International Science and Technology Center (ISTC) enters its 26th year of operations, the contributions of peer-to-peer science and regional security cooperation in promoting peace, prosperity, and health are clear. Still, the need for even greater partnership is also clear as illustrated by the COVID-19 pandemic. The speed with which infectious diseases can spread globally prompted the ISTC Parties, years ago, to make public health one of the top priorities of its open and transparent science engagement.

Significant public health challenges confront us all. The emergence of novel viruses and antibiotic-resistant bacteria reflect nature's complex life cycles and can impact all the regions of the world quickly. Modern, rapid transportation for people and goods, so important to economic prosperity, can also result in the spread of infectious diseases. During normal peak airline travel, over 1 million people are in the air at the same time, each one a potential disease vector. Some scheduled airline trips transit over one-third of the earth non-stop in about 18 hours.

This ease with which any one of us can be exposed to a new infection for which we lack immunity or resistance highlights the need for more effective, less disruptive public health responses. To meet this challenge, the ISTC expedites our ability to work together. Many ISTC biotechnology projects have focused on medical treatments, infectious disease reporting, and tools for understanding human as well as animal pathogens. Additional projects, approved by the ISTC Scientific Advisory Committee, await funding.

International science cooperation is most important when local problems become regional or global. Whether the risks involve proliferation, terrorism, disease, environmental degradation, climate change, water shortages, nuclear accidents, chemical spills, or other transnational developments, the ISTC has helped. And more must be done. The year 2019 included a

number of milestones in the continued transition and transformation of the ISTC. ISTC activities have involved participants from some ninety countries and has provided \$1.4 billion dollars in funding to 77 thousand scientists. Now, the focus must be on the future, not the past.

The new ISTC Continuing Agreement entered into force on December 14, 2017, only after the governments that are now Parties to the ISTC all completed ratification. The extra effort taken by each of these Party governments to ratify the new Agreement in accordance with their own constitutional requirements demonstrates their commitment to use the ISTC. The new agreement did more than keep the ISTC going – it created a rock solid legal foundation for the new, more flexible ISTC that is now open for business. The Center is now a more affordable, more efficient, and more effective vehicle for all the Parties to use.

The 2017 Continuing Agreement retained the ISTC principles of operating transparently and by consensus. It expanded full, equal, and permanent Board Membership to all Parties who ratify the Agreement. It opened the door to broader and more diverse governmental participation while preserving the ISTC's special diplomatic status and tax advantages. The Agreement made clear that the ISTC will remain an intensely intergovernmental organization with hands on participation by member Governments. Yet, it also provides greater flexibility to work with other Governments, individual departments and agencies, industrial partners, NGOs, and more traditional international organizations.

The new mandate for the ISTC is worldwide. In addition to participants from Asia, Europe, and North America, activities now include participants from the Middle East, Southern Africa, and South Asia. Recent workshops included participants from Jordan, Kuwait, Mongolia, Pakistan, and Afghanistan. Networking with other centers such as the Middle East Scientific Institute for Security (MESIS) provides even more opportunities. As international research and trade expand, Parties cooperate to ensure

that this does not contribute to the accidental or deliberate development of weapons of mass destruction. ISTC is now in its third year of work on enhanced national and regional export control.

The ISTC continues to work very closely with the European Union's flagship program, the CBRN Centres of Excellence. We seek synergy. The ISTC and the EU Centres try to complement, but not duplicate their work. With eight regional secretariats including much of Africa and Southeast Asia, the sixty members of the EU Centres include about forty countries that are not among those countries whose scientists have already participated in ISTC activities. This networking has the potential to reach out to half the countries of the world while both organizations retain a manageable size.

The ISTC has new rules and funding mechanisms to engage scientists from more diverse regions of the world, but they have also developed Targeted Initiatives to address their own highest priorities. These more flexible and dynamic programs have also permitted reductions in administrative cost and management overhead. All work is open and unclassified and monitored through national and international audits reflecting the highest accounting standards. Best practices are encouraged also in safety, security, and the protection of intellectual property.

Today's reality, underscored by the coronavirus pandemic, is that there is more science to be done than any one nation can do. Modern multi-disciplinary science is, of necessity, international with the added benefit that the total advance can be greater than the sum of the parts. The digital age makes some of that cooperation easier and less expensive and comes naturally to the younger generation of scientists who increasingly populate ISTC programs. Virtual engagement is not the same as side-by-side science, but the two together can be more productive than either separately.

The future mandates that we modernize. This means engaging scientists, technologists, engineers, and mathematicians (STEM) from around the world. Fortunately, governments, private partners, and individuals now have

access to a timely and cost effective International Science and Technology Center as a new STEM generation is readied to step up to the challenges. During this year's celebration of the ISTC's 25th Anniversary we recognized this younger, emerging generation and also women in science who will lead peer-to-peer scientific engagement in the years ahead.

I wish to congratulate all the Parties for their success in transforming the ISTC and for focusing on the future. Among the most energetic Board Members in this endeavor were Samvel Haroutunyan from Armenia, Toshiaki Kobayashi from Japan, and Eddie Maier from the EU – all of whom will be greatly missed as they move on to their next responsibilities. Special appreciation must be extended to the Government of Kazakhstan, both its officials and its scientists. The visionary leadership provided by Kazakhstan was vital to the transformation of the ISTC, a fact that should make every Kazakh proud and the rest of us grateful. From our new ISTC headquarters in the center of Eurasia, we are well positioned for success.

The Governing Board relies upon the Executive Director, the Secretariat, the Branch Offices, and the Science Advisory Committee to provide the day-to-day support for all of the ISTC's achievements. These staff are accountable to the Board, just as the Governing Board is accountable to the Parties. These professionals are also conduits for the voices of science who are the engines of our projects, training, seminars, and workshops. We are indebted to them for their fine work. On behalf of the Governing Board, I wish the entire ISTC family the greatest possible health and happiness during the current medical emergencies.

Ronald F. Lehman, Ph.D
Chair, Governing Board
International Science and Technology Center



STATEMENT OF THE EXECUTIVE DIRECTOR

It has been an exciting 25 years here at the ISTC, and this year was no different. In 2019, the ISTC began several new projects and activities including two regional Central Asian trans-boundary water security and monitoring management projects that originated from Science Advisory Committee

seminars on Water Safety and Security. Both projects look at water security, monitoring, and risk assessment of mining and uranium tailings in the watershed of Central Asian Countries including Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan.

These projects focus on contamination of the Central Asian river basin (Syr-Darya and Amu-Darya rivers and tributaries) and set up surface water monitoring stations as remediation capacity for former uranium legacy sites. Satellite earth observation provided by the European Space Agency (ESA) is being used to monitor and provide high quality data for water and land resources. As part of a legislative and regulatory capacity for remediation of uranium legacy sites in Central Asia, an additional regional watershed monitoring system is under discussion for implementation, along with the proposed building of a water treatment facility in Taboshar, Tajikistan, to clean contaminated mine water discharge.

The ISTC continued its geographical and thematic diversification of its activities into new and varied global locations, such as Argentina, Kuwait, and Lebanon. Over 90 countries have participated in ISTC activities to-date. The Center is now truly a global organization.

To mark ISTC's 25th Anniversary, the Science Advisory Committee (SAC) judged and awarded scientific security themed papers written by young scientists. Aptly named, Awards for Young Scientists, the overall winner of the competition was an Armenian female scientist. Additionally, the Georgian Shota Rustaveli National Science Foundation sponsored separate awards to the best submitted papers to Georgia. Also, the Japanese ISTC



Left to right: Mr. Parviz Normatov, Mr. Samvel Haroutiunian – Armenian member of the Governing Board, Mr. Ronald Lehman – Chair of the Governing Board, Ms. Nona Movsisyan, Mr. Hayk Sargsyan, Mr. Zviad Gabisonia – Georgian member of the Governing Board, Ms. Fumie Hara – Japan member of the Governing Board, Mr. David Cleave – ISTC Executive Director

member party sponsored a Scientific Travel Mission to Japan for the winners, which was postponed due to COVID-19.

The ISTC would like to recognize and thank Mr. Eddie Maier, the EU's ISTC Governing Board Member since 2013 and former Deputy Head of Unit of Security and Nuclear Safety at the European Commission's Directorate-General for International Cooperation and Development. Eddie retired at the end of 2019, following his last ISTC duty to attend the ISTC Governing Board Meeting GB69, in Yerevan, Armenia. On behalf of the ISTC Secretariat we wish Eddie well in his retirement. I wish to thank the Governing Board and Party Representatives for their longstanding support and guidance, and the entire ISTC staff for their continued hard work and dedication over the last 25 years. We look forward to the next 25 years as we continue to transform and expand.

David Cleave
Executive Director, ISTC

OVERVIEW OF ISTC ACTIVITIES

Grants Paid by ISTC to Scientists in 2019 and Total Grants Paid (1994-2019) - by Country

Country	# of Paid Scientists in 2019	USD Grant Payments to Scientist in 2019	# of Scientists Registered 1994-2019	USD Grant Payments 1994-2019
Armenia	147	361,736	3,686	30,621,582
Belarus	0	0	1,868	15,923,194
Georgia	109	366,342	2,735	22,629,102
Kyrgyzstan	90	206,019	1,489	11,640,881
Kazakhstan	373	876,732	5,225	42,329,650
Russia	0	0	60,942	434,173,310
Tajikistan	130	263,018	835	8,864,906
Total	849	\$2,073,847	76,780	\$566,182,625

**Some scientists participated in multiple projects but were registered once for these statistics*

2019 Project Funding and Total Project Funding (1994-2019) - by Beneficiary Country

Country	Number of funded projects 2019	Allocated funds 2019 (USD)	Number of funded projects Total	Allocated Funds Total (USD)
Armenia	0	0	214	54,298,118
Belarus	0	0	125	32,005,277
Georgia	1	120,000	206	43,485,214
Kazakhstan	2	650,340	290	110,234,986
Kyrgyzstan	2	3,078,229	105	31,759,676
Russia	0	0	2,630	897,686,073
Tajikistan	3	1,026,340	72	26,992,226
Ukraine	0	0	1	64,296
Regional	2	3,663,308	10	22,770,073
Total	10	\$8,538,217	3,653	\$1,219,295,937

2019 Project Funding by Technology Area

Tech area	Number of funded projects 2019	Allocated funds 2019 (USD)
Environment	4	7,046,769
Fission Reactors	1	293,108
Medicine	2	190,000
Other Basic Sciences	1	358,000
Physics	2	650,340
Total	10	\$8,538,217

2019 Partner Project Funding by Party

Party	Number of projects 2019	Partner Funding 2019 (USD)
European Union	1	3,370,200
United States	3	3,371,337
*Total:	4	\$6,741,537

MAJOR TARGETED INITIATIVES IN 2019



Nuclear Non-proliferation, Security & Safety Capacity Building

Nuclear Safety and Safeguards Support for Southern African States

Through the EU funded project, the ISTC implements capacity building activities for safe uranium mining and transport, and facilitates the exchanges of best practices with sub-Saharan African countries. The ISTC works with the IAEA and the African Commission on Nuclear Energy to assist the 16 member states of the Southern African Development Community to increase the level of nuclear safety and security culture and live up to their international commitments under United Nations Security Council Resolution 1540 (UNSCR 1540). The project successfully launched a web-based Information Tracking System (ITS) in Tanzania, Malawi, Zambia, and Namibia to monitor cross-border transport of uranium ore concentrate and exchange relevant data in a fast and consistent manner. In 2019, the ISTC supported training and workshops for 384 experts. During a Project Steering Committee Meeting, Prime Minister of Tanzania Kassim Majaliwa expressed “deep appreciation to the EU” for the nuclear safety, security, and safeguards support through the project. In 2019 project participants Comoros and Zimbabwe ratified the Convention on the Physical Protection of Nuclear Material and IAEA Comprehensive Safeguards Agreement and Additional Protocol.

Nuclear Security Support in Eastern and Central Africa

The EU funds the ISTC to support its EU CBRN Centres of Excellence (CoE) to implement activities in 11 Eastern and Central African countries to strengthen and harmonize the nuclear regulatory frameworks, enhance their nuclear safety and security, and to support their efforts to the international obligations they have assumed under a plethora of UN and multilateral treaties and conventions, such as the Nuclear Non-Proliferation Treaty, the International Atomic Energy Agency (IAEA), the Convention on the Physical Protection of Nuclear Material, and the UNSCR 1540. In 2019, the ISTC supported 27 train-the-trainer courses and tabletop and field exercises involving almost 150 participants. The project team also completed 11 national nuclear detection equipment needs assessments and provided input to national reporting on UNSCR 1540.

Peaceful Uses of Nuclear Energy and Nuclear Applications and the Role of National Security

The ISTC organized three U.S. Department of Energy National Nuclear Security Administration (DOE/NNSA) panel discussions in 2019, in partnership with the Vienna Center for Disarmament and Non-Proliferation/Middlebury Institute. The discussions covered key aspects of nuclear security as part of the sustainable use of nuclear and other radioactive materials for IAEA Member States.



Biosafety & Biosecurity

Biosafety and Biosecurity Training and Strengthening National Legal Frameworks in Central Asia

The EU funds the ISTC to support its EU CBRN CoE to implement activities to provide specialized biosafety and biosecurity training and strengthen relevant national legal frameworks in seven Central Asian countries. The effort aims to 1) Raise awareness and promote collaboration on biosafety, biosecurity, emergency response, and incident management issues locally and regionally, 2) Strengthen relevant biosafety and biosecurity national legal frameworks and harmonize them with the World Health Organization’s International Health Regulation (WHO IHR), Biological

Weapons Convention (BWC), and Codex Alimentarius food safety laws, and 3) Strengthen local and regional training infrastructure and tailor local biosafety and biosecurity training to international standards, while stimulating regional cooperation. In 2019, the ISTC helped organize a conference on “Bridging the Gaps” for over 170 participants to discuss strengthening policies, national regulatory frameworks, and capacity to mitigate biosafety and biosecurity risks. The ISTC also funded workshops for more than 280 experts.



Dual-Use Export Control

Export Control on Dual-Use Materials and Intangible Technologies in Central Asia

The ISTC supports EU funded efforts to engage relevant academic communities in Central Asia and adjacent regions by raising awareness of the risks related to intangible transfers of technology. Activities foster the social and civic role of scientists in society and seeks to enable them to assist national authorities to establish and maintain a comprehensive export control regime, and to provide relevant industries with guidance on compliance. The practical implementation involves building a network of scientists through a series of conferences and courses and through an electronic discussion platform. In 2019, the ISTC coordinated training and events for 55 participants and organized a doctoral research grant. The ISTC also supported the development of export control handbooks for

Armenia and the Kyrgyz Republic, and modeled internal control programs for Armenia and Kazakhstan.

Commodity Identification Training in Armenia

The ISTC supports DOE/NNSA efforts to improve the ability of Customs personnel to identify dual-use commodities that are subject to diversion and use in chemical, biological, nuclear, radiological, or missile development programs. The goal of this training is to: 1) familiarize Customs inspectors with WMD-related materials and equipment as identified on the control lists of multilateral export control arrangements; and 2) familiarize participants on how changes to Armenian export control legislation will impact customs clearance procedures and enforcement obligations. In 2019, the ISTC worked with Armenia’s Research Center for the Problem of Non-proliferation of Weapons of Mass Destruction (NPC) to conduct two Commodity Identification Training (CIT) events in Armenia.



Seismic Monitoring & Hazard Mitigation

The Uplift and Seismic Structure of the Greater Caucasus

In a partnership funded by DOE/NNSA, leading scientists in the Caucasus and collaborators from three U.S. Universities (University of Missouri, Oregon State University, and Michigan State University) are carrying out a large scale regional passive seismic experiment to study the structure of the Greater Caucasus, among the fastest-growing mountains in the world. Merging data from 52 temporary seismic stations with data from the national seismic networks of participating countries, the project will create robust models of 3-D seismic velocity structure and determine accurate hypocentral earthquake locations for the Caucasus-Caspian region to better understand the uplift mechanism for the Greater Caucasus. Project experts completed three expeditions to service and maintain stations in 2019 and finalized a two-year project extension.

Seismic Network Expansion in the Caucasus and Central Asia

Funded by DOE/NNSA, this partnership is advancing a coordinated regional approach to seismic monitoring and earthquake hazard mitigation in Central Asia and the Caucasus. Since earthquakes do not stop at national borders, effective monitoring, hazard assessment, and risk mitigation requires sustained regional collaboration. The project is strengthening regional seismic monitoring by expanding national seismic networks with additional high-quality digital broadband seismic stations, as well as short-period seismic stations to monitor specific hazards such as volcanoes. Participating ISTC countries include Armenia, Kazakhstan, Kyrgyzstan, and Tajikistan, and STCU participants are Azerbaijan and Georgia. Working with project collaborators from Lawrence Livermore National Laboratory and the Incorporated Research Institutes of Seismology, the project is making capacity improvements sustainable by providing training on best practices at every step: from seismic station site selection, to equipment installation and maintenance, to data processing and long-term network management.

KEY TRAINING AND EVENTS

Nuclear Security Workshop in Vienna

The ISTC organized an EU funded side event at the IAEA General Conference on "EU Contribution to the International Security Regime – Advances in Nuclear Security in CoE Region East and Central Africa," attended by more than 60 high ranking officials, diplomats, and experts from the EU, the IAEA, and the African Commission on Nuclear Energy.

Peaceful Uses of Nuclear Energy and Nuclear Applications and the Role of National Security

In partnership with the Vienna Center for Disarmament and Non-Proliferation/Middlebury Institute, ISTC facilitated three DOE/NNSA panel discussions in 2019, covering key aspects of nuclear security as part of the sustainable use of nuclear and other radioactive materials for IAEA Member States.

Electronic Commodity Identification Training

In December 2019, the ISTC arranged for officials from Kenya and South Africa to participate in a DOE/NNSA Electronic Commodity Identification Training held near Chicago, Illinois.

Nuclear Safety Courses

The ISTC coordinated EU funded nuclear safety courses for over 120 professionals from Zambia, Zimbabwe, Malawi, South Africa, Mozambique, Tanzania, Botswana, Eswatini and DR Congo organized by the RSA National Nuclear Regulator in Centurion, South Africa, and by the Radiation Protection Board in Lusaka, Zambia.

Regional Seismic Workshop

The ISTC supported the implementation of a DOE/NNSA funded workshop on Location Improvement Using 3D Models in the Gulf Region, in partnership with the Kuwait Institute for Scientific Research. The four-day workshop was attended by 16 trainees from Gulf countries.

Export Control on Dual Use Materials and Intangible Technologies

Organized an EU funded conference on Dual-Use Education and Non-proliferation Awareness Raising, CONDENSE, in August in Ypres, Belgium, involving 33 young scientists from 17 countries.

Nuclear Safety and Security Exchange

The ISTC organized an EU funded visit for 23 representatives from 13 South African states to visit Finnish nuclear safety and security institutions and exchange best practices.

Commodity Identification Training in Armenia

The ISTC supported implementation of DOE/NNSA funded Regional Commodity Identification Training at two customs points in Armenia to improve the ability of Customs personnel to identify dual-use commodities that are subject to diversion and use in chemical, biological, nuclear, radiological, or missile development programs.

Strengthening the National Legal Framework and Provision of Specialized Training in Central Asian Countries

Aiming to raise biosafety/security awareness and cooperation, the EU funded ISTC to provide equipment, supplies, and training for all participating partner countries. EU trainers conducted seven workshops for 88 biosafety experts who, after training, held more than 60 biosafety courses for 2,000 participants in their countries.

Central Asia Seismic Hazard Assessment and Bulletin Unification

The ISTC organized a DOE/NNSA workshop in Almaty for participants and collaborators to review progress in digitizing analog seismic bulletins. Once digitized, the project will merge and re-analyze the bulletin data to create improved seismic hazard assessments.

Strengthening Scientific Networks

The ISTC organized Japan-funded efforts to strengthen international scientific networks by providing training and scientific exchange opportunities for experts from ISTC member countries. This included participation in several events in Japan including a Science and Technology in Society Forum for young scientists, a conference for new energy technologies, and an agricultural exposition. Japan also funded participants to attend an astronomy conference in Kazakhstan and a nonproliferation fellowship in the United States in 2019.

Biosafety Association of Central Asia and the Caucasus: "Bridging the Gaps" Conference

In March, over 170 participants from Central Asia, the Caucasus, Eastern and Western Europe, United States, and various international organizations joined an EU funded discussion on cooperation and coordination and to stimulate discussions on strengthening policies, capabilities and capacities to mitigate Biosafety and Biosecurity risks in Tashkent, Uzbekistan.

-  Participants of ISTC Activities in 2019
-  Nuclear Non-proliferation, Security & Safety Capacity Building Initiative
-  Biosafety & Biosecurity Initiative
-  Dual-Use Export Control Initiative
-  Seismic Monitoring & Hazard Mitigation Initiative

Research and commercialization at “Armbiotechnology” Centre

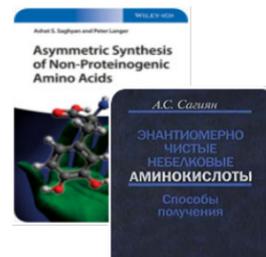
The Centre “Armbiotechnology” NAS RA is the only Armenian centre responsible for the development of biotechnological science and research. In a joint funding effort between the EU and U.S., the ISTC plays a role in the Centre’s achievements, having successfully completed three commercialization projects, one regular project, and 13 projects on organization of scientific conferences and workshops. Most importantly, and successfully realized, commercial projects include research aimed at the development of methods for the biomimetic asymmetric synthesis of optically active non-protein (R-) and (S)-amino acids, short peptides, and other biologically active substances. Total project cost was \$400,000.



Supporting Armenian laboratories to combat COVID-19

In 2019, a team of experts from the Integrated Quality Laboratory Services (IQLS), a U.S. Defense Threat Reduction Agency’s (DTRA) and ISTC subcontractor, provided consulting to support laboratory systems in Armenia, with a total project cost of approximately \$2.1 million. The support was aimed at strengthening capabilities of human and veterinary laboratories to develop systems for detecting, diagnosing, reporting, and securing of especially dangerous pathogens (EDPs) and non-EDP differential diagnosis by implementing “One-health” principles and using syndromic approach. IQLS, in collaboration with the National Center for Disease Control and Prevention of the Ministry of Health (NCD/CP/MOH), the Nork Infectious Hospital, and the Republican Veterinary Sanitary and Phytosanitary Laboratory Services Center implemented the following activities:

- Laboratory system level workshops: sample transportation, reference laboratories, tiered level laboratory system, strengthening local/Marz lab networking capacities
- Theoretical trainings: quality management systems, biosafety and biosecurity, equipment management, diagnostic algorithms
- Practical bench-level trainings: bacteriology, serology, molecular biology
- External Quality Assessment (EQA): development of national programs, support in participation in international EQA subscription



PROJECT HIGHLIGHT

Synthesis and screening of a new generation of optically active non-proteinogenic α -amino acids, peptides and polymers containing unsaturated groups in the side chain

“Armbiotechnology” obtained 19 new non-proteinogenic amino acids. Samples were passed to the group of synthesis of peptides, polymers, and biochemical and microbiological research for further studies. Based on the obtained amino acids, four peptides and the corresponding activated and protected derivatives were synthesized; three biodegradable polymers for use as matrices when fabricating the nanoparticle; and 19 biochemical and microbiological amino acids were isolated from different sources. Compounds inhibiting collagenase activity have been revealed and IC50 values for inhibitors have been determined.

Leading Institute	Yerevan State University
Foreign Collaborators	The University of Texas at San Antonio, Universitat Politècnica de Catalunya, Université de Paris Sud, University Rostock, Université de Nantes
Project Duration	August 2017 – July 2020
Funding Parties	EU and U.S.
Project Cost	\$400,000

High mountain large lakes as a key component of local environment, study of natural and man-made impacts

This EU-funded project is a comparative study of the natural and anthropogenic impacts on the environments of high-mountain lakes to develop models of future lake evolution. Changes of geological and climate conditions have caused fluctuations of water level – Lake Sevan (Armenia), Lake Parvani and Saghamo (Georgia), and Issyk-Kul (Kyrgyzstan) – and brought changes in their environments. The project produced a comprehensive GIS database on geological hazard assessment; morpho-structural age of lacustrine sediments and deformed terraces; geophysical and geochemical investigation of landscapes, sediments, and submerged man-made structures; gas emissions; and geochemical activities and anomalies. The database is in high demand for social and economic development of the studied lake areas. Total project cost was \$392,084.



Top: Sediment coring from ice on Lake Paravani with Estonian collaborators, from the Tallinn University

Lower Left: Water, sediment and gas sampling in Lake Sevan

Lower Right: Fieldwork on surroundings of Lake Issyk-Kull

Mycobacterium bovis infection in South Caucasus and its health burden

This joint Japan, U.S.-funded study examines the genetics and health burden of bovine tuberculosis (bTB) in cattle, providing valuable information on bTB epidemiology, human infection risk pathways (likely the cause of prevalence of human TB in Georgia), and on dissemination routes in the Caucasus region. During the study, 1,700 randomly selected animal corpses were inspected, and 429 cases were selected for lab examination. Project cost was \$291,150.



PROJECT HIGHLIGHT

Open access database of antimicrobial activity and structure of peptides

The ISTC provides a comprehensive tool to perform de novo design of peptide-based anti-infectives with desired properties. A database was created of antimicrobial/cytotoxic activities and structures of peptides (DBAASP) as a repository of activities, chemical, and 3-D structures of 15,000 peptides.

Graphic: In 2019, users from 102 countries have used DBAASP

Leading Institute	I. Beritashvili Center of Experimental Biomedicine (IBCEB), Tbilisi, Georgia
Foreign Collaborators	National Institute of Allergy and Infectious Diseases
Project Duration	February 2014 – February 2021
Funding Parties	U.S. Department of Health & Human Services / National Institute of Health / National Institute of Allergy and Infectious Diseases / Office of Cyber Infrastructure and Computational Biology
Project Cost	\$535,300



REPUBLIC OF KAZAKHSTAN

Environmental risk assessment of nuclear excavation tests: Chagan Underground Nuclear Test at the Semipalatinsk Test Site, Kazakhstan, a case study

Complex radioecological research showed large areas to the north and northeast from the “Atomic” lake region, situated at Semipalatinsk Test Site, that are highly contaminated with long-lived radionuclides. Contaminated soils of ²⁴¹Am, ¹³⁷Cs, ⁹⁰Sr, and ²³⁹⁺²⁴⁰Pu of minimum significant activity were treated as solid radioactive waste. In partnership with the EU and Japan’s Atomic Energy Agency, the National Nuclear Center of the Republic of Kazakhstan / Institute of Radiation Safety and Ecology, Kurchatov, Kazakhstan developed a remediation plan, which included actions to remove soil, create ditches, and fence the outer part of the site. Project cost was \$120,000.

Molecular characterization of swine influenza viruses circulating in different regions in Kazakhstan and comparison with contemporary human influenza viruses

In a partnership between the Institute of Microbiology and Virology, Almaty, Kazakhstan and St. Jude Children’s Research Hospital, Memphis, Tenn., this project characterizes the prevalence of influenza viruses in swine in Kazakhstan, and looks to identify zoonotic and reverse zoonotic transmission events. 719 biosamples were collected from swine farms and private farmsteads, and 1,266 nasopharyngeal swabs and 235 blood serums from patients in healthcare facilities, that isolates a cluster combining influenza A/ H1 virus strains of the HA gamma lineage (A/ California/07/2009 (H1N1)pdm, A/swine/ Italy/153511-11/2013 (H1N1), A/Ohio/09/2016 (H1N1), A/swine/Illinois/A01462632/2015(H1N2)). These isolates are highly similar to A/Michigan/ 45/2015 (H1N1)pdm09 strain, recommended by WHO as a vaccine strain during the 2018-2019 epidemic season. Total project cost was \$300,000.



Swine nasopharyngeal swab collection



PROJECT HIGHLIGHT

Advancement of nuclear forensics activities in Kazakhstan

This DOE/NNSA funded project looks to create a national nuclear forensics library by cataloguing uranium ore concentrate and other nuclear materials in Kazakhstan. Testing for nuclear materials was conducted on five samples of uranium ore concentrates from the Lawrence Livermore National Laboratory (LLNL). The works are being performed on the study of the list of nuclear materials, stored in the INP asset zone, and discussions are ongoing on the opportunities to receive the samples of the selected materials for experimental laboratory study.

Photo: Joint discussion of the obtained results

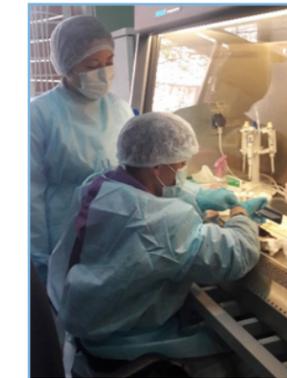
Leading Institute	Institute of Nuclear Physics, Almaty, Kazakhstan
Foreign Collaborator	Lawrence Livermore National Laboratory, USA
Project Duration	February 2018 – August 2020
Funding Parties	U.S. Department of Energy / National Nuclear Security Administration
Project Cost	\$400,000



KYRGYZ REPUBLIC

Monitoring especially dangerous Zoonotic diseases in the protected areas in Kyrgyzstan

Since 2017, in a partnership with French Public Agency Expert, scientists of the Institute of Biotechnology of the NAS KR led 24 field expeditions to collect biological materials for monitoring zoonanthropotic (zoonotic) diseases circulating in protected areas of the Kyrgyz Republic. In total, about 3,000 biological samples were collected, from which DNA and RNA were isolated. DNA and RNA are cataloged and stored at -80 C° for further assays. Real time polymerase chain reaction (PCR) is performed with these samples to detect anthroozoonosis diseases. Through these efforts, scientists have revealed a number of zoonanthropotic diseases circulating in the wild. This three-year project costs \$300,000.



Process of DNA and RNA isolation



Expedition in the Issyk-Kul region



Project participants take biological samples



PROJECT HIGHLIGHT

Expanding global knowledge of tuberculosis by establishing the Tuberculosis Portal

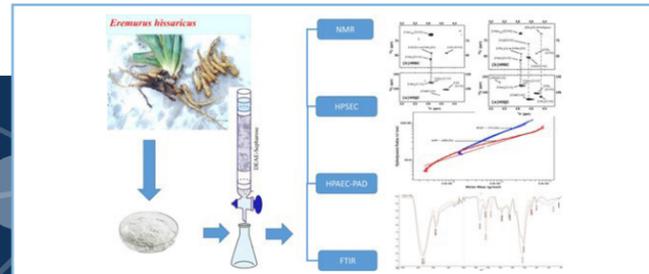
ISTC continues to implement Tuberculosis (TB) Portals projects including one in Kyrgyzstan. Through an international consortium of doctors, radiologists, and microbiologists from countries with a heavy burden of drug-resistant tuberculosis, this online portal is a repository of data collected from TB patients used to assess the epidemic situation, conduct drug sensitivity analysis, and mapping.

Photo: Isolation of Mycobacterium tuberculosis strains

Leading Institute	National Center of Phthysiology Bishkek, Kyrgyzstan
Foreign Collaborators	National Institute of Allergy and Infection Diseases, USA
Project Duration	February 2017 – January 2020
Funding Parties	U.S. Department of Health & Human Services / National Institute of Health/National Institute of Allergy and Infectious Diseases/ Office of Cyber Infrastructure and Computational Biology
Project Cost	\$70,000



REPUBLIC OF TAJIKISTAN



PROJECT HIGHLIGHT

Biological activities from Plant Oligosaccharides and their complexes with polyphenol

A water-soluble polysaccharide (galactomannan-GM) and an acid-soluble polysaccharide (galactoglucomannan), with 23% and 8% yields, respectively, were obtained and characterized by FTIR, HPAEC-PAD, HPSEC, methylation linkage analysis, and NMR spectroscopy. These polysaccharides are an available raw material with the potential for use in several industrial applications. The study of these polysaccharides and oligosaccharides (OS) were obtained from fruit pomace (grape, apricot, and bee glue) and *Eremurus Hissaricus* (*E. Hissaricus*) growing in the Tajikistan Republic to create an advanced healthy material (AHM). As part of the project, biologically active compounds have been obtained and chemically characterized.

Photo: *E. Hissaricus* in flowering phase and lower part of the plant

Leading Institute	Chemistry Institute of the Tajikistan Academy of Sciences
Participating Institute	Institute of Botany, Plant Physiology and Genetics of the Tajikistan Academy of Sciences
Project Duration	May 2016 – July 2019
Funding Parties	U.S. DOS, USDA
Project Costs	\$374,000

Molecular characterization of field isolates and improving surveillance for rabies in Tajikistan

This project, funded by the British Ministry of Defense, became the basis of the Monitoring and Evaluation Plan for the “Comprehensive Rabies Control Program in the Republic of Tajikistan,” which contributes to improvement of the epidemiological surveillance of zoonotic diseases in the country. A new diagnostic method – polymerase chain reaction (PCR) – has been established for rabies diagnosis from 502 samples of animal species (of which, 247 tested positive). As this diagnostic assay has been ratified by the World Organisation for Animal Health (OIE), it is used to replace the former test as a confirmatory assay for rabies. The results of this project are impactful to establish new diagnostic capabilities, enhance biosecurity and biosafety, and national surveillance and sustainability. Total project cost was approximately \$400,000.



(Left and right) Identifying samples to test

PROJECTS COMPLETED IN 2019

TITLE	COUNTRY	LEAD INSTITUTE	FUNDING BY	COLLABORATOR COUNTRY
Control of light in structured nonlinear media	Armenia	Institute for Physical Research		
Phage therapy against MDR Salmonella infections	Armenia	Institute of Molecular Biology		
Development of method for obtaining slow-action fertilizer from aluminosilicate	Armenia	Institute of General and Inorganic Chemistry		
System for protection from explosions	Georgia	G. Tsulukidze Mining Institute		
Epidemiology of CRE in Georgia	Georgia	National Center for Disease Control and Public Health		
Atomic Lake	Kazakhstan	National Nuclear Center of the Republic of Kazakstan / Institute of Radiation Safety and Ecology		
Lithium. Tritium.	Kazakhstan	National Nuclear Center of the Republic of Kazakstan		
Investigation of HTGR fuel	Kazakhstan	Ministry of Energy of the Republic of Kazakhstan / Institute of Nuclear of Physics		
Novel antibiotics and anticancer agents from extremophilic actinomycetes	Kazakhstan	Institute of Microbiology and Virology		
Functional food additives	Tajikistan	Institute of Chemistry named after V.I.Nikitin, Academy of Sciences, Republic of Tajikistan		

¹ U.S. Department of Health & Human Services / National Institute of Health / National Cancer Institute

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