Annual Report
2012
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Annual Report 2012
18 Years Supporting International Scientific Cooperation
Innovation, cooperation, and adaptability have been the three pillars of success for the International Science and Technology Center (ISTC). Today, the ISTC is widely acclaimed for creating beneficial technologies, encouraging commercialization, generating economic growth, promoting greater public health, improving our environment, and advancing both basic and applied science. All the while, the ISTC has stayed true to its core objective, advancing international security in the interests of all of its members. 

As the ISTC prepares to move to a new headquarters in Almaty, Kazakhstan, emphasis is on sustaining cooperation and building deeper partnerships. Drawing upon lessons learned along the way, the Center continues to transform itself into a more modern, agile, efficient, and effective intergovernmental science organization, looking to enhance international security and prosperity. 

The world now is very different from the world twenty-one years ago when the foreign ministers of Russia, Germany, and the United States jointly issued a call for the creation of the ISTC. The ISTC is different also. The founders of this bold initiative were focused on quickly addressing dangers arising from the legacies of the past. Today, the members of the ISTC are teamed to address new challenges facing humanity’s future. The founders may not have envisioned that more than 40 countries would eventually become engaged. They could not have anticipated that contributions thus far would total $1 billion, of which more than $668 million has supported more than 2,700 projects with grants to over 77,000 scientists. Nor could they have anticipated that the full richness of their talent.

The evolution of the ISTC continues. Support from member governments has been essential. These Parties provide the leadership necessary for the ISTC to be of continuing value. At the same time, the development of the Partner’s program, through which both government and private entities can fund cooperative science, has more than matched regular government funding for projects and has created greater opportunities for mutual benefit. 

From the beginning, the ISTC has adapted to changing circumstances and the evolving needs of the parties. Important experiments, modifications, and reforms over the years included the introduction of international accounting practices and standards and programs for promoting commercialization of suitable technologies to deal with public needs such as health, safety, environment, remediation and restoration. Important training was added to develop best practices in business skills including the protection of intellectual property. New fields of science and new generations of scientists joined the effort. Increasingly, projects were targeted toward the priorities of the members rather than just the interests of the researchers. Many projects became intensely multilateral in both participation and funding.

Seven years ago, the ISTC made a decision to transform itself further to serve the Parties better as they seek to meet contemporary and emerging needs. Building upon changes already made and experiments already undertaken, the transformation underway encourages a spirit of true partnership, promotes more balanced co-funding of projects, reduces overhead and administrative costs, and increases efficiency and agility.

To measure the value of the ISTC, the Center is often asked to report on inputs to the Center such as funding, facilities, and equipment. The best measures however, involve outputs such as knowledge enhanced, health improved, partnerships created, and societies advanced. Above all, we must recognize that the many contributions of the ISTC are really the product of the scientists, engineers, physicians, and technicians from many different countries and cultures who work together every day through the ISTC for the benefit of all.

Working across many time zones, in numerous countries, under different circumstances, and to meet specific needs is a tremendous challenge. In overseeing this effort, the Governing Board has benefited from the wisdom of its members, lead by the dean of the Board, Minister Lev Ryabyev of the Russian Federation. The Board has also benefited from strong support from the Parties and during this period of transition must acknowledge the special leadership undertaken by the Government of Kazakhstan.
2012 represented a difficult year for the organization, as downsizing, which was started several years ago, was continued, funding in support of research projects from the Parties continued to decline, and the Executive Director for the past four years unexpectedly departed at the end of August. However, despite these challenging developments, staff continued to respond in a positive way and the operations were maintained at a high level of professionalism and client service throughout the year.

Partner funding became more and more important and rose to the highest percentage level (85%) since the program was initiated in the late 1990s, both in terms of project support and supplementary budget activities. These activities include such things as supporting scientist travel to meet with colleagues internationally and to attend important training sessions and workshops, funding patents, and supporting maintenance contracts related to security upgrades at key facilities and institutes. During the year, new projects funded by both Parties and Partners focused on Central Asia, the Caucasus and Belarus. The EU has recently become very active through DEVCO as a partner to the ISTC and is supporting more than EUR 6.8 million in new project activities, with a focus on biosafety and biosecurity in Central Asia.

Most importantly, supplementary activities continued to be developed and implemented and comprised a more significant percentage of the Center’s activities during the year. For example, new targeted initiatives (TIs) continued to be expanded, with project developmental workshops being held in various countries, such as the Science and Technology for the Prevention of Biological Threats: Progress & Future Plans Workshop (Center on Export Controls) held in Bishkek, Kyrgyzstan; the Probiotics TI International Conference Bacteriophages and Virology in Tbilisi, Georgia; and the Efforts Against Illicit Trafficking of Nuclear and Radiation Materials in Central Asia – Regional Priorities and Experience under the TI on Scientific and Technical Support against the Illicit Trafficking of Nuclear and Radioactive Materials held in Almaty, Kazakhstan.

Other important developments included the re-engagement of the Norwegian Party in supporting a major joint expedition to the Kara Sea, involving both Norwegian and Russian scientists working together to monitor possible radiation effects of previously sunken nuclear waste materials and a previously scuttled nuclear submarine. Follow-up workshops to present data and results are now planned in 2013 through the ISTC.

Additionally, the catastrophe at the Fukushima Daiichi nuclear plant in Japan stimulated the ISTC and its Parties to reach out to try and assist in some way. The immediate engagement and funding support provided by the US Department of Energy GIPP resulted in funding and support for many meetings between Russian nuclear scientists, who had previously worked on resolving similar technical problems related to the Chernobyl disaster, and Japanese experts, both in Japan and Russia. A follow-up Call for Proposals was subsequently carried out jointly with the sister center STCU in Ukraine and resulted in identification and funding support for at least 6 new projects which will focus on rehabilitation and monitoring aspects connected to the Fukushima area.

As the new Executive Director, I have been tasked to continue the winding down of operations in Moscow and the Russian Federation in 2013, while maintaining a high level of support for the other member countries of the organization; to continue to manage the over 180 projects still underway in seven countries; and to continue to engage with the dozens of Partner companies and government agencies and the network of scientific collaborators across the globe supporting this work. At the same time, the government of the Republic of Kazakhstan has invited the ISTC to relocate its headquarters to that country. As a direct result, a new multilateral agreement to continue the ISTC and a bilateral agreement between Kazakhstan and the ISTC to host the headquarters are under development. A new Facility Agreement to provide office space for an expanded office and staff in Almaty as a precursor to establishing a main office is also being negotiated at this time.

These developments serve to demonstrate clearly the continuing interest of most of the countries which belong to and support the ISTC in continuing to use science and technology as a means of ensuring security, both locally and globally. Providing the support necessary to a part of the world still requiring partnership and engagement of its scientific community remains critically important. However, an additional new focus of future efforts on a wider geographic area and on subjects which will continue to address such themes as disease surveillance, illicit trafficking of CBRN materials, detectors for these materials, and other targeted initiatives aimed at supporting global security and non-proliferation can only strengthen this dimension of the ISTC.

The currently increasing importance of Partners to the operations in fact reflects a previous strategic direction and will be part of the foundation of the “new and improved” ISTC being established in Kazakhstan. Private-sector engagement to support innovative new work in areas responding to security challenges will be promoted as will non-government and other government-agency partnerships devoted to global non-proliferation and to addressing security issues of regional and global concern.

It is my honor and privilege to be selected to play a pivotal role in the transition of the organization to a new and dynamic level, which will reflect the changing times as well as the equal partnerships planned between all member countries that will form the foundation for future engagement.

The staff which comprises the Secretariat - those remaining and those who were vital members in the past - can be proud of the fact that they have played a significant part in helping to make the world a safer place over the past eighteen years.
OVERVIEW OF ISTC ACTIVITIES IN 2012

ISTC – Pursuing our Objectives

The ISTC coordinates the efforts of numerous governments, international organizations, and private sector industry, providing scientists from Russia, Georgia and the CIS new opportunities for international partnership. The ISTC plays a central role in the management of these science partnerships.

Overview of ISTC Activities

- The information provided below gives an overview of funded projects by financing source, beneficiary country and technology area.
- These figures show that between 1994 and 2012 the ISTC supported 2,764 projects with a total value of USD $868,047,033. Most projects were funded in the areas of environment, biotechnology, physics and fission reactors. Over the years the EU and the USA have been the main sources of funding for ISTC projects and to date research institutes in the Russian Federation have benefited most from this funding.
- However, this year, the ISTC’s Partners provided 85% of the funding, which illustrates that the Center is now moving in a new direction. Additionally, this funding is directed more and more to the ISTC’s countries in Central Asia and the Caucasus.

2012 Project Funding and Total Project Funding (1994-2012) - by Source

2012 Project Funding ($ 4,560,663) by Source

1994-2012 Total Project Funding ($ 868,047,033) by Source

**Please note that real number of funded Partner Projects is 750 as there are several partner projects where 2 or 3 Partner Companies are involved**

Grants paid by the ISTC to Beneficiary Scientists in 2012 and Total Grants paid (1994-2012) - by Country

Grants paid ($ 11,589,557) in 2012 by the ISTC to Beneficiary Scientists

Total grants paid ($ 541,032,117) by the ISTC to Beneficiary Scientists
18 Years Supporting International Scientific Cooperation

<table>
<thead>
<tr>
<th>Tech area</th>
<th>Number of funded projects-Total</th>
<th>Allocated funds-Total (USD)</th>
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<td>Space, Aircraft &amp; Surface Transportation</td>
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Total: 2,764 868,047,032

2012 Project Funding and Total Project Funding (1994-2012) – by Beneficiary Country

2012 Project Funding ($5,460,665) by Beneficiary Country

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<th>Allocated funds 2012 (USD)</th>
<th>Number of funded projects Total</th>
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Total: 12 5,460,665 2,764 868,047,032

1994-2012 Total Project Funding ($868,047,032) by Technology Area
Increases in agricultural production and the maintenance of high crop yields are possible only by using fertilizers. Soluble fertilizers are applied in large quantities, significant proportions of which are lost to the environment through leaching. The pollution this causes has an adverse effect on ecosystems and the health of humans and animals.

To combat this problem, an environmentally friendly and economically efficient technology has been developed for production of a polymerized, multi-component and prolonged-action fertilizer. The fertilizer releases nutrients to plants in a controlled manner, thereby preventing losses and contamination of the environment. The application of controlled-release fertilizers enables a reduction by up to 50% of mineral fertilizers used. This new composition increases the coefficient of nitrogen assimilation by plants and improves germination. This in turn enables a 45-50% drop in the required seeding material volume and a 10-20% rise in the harvest.
Scientists are coming to recognize more and more the long-term cosmic threat associated with near-Earth asteroids (NEAs) and the systematic monitoring of all large objects is essential for forecasting and evaluating the potential hazards of an impact hazard with the Earth. This was most recently demonstrated when a small asteroid with an estimated mass of 10,000 tons exploded at a height of 23 kilometers with the force of approximately 400 kilotons of TNT over the Chelyabinsk Oblast of Russia on February 15, 2013 causing a fireball that was witnessed by thousands and widespread damage, but luckily no fatalities. This event is especially troubling because there was no prior knowledge of this asteroid before it entered the earth’s atmosphere.

Thus project T-1629 seems particularly timely as it was designed to arrange a fireball network of 5 observation stations in Tajikistan to obtain new scientific knowledge of fireball/meteoroid physics and new data on the near-Earth meteoroid environment. The 5 stations, located 80-90 km from one another, have photographed more than 170 fireballs and their trajectory data, radians, orbits, lights curves, masses and densities have all been determined. In addition, observations by the stations of the 2009 Leonid activity (a family of near-Earth asteroids and its parent body, the 2004MB6 NEA) proved unique and confirmed forecasts previously made by foreign astrophysicists. Results and technical knowhow developed as part of T-1629 has added to the international scientific communities’ knowledge of NEAs and our ability to detect and track asteroids that may pose a hazard to earth.
Project #4006
Tick-Borne Encephalitis Virus Population

Leading Institute: Research Institute of Epidemiology and Microbiology, Vladivostok, Russia
Supporting Institute: Limnological Institute, Irkutsk, Russia
Total funds allocated: US $300,000
Total Grants: US $177,600

Project #4006 was aimed at molecular genetic typing and a virulence study of the Far Eastern tick-borne encephalitis (TBE) virus population. It transpires that all strains studied are of the Far East Russia subtype and are clustered into 3 phylogenetic groups. The first cluster contains strains isolated from clinically silent disease cases, while the second and third clusters contain strains from patients with the encephalitis virus. As a result of complete genome sequencing of 35 TBE virus strains, the substitutions were detected, which affect the strains’ virulence.

It was discovered that TBE virus pathogenic potential is made up of strain virulence and the specific features of the patient’s immune system. Immunopathological markers were disclosed which can be used for early prediction of the severity of clinical manifestations and a prognosis of the course of the disease, with the ability to eliminate rapidly the TBE virus or development of chronic infection. The project results are patented, joint field expeditions have been conducted involving the Graduate School of Veterinary Medicine, Hokkaido University, Japan and the Institute of Epidemiology and Microbiology, Vladivostok and, in 2011, a Japan-Russia ISTC Workshop was held in Sapporo on Tick-Borne Encephalitis, Haemorrhagic Fevers and Rabies.

Main objectives and results:
Project #B-1603
Alkali-Based Borohydrides for Hydrogen Production

Leading Institute: Heat and Mass Transfer Institute NAS of Belarus, Minsk
Total funds allocated: US $156,140
Total Grants: US $105,600

Main objectives and results:
The objective of project #B-1603 was to study the hydrolysis of aqueous alkaline solutions of sodium borohydride and develop efficient technologies for generating hydrogen, involving the fabrication of a pilot demonstration model hydrogen generator and kinetic models of hydrolysis of sodium borohydride at low and highly concentrated aqueous alkaline solutions.

The hydrogen generator uses a flow-type reactor applying a circulation scheme, where there is no need to complete hydrolysis in a single pass, a less-effective and smaller-volume of catalyst can be used, where the thermal regime of the catalyst is more uniform, and where the final degree of hydrolysis is easier to control. A catalyst based on Raney nickel has been developed that offers substantial mechanical strength, which can be used in the form of easily removable cartridges, and which contains no precious metals, hence keeping costs low.

The generator produces 1.5 n.m$^3$/h of hydrogen in steady state, while the technical specifications of the generator allow it to obtain as much as 3 n.m$^3$/h and possibly higher. The project results may be applied for development of disposable sources of hydrogen in collaboration with the Institute of Catalysis SB RAS and the range of potential customers is considerable.

Main objectives and results:
Project #B-1603 was aimed at molecular genetic typing and a virulence study of the Far Eastern tick-borne encephalitis (TBE) virus population. It transpires that all strains studied are of the Far East Russia subtype and are clustered into 3 phylogenetic groups. The first cluster contains strains isolated from clinically silent disease cases, while the second and third clusters contain strains from patients with the encephalitis virus. As a result of complete genome sequencing of 35 TBE virus strains, the substitutions were detected, which affect the strains’ virulence.

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Main objectives and results:
Project #B-1603 was aimed at molecular genetic typing and a virulence study of the Far Eastern tick-borne encephalitis (TBE) virus population. It transpires that all strains studied are of the Far East Russia subtype and are clustered into 3 phylogenetic groups. The first cluster contains strains isolated from clinically silent disease cases, while the second and third clusters contain strains from patients with the encephalitis virus. As a result of complete genome sequencing of 35 TBE virus strains, the substitutions were detected, which affect the strains’ virulence.

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18 Years Supporting International Scientific Cooperation

US

During 2012, the United States Party, an original signatory to the ISTC Agreement, continued its major contribution to ISTC operations and remained one of the largest contributors to the Center’s Science Projects. Technology areas supported by U.S.-funded projects include medicine, chemistry, agriculture, environmental science, fission reactors, new materials, and non-nuclear energy. Research efforts of CIS/Georgian scientists, supported by U.S. funding, have resulted in the development of new vaccines, alternative methods for combating various diseases, and advanced materials and technologies to facilitate environmental monitoring, to name just a few. Also in 2012 the US Party has shown leadership and commitment to supporting the ISTC’s planning for future project efforts in the CIS and Georgia. Since 1994 the USA has funded 546 projects to a total amount of US$225,115,151.

Project #KR-1880

Pectin-Based Composites for Biomedical Application

Main objectives and results:
The goal of Project #KR-1880 is to fabricate metal-containing composite nanomaterials based on a natural biological polymer, to be ultimately applied as antitumor and chemosensitizing substances. The pulp of sugar beet Beta vulgaris was used to isolate pectic polysaccharides for this purpose.

Samples of metal-derived pectin nanof ormulations were synthesized, including Cu(0), Fe3O4, Ag(0)-pectin nanocomposites. Nanoparticles of iron oxides Fe3O4 were produced both by an ex situ method, involving the precipitation of nanoparticles followed by their incorporation into the pectin matrix, and using chemical precipitation in situ when the magnetic particles are grown within the pectin matrix. Cu(0)- and Ag(0) pectin nano-

To prove the composition and structure of the fabricated composites, an entire arsenal of modern ultrahigh resolution techniques was used, including FTIR-, Mössbauer-, UV-, EPR-, ultrasound spectroscopies, XRD, SEM, TGA-DSC-thermal analyses.

Estimation of the anticancer potential of the bionanocomposites was performed on Wistar rats against the Pliss lymphosarcoma, Walker carcinosarcoma 256 (W256), and sarcoma 45. Testing of pectin formulations (400 mg/kg) on W256 and sarcoma 45 in experiments with Wistar rats showed high anticancer potential and a capacity to increase lifetime by up to 56%.

The concept of using a pectin-made hydrogel, as a potential delivery vehicle, is based on its biodegradable nature and flexible structural networks, allowing the device to be designed to a specific shape. Moreover, a variety of pharmacological properties of pectins suggest them as a potential source of novel non-toxic drugs.

Main objectives and results:
The goal of project T-1257 was to use modern biotechnology detection technologies to survey and characterize the origins and causative microbes of waterborne acute intestinal diseases found in human populations around the Republic of Tajikistan and to investigate potential methods of prevention and treatment.

Worldwide waterborne intestinal diseases afflict millions of people every year with infants and children often suffering the most, leading to death in severe cases. Although the symptoms of acute intestinal diseases can be very similar there are a myriad of different microbes that can cause them.

Working with collaborators from the bacteriological laboratory of the Research Institute of Medical Sciences of the U.S. Armed Forces (AIRMSc) the project team created the country’s first functioning polymerase chain reaction (PCR) laboratory for diarrheal diseases, using conventional and real-time research methods.

As part of the project, the structure of diarrheal diseases was determined using state-of-the-art PCR methods and the sensitivity of detected pathogens to antibiotics was tested. This study utilized modern and rapid PCR technologies for the first time in Tajikistan to identify and differentiate ten (Shigellae, E. coli, Proteus, Klebsiellae, Salmon. paratyphi, Salmon. paratyphi B, Salmonella, Enterobacter, Campylobacter, and Citrobacter) of the most common bacterial pathogens that cause the vast majority of acute intestinal diseases in patients from different regions of Tajikistan. Another part of this project involved the testing of a wide range of antibiotics in vivo against bacterial pathogens with the drugs ciprofloxacin, chloramphenicol and cefazolin showing the greatest efficacy against the largest number of pathogenic isolates. As intestinal diseases of this type are by no means exclusive to Tajikistan and as the technology applied can generate results in 1-2 days, this study may prove also useful in other parts of the world.
A substantial volume of ISTC Projects is financed jointly by more than one party, or co-funded. A collaborative approach to funding is practicable for a number of reasons, such as interest in the project area and specific objectives shown by several funding parties at a time, ambitious tasks, claimed in the project, which require the involvement of multiple resources, and sharing expenses with a view to sharing anticipated gains.

**PROJECT # A-1591**
Lead Free Glass Frits and Ceramics

**Leading Institute:** Institute of Electronic Materials, Ltd, EN, Yerevan, Armenia

**Funding Party:** EU and RK (233,477 EUR + US $ 120,000)

**Total funds allocated:** US $491,114.49 ($220,000 + 233,477 EUR)

**Total Grants:** US $ 329,800

**Main objectives and results:**
Glass materials are widely used both in industry and in our everyday lives. Glass compositions with a wide range of properties are irreplacable in the production of various display solutions, hybrid films, magnetic heads and many other fabrications in electronics. The most widespread industrial glass composites were developed about fifty years ago on the basis of PbO-B₂O₃ systems. Scientists are now actively investigating lead-free systems to identify structures able to replace toxic oxides of lead and cadmium in glass compositions. The main objective of this project was to optimize the process for identifying structural properties and then to apply them in glassmaking, including vitreous materials, glass-ceramics, and crystals. The method used involves the construction of phase diagrams and glass-formation diagrams by way of the high-speed cooling of liquid melt. The imposition and analysis of the diagrams can then determine the family of eutectic and stoichiometric glass compositions and optimize the search and development of promising new vitreous and glass-ceramic materials. This method significantly reduces the time and cost required for creating promising materials with the necessary properties.

**PROJECT # B-1628**
Optical Multi-Channel Interferometer

**Leading Institute:** B.I. Stepanov Institute of Physics, Minsk, Belarus

**Funding Party:** RK: $150,000; IZFP/Fraunhofer institute, Saarbrücken, Germany: $150,000

**Total funds allocated:** US $300,000

**Total Grants:** US $210,362

**Main objectives and results:**
Project # B-1628 elaborated a new method for the laser-acoustic stimulation of acoustic waves in steel samples using an Electro-Refractive Crystal detector, offering a completely nondestructive and noncontact method for testing metallic components. An added advantage is that recording equipment can be located up to 30 cm away from the investigated sample (30 cm) which facilitates product quality control in places that are usually inaccessible because of high temperatures (up to 150°C).

Two new four-channel laser ultrasonic defectoscopy prototypes were created and it was shown that a laser-acoustic defectoscope based on an optical multi-channel interferometer is suitable for industrial application because of its higher resistance to mechanical vibrations, acoustic noise, and ambient temperature fluctuations. The device can be applied for quality testing of not only industrial samples used in metallurgy, machine-building and microelectronics, but also for the testing of biological objects.

The leading institute is B.I. Stepanov Institute of Physics, Minsk, Belarus.
Partner Projects

In 2012 Partner projects continued to be the main source of ISTC project funding. In particular, Partner projects funded by United States governmental Partners such as the DOE, DTRA, USDA-ARS, EPA and others played the most significant funding role of the ISTC. In addition to OSG Partners the European Union Partner, the European Aid Co-Operation Office, has also contributed significantly to the Partner project program. Some examples of Partner projects that came to fruition in 2012 are presented below.

Partner – The Department of Energy & Climate Change (DECC) of the United Kingdom of Great Britain and Northern Ireland.

**PROJECT #3913P**
Production of Electroluminescent Light Sources

- **Leading Institute:** Russian Federal Nuclear Center - All-Russian Scientific Research Institute of Experimental Physics, Sarov, Russia
- **Supporting Institute:** ELISAR, Ltd, Sarov, Russia
- **Total funds allocated:** US $ 400,958.00
- **Total Grants:** US $154,957.00

**Main objectives and results:**
The objective of Project #3913p was to develop, test, establish pilot production and introduce into medical practice reasonably priced, low-density biochips for diagnostics of a limited set of bacteria and viruses for multiple purposes.

In the course of the project, the technology was fine-tuned for serial production of electroluminescent light sources using unique, domestically-sourced materials, the production of electroluminescent panels was established and 19 new workplaces were created, including 17 for former weapons specialists from the Russian Federal Nuclear Center - All-Russian Scientific Research Institute of Experimental Physics. ELLS panels have been certified and sales have commenced.

**PROJECT #A-1754P**
Laboratory Furnace Production

- **Leading Institute:** A.I. Alikhanyan National Science Laboratory Yerevan, Armenia
- **Total funds allocated:** US $220,781
- **Total Grants:** US $74,708

**Main objectives and results:**
Project #A-1754p was focused on establishing a commercial enterprise under the auspices of the Laboratory for Low Temperature Physics (LLTP) of the Yerevan Physics Institute, for laboratory furnace development, production, upgrading and servicing.

LLTP was supplied with the necessary equipment and materials for initial laboratory furnace development and manufacturing and the necessary production benches were designed and produced. The first high-temperature furnaces have been manufactured and sales have commenced.

In addition to the laboratory furnaces, a range of electronic devices has also been designed and manufactured, including vibrating wire-based sensors, systems for high-temperature measurement in the presence of electromagnetic interferences, step motor PC and manual control drivers.

**PROJECT #K-1541P**
Hydrogel Dressings

- **Leading Institute:** Institute of Nuclear Physics of the National Nuclear Centre of the Republic of Kazakhstan, Almaty
- **Total funds allocated:** US $320,831
- **Total Grants:** US $77,575

**Main objectives and results:**
Project #K-1541p was directed to launch production of hydrogel dressings based on the Electron Accelerator ELV-4 at the Institute of Nuclear Physics of the National Nuclear Center of Kazakhstan.

All necessary authorizations/permissions were obtained for the production of hydrogel dressings in Kazakhstan, the necessary process equipment was procured, installed and commissioned, and a pilot batch of hydrogel dressings was produced. Additionally, all mandatory clinical tests of the pilot hydrogel dressings were successfully completed. The production area was accordingly certified and a commercial batch of 10,000 hydrogel dressings was produced, creating 22 new jobs.
Main objectives and results:
This project was implemented as part of a larger program that DEVCO is conducting through the ISTC with a focus on Strengthening Bio-Safety and Bio-Security Capabilities in Central Asian Countries. The overall objective of the 3-year project can be separated into two key elements: 1) renovation of the training facility (including a dormitory for trainees), and 2) provision of training for medical and bio-research personnel from Central Asian beneficiary countries to improve awareness of modern bio-security/bio-safety practices and concerns, thereby resulting in decreased risk of illicit acquisition/exportation of deadly pathogens, intentional/accidental release of a biological agent and employee contamination. In 2012, the existing facility was fully renovated to become a state-of-the-art training facility, with new laboratory equipment, including real-time PCR and Bio-safety cabinets, which now enables KSCQZD to conduct courses in classical and modern techniques. Additionally, a dormitory for trainees was renovated and equipped for 25 students to stay on campus for up to 6 months. To date a total of 226 specialists (physicians, biologists and lab technicians) from Central Asian beneficiary countries have been trained at the new training facility. As part of the project, training curricula were updated and new approaches introduced, to cover the needs of Central Asian countries. Curricula were developed in line with international biosecurity management standards, particularly the EU CWA 15793:2008 Laboratory Biorisk Management System. The new training facility now enables KSCQZD to conduct courses in classical and modern techniques. Additionally, a dormitory for trainees was renovated and equipped for 25 students to stay on campus for up to 6 months. To date a total of 226 specialists (physicians, biologists and lab technicians) from Central Asian beneficiary countries have been trained at the new training facility. As part of the project, training curricula were updated and new approaches introduced, to cover the needs of Central Asian beneficiary countries.

Main objectives and results:
The main objective of Project T-1818p was to send a Tajik scientist to Europe for one year of comprehensive bio-safety and related laboratory training. The trainee completed a one-month intensive English-language course in Tajikistan before granting of a place at the Robert Koch Institute in Berlin. There the person passed a probationary phase, received theoretical and continued practical training in biosafety, and engaged in practical lab work under the supervision of an RKI group leader. Upon returning to Dushanbe he was able to join an ISTC project as a biosafety trainer.

Main objectives and results:
Enhancing state systems for the accounting and control of nuclear materials is both a requirement outlined in the IAEA comprehensive safeguards provisions and a priority for Nuclear Security Summit participating countries. Today, large-scale reprocessing facilities rely solely on Nuclear Material Accountancy (NMA) to detect material diversion attempts. This US Department of Energy (DOE)-ISTC project leveraged decades of experience from the US-Russian Material Protection Control and Accounting program to examine methods for enhancing diversion detection capabilities. Collaborators, including technical experts from VNIEF, NPO Mayak, VNIF and the Siberian Chemical Combine, focused on the back end of the nuclear fuel cycle to explore new applications of existing, and the development of new, material accounting software, environmental sampling and process monitoring technologies. One of the most exciting outcomes of this collaboration was a computer model that not only simulates theft or diversion attempts, but incorporates the operational capabilities and detection errors of existing software and sensors to estimate the probability that those attempts would be detected. A generic reprocessing system, designed to simulate the PUREX facilities (like those at NPO Mayak, La Hague and Rokkasha), was used to model various scenarios, including one in which the liquid stream was diluted with nitric acid to obscure diversion, and one in which small amounts of liquid were diverted without an attempt to hide the change in total volume. Exchanging simulated sensors for those actually in use, this computer model could be used to evaluate the material diversion detection capabilities at reprocessing facilities worldwide. Responding to the need, identified by the IAEA, to enhance material controls, building on decades of experience, and leveraging existing technologies, this project effectively demonstrates the power of international collaboration and scientist engagement.

Main objectives and results:
One of the most exciting outcomes of this collaboration was a computer model that not only simulates theft or diversion attempts, but incorporates the operational capabilities and detection errors of existing software and sensors to estimate the probability that those attempts would be detected. A generic reprocessing system, designed to simulate the PUREX facilities (like those at NPO Mayak, La Hague and Rokkasha), was used to model various scenarios, including one in which the liquid stream was diluted with nitric acid to obscure diversion, and one in which small amounts of liquid were diverted without an attempt to hide the change in total volume. Exchanging simulated sensors for those actually in use, this computer model could be used to evaluate the material diversion detection capabilities at reprocessing facilities worldwide. Responding to the need, identified by the IAEA, to enhance material controls, building on decades of experience, and leveraging existing technologies, this project effectively demonstrates the power of international collaboration and scientist engagement.

Main objectives and results:
Project #3427p was implemented as part of a larger program that DTRA is implementing through the ISTC in Russia, with a focus on cooperative research and upgrades in bio-security and bio-safety at institutes. The objective of this project is to study foot-and-mouth disease (FMD) strain characterization and enhance bio-safety at ARRIAH by enabling the institute to utilize on-site bio/medical waste generated at the institute and also samples and livestock that they receive for further characterization and study from other veterinary stations and institutes in Russia.
### Agriculture

| #226 | Catalytic Antibodies as Antiviral Therapeutics | Institute of Biogeogenic Chemistry, Moscow, Russia | Partners |
| #254 | Apoptosis and Gangliosides | Institute of Biogeogenic Chemistry, Moscow, Russia | Partners USA |
| #285 | Pre-Clinical Trials of Drugs | Research Center of Toxicology and Biotechnology, Obninsk, Moscow reg., Russia | Partners USA |
| #288 | Technology for Anti-tumor Strain Production | Institute of Biogeogenic Chemistry, Moscow, Russia | Partners USA |
| #291 | Lyme Disease Immunopathogenesis | State Research Center for Applied Microbiology and Biotechnology, Obninsk, Moscow reg., Russia | Partners USA |
| #297 | HIV-1 variability | Scientific Research Institute of Vaccines and Serums, Moscow, Russia | Partners USA |
| #356 | Reference Preparations for Hepatitis C | State Research Center of Virology and Bacteriology, VECTOR, Novosibirsk, Novosibirsk reg., Russia | Partners USA |
| #365 | Allowable Soil Contamination | Scientific Research Institute of Hygiene, Toxicology and Occupational Pathology, Nizhny Novgorod, Russia | Partners USA |
| #386 | Genetic Polymorphism of HIV-1 | Virology Institute of Virology, Moscow, Russia | Partners USA, The Netherlands |
| #400 | Functional Nutrition Synthetic Product | Establishment of the Russian Academy of Medical Sciences Research Institute of Epidemiology and Microbiology, Moscow, Russia | Partners USA, Japan |
| #406 | Tick-Borne Encephalitis Virus Population | Virology Institute of Virology, Moscow, Russia | Partners Japan |
| #574 | Colon Cancer and Inflammatory Bowel Diseases Systematics | Belarusian State Medical University, Minsk, Belarus | Partners EU, Germany |
| #579 | Crop Disease Resistance in the Caucasus Region, Production of Cultivar material for medical and cosmetic applications | Belarusian State University, Institute of Phytopathology, Minsk, Belarus | Partners USA, Japan |
| #583 | Wheat Grain Treatment | National Center of Biotechnology, Stavropol, Krasnodar region | Partners Germany |
| #589 | Refined Enzymatic Preparations | National Center of Biotechnology, Stavropol, Krasnodar region | Partners Germany |
| #591 | Blaneradiation of Mercury Contaminated Groundwater | Institute of Microbiology and Virology, Almaty, Kazakhstan | Partners UK, USA |
| #593 | Animal Disease Diagnostics | National Biotechnology Center of Almaty / Research Institute for Biological Safety Problems, Almaty, Kazakhstan | Partners USA |
| #599 | Genetic Effects of Nuclear Test Site | National Nuclear Center / Institute of Radiation Safety and Ecology, Karaganda, Kazakhstan | Partners Germany |
| #599 | M.Tuberculosis Multi-Drug Resistance | National Center of Cardiology and Internal Medicine, Bishkek, Kyrgyzstan | Partners Germany |

### Biotechnology and Health

| #226 | Catalytic Antibodies as Antiviral Therapeutics | Institute of Biogeogenic Chemistry, Moscow, Russia | Partners |
| #254 | Apoptosis and Gangliosides | Institute of Biogeogenic Chemistry, Moscow, Russia | Partners USA |
| #285 | Pre-Clinical Trials of Drugs | Research Center of Toxicology and Biotechnology, Obninsk, Moscow reg., Russia | Partners USA |
| #288 | Technology for Anti-tumor Strain Production | Institute of Biogeogenic Chemistry, Moscow, Russia | Partners USA |
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| #297 | HIV-1 variability | Scientific Research Institute of Vaccines and Serums, Moscow, Russia | Partners USA |
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| #365 | Allowable Soil Contamination | Scientific Research Institute of Hygiene, Toxicology and Occupational Pathology, Nizhny Novgorod, Russia | Partners USA |
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| #599 | M.Tuberculosis Multi-Drug Resistance | National Center of Cardiology and Internal Medicine, Bishkek, Kyrgyzstan | Partners Germany |

### Environment

| #226 | Carbon-14 Recovery | Eilatot Radium Institute, St Petersburg, Russia | Partners Germany |
| #579 | Transport of Pollution to Pacific Region | Institute of Atmospheric Physics, Moscow, Russia | Partners Japan, Japan |
| #582 | Radionuclide Sorbents for Deactivation | VНИЕФ, Sarov, N. Nogorod reg., Russia | Partners USA |
| #593 | Soil Natural Self-Cleaning | VНИЕФ, Sarov, N. Nogorod reg., Russia | Partners USA |
| #579 | From Exposure to Disease Endpoints | Scientific Research Institute of Hygiene, Toxicology and Occupational Pathology, Voronezh, Russia | Partners Germany |
| #579 | Control of the Forest Carbon Balance | Federal State Enterprise – Russian Research Institute for Integrated Water Management and Protection, Kemerovo, Kemerovo reg., Russia | Partners France, Spain, Germany |
| #579 | Gas-and-Aerosol Emission from Forest Fires | NPO Mayak, Oziorsk, Chelyabinsk reg., Russia | Partners USA, Germany, Canada, France |
| #579 | Hydroacoustic Underwater Array | Federal State Unitary enterprise “H. Andrejuk Acoustics Institute”, Moscow, Russia | Partners Germany, Norway |
| #579 | Hydrogenases from Phototrophic Bacteria | Institute of Basic Biological Problems, Dushanbe, Tajikistan | Partners Portugal, Italy |
| #579 | Weather Influence on Waterborne Infections | State Research Center of Virology and Biotechnology, VECTOR, Koltsovo, Novosibirsk reg., Russia | Partners USA |
| #579 | Geoeconomic Matrixes for Radioactive Waste | Research Institute of Technology, Seosnyi Ber, Leningrad reg., Russia | Partners Germany, Spain, Ue, Korea, Finland |
### Fission Reactors

<table>
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<tr>
<th>No</th>
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<tr>
<td>#319</td>
<td>Safety use of Dispersive Fuel</td>
<td>VINIEF, Sarov, N. Novgorod reg., Russia</td>
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<td>#313</td>
<td>Channel Type Reactor with Control</td>
<td>Federal State Unitary Enterprise Research and Development Institute of Power Engineering named after M.A. Druzhinin, Moscow, Russia</td>
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<td>#392</td>
<td>Corium Melt Interaction with Reactor Vessel</td>
<td>Research Institute of Technology, Snezhnaya Bar, Leningrad reg., Russia</td>
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<td>#395</td>
<td>VVER Vessel in Severe Accident</td>
<td>Moscow Power Engineering Institute, Moscow, Leningrad, Russia</td>
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<td>#751</td>
<td>Fission Product Yield</td>
<td>Khiplin Radium Institute, St Petersburg, Russia</td>
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<td>France, Austria</td>
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<td>#919</td>
<td>Phase Relations in Cerium Systems</td>
<td>Research Institute of Technology, Snezhnaya Bar, Leningrad reg., Russia</td>
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<td>#914</td>
<td>Irregular Heterogeneous Effects in a LWR Fuel</td>
<td>Federal State Unitary Enterprise Research and Development Institute of Power Engineering named after M.A. Druzhinin, Moscow, Russia</td>
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<td>#916</td>
<td>Thermo-Hydromechanics of Oxidizing Melt in Severe Accidents</td>
<td>Nuclear Safety Institute, Moscow, Russia</td>
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<td>#938</td>
<td>Material Interactions in CANUDU - Specific Corium</td>
<td>Research Institute of Technology, Snezhnaya Bar, Leningrad reg., Russia</td>
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<td>#912</td>
<td>Corium of Boiling Water Reactor (EPICOR)</td>
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<td>#305</td>
<td>Basalt Fiber Based Filters</td>
<td>A.I. Alikhanyan National Science Laboratory, Yerevan, Armenia</td>
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<td>#810</td>
<td>Maintenance Simulator for NPP Equipment</td>
<td>Armenian Scientific-Research Institute of Nuclear Power Plants Exploitation, Yerevan, Armenia</td>
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<td>Technologies of the Joint Institute for Power and Nuclear Reason</td>
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<td>#350</td>
<td>Encapsulation of Cs-137 Sources</td>
<td>Isotope Technologies, Minsk, Belarus</td>
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<td>#858</td>
<td>BN-350 Hot Cell Depository</td>
<td>Nuclear Technology Safety Center, Almaty, Kazakhstan</td>
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<td>Organization of Cd-199 Isotope Manufacture</td>
<td>National Nuclear Center of the Republic of Kazakhstan / Institute of Nuclear Physics, Almaty, Kazakhstan</td>
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<td>#823</td>
<td>Cesium Trap for BN-350 Reactor</td>
<td>Nuclear Technology Safety Center, Almaty, Kazakhstan</td>
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### Fusion

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<td>#493</td>
<td>Monograph “Magnitocumulative Generators”</td>
<td>VINIEF, Sarov, N. Novgorod reg., Russia</td>
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<td>#384</td>
<td>Dust Technologies for Thermonuclear Fusion</td>
<td>Kurchatov Research Center, Moscow, Russia</td>
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### Information and Communications

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<td>#348</td>
<td>Complex to Protect Objects from Terrorism</td>
<td>Institute of Robotics and Technical Cybernetics, St Petersburg, Russia</td>
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<td>#359</td>
<td>Smart Vision Sensor development</td>
<td>VINIEF, Sarov, N. Novgorod reg., Russia</td>
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<td>#354</td>
<td>Human Cardiovascular System Model</td>
<td>VINIEF, Sarov, N. Novgorod reg., Russia</td>
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<td>#385</td>
<td>Security at Nuclear Fuel Processing</td>
<td>VINIEF, Sarov, N. Novgorod reg., Russia</td>
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### Instrumentation

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<td>#373</td>
<td>Objects Revealing</td>
<td>VINIITE, Snezhinsk, Cheboksarsk reg., Russia</td>
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<td>#346</td>
<td>Detectors for X-Ray Imaging</td>
<td>A.I. Alikhanyan National Science Laboratory, Yerevan, Armenia</td>
<td>EU, USA</td>
<td>USA, Sweden</td>
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<td>#344</td>
<td>Spectrometer for Detecting Skin Cancer</td>
<td>Institute of Radiophysics and Electronics, Ashgabat, Turkmenistan</td>
<td>Canada, Japan, Ukraine</td>
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<td>#359</td>
<td>Spectroscopic Ellipsometry</td>
<td>B.I. Stepanov Institute of Physics, Minsk, Belarus</td>
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### Manufacturing Technology

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<tr>
<td>#324</td>
<td>Market Research for INP Technologies</td>
<td>National Nuclear Center of the Republic of Kazakhstan / Institute of Nuclear Physics, Almaty, Kazakhstan</td>
<td>Partners</td>
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<td>#356</td>
<td>Market Technologies in Institute of Atomic Energy</td>
<td>National Nuclear Center of the Republic of Kazakhstan / Institute of Atomic Energy (U), Almaty, Kazakhstan</td>
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### Materials

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<tr>
<td>#373</td>
<td>Rocks out of Intermetallic Alloys</td>
<td>Russian Academy of Sciences / Institute of Metals Superplasticity Problems, Ufa, Bashkiria, Russia</td>
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<td>#395</td>
<td>Nanometer Structures</td>
<td>NII EFEF, St Petersburg, Russia</td>
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<td>USA</td>
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<td>#401</td>
<td>Equal Channel Angular Pressing Die-Set</td>
<td>Ufa State Technical University of Aviation, Ufa, Bashkortostan, Russia</td>
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<td>#317</td>
<td>Liquid Crystals as Diffraction Grating</td>
<td>Institute for Physical Research, Ashgabat, Turkmenistan</td>
<td>Canada</td>
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<td>#351</td>
<td>Lead Free Glass Frits and Ceramics</td>
<td>Institute of Electronic Materials, Yerevan, Armenia</td>
<td>EU, Korea</td>
<td>France, Germany, Korea, Spain, Finland</td>
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<td>#365</td>
<td>Transparent Conductive Nanomaterials for Solar Cells</td>
<td>State Engineering University of Armenia, Yerevan, Armenia</td>
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### Medicine

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<tr>
<td>#378</td>
<td>Lyme Borreliosis in U'jan and Kirov Regions</td>
<td>State Research Center for Applied Microbiology, Obolensk, Moscow reg., Russia</td>
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<td>#382</td>
<td>Phage-immunotherapy of asthenia</td>
<td>Institute of Immunological Engineering, Luoyucun, Moscow reg., Russia</td>
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<td>#307</td>
<td>Influenza Surveillance in Armenia</td>
<td>RAMS / Research Institute of Influenza, St Petersburg, Russia</td>
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<td>USA, France</td>
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<td>#339</td>
<td>Critical concentration of anti-TB drugs</td>
<td>State Research Center for Applied Microbiology, Obolensk, Moscow reg., Russia</td>
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<td>USA</td>
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<td>#383</td>
<td>Center for New Drugs Development</td>
<td>Non-profit Partnership “Center for development of new potential Medicines “ORCHEMED”, Moscow, Russia</td>
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### Non-Nuclear Energy

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<tr>
<td>#3094</td>
<td>Small Capacity Fuel Cells</td>
<td>VNIIEF, Sarov, N. Novgorod reg., Russia</td>
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<td>#3561</td>
<td>Production of Solid Oxide Fuel Cells</td>
<td>VNIIEF, Sverchkov, Chelyabinsk reg., Russia</td>
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<td>#3563</td>
<td>Small Capacity Fuel Cells</td>
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<td>#3642</td>
<td>Bioreactor for Fuel Ethanol</td>
<td>Dushman-Mishina Institute of Biochemistry and Biotechnology, Tula, Russia</td>
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<td>#3578</td>
<td>Acute Intestinal Diseases in Tajikistan</td>
<td>Republican Center for State Sanitary Epidemiological Control, Dushanbe, Tajikistan</td>
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### Other

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<tr>
<td>#3576</td>
<td>Modular Constructions for Buildings</td>
<td>Mining and Chemical Complex, Zheleznozernyi, Krasnoyarsk reg., Russia</td>
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<td>#3590</td>
<td>Groundwater Dating</td>
<td>VNIIEF, Sarov, N. Novgorod reg., Russia</td>
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### Physics

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<td>Alvarez-Type Accelerating Structure</td>
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<td>#3889</td>
<td>Radio-frequency Quadrupole Accelerating Structure</td>
<td>Institute for High Energy Physics (HEP), Protvino, Moscow reg., Russia</td>
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<td>#3938</td>
<td>Scintillators for Calorimeter at LHC</td>
<td>Bogoroditsk Plant of Techno-Chemical Products, Bogoroditsk, Tula reg., Russia</td>
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<td>#3947</td>
<td>Aperometric System for Surgery of Eyes</td>
<td>VNIIEF, Sarov, N. Novgorod reg., Russia</td>
<td>EU, UK, Ireland, Sweden</td>
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<td>#3560</td>
<td>Strip Detector for Baricentric Matter Investigations</td>
<td>Khlopin Radium Institute, St Petersburg, Russia</td>
<td>EU, Other</td>
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### Other Basic Sciences

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<th>Funding Party</th>
<th>Collaborators</th>
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<tr>
<td>#3576</td>
<td>Modular Constructions for Buildings</td>
<td>Mining and Chemical Complex, Zheleznozernyi, Krasnoyarsk reg., Russia</td>
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<td>USA</td>
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<td>#3590</td>
<td>Groundwater Dating</td>
<td>VNIIEF, Sarov, N. Novgorod reg., Russia</td>
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### Space, Aircraft and Surface Transportation

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<th>Collaborators</th>
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<td>#3876</td>
<td>In-Odor Experiment with Inflatable Solar Generator</td>
<td>NPOL Lavochkin, Khimki, Moscow reg., Russia</td>
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<td>#3951</td>
<td>Demonstration for Flight tests</td>
<td>Siberian Branch of RAS / Institute of Theoretical and Applied Mechanics (ITPMech), Novosibirsk, Russia</td>
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<td>#3877</td>
<td>Neutron Spectrometer for Spacecraft</td>
<td>Khlopin Radium Institute, St Petersburg, Russia</td>
<td>EU, Italy, The Netherlands, Belgium</td>
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<td>#3871</td>
<td>Thermal Diagnostics of Aerospace Structures</td>
<td>MAI (Moscow Aircraft Institute), Moscow, Russia</td>
<td>EU, Germany, France</td>
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<td>#3060</td>
<td>Variable Geometry Rotor</td>
<td>Georgian Technical University, Tbilisi, Georgia</td>
<td>EU</td>
<td>Italy, USA, Canada</td>
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<td>#3129</td>
<td>Fireball Network in Tajikistan</td>
<td>Institute of Astrophysics, Dushanbe, Tajikistan</td>
<td>EU, China, Russia</td>
<td>Czechia, UK</td>
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**ISTC STRUCTURE**

**Permanent Governing Board Parties**
- Canada
- European Union
- Japan
- Russian Federation
- United States

**Other Parties**
- Norway
- Republic of Korea

**CIS Parties and Georgia**
- Armenia (Board Member in 2012)
- Belarus
- Georgia (Board Member in 2013)
- Kazakhstan
- Kyrgyz Republic
- Tajikistan

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**Glossary of Main ISTC Terms and Programs**

The **Bio-safety/Bio-security Program** provides additional resources to support various Bio-safety and Bio-security initiatives.

The **Commercialization Support Program** facilitates and strengthens long-term commercial self-sustainability efforts by ISTC beneficiaries through promotion of marketable products and services.

The **Communication Support Program (CSP)** supports eligible CIS institutes and organisations for building IT infrastructure where existing capabilities inhibit the accomplishment of ISTC projects and the development of commercial opportunities.

The **Competency Building Program** supports former scientists, engineers and their organisations to improve the basic skills needed to create, maintain and develop self-sustainable business and commercialisation of technologies.

The **Governing Board** is the primary ISTC decision-making body, which is made up of representatives from Canada, the European Union, Japan, the Russian Federation and the United States, with one yearly rotating seat for representation of one of the other countries of the CIS member states or Georgia.

The **Mobility Program** provides additional opportunities for direct communication of the Russian and other CIS and Georgian scientists with their colleagues from abroad through financing international travel related to ISTC projects and activities.

The **Outreach Program** explains the objectives and working methodology of ISTC including the disseminating of ISTC project results.

The **Partner Promotion Program** attracts initiates and develops projects between the private sector and institutes in Russia and other CIS member countries or Georgia.

The **Patenting Support Program** provides assistance and support for the appropriate protection of intellectual property created under ISTC regular projects for its effective exploitation.

The **Responsible Science Management program** aims to increase awareness among scientists about the potential dual-use of research including the use of sensitive materials.

The **Science Workshop and Seminar Program** promotes the integration of ISTC beneficiary institutions and scientists and engineers into the international S&T community through supporting various science events.

**ISTC Targeted Initiatives**

A number of targeted initiatives were continued and focused their approach and technical solutions on a number of topical problems of global interest.

- Drug Design and Development
- Law Enforcement Technology
- Probiotics and Health
- Science and Technology in the Prevention of Biological Threats
- Scientific and Technical Support against the Illicit Trafficking of Nuclear and Radioactive Materials
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