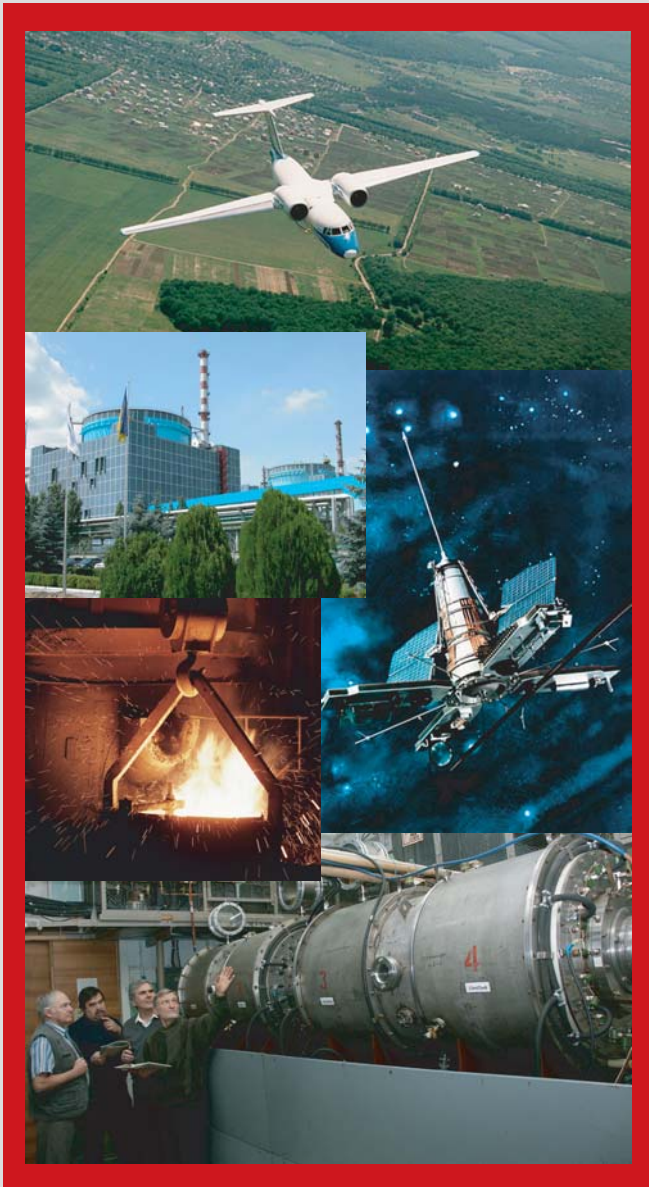




SCIENCE & TECHNOLOGY
CENTER IN UKRAINE

ANNUAL REPORT

2005

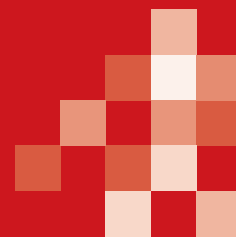











*For a Safer and Better World, Supporting
the Transition Weapons of Mass
Destruction Research into Peaceful Civilian
Applications*



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▶ WELCOME FROM THE CHAIRMAN OF THE BOARD



◀ ZORAN STANIĆ
Chairman of the STCU Governing Board

In its second decade, STCU is advancing the fulfilment of its mandate of non proliferation. This report is describing STCU's achievements in 2005. The Centre offered the possibility to talented Ukrainian and other CIS former weapon scientists to participate in peaceful research projects and in other activities that promote their self-sustainability and contribute to their integration into the international scientific community.

Last year's research projects covered a broad range of science and technology areas, namely: aerospace and aeronautics, biotechnologies, agricultural sciences and medicine, material sciences, chemistry, environmental research, industrial technology, sensors, nuclear energy and safety, physics. The projects are increasingly oriented to all STCU Parties' priorities and many of them address problems of global

importance.

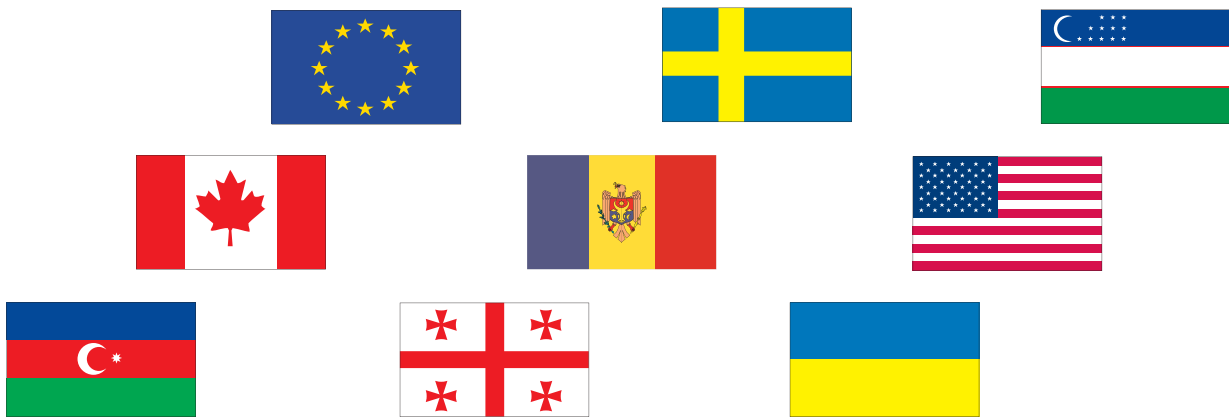
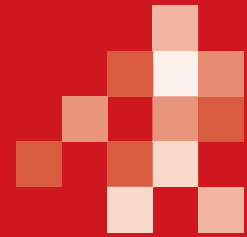
However, STCU's activities go beyond project funding. The initiatives aiming at the self-sustainability of the former weapons scientists represent now an essential part of the Centre's overall policy. In that regard, I would like to stress that these initiatives are the necessary step towards the fulfilment of the STCU objectives.

In fact, since its creation, the STCU has seen its mission evolving. During the first years of its operation, STCU had to demonstrate its ability to support peaceful research projects performed in previously weapons laboratories of the former Soviet Union. This has been achieved, and has been a real success.

While the regular research projects continued to be the main instrument to achieve

its objectives, since 1997 this instrument has been complemented by the Partnering programme and later by a more systematic technology exploitation policy. Both initiatives focus on the commercialisation aspects of project results and led the Centre to support some further steps towards exploitation by the market. To date, more than 120 organisations from various STCU Funding Countries have become STCU Partners.

After almost ten years of operation and following a re-evaluation of the evolving environment within which the Centre is operating, the STCU Governing Parties approved a reorganisation of the Centre. This reorganisation was implemented by the end of 2004. It focused towards the permanent redirection of the former weapon scientists into long-term, self-sustaining, civilian careers contributing to the



development of market economies and peaceful R&D capacity within the CIS countries.

Among other STCU activities, the "Targeted R&D Initiatives" launched in 2005 and the "Institute Sustainability Development Programme", illustrate the continuous efforts of the Center to adapt itself to an evolving environment while meeting the objectives of the Agreement establishing STCU. Both initiatives are contributing to the restructuring of the laboratories themselves, in their effort to create a sustainable civil R&D sector generating income and hence sustainable jobs.

STCU is successfully accomplishing its mission, carrying out efficiently all the tasks entrusted to it. As an organisation at international level, the STCU represents a model and a breakthrough as regards both its efficiency for curbing proliferation and

the trust and confidence established among the Parties, guiding their relations. Moreover, STCU is contributing to the overall dialogue between the Funding and the Beneficiary countries, while pursuing its goal to address international science and technology issues in support of international security.

I would more particularly like to mention the important contribution of STCU to the integration of the scientific communities of the CIS countries into the international scientific community. Through STCU, scientists and laboratories of these countries not merely participate but they are being integrated in numerous international scientific networks. Within these networks, all the scientists and laboratories involved do benefit from the best practices of their colleagues and peers, including the state-of-the-art expertise in areas such as the commercialisation of results and the

protection of Intellectual Property Rights.

The strength of STCU emanates from the continuous support of all the STCU Parties. However, STCU's success must also be attributed to the STCU leadership and to the staff within the STCU Secretariat and the Parties' delegations. On that account and on behalf of all members of the Governing Board, I wish to express our appreciation to the STCU Executive Director and to the other STCU Management Committee members, to the Parties' delegations and to our STCU staff in Kyiv and the Branch Offices for their great efficiency and dedication.

Last but not least, a special tribute should be paid to the CIS scientists for keeping up their long standing tradition of excellence and their vision.

▶ WELCOME FROM THE STCU EXECUTIVE DIRECTOR

WELCOME FROM EXEC



◀ ANDREW A. HOOD
STCU Executive Director

The STCU in 2005 made significant progress in a number of areas, all tied to the objectives and goals set by the STCU Reorganization Plan adopted in 2004. The STCU and its staff are proud to highlight this progress because it demonstrates the inherent capability of STCU to provide a variety of value-adding services in complete concert with its nonproliferation mission.

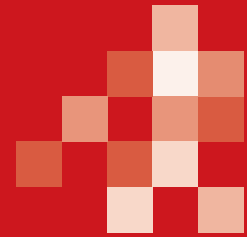
The most significant achievement of 2005 was the jointly financed Targeted R&D Initiative between STCU and the National Academy of Sciences of Ukraine (NASU). NASU and STCU each committed US\$500,000, for a total of US\$1million, which financed seven collaborative research projects in four areas

of national priority for Ukraine. The significance of this partnership cannot be overstated; it is the first time an STCU Recipient Party has contributed matching funds to an STCU activity; it is the first time that STCU and Recipient Party have joined in a cooperative partnership to competitively select research projects that target substantial numbers of former weapon scientists toward the national needs of the Recipient Party; it is one of the largest (in terms of financing) collaborative science partnerships in Ukraine; and it demonstrates the capability of STCU in organizing and implementing a focused, joint partnership with Recipient Party government entity.

The success of this Targeted Initiative has attracted the attention of other

potentially important partners. Among the future possibilities include the Ministry of Education and Science of Georgia and the Ministry of Environmental Protection of Ukraine. This growing interest in the Targeted Initiatives approach demonstrates one way in which the STCU nonproliferation mandate can integrate with the national/regional science research priorities of the STCU Beneficiary Parties. By entering a partnership with STCU, the Recipient Party itself contributes to the long-term sustainability of their former weapon scientists by focusing these scientists onto their country's economic and societal priorities.

Another achievement of 2005 was the focused effort to attract more private-



sector funding for STCU Partner Projects. While there was an overall reduction in approved Partner Project funding in 2005, Partner Projects remained a significant percentage of STCU project activity. Further, by the end of calendar year 2005, there were encouraging signs of increasing private-sector Partner Project funding; we hope this will soon result in an increase in sustainable private sector financing to former weapon scientific teams and institutes.

To encourage further private-sector interest, STCU modified its Partnership Promotion activities so that STCU-sponsored delegations of former weapon scientists and institute officials would be competitively selected and better prepared to showcase their capabilities to commercial representatives and other private organizations. In addition, the STCU-sponsored preparatory training in presentation and business/marketing skills fosters the long-term capacity of these former weapon scientists and institutes to interact and market themselves effectively to a commercial technology audience.

STCU expanded its other efforts to build the self-sustainability of former weapon scientists and institutes. STCU continued to organize workshops and targeted training programs in intellectual property protection, commercialization of science

research, and competitive research grant writing. STCU initiated a targeted study at selected former weapon institutes to develop technology transfer offices within the institute. STCU also engaged in an outreach effort to national, regional, and international programs to match STCU former weapon scientists to these programs, as well as to leverage the activities of these programs in concert with STCU's nonproliferation objectives.

Finally, STCU continued to work on its own internal capabilities to better support its mission and to maintain the highest standards of professional management. In 2005, the STCU identified contact points among its professional staff to be "subject matter experts" in several high-interest S&T areas. These subject matter experts will provide more timely information and focused customer service to the STCU Parties and others interested in STCU Recipient Party capabilities in these S&T areas. STCU also continued its information technology structure improvements, including the installation of a modern, integrated financial system that will give a near-real-time picture of all project and administrative details, both technical and financial. STCU will continue to improve access to its information via its web site and through other public outreach.

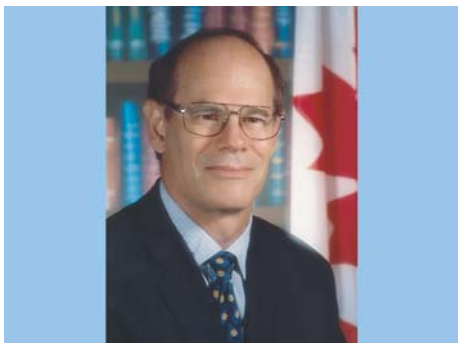
Throughout 2005, STCU positioned its activities toward the continued pursuit of

its nonproliferation objectives while staying alert for new opportunities to achieve these objectives. STCU continues its evolution in combining its nonproliferation mandate with customer-service and value-adding activities that will achieve long-term, sustainable civilian research employment and global integration of the former weapon scientists in Ukraine, Azerbaijan, Georgia, Moldova, and Uzbekistan.

*To Learn More About
Joining the STCU
Partner Program, visit
www.stcu.int/offer*



▶ EVENTS AND ACCOMPLISHMENTS IN 2005



February 1, 2005
Senior Coordinator of Global Partnership Program, Ministry of Foreign Affairs, Canada, Visits STCU

Mr. Allan Poole, Senior Coordinator of the Global Partnership Program, Department of Foreign Affairs and International Trade of Canada, paid a courtesy call to Executive Director Andrew Hood and discussed future involvement of the Canadian Global Partnership Program with STCU.



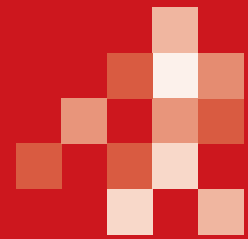
February 10, 2005
19th Governing Board Meeting, Kyiv, Ukraine

This meeting was originally scheduled for December 2004. The Governing Board approved 25 regular, government funded scientific projects (including continuations) in Azerbaijan, Georgia, Ukraine and Uzbekistan for a total of US\$2,544,835 and €775,000. The Governing Board also confirmed 15 new Partner Projects activities, valued at US\$3,829,417.40 and €289,267.00. These projects and associated funding were recorded as 2004 STCU activity.



April 1, 2005
Meeting of International Organizations in Kyiv, Ukraine

The European Commission's Delegation to Ukraine and STCU hosted this meeting of international and bilateral organizations to improve understanding of each other's programs and explore ways to more effectively cooperate together. The meeting included the representatives from CRDF, TACIS, the British Council, NATO Information and Documentation Center, Ministry of Education and Science, and the National Academy of Sciences of Ukraine.



May 30, 2005

First Targeted R&D Initiative between the STCU and the National Academy of Sciences of Ukraine

STCU and National Academy of Sciences of Ukraine agreed to co-finance, as equal partners, science projects totalling US\$1 million. Under this Targeted Initiative, former military scientists in Ukraine would participate in research projects targeting several national S&T priority areas of the Ukrainian government. The 21st Governing Board Meeting approved the STCU share of 7 projects under this Targeted Initiative, totaling US\$378,050 and €97,560.



May 25, 2005

STCU Executive Director meets with Minister of Education and Science of Ukraine

The Ministry of Education and Science of Ukraine hosted this meeting between STCU Executive Director Andrew Hood and Mr. Stanislav Nikolaenko, Minister of Education and Science of Ukraine. The meeting resulted in the creation of three joint working groups to address specific working-level issues and increase communication between STCU and the Ministry.



June 6-8, 2005

STCU Promotional Mission - "Nanotrends 2005" Conference and Exhibition, Munich, Germany

STCU led a delegation of Ukrainian nanotech scientists to this event, to become familiar with modern nanotechnology trends and create linkages with German science and industry. The meetings were organized in cooperation with the International Bureau of German Federal Ministry of Education and Research and the German Embassy in Ukraine.



▶ EVENTS AND ACCOMPLISHMENTS IN 2005

ACCOMPLISHMENTS



June 16, 2005 **20th Governing Board Meeting, Tbilisi, Georgia**

At this first-ever STCU Governing Board Meeting in Georgia, the Board approved 26 new regular, government funded scientific projects for a total of US\$3.0 million and €1.2 million. The Governing Board also confirmed 12 new Partner Projects valued at US\$1.7 million, and 3 Partner Project contract extensions valued at US\$440,000.

The meeting also saw the passing of the STCU Governing Board Chairmanship from the USA under Dr. Victor Alessi (who had held this position during the past 2 years) to Mr. Zoran Stancic, Deputy Director General for Research, European Commission.



June 23, 2005 **Cooperation Statement between STCU and the Academy of Technological Sciences of Ukraine**

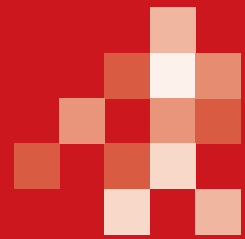
STCU and the Academy of Technological Sciences of Ukraine signed a joint statement outlining directions of cooperation where STCU programs and activities could be targeted toward the Academy goals. The Academy is a professional organization of mostly former military-industrial production complexes, working to promote Ukraine's technology transfer capabilities and innovation economy development.



September 11-13, 2005 **Environmental Workshop, Dnipropetrovsk, Ukraine**

STCU organized this workshop to bring together invited western environmental science experts with Ukrainian scientists, government officials, and industrialists in order to establish environmental research priorities for future STCU-Ukrainian cooperation. Outcomes of the workshop were the identification of environmental research priorities; establishing effective linkages with key stakeholders, including Ukrainian industrial leaders affected by Ukrainian environmental policies; and engagement of the Ministry of Environmental Protection of Ukraine.

ACCOMPLISHMENTS



September 19-29, 2005

"NATO Advanced Study Institute: Photon-Based Nanoscience & Technology", Sherbrooke, Quebec, Canada

STCU led a delegation of 12 scientist to participate in this photonics conference and organized meetings with Canadian businesses. The event was organized in cooperation with the Canadian International Development Agency (CIDA), the University of Manitoba, DirectionPlus Inc., and Vitesse Reskilling, Canada.



September 27-28, 2005

IPR Workshop in Baku, Azerbaijan

STCU hosted this workshop entitled "Intellectual Property Rights and Science: Building a Business on Your Ideas." Speakers from the United States covered a wide range of IPR topics relevant to researchers seeking to commercialize their ideas. Approximately 50 Azeri and Georgian scientists and administrators participated, including twenty selected Georgian scientists, and five selected researchers from Ganja, Azerbaijan.



October 30-November 4, 2005

STCU Promotional Mission - American Institute of Chemical Engineers Annual Meeting, Cincinnati, USA

The U.S. Department of States, in conjunction with ISTC and STCU, sponsored representatives from chemical institutes in Russia, Kazakhstan and Ukraine to participate in this annual meeting. STCU scientists held meetings with representatives from 19 different U.S. chemical companies and visited the Environmental Protection Agency regional laboratory and the Procter&Gamble Headquarters in Cincinnati.



▶ EVENTS AND ACCOMPLISHMENTS IN 2005

ACCOMPLISHMENTS



November 14-18, 2005

Canadian International Development Agency (CIDA) Mission to Ukraine

Nine Canadian companies participated in this 13th CIDA Mission to Ukraine. The mission focused on a variety of R&D areas: biotechnology and medicine, sensors and measuring systems, alternative energy development, material science. The companies participated in meetings at 35 institutions located in Kyiv, Lviv, Dnepropetrovsk, Kharkiv, Odessa and Sevastopol. As a result, 7 new Partnership Projects were developed. The mission also identified areas for future STCU targeted training, particularly in the areas of license negotiations and contract bidding practices.



November 26, 2005

Director General (Research) of the European Commission Visits STCU

STCU Executive Director Andrew Hood hosted Mr. Achilleas Mitsos, then Director General of Research for the European Commission. That was the first time Mr. Mitsos visited the STCU Headquarters, and he and the STCU Executive Director discussed various aspects of the European Commission's fruitful participation in the STCU activities, perspectives on Science Centers' concept, and possible future directions.



December 2, 2005

Michel Zayet Appointed New Deputy Executive Director from the European Union

Previously working for the European Commission (DG External Relations), Mr. Zayet brings his expertise in Development Projects gained in the fields of Investment & Financial Services, Enterprises Restructuring, and Support to High Technologies. As of January 2006, he will lead the Science Excellence Department of the STCU.



December 2, 2005

21st Governing Board Meeting, Kyiv, Ukraine

The STCU Governing Board approved 25 new regular, government funded scientific projects for a total of US\$1,996,975 and €1,311,900. The Governing Board also confirmed 9 new Partner Projects valued at US\$1,776,012 and €100,500, and confirmed 6 Partner Project contract extensions valued at US\$507,786 and €9,923.

▶ INFORMATION TECHNOLOGY ACTIVITY IN 2005

IT ACTIVITY

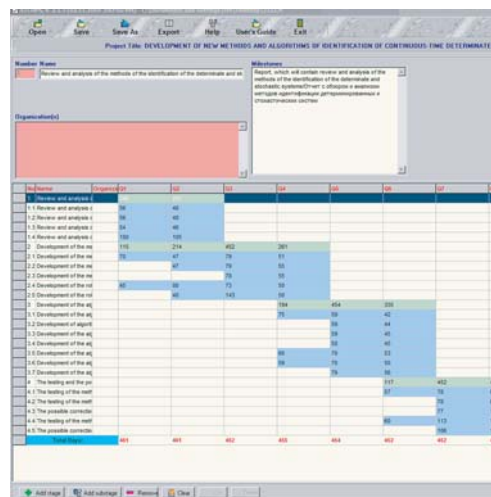
The STCU Project Software (STCUPS), officially launched in February of 2005, has provided an invaluable tool in the STCU Proposal and Project preparation process. The STCU-created software allows for the electronic filing of project proposal and project information which facilitates a high degree of data validation and quality control by project scientists and the STCU staff. The STCU Project Software went through two revisions in 2005; the first revision added additional user-requested capabilities, the second revision corrected some minor errors and expanded the functionality as it related to STCU administrative and financial functions. A third revision, including the Partner Project Processing, is expected during the first quarter of 2006.

In the fall 2005, the STCU launched the Enterprise Resource Planning (ERP) package Microsoft Navision Attain ®. This packaged solution completely integrated the STCU's Administrative and Financial Departments, as well as utilized the data produced by the STCU Project Software (STCUPS) in order to facilitate the integration of information contained in the STCU Technical Database. The new ERP package was rolled out for all Administrative and Supplemental activities as of October 1, 2005, and for all newly signed projects as of that date as well. In 2006, the STCU will complete the transition from its legacy finance and administrative systems by moving all remaining active projects to the new ERP package, as well as historical data.

During 2005 the STCU continued its efforts from 2004 to provide a robust and dependable level of redundancy to the STCU information and technology resources. The STCU installed new equipment to accommodate the ever increasing needs of the STCU users, as well as to increase data storage space, and data archiving and back-up capability. The STCU also upgraded its telecommunications equipment from an outdated analog system to a modern digital system. This has allowed for direct extension dialing from outside the STCU and for voicemail to be used at all of the office work stations.

The year 2005 was the final year of the three-year information and technology resource replacement cycle and as a result of the completion of these efforts by the

STCU, there are no employees at the STCU with information technology equipment more than three years old. This has resulted in the marked decrease of equipment-related complaints and problems received by the STCU IT staff over previous years. The year 2006 will see a continued effort to improve and take advantage of STCU's modern IT systems. For example, the STCU will be launching an improved version of the STCU Web Site (scheduled for January 2006), will provide a number of improvements to the existing STCU Project Software, and Project Technical Database enhancements that will facilitate easier access to project information and a continued progress toward a "near paperless" office environment.



▶ STCU Software View

▶ FINANCIAL ACTIVITY IN 2005

FINANCIAL ACTIVITY

The year 2005 saw a reduced amount of new STCU project funding, which reverses the trend seen in new funding since 2000. In 2005, the STCU Governing Board approved over US\$13 million in new projects, a decrease of approximately US\$2 million in total new project funding from the previous year, and representing a decrease from the average amount of new funding over the past six years.

New Partnership Project funding in 2005 saw a decrease in levels as compared to that achieved in previous years. However, the US\$4.49 million in total Partnership Project funding approved by the STCU Governing Board in 2005 is the fourth largest annual total since 2000, and

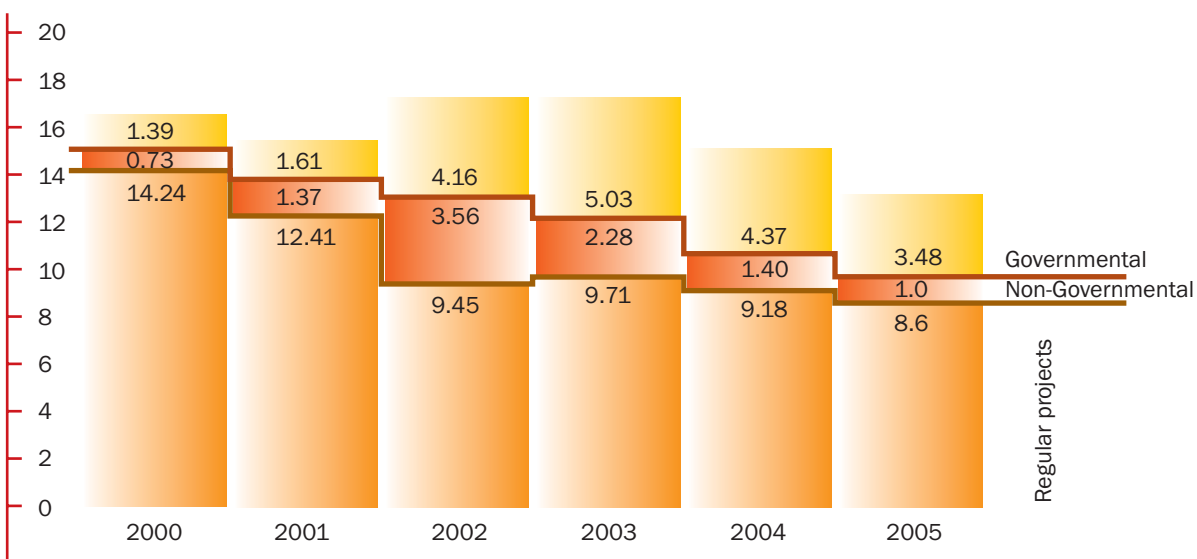
the percentage of project funding coming from STCU Partner organizations continues to be significant over the same six-year period. In 2005, new project funding from all Partner organizations represented almost 35% of the total amount of new STCU project funding approved in that year.

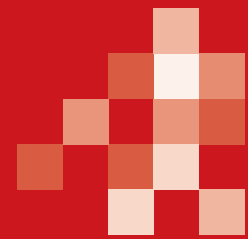
As in previous years, external auditors from both Lubbock Fine and the U.S. Department of Defense-Defense Contract Audit Agency (DCAA) audited the financial management and accounting systems as well as the system of internal controls for both the operations of the STCU administration and STCU-funded projects. Lubbock Fine Chartered Accountants audited the December 31, 2005 financial statements, a copy of which may be

obtained in the Document Center of the STCU website at: www.stcu.int/documents/stcu_inf/reports/audit/2005/. Some minor weaknesses were identified in conjunction with the December 31, 2005 financial statement audit and will be corrected during the course of 2006.

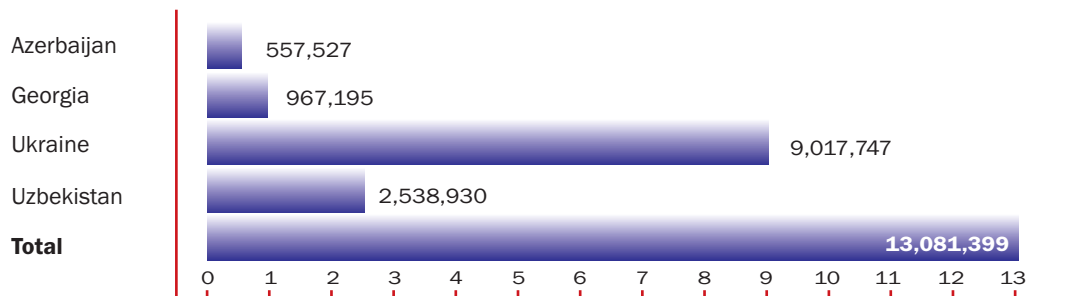
The DCAA audited 24 projects during 2005, and worked closely with technical auditors from various organizations (Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Texas State University at San Marcos, and the U.S. Department of Energy) on all of these audits to produce both financial and technical audit findings. The project audits performed by DCAA and the technical auditors identified only minor weaknesses which also will be corrected during 2006.

Regular/Partnership Funding, 2000-2005 (funding in USD/year)

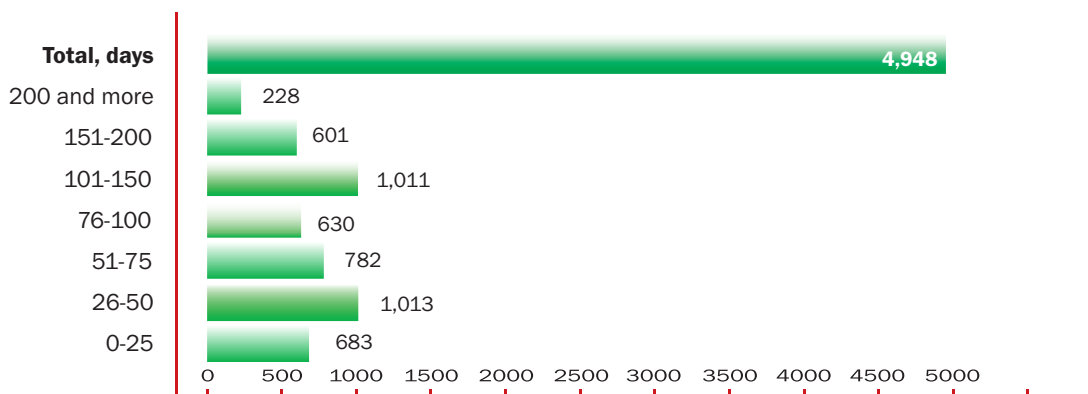




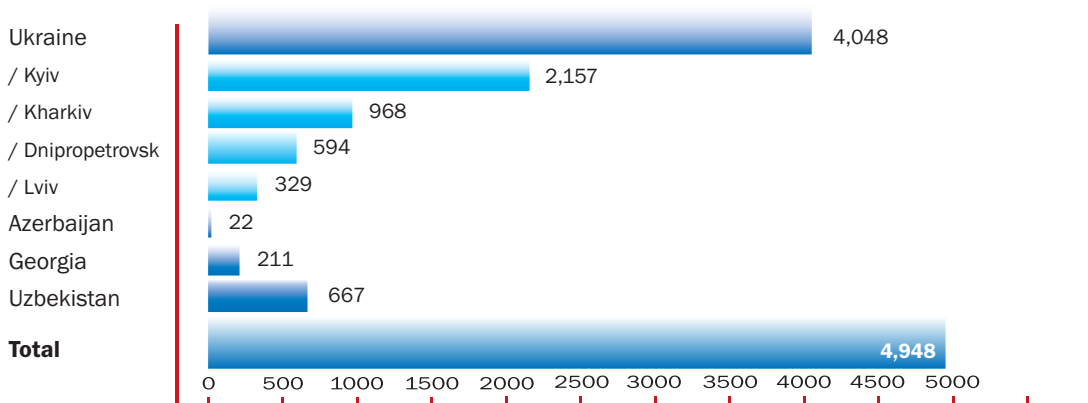
New Project Funding in 2005 by LOCATION OF RECIPIENT ORGANIZATION (USD, million)



Participants Involved in STCU Projects by Days Worked, 2005 (days worked/# of people)



Participants Involved to STCU Projects in 2005 by Country/Region (number of people):



▶ AEROSPACE AND AERONAUTICS

The most promising industry in Ukraine is the aerospace sector. Today the space community of Ukraine is led by the National Space Agency comprising over 30 industrial enterprises, design offices, and scientific research institutes, engaging over 41,000 scientists, engineers and specialists. Many of the main trends in space science research across the STCU membership include:

- Scientific Space Research
 - Remote sensing of the Earth
 - Satellite telecommunication systems
 - Development of the ground-based infrastructure for navigation and special information system
 - Space activities in the interests of national security and defense
 - Space complexes
 - Development of advanced space technologies.
- For example, the Yangel Yuzhnoye State

Design Office in Dnipropetrovsk is one of the world leaders in space rocket system development and space launch vehicle science and technology. More than 4500 scientific experts who develop spacecraft for scientific, defense and economic purposes work at the Yuzhnoye.

The Azerbaijan National Aerospace Agency (ANASA) of National Academy of Sciences of Azerbaijan was set up to coordinate and establish the scientific and industrial base for conducting fundamental and applied investigations in space research of the Earth and application of the results in the national economy of the country. ANASA consists of 5 scientific and technological enterprises: Institute for Space Research of Natural Resources; Scientific-Research Aerospace Informatics Institute; Scientific-Research Institute of Ecology; Special Space Device

Development Bureau, and Pilot Plant of Construction of Space Devices.

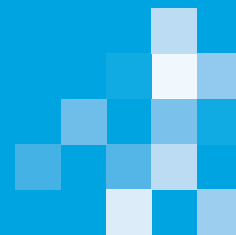
Uzbekistan also possesses highly qualified scientific and technical potential in the sphere of space research. The Uzbek State Space Research Agency develops projects for creation of reception systems, processing and distribution of satellite information including the development of satellite technologies in telecommunication, remote sensing, control and warning for emergency situations. Equipment made by Uzbek enterprises was used on "Salyut" and "Mir" space stations, in the programs for the research of the Moon, Venus and Mars, and currently keep working in space satellites within the framework of the Interball international project.

In the aircraft sector, Ukraine possesses significant potential for aircraft



◀◀ "Sich-1", the first Ukrainian national satellite (equipped with side-looking radar) was designed by Yuzhnoe state Design Office

◀ AN-74 TK-200 is one of the planes designed by Antonov ASTC



design and manufacturing. ANTONOV aircraft building enterprise is the leading aeronautical company in Ukraine. It designs and produces new aircrafts and develops modifications of formerly invented aircrafts. In Ukraine, there are two aircraft building factories (the Kyiv State Aviation Plant AVIANT and the Kharkiv State Aviation Production Enterprise) and 26 design offices work for the aviation instrument-making industry of Ukraine.

Uzbekistan also has R&D activities in the aircraft sector. The Tashkent Aviation and Production Association (TAPAC) has a powerful production and flight testing base, and it currently manufactures Ilyushin-76TD (MD) and Ilyushin 76 (TF) MF aircraft as well as the new Ilyushin-114 aircraft.

Project Activity

During 2005, no STCU Regular or Partner Project was approved that was specifically in the aerospace field. One Regular Project approved in 2005 (STCU #3567), although primarily a materials research project, involves the Yuzhnoye SDO and will develop a conceptual Thermal Protection System (TPS) for multiple applications related to thermal and pressure loads on specific spacecraft sections during atmospheric reentry. This project was financed for €197,730 by the European Union and includes the collaboration of experts from the European Space Agency (ESA). While no Partner Projects in the aerospace field were approved in 2005, a Partner Project at the Paton Electric Welding Institute (Kyiv), "Welding and Brazing for Repair of Aircraft and Gas Turbine Engine Components", was suc-

cessfully finished in 2005. The project was funded by the U.S. Department of Energy for the sum of US\$1,260,000 and it is hoped the U.S. industry partner and Paton Institute will commercialize the results of this project to the benefit of both partners.

Major Activities

STCU provided financial support to a patent application on Earth Ionosphere Monitoring offered by Lviv Branch of Institute of Space Research. STCU also sponsored the International Workshop "Advanced Airspace Materials" (June 29-July 1, in Kyiv, Ukraine). The Workshop was devoted to the discussion of projects related to the new ceramic and non-metallic material; organic composite materials; metallic materials; mechanics for materials and devices.

▶ New Detectors Developed for Space-Based Research.

To detect simultaneously various types of energetic elementary particles in near Earth space, engineers have used both separate detectors and combinations of detectors in telescopic systems. The V. Karzin Kharkiv National University led STCU Project #1578, a project to develop new versions of satellite devices for measurements of charged energetic particle fluxes. The main features of this model are the application of position-sensitive detector matrices as well as scintillation detectors viewed by large area silicon photodiodes. An advantage of such design is a wide energy range for each particle type with a simultaneous definition of spatial direction. The successful outcome of this project led to the National Space Agency of Ukraine decision to sponsor Kharkiv National University for the development of a satellite telescope, called STEP-F, for the detection of electrons and protons. The telescope would be installed on board the Coronas-Photon Russian space mission.



▶ BIOTECHNOLOGIES, AGRICULTURAL SCIENCES AND MEDICINE

The Biotechnology, Agriculture, and Medicine area is a major activity area for STCU. Scientists of the STCU recipient countries have actively contributed to the major top-priority problems in this area, including:

- medical equipment and tools;
- new materials for medical and biotechnological applications;
- express diagnostics and test systems;
- long-term research of the biological/public health consequences of Chernobyl accident;
- medical preparations and drug design;
- biotechnologies for environment and agriculture; and
- genetic engineering

Many Ukrainian biology-related research institutions were strongly involved in STCU activities. These include institutes falling the National Academy of Sciences of Ukraine (e.g. Palladin Institute of Biochemistry, Institute of Molecular

Biology and Genetics, etc.), Academy of Medical Sciences of Ukraine (Research Center for Radiation Medicine, Gromashevsky Institute of Epidemiology and Infectious Diseases, etc.) and Ministry of Public Health (Mechnikov Ukrainian Anti-plague Institute and Central Sanitary Epidemiological Station). Many STCU projects in this technical area involve close cooperation between medical/biological institutes and major applied scientific centers, such as the Kharkiv Institute of Physics and Technology, Institute for Single Crystals, and the Yangel Yuzhnoye State Design Office.

STCU also has a significant number of biotechnology-related projects in Uzbekistan, mostly dedicated to agriculture technologies, detecting and imaging technologies, microbial diversity and biological control. Among the most active institutions participated in the STCU program in 2005 were Sadikov Institute of Bioorganic Chemistry, Institute of

Genetics and Plant Experimental Biology, Institute of Microbiology and Institute of Chemistry of Plant Substances.

The STCU project activity in Georgia was concentrated mostly in Eliava Institute of Bacteriophage, Microbiology and Virology and Durmishidze Institute of Biochemistry and Biotechnology and related to the development of new antimicrobial-antifungal composites and effective remedies, and evaluation of efficacy of bacteriophage treatment of different pathologies.

Project Activity

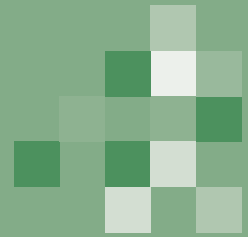
In 2005, 13 new bio-related Regular Projects were approved for funding, totaling over US\$1.04 million and €545,000. Among these is an STCU project (#3028), submitted by the Scientific Technological Center "Agrobiotech" and the Zabolotny Institute of Microbiology and Virology (both in Kyiv). The original project pro-



Sapphire Hip Joint,
Institute of Spine and
Joint Pathology
(Project #1913)



Young scientists in the
laboratory of biopreparation
technology,
Palladin Institute of
Biochemistry



posal was revised and improved under a STCU Project Development Grant, resulting in its 2005 approval for full funding of US\$180,000 by the United States. Through successful cooperation with the U.S. collaborators on the project, the Ukrainian team expects to yield a marketable technology, and perhaps products (plant growth biostimulators), for experimental and agricultural use.

Also in 2005, 9 new Partner Projects in the biotechnology area were approved for funding and some already active Partner Projects received additional funds for extended research work. The contributions for these Partner Projects total nearly US\$2.28 million. In particular, the U.S. Department of Energy's Initiatives for Proliferation Prevention Program prolonged two Partner Projects (P194 and P196) for an additional year of funding at the request of Lawrence Berkeley National Laboratory, which is interested in further cooperation with Georgian and Uzbek

Institutes on microbial diversity research. International co-operation between biotechnology/agricultural research organizations of recipient and funding countries continued to be active through STCU in 2005. For example, in 2005, the U.S. Department of Agriculture-Agriculture Research Service commenced four new Partner Projects in Uzbekistan, totaling over US\$1.2 million and adding to the over US\$4million in STCU Partner Projects contributed by USDA to advancing agricultural technologies in Uzbekistan.

Major Events

STCU provided financial support for several conferences in the area of Biotechnology, Agricultural Science and Medicine. One of the most significant of these was the Conference on Questions of Especially Dangerous Infections, Biological Safety, Bio-Security and Measures of Fight against Bioterrorism (September 21-23, Odessa). This

conference was hosted by the Odessa Anti-plague Institute and included representatives from the U.S. Department of Defence BW Proliferation Prevention Program (a DoD Cooperative Threat Reduction program) and the Foreign Affairs of Canada Global Partnership Program. The STCU also participated in two international seminars in Uzbekistan: the "Improved Income and Nutrition in Central Asia and the Caucasus through Enhanced Market- and Trade-oriented Vegetable Systems Research and Development" workshop (organized by the AVRDC World Vegetable Center and sponsored by the Asian Development Bank, the German Agency for Technical Co-operation, the Japan International Cooperation Agency, and others); and the "Pest Management Stakeholders Forum for the Central Asia Region" workshop (organized by Michigan State University in collaboration with the STCU and including representatives of USAID, The World Bank, UNDP, UNESCO, and others).

▶ MICROBIAL DIVERSITY FOR NOVEL BIOTECHNOLOGY APPLICATIONS

Extremophilic microorganisms are adapted to survive in such ecological niches as high and low temperatures, extremes of pH, high salt concentrations, high pressure, etc. Because these extremophiles produce unique biocatalysts, there is commercial interest in bioprospecting for extremophiles with potential immediate use in the food, chemical and pharmaceutical industries and in environmental biotechnology. The Republic of Georgia is characterized by extreme soil-climatic diversity within a small geographical area. Taking advantage of this concentration of ecological extremes, STCU Partner Project P196a (financed by the U.S. Department of Energy Initiatives for Proliferation Prevention Program) teams Lawrence Berkeley National Laboratory in California and a U.S. industry partner with the Durmishidze Institute of Biochemistry and Biotechnology in Tbilisi to collect, isolate, analysis, and develop a culture collection of extremophilic microorganisms from the southern Caucasus Mountains and other environmental sites in Georgia.



▶ MATERIAL SCIENCES

MATERIAL SCIENCES

Material science covers a wide portion of STCU-sponsored activity. The main research topics fall in the field of advanced material science, development and application of research-intensive technologies, development of new materials with designed properties, etc. Among the more significant trends in material science research within the STCU member countries are: new advanced materials based on the non-metal nitrides; hydrogen and metal hydride technologies for composite material matrices; new class of thermo-electric porous materials; radiation materials science and low temperature materials science; physical-chemical processes in materials interacting under concentrated solar radiation; high-refractory materials for application in medicine, industry, agriculture and other areas of application.

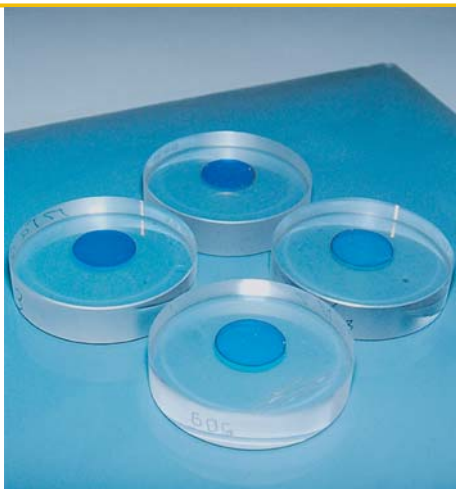
Several notable materials research insti-

tutes involved in the STCU projects and other activities include: in Ukraine, the I. M. Frantsevich Institute of Problems of Materials Science, the V. N. Bakul Institute for Superhard Materials, and the V. E. Lashkaryov Institute of Semiconductor Physics; in Georgia, the Institute of Metallurgy and Materials Science, and the Georgian Technical University; in Uzbekistan, the Institute of Nuclear Physics, and the Institute of Material Sciences of the Scientific-Production Association "Physics-Sun".

Project Activity

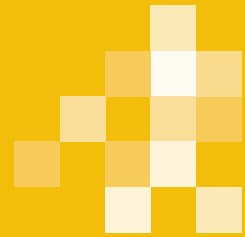
In 2005, the STCU approved 14 projects for funding in the materials science area, totaling approximately US\$1.45 million and €917,000. STCU Project #3898, for example, is a Regular Project selected under the jointly funded Targeted R&D

Initiative between STCU and the National Academy of Sciences of Ukraine. Under the Targeted Initiative, this US\$134,000 project was financed one-half by NASU and the other half from shared contributions of Canada, the EU, and the United States (see Success Story in Environmental Research section for more detail on the Targeted Initiatives Program). STCU #3898 will develop nanostructured relaxor ferroelectrics, which could improve the characteristics and prices of sensors, actuators and transducer devices based on ceramic ferroelectrics. These ceramics promise to be useful in several branches of modern electronics in the field of human health (devices for medical ultrasonic diagnostic and imaging) and social life (detection equipment and sensors against terrorism and other security systems).



◀◀ Experimental specimens of the He - Ne laser mirrors (STCU #1356)

◀ High-quality acousto-optical paratellurite single crystals (STCU #817)



Also approved in 2005 were 2 Partner Projects in the material sciences field, totaling US\$66,000. Among these was Partner Project P232, financed by the European Office of Research and Development of the U.S. Air Force (US\$25,000). The project will examine the optical properties of a relatively new crystal material to be grown by scientists at the Institute of Solid State Physics (Uzhgorod, Ukraine) and analyzed and evaluated by the Institute of Physics (Kyiv). The work on this project will bring new improvements of crystal growth technology that will ensure better photorefractive properties of importance for a broad array of optical and near-infrared laser applications.

Major Events

The STCU supported 6 conferences in materials science area in Ukraine and

Georgia including: "The Prospective of Developing and Practical Application of SHS in South Caucasus" (14-17 March, Tbilisi, Georgia); International Conference "Crystal Materials-ICCM'05" (May 30-June 2, Kharkiv, Ukraine); the IX International Conference "Hydrogen Materials Science and Chemistry of Carbon Nanomaterials" (September 5-11, Sevastopol - Crimea, Ukraine); and the 6th International Ukrainian-Russian Workshop "Nanophysics and Nanoelectronics" (September 26-28, Kyiv, Ukraine).

The STCU and the Canadian International Development Agency (CIDA) supported the travel of a delegation of Ukrainian scientists from Donetsk, Kyiv, Ivano-Frankivsk and Lviv to participate in the International Conference COM-2005 "Challenges for the Metals and Materials Industry", held

in Calgary, Alberta, Canada on August 21-24. During the visit the Ukrainian delegation visited a number of industrial and scientific institutions for establishing some scientific-business contacts for possible collaboration within the STCU programs. The STCU also organized a Promotional Mission of Ukrainian scientists to Canada for a Nanophotonic materials conference (September-October). The main goal was widening horizons of the STCU-sponsored scientists into the most modern trends in nanotechnology by networking with Canadian science and industries by the means of iterative targeted matchmaking.

▶ JOINT AZERI-UKRAINIAN TECHNOLOGY DEVELOPMENT OF HYDROGEN-STORING NANOSTRUCTURAL CARBONS

Nanostructural carbon materials can accumulate large amounts of hydrogen. This capacity opens new possibilities of hydrogen use in devices such as hydrogen-based fuel cells. However, nanotube saturation with hydrogen requires large amounts of input energy. To produce fullerene hydrides with the needed hydrogen sorption properties, most of the current methods are expensive and do not provide sufficient cyclic stability. To address this problem, the Azerbaijan Space Agency and the I.M. Frantsevich Institute of Problems of Materials Science (Kyiv) undertook a joint STCU project (Project #AZ-02) to study 30-40 types of metal-carbon alloys used for synthesis of nanostructural carbon hydrides, in order to optimize the hydrogenation of these compositions. Results of this research will be used to develop a model of a portable hydrogen accumulator usable in miniature fuel cells.



▶ CHEMISTRY

CHEMISTRY

Chemical scientists working through STCU focus their investigation on new priority directions that are of current importance in the world:

- nanostructural chemistry and chemistry of nanocomposite substances
- development of synthesis of dispersed substances and their compounds;
- theory of synthesis of pharmaceutical substances containing polymers, and synthesis of physiologically active pharmaceutical compounds with high selectivity;
- synthesis of catalysts, and catalytic chemistry of single-carbon molecules;
- synthesis of high-molecular organic compounds for food industry
- total screening and creation of new compounds' databases.

Within the STCU membership, Ukraine has a well-developed chemical research

infrastructure, and the leaders among the Ukrainian institutes include: Institute of Surface Chemistry; Institute of Bioorganic Chemistry and Petrochemistry; Ovcharenko Institute of Biocolloidal Chemistry; Institute of Macromolecular Chemistry; Vernadsky Institute of General and Inorganic Chemistry, Litvinenko Institute of Physical-Organic Chemistry and Coal Chemistry; Dumansky Institute of Colloid Chemistry and Water Chemistry; Bogatsky Physico-Chemical Institute.

Azerbaijan also has a developing chemical research system by virtue of its petrochemical industry. Several Azeri chemistry institutes are involved in STCU projects: Institute of Petrochemical Processes; Institute of Chemical Problems; Institute of Chemistry of Additives; Institute of Polymer Materials, as well as chemistry fac-

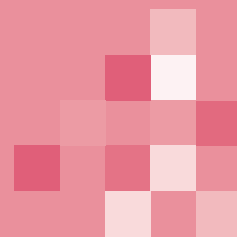
ulties of the following higher educational institutions under the Ministry of Education: Azerbaijan State Oil Academy, Azerbaijan State University, Azerbaijan State Technical University.

Georgia and Uzbekistan have some specialized chemical research capabilities as well. The following Georgian chemistry institutes received financing from the STCU: R. Agladze Institute of Inorganic Chemistry and Electrochemistry; P. Melikishvili Institute of Physical and Organic Chemistry; F. Tavazde Institute of Metallurgy; and the Georgian Technical University. Most of Uzbek projects financed by the STCU are related to biochemistry technologies. All five chemistry institutes in Uzbekistan received financing from the STCU: Institute of the Chemistry of Plant Substances, Institute of Biochemistry, Institute of Bioorganic



◀▶ Hot Pressing Facility,
National Science
Center Kharkov
Institute of Physics &
Technology

◀▶ Control system of Li-Ion
batteries,
Kyiv National University
of Technology and
Design



Chemistry, Institute for Chemistry and Physics of Polymers, and the Institute of General and Inorganic Chemistry.

Project Activity

In 2005, STCU approved one new chemical-related Regular Project of approximately US\$124,000. One Partner Project of US\$300,000 also was approved for funding in 2005.

The Regular Project, STCU #3017(R), was developed by Prof. Boris Drach of the Institute of Bioorganic Chemistry and Petrochemistry (Kyiv). It was originally granted funds under the STCU Project Development Grant to improve the proposed research. The main goal of the project is to develop principally new bioactive preparations, in particular agricultural and pharmaceutical substances based on func-

tionally substituted derivatives of azole and azine families. Three project participants visited the USA under the Project Development Grant, and consulted with several American commercial experts, including experts from Merck & Co., Procter & Gamble Pharmaceuticals, and Synthron Chiragenics. The visits helped the Ukrainian scientists improve their proposal and to concentrate on new compounds that were of interest to U.S. companies. Prof. Drach and his team successfully resubmitted their revised proposal and it was fully funded by the United States.

Major Events

In 2005, several conferences involving chemical science and research were supported by STCU. The Institute of Hydrogen and Solar Energy (Kyiv) organized the IX International Conference

"Hydrogen Material Science and Chemistry of Carbon Nanomaterials", and Institute of Surface Chemistry, Kyiv, "NATO Advanced Research Workshop: Pure and Applied Surface Chemistry and Nanomaterials of Human Life and Environmental Protection".

The STCU Patent Support Program also provided financial assistance to patent applications in the chemical technology area. Dr. Leonid Golovko from the Institute of Bioorganic Chemistry and Petrochemistry received STCU support for three patent applications on results from his STCU project on analyses of unique chemical compounds as friction-resistant surface films for metal and metal ceramics..

▶ NANO-SCALE PURIFICATION TECHNOLOGY FOR ELECTROCHEMICAL ENERGY STORAGE

SUCCESS STORY

The U.S. Department of Energy Initiatives for Proliferation Prevention Program financed an STCU Partner Project (P-154) that seeks to develop a new, low-cost synergistic technology using combined chemical and low-temperature purification techniques on graphite/carbon material. Such a strategy will allow the production of natural graphite of 99.99% purity, suitable for modern electrochemical energy storage systems - Li-ion batteries, supercapacitors, etc. This project involves experts from Argonne National Laboratory (USA), a U.S. industry partner, and four Ukrainian institutes - Litvinenko Institute of Physical Organic and Coal Chemistry (Donetsk), Kyiv National University, Kharkov Institute of Physics & Technology, and Ferroservice Company (Donetsk). The project uses previous results from several STCU projects and a NATO Science for Peace project. The project will eventually seek to establish a functional Joint Venture (JV) in Ukraine targeting the energy and cutting tools markets in Europe.



▶ ENVIRONMENTAL RESEARCH

ENVIRONMENTAL RESE

The Countries of the former Soviet Union, including STCU member countries, share the problem of severe deterioration of the environment and natural resources. Outcomes of industrial and solid waste, urban air pollution, unsustainable agricultural practices, and depletion of natural resources continue to affect the environment adversely. A wide scope of research activities includes, but is not limited to: protection of surface and underground waters, and air from pollution; ecological safety of lands, forests and other flora, fauna, and marine environments. Research in safe solid/liquid waste treatment and disposal, including nuclear wastes, obsolete pesticides, excessive and obsolete ammunition, etc. Design of new tools for environmental monitoring, modelling, and risk assessment. Research into renewable, alternative energy generation,

including wind-generated power and hydropower generation.

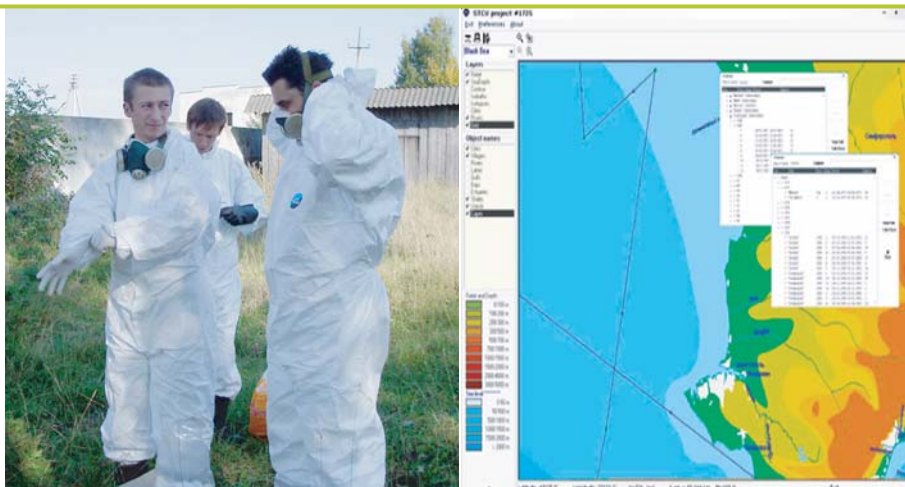
Among governmental and scientific organizations in STCU member countries that address environmental issues are numerous research institutes under the Ministries for Environmental Protection and Public Health, relevant departments in the State Universities and Technical Institutes, scientific institutes of the National Academies of Science, and many other non-governmental and private organizations.

Project Activities

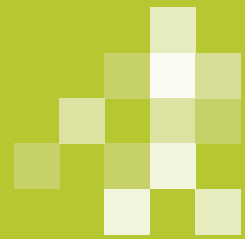
In the year 2005, STCU approved 10 Regular Projects in the environmental research field with the total funding of approximately US\$1.08 million and €208,000. Among these projects is STCU

#3626, a project from the Institute of Chemistry of Additives (Baku, Azerbaijan) and financed by the United States for approximately US\$199,000. The project team will investigate samples of the petroleum-contaminated soils from various regions of Azerbaijan for microorganisms that have potential for oxidizing certain hydrocarbons. The goal is to isolate, evaluate, and develop effective nutrient medium for these microorganisms in order to use them as a biological mechanism for oil spill remediation.

Also in 2005, two Partner Projects related to environmental research were approved for a total amount of US\$325,000. Among these was a project (P224) financed by the U.S. Environmental Protection Agency (EPA), a Governmental Partner of STCU. This project is researching the effect of envi-



- ◀▶ Exploring the pesticide stockpile (STCU P169 (EPA))
- ◀ The Geographic Information System (GIS) form representing oil concentration measurements (STCU #1725)



ronmental conditions and water quality on the population of malaria vectors in Uzbekistan, and is being carried out by scientists from the Uzbek Institute of Zoology. The STCU has a growing relationship with EPA, whose program seeks to improve environmental management through a series of demonstration projects, capacity building efforts, environmental analyses, and training programs at the local and national levels.

In support of the EPA program, STCU provides help in matchmaking between EPA scientists and NIS institutes to establish contacts and facilitate proposal preparation and work plan development.

Major Events

STCU organized and led a workshop "Establishing Research and Development

Priorities in the Environmental Sciences within Ukraine" held in September, in Dnipropetrovsk, Ukraine. The workshop was organized jointly with "EcoMet" (Ecological Association of Mining and Metallurgical Enterprises of Ukraine) located in Dnipropetrovsk, and the National Academy of Sciences of Ukraine. More than 100 managers, academic researchers, and governmental officials were invited to discuss topics of air and water protection, waste reprocessing, and soil damage prevention. One of the outcomes of this workshop was discussions for future cooperation with the Ministry of Environmental Protection of Ukraine, focusing on research projects that would meet Ukrainian national environmental priorities and the STCU non-proliferation mandate.



▶ ENVIRONMENTAL RESEARCH HIGHLIGHTS STCU-UKRAINIAN TARGETED INITIATIVE

STCU and the National Academy of Sciences of Ukraine (NASU) commenced a Targeted Initiative, the first time that a STCU Recipient Party has contributed its own funds, in matching amounts, to STCU projects. Up to US\$1 million in projects, financed equally by NASU and the STCU, focused former weapon scientists onto several research areas of Ukrainian national priority.

Of the seven winning proposals (selected by consensus of Canada, the EU, the U.S. and NASU), the largest number (3) and largest funding total (over US\$340,000) were environmental technology projects. These projects were: a project for monitoring atmospheric ozone concentrations over Ukraine using standard European Environmental Agency methods (STCU #3894); a project to develop rapid and inexpensive methods of perchlorate detection for field-monitoring ground and surface waters (STCU #3871); and a project to develop a pyrometallurgical technology for recycling oxidized wastes containing nickel and chromium (STCU #3897).



▶ SENSORS

SENSORS

STCU activities in sensors technology development has focused primarily in the areas of mechanical, electrical, microwave, radar, semiconductor, thin film, surface, optical, biological, bio-membrane, and different combinations of these sensor types. Currently, the main general trends in sensor technology development within STCU project activity are: increasing of sensitivity and detectability; increasing speed of response; lowering cost; reducing size; and improving compatibility with associated electronics.

Former weapon scientists of the STCU member countries are strong in sensor development and design, associated measuring and control equipment, and scientific devices for a wide range chemical, biological, technological, and engineering

applications. Ukraine leads in sensors research and development activity among the STCU member countries, with Georgian scientists and Uzbek scientists performing joint STCU projects with these Ukrainian institutes.

Most STCU activity in sensors and related measuring systems is conducted by the Ukrainian institutes under the National Academy of Science of Ukraine (e.g. Paton Welding Institute, Institutes of Physics and Physics of Semiconductors, Institute for Single Crystals etc). Manufacturing plants such as ARSENAL, KVANT, KOROLEVA Inc., and manufacturing departments of the Ukrainian Institutes also are deeply involved in sensor technology development

Project Activity

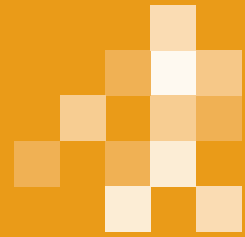
In 2005, STCU approved 2 Regular Projects with total funding of approximately €305,000. One of these Regular Projects (STCU #3535) involves the Lviv Polytechnic National University in Ukraine and its research related to the International Thermonuclear Experimental Reactor (ITER) program (see Success Story). This STCU project supports 17 former weapon and 8 young Ukrainian scientists during 30 months of research.

Also in 2005, two STCU Partner Projects totaling approximately US\$128,000 were approved. One of these Partner Projects is funded by a Canadian company and involves a project team from the Magnetic Sensor Laboratory of the Lviv



◀◀ Radar interferometer sensor for monitoring of building structures (STCU #1954)

◀ Monitoring of Chernobyl Reactor Shelter



Polytechnic National University. The project will develop a prototype of a flexible shape measuring device that will determine the shape of an object along one axis. The project includes the construction of the prototype device, signal processor, and operating software. The goal is for the Lviv team to build the prototype device for testing by the Canadian company, with the hope that further joint commercialization and production can occur in the future.

Major Events

In 2005, STCU supported six international conferences and workshops where project results on sensors were reported or presented. The international level of those STCU-supported events confirms high quality of the STCU projects in the

sensors area and opens new possibilities for international collaboration of former weapon scientists.

During the November 2005 Canadian International Development Agency (CIDA) trade mission to Ukraine, STCU and CIDA facilitated commercial match-making of Canadian businesses and Ukrainian scientists, including matchmaking in the sensor technology area. From this CIDA mission, an STCU Partner Project was designed (expected to begin in early 2006) for joint Canadian-Ukrainian development of a humidity monitoring system of natural gas in a high pressure pipelines.

STCU also provided financial assistance for a Ukrainian patent application for a sensor technology developed in the

STCU project.



▶ UKRAINIAN SCIENTISTS DEVELOP SENSORS FOR INTERNATIONAL FUSION ENERGY RESEARCH

Through a series of collaborative research projects (including several STCU projects), the Magnetic Sensor Laboratory (MSL) of the Lviv Polytechnic National University has been building a strong reputation within the global nuclear science community. MSL now has several collaborative efforts that will involve this Ukrainian laboratory into the ITER program through European collaborations. STCU #3535 is one such example, a project, financed by the European Union and involving collaborators from members of Association EUROATOM (CEA, France, and Institute of Plasma Physics, Czech Republic). The project will develop unique magneto-measuring instrumentation for extreme operation conditions inside the future ITER nuclear fusion reactor. The novelty of the instrumentation, with its self-diagnostics and self-correction capabilities, will allow accurate magnetic field measurements under the harsh conditions of the fusion reactor environment and also allow long-term operation of the instrumentation without its replacement.



▶ INDUSTRIAL TECHNOLOGIES

INDUSTRIAL TECHNOLOGIES

The field of Industrial Technologies is one of the strongest components of applied research and development work in STCU activities: by far, the bulk of these activities take place in Ukraine (with a smaller contribution coming from Azerbaijan, Georgia and Uzbekistan). Industrial Technologies encompasses welding and metallurgy, as well as communications infrastructure, experimental industrial technologies and information technologies.

Of the general trends in this S&T category, several appear to be of growing interest. Electron beam (EB) welding is moving into more advanced applications, often involving the development of unique pieces of equipment. Large, single crystal production from a variety of materials are being used in large-scale lasers,

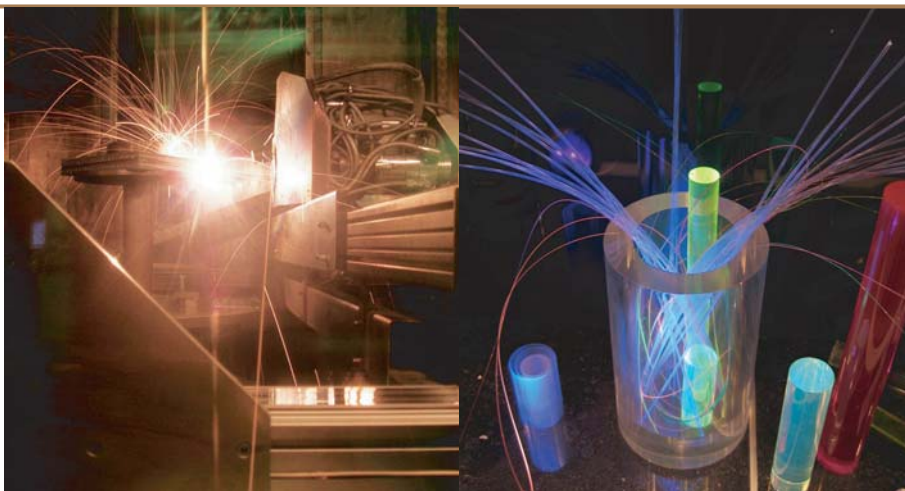
medical imaging devices, and in other applications. Novel uses of titanium and titanium alloys in industrial applications is an expanding activity. Software development appears to be an expanding field for STCU member countries, particularly in Ukraine.

Leading institutes with activities in the Industrial Technology area include: Paton Electric Welding Institute, Kyiv (EB welding equipment and technologies for physical vapor deposition of various coatings; electroslag melting technologies for production of high-purity titanium slabs); Institute for Single Crystals, Kharkiv (scintillators and large, single crystal R&D and production technology); Institute for Superhard Materials, Kyiv (production and application of synthetic diamond, cubic boron nitride and other superhard (SHM) materials, high-density high-tech

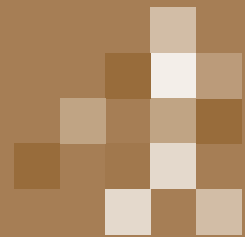
ceramics, and cemented carbides). In the field of Information Technology and Communications Infrastructure, leading institutes include: Institute of Cybernetics, Kyiv (computer science, artificial intelligence, theory of programming, pattern recognition, parallel programming and processing); and the State Scientific and Research Institute of Information Infrastructure, Lviv (software for neural network of high productivity and learning effectiveness).

Project Activity

STCU financed 16 regular projects in Industrial Technologies totaling approximately US\$1.69 million and €434,000. Among these was STCU Project #3905, a US\$66,200 project to monitor, analyze, and make remaining life predictions on oil pipelines and oil transit systems in



- ◀▶ Electron Beam Welding in process at Paton Welding Institute laboratory
- ◀ NASU developed and produced optical scintillating fibers for light transmission and wavelength shift, Institute for Scintillating Materials



Ukraine. This project was financed by Canada, the EU, and the United States and will be performed by four Ukrainian institutes led by the Pidstryhach Institute for Applied Problems of Mechanics and Mathematics in Lviv.

In addition, 12 Partner Projects totaling almost US\$1.25 million and €110,000 were approved. Included in these was a US\$455,000 Partner Project financed by the U.S. Department of Energy's Initiatives for Proliferation Prevention Program and the Paton Electric Welding Institute to develop and evaluate for commercialization a specialized welding technique for pipes made of certain steel grades and lightweight metal alloys. Many of the most successful STCU Partner Program efforts have been in the Industrial Technology specialty, with several private sector Partners drawn to this

traditional Ukrainian S&T strength.

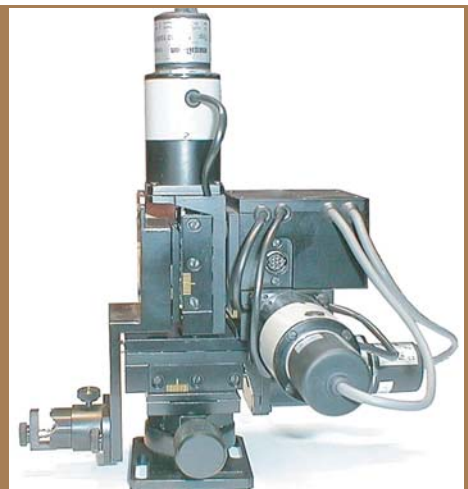
Major events

STCU supported International Workshop "Problems of automated recognition of biological objects" organized by State Scientific Research Institute of Information Infrastructure in Lviv. Also the 14th International Symposium "Advanced Display Technologies" was supported by the STCU.



▶ MICRO-ELECTRONICS TECHNOLOGY SEES U.S. CIVILIAN COMMERCIAL SUCCESS

The Small Scientific Production Enterprise "Lileya" was founded in 1992 by the group of professionals formerly of the "ARSENAL" Corporation in Kyiv. The main direction of activity of Lileya Enterprise is the research, development and manufacturing of high technological devices based on piezoelectric motors and precision machine technologies used in space and ground systems. Led by Dr. S. Petrenko, with 25 years experience as engineer - researcher in the field of solid-state electronics engineering, the Lileya Enterprise has had several STCU projects, including two Partner Projects with U.S. companies, to develop a variety of multifunctional piezoelectric micromanipulators. Taking advantage of STCU Patent Support Program and working closely with the STCU staff and with U.S. representatives, these micromanipulator devices have been patented in the United States and recently a commercial licensing agreement was signed with a U.S. company.



▶ NUCLEAR ENERGY AND SAFETY

NUCLEAR ENERGY AND

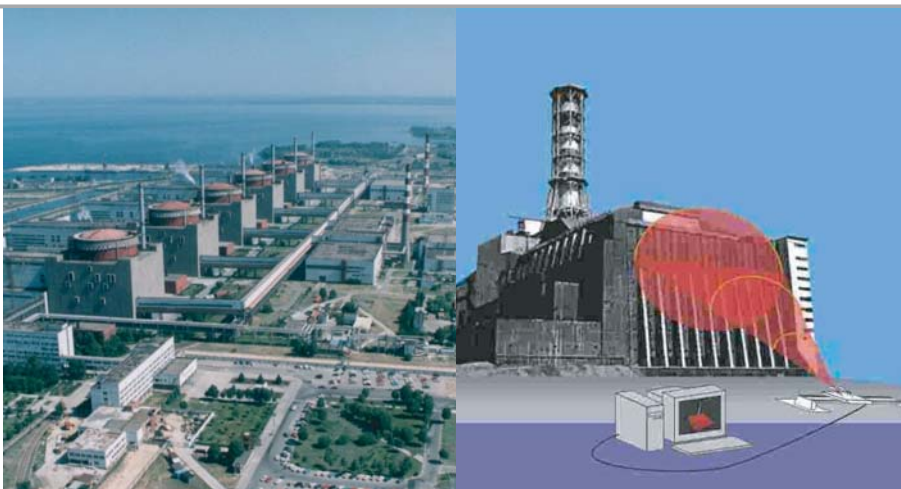
Nuclear energy and safety make up a growing sector of importance for several STCU member countries. The majority of nuclear energy, nuclear safety, and nuclear science research (including radioactive isotope analysis, commercial isotope production, nuclear physics, radiochemical analysis, etc.) is conducted at a few major institutes in Ukraine and Uzbekistan, although basic nuclear science education and research takes place at other locations, such as the Institute of Applied Physics of the National University of Uzbekistan, the Nuclear Physics Laboratory of Samarkand State University, the Sukhumi Institute of Physics and Technology, and the E. Andronikashvili Institute of Physics (both in Tbilisi, Georgia). Other areas of concentration include: Nuclear-related studies involving decommissioning activities at Chernobyl; Irradiation effects upon candidate materials for

nuclear waste containers; Electro-reclamation systems for decontaminating water and soils; Low-level nuclear waste container designs; Development of High-Level Waste partitioning technologies; Development of a monochromatic X-ray locator for the control of nuclear materials subject to non-proliferation monitoring.

In addition to the continuing safety issues surrounding the shutdown Chernobyl plant, Ukraine has designated nuclear-generated energy as an important pillar of its national energy strategy. Nuclear energy's contribution to energy production in Ukraine is a very significant: 45% of the total electric power produced on a yearly basis. With 15 power units operating at four nuclear power plants (including six 1000 MW Soviet-designed reactors at the Zaporizhzhia plant in central Ukraine—the largest nuclear power plant in Europe),

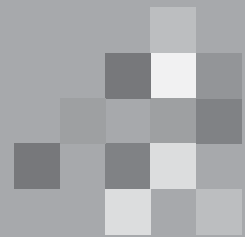
nuclear energy, and consequently nuclear safety, is clearly a major component in Ukraine's national strategy.

Nuclear-related research also is a major feature in the science activities of the STCU member countries. Ukraine operates a research reactor at the Institute for Nuclear Research in Kyiv, and nuclear material is secured and used at the Kharkiv Institute of Physics and Technology in Kharkiv. Uzbekistan also operates a VVR-SM class research reactor at the Institute of Nuclear Physics in Tashkent. Ukraine and Uzbekistan also possess radioactive waste facilities, and many of the STCU member countries have smaller facilities and laboratories at industrial, educational, and medical institutions that use radioactive materials and sources.



◀◀ Zaporizhzhia Nuclear Power Plant, the largest nuclear power plant in Europe (STCU #1903)

◀ Concept for scanning the western “contraforce” wall of the Chernobyl Unit-4 sarcophagus “Shelter” (STCU #1954)



nuclear safety/nuclear energy field was approved for funding (funded by the European Union for €163,300). This project (#3685) cuts across both physics and nuclear energy research fields with its focus on experimental research into thermonuclear fusion as a future energy source. The project involves the Karazin Kharkiv National University in collaboration with the Max-Planck Institute in Germany (see Physics section for more detail).

STCU Partner Project P233 was started at the Kharkiv Institute of Physics and Technology (Ukraine) to design an accelerator-driven sub-critical assembly using low-enriched uranium fuel. The project deliverable will be an efficient accelerator design that does not require highly enriched nuclear material. When completed, the new Institute's accelerator facility will be used for medical isotope production, reactor physics experiments, analytical and experimental studies, and will pro-

vide training support to the Ukrainian nuclear power industry.

The Project received funding of US\$750,000 from Office of Global Nuclear Material Threat Reduction of the U.S. Department of Energy engaged in a global effort to reduce the proliferation threat of excess, highly enriched nuclear materials.

Another recent Partner Project of note is Project P244, prepared during 2005 and expected to commence in early 2006. This US\$17,000 Partner Project is financed by the Pacific Northwest National Laboratory (USA) and involves a scientific team at the Kharkiv Institute of Physics and Technology (Ukraine). The project intends to use unique signatures of uranium (U-235) observable through nuclear resonance fluorescence to develop detection systems for locating and identifying nuclear material within sealed cargo containers. The project will focus on detecting

uranium U-235 material smuggled inside shipping containers, supporting international nonproliferation goals and border security.

Major Activities

The STCU participated in the UK DTI-sponsored, first annual "CNCP - Kazakhstan, Ukraine, Uzbekistan" conference, held in March at the Institute of Nuclear Physics in Almaty, Kazakhstan. Representatives of UK DTI-CNCP, the International Science and Technology Center (ISTC), and the STCU shared their experiences in nonproliferation and sustainability development. Delegations from the Kharkiv Institute of Physics and Technology, Ukraine; Institute of Nuclear Physics, Uzbekistan; and Institute of Nuclear Physics, Kazakhstan presented new technologies undergoing commercialization development through CNCP support.

▶ UK INPUT TO CREATION OF SUSTAINABLE EMPLOYMENT FOR WEAPONS SCIENTIST

The Closed Nuclear Centers Program (CNCP) is funded by the United Kingdom's Department of Trade and Industry (DTI) and represents the UK's contribution to limiting the proliferation of expertise in weapons of mass destruction. Using the STCU partnership mechanism, in 2005 DTI contributed \$103,100 for contracting two projects: one at the Kharkiv Institute of Physics and Technology in Ukraine, and the other at the Institute of Nuclear Physics in Uzbekistan focused on market research and business planning for the manufacture of high-tech civil products using the Institutes' R&D capabilities. Successful implementation of these projects has opened the next stage: an investment of \$841,149 for creation of five sustainable spin-off companies with 100 permanent employments, 62 of which will be for scientists and engineers previously involved in the development of weapons of mass destruction.



▶ PHYSICS

Physics forms the scientific background for the majority of state-of-the-art science-intensive technologies and drives the general trends of contemporary technique development in areas of power engineering, materials design, aerospace-systems engineering, quantum electronics, computer engineering, nuclear and radiation technologies, etc. In the STCU membership, some of the main focuses of physics research include: fundamental interactions and microscopic structure of matter, solid state physics, low- and ultra-low-temperature physics, including superconductivity and superfluidity, nanophysics and nanotechnologies, radiophysics and electronics, astronomy and radio astronomy, laser and plasma physics.

In Ukraine, contemporary fundamental physics research focuses on most of these

areas of high priority. The Ukrainian physics research activities cover practically the whole diversity of the material world. Ukrainian experts in plasma physics are continuously invited to apply their skills to investigate the physics of plasma confining, plasma heating processes, and plasma diagnostics. About 30 institutes of the National Academy of Sciences of Ukraine, plus universities and branch ministries are involved in the fundamental physics researches. The mainstream of projects in physics S&T area supported through STCU program came from the National Science Center "Kharkiv Institute of Physics and Technology", Institute for Nuclear Research, B.I. Verkin Institute for Low Temperature Physics and Engineering, Usikov Institute of Radiophysics and Electronics, and Institute of Physics.

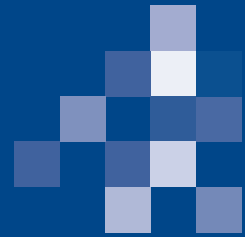
In Uzbekistan, research in basic physics are mainly located at the Institute of Nuclear Physics (physics of high and low energies, theory of nuclear reactions, astrophysics), Institute of Electronics (interaction of radiation and charged particles with matter), Institute of Material Sciences at the Scientific-Production Association "Physics-Sun" (fundamentals of material design).

The physics research in Georgia is principally represented by the E. Andronikashvili Institute of Physics (low temperature physics), Sukhumi Institute of Physics and Technology (nuclear physics), Georgian State University (nuclear and molecular physics, solid state physics) and National Technology Center "Institute of Stable Isotopes" (physics of isotope materials).



◀◀ Dr. Alexander Dolbin calibrating of the heat expansion setup in the lab, Institute for Low Temperature Physics and Engineering

◀ 10 MV Electrostatic Tandem Accelerator, Institute for Nuclear Research



Project Activity

In 2005, there were no Regular or Partner Projects approved that were primarily related to physics. However, several projects started in 2005 are primarily related to experimental research on controlled thermomolecular fusion. This includes the €163,000 STCU Project #3685 involving Ukrainian scientific work on WENDELSTEIN 7-X superconducting stellarator at the Max Plank Institute of Plasmaphysics in Germany (see Success Story). Max Plank Institute of Plasmaphysics also commenced a €49,000 Partner Project in January 2005 with the Kharkiv Institute of Physics and Technology (Ukraine) to develop a system of heavy-ion beam probe diagnostics of plasma, which will allow measurements of plasma parameters in the Max Plank Institute's WEGA stellarator (a student

training device and basic plasma research device as well as a test bed for the larger WENDELSTEIN 7-X superconducting stellarator).

Also worthy of mention is STCU Partner Project P034, which is a good example of long-term cooperation on investigation of physical processes in plasma with reference to stellarator and tokamak facilities. Again, the financing Partner was the Max-Planck Institute of Plasmaphysics, Germany and in this case, the project team was from Institute of Nuclear Research (Kyiv). This partnership started in December 1999 and lasts up to present time through a consecutive series of STCU Partner Projects totaling to US\$198,000 and €32,000.

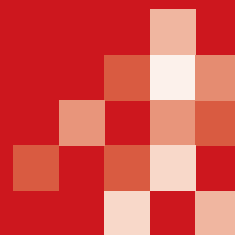
Major Events

In 2005, STCU co-sponsored the Tenth International Conference and School of Plasma Physics and Controlled Fusion (Crimea, September, organized by the Institute of Plasma Physics) and the 6th International Ukrainian-Russian Workshop on Nanophysics and Nanoelectronics (Kyiv, September).

▶ UKRAINIAN SCIENTISTS' CONTRIBUTION TO INTERNATIONAL FUSION RESEARCH

At the Max-Planck Institute for Plasmaphysics in Greifswald (Germany), the new generation of superconducting stellarator (WENDELSTEIN 7-X) is under construction and currently is the world's largest and the most advanced Stellarator experiment. This project has been given preferential support by the Association EURATOM and is considered the foundation for a future fusion reactor-stellarator apparatus. However, there are some key problems for this configuration, including impurity transport and surface electromagnetic waves effect on the charged particles motion. The STCU Project #2313, "Impurity transport and electromagnetic waves in the plasma periphery of a HELIAS reactor configuration and WENDELSTEIN 7-X" created a close collaboration with Drs. Friderich Wagner and Horst Wobig from Max Plank Institute and the scientists of V.N. Karazin Kharkiv National University. The project, funded by the European Union, addresses key scientific considerations in thermomolecular fusion: the transport phenomenon in plasma, plasma confining and plasma heating processes. This collaboration will continue under STCU Project #3685 "Impurity transport in 3D magnetic field including ergodic effects for the stellarator Wendelstein 7-X and Tokamaks" funded by the European Union in 2005.





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