SCIENCE FOR THE BENEFIT OF MANKIND

FAN VA TURMUSH

«Science and Life» popular science journal
Centre for Promotion of Science Uzbekistan Academy of Sciences
2/2025

OBSERVE THE WORLD CLOSELY

- LOW-POWER ELECTRICAL SYSTEMS
- IS THE GROWTH OF MYNA POPULATION IN CITIES DANGEROUS?
- THE RELEVANCE OF CREATING MODERN HISTORY
- KHIVAN PRINCES
- CHILDREN'S PIANO MUSIC

Temurgozi Tura, son of Isfandiyar-khan. 1902-1915 гг.

EDITORIAL

From the editors

In the era of a total and intrusive information flow, primarily flooding the Internet, it is not easy to distinguish the reliable from the superficial and unreliable. Flashy, but false, fake information forms a stereotype of thinking that poorly perceives a scientifically based and thorough analysis of the real picture of the world, which may seem overly complex and uninteresting to the modern reader.

In such a difficult situation, the staff of the journal "Fan va turmush" tries to provide its readers with high-quality scientific information in a popular format. Given the limited capabilities of printed publications, the electronic version of the journal is posted on the website of the Uzbekistan Academy of Sciences www.academy.uz. Also, interesting articles are published on the pages of the electronic journal «Art & Science» of the Centre for the Promotion of Science of the Uzbekistan Academy of Sciences, which is well represented in social networks.

In the modern era, the reliability of information sources is important. In our journal, we will continue to publish information about achievements, discoveries and new results in the field of science, presented by leading scientists and young researchers based on a deep analysis of theory and practical developments.

The introductory article talks about the scientific festival "FORMULA 2025" organized for the first time in our country. This festival, which became a unique holiday for scientists and the population of our country interested in science, especially young people, included more than 10 different events. It is also symbolic that the festival was held in the Botanical Garden of the Uzbekistan Academy of Sciences, emphasizing the connection of science with a unique zone of the natural environment. The participation of famous scientists, motivators and bloggers in the festival allowed to attract a larger number of young people.

The section "Numbers Rule the World" contains articles by Professor H. Ashurov on the development of physical electronics and Academician R. Muminov and his students on low-power solar energy systems, proving the thesis that the basis of the "green economy" is renewable energy sources. This is a vitally important area of our lives and we will continue to publish articles on this topic in subsequent issues.

The section "Nature and Man" presents articles by Professor B. Kholmatov "Is the reproduction of the Myna dangerous?" and Z. Rajabov about a unique fish - the Amu Darya shovelnose sturgeon. The first article analyzes the impact of human urbanization processes on nature using the example of a bird - the myna. The article concludes that the widespread opinion that "sparrows are dying out because of the reproduction of the myna" is incorrect. The article about the Amu Darya shovelnose sturgeon provides interesting scientific information about the various types of this rare fish, listed in the Red Book.

In the section "World of Technology and IT", the editors present the article "Prospects of the Digital Future", dedicated to the International Conference on Digital Technologies, which provides an overview of the main current trends in this area and presents the opinions of leading scientists and experts.

The section "Society, History and Culture" also presents a number of informative and interesting articles. For example, the article by Academician S. Gulyamov on the creative economy, since the concept of "creativity" is currently one of the most pressing aspects of modern development of society. In the article by D. Begalieva "Khiva Princes" such issues as the education and training of princes in the Khiva Khanate and the choice of the heir to the throne are considered using historical examples. For those interested in modern and contemporary history, the essay by Kh. Abdurasulov on the trade and economic policy of Russia in Turkestan and the article by political scientist F. Usarova on current issues of modern history will be useful.

The "Young Researchers" section contains articles by young researchers from Namangan: D. Muydinova on the pottery art of Gurumsaray and M. Alimjanova about the work of L. Sadriddinov.

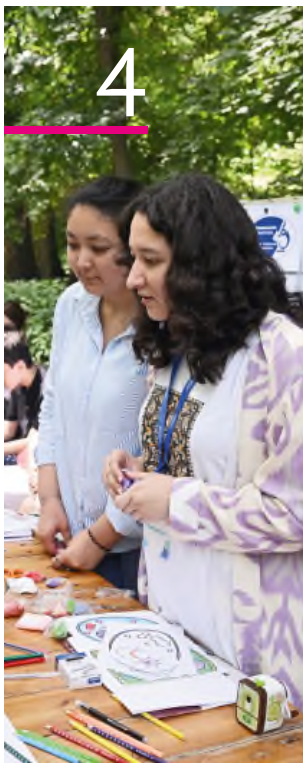
The section "News of Uzbekistan" published an analytical article by Academician Akbar Khakimov on the topic "Historical breakthrough – Uzbekistan at Sotheby's and Christie's auctions". This is a great achievement for Uzbekistan. Currently, active work is underway to form a museum exposition of the Centre for Islamic Civilization in Uzbekistan. More than 400 scientists and scholars of our country are working on the exposition. For the first time, Uzbekistan participated in the famous Sotheby's and Christie's auctions in London to acquire historical artifacts for the museum, and more than 60 exhibits were returned to their historical homeland. The author revealed the historical and artistic value of each exhibit.

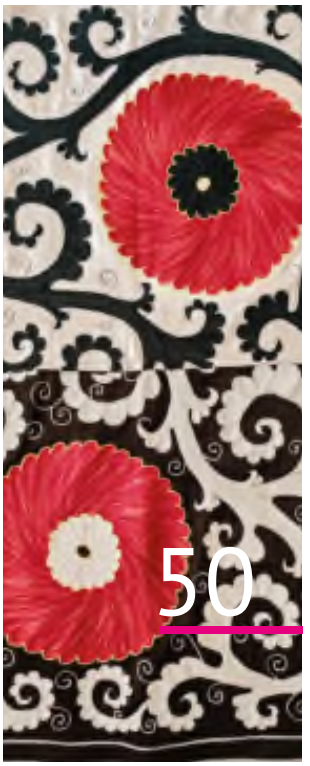
Today, special attention is paid to our national literature. As a result of many years of work by the staff of the Institute of Uzbek Language, Literature and Folklore of the Uzbekistan Academy of Sciences, a 4-volume "Encyclopedia of Alisher Navoi" was published, the announcement of which is given in the new editions section.

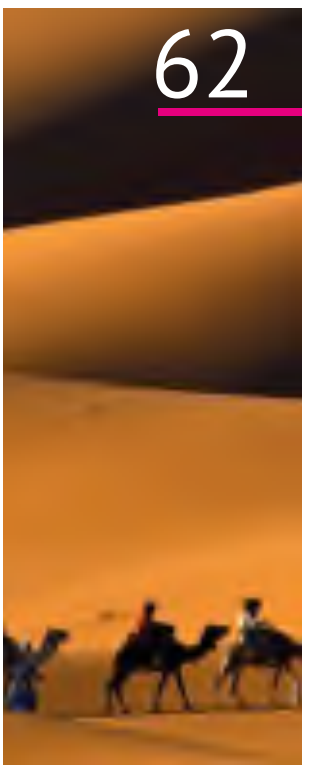
Dear reader!

The editorial staff of the journal "Fan va" turmush" strives to bring the light of science into every home. We wish you a pleasant leisure time!

CONTENT







The first science festival "FORMULA 2025" was held in tashkent on may 17, 2025

Mohira Jumanova,
Press Secretary of the Academy of Sciences of Uzbekistan

The Tashkent Botanical Garden of the Uzbekistan Academy of Sciences became the first venue for a large-scale open-air popular science festival "Formula 2025", organized by the Uzbekistan Academy of Sciences with the support of the Asian Development Bank (ADB) and the World Bank's MUNIS Programme. Thousands of schoolchildren, students, young people, scientists and families with children gathered to spend the day getting acquainted with scientific achievements, ideas and experiments.

Formula 2025 is the first large-scale national open-air platform for scientific communication in Uzbekistan, bringing together scientists, inventors, teachers, students, schoolchildren and everyone interested in science and the future. The festival has become a lively space for interaction between the academic community and the general public, demonstrating that science can be exciting, accessible and inspiring.

The goal of the festival is not just to talk about science, but to involve young people in the process of learning, to awaken interest in research activities, to show the importance of scientific knowledge in everyday life and the sustainable development of the country.

At the same time, one of the key objectives of the festival is to draw the attention of the general public to the fact that the Botanical Garden is not just a picturesque place for walks, but a full-fledged scientific facility of the Uzbekistan Academy of Sciences. Serious research is conducted here in the field of botany, ecology and protection of biodiversity. Through the festival format, the organizers strive to show that science lives next to us, and spaces such as the Botanical Garden play an important role in the study and preservation of the natural heritage of Uzbekistan.

"The formula of the future is not only technology, but also inquisitive minds that we strive to inspire. It is such festivals that form respect for science and bring it closer to people," said Shavkat Ayupov, President of the Uzbekistan Academy of Sciences during the opening ceremony of the Science Festival.

"We, at the Asian Development Bank, believe that it is the development of science that leads to improved well-being of the population and economic growth," said Kanokpan Lao-Araya, head of the ADB office in Uzbekistan. "By introducing innovations and supporting strategic reforms, we contribute to the construction of a sustainable and inclusive economy in Uzbekistan, where technology and knowledge become the driving force of modernization," she also noted.

From 10:00 a.m. until evening, the territory of the Botanical Garden turned into a space for live scientific communication, where each guest could feel like a researcher. Particular attention was paid to the formation of a culture of critical and analytical thinking,

stimulation of a creative approach to learning and creation of conditions for an open dialogue between generations, scientific sectors and ideas.

The festival offered a wide range of events for all ages:

- ScienceTalks - interesting lectures by scientists, presented in comprehensive language
- Quizzes, master classes and scientific stands
- #SheScience - panel session on the role of women in science with Bir Kun Podcast
- Scientific Humor - # ComedyScienceBattle by Nozim Safari
- Bloggers' speeches: Texnoplov, EKOLOG.UZ
- Children's areas with interactive experiments and robotics
- Cinema Zone by Retro Film Club
- Musical performances from such groups as the Bu Qal'a , Shovqin , Yosh Blond and the participants of the show Ovoz
- Intellectual game Zakovat among scientists of the national Academy of Sciences

A series of public mini-lectures #ScienceTalks became the intellectual core of the Formula 2025 festival. Scientists and scholars from the Uzbekistan Academy of Sciences shared their discoveries, explaining science simply, vividly and enthusiastically. The stage turned into a place where every guest – from a schoolchild to a teacher – could feel how science speaks to them directly. For example, festival guests learned about the laws of chaos from physicist Pulat Tajimuratov , about the molecules of the future – from chemist Aziz Ibragimov, and geneticist Alisher Abdullaev explained how genes influence our everyday life. Researcher Eldor Asanov concluded this block with a presentation on the role of the humanities in the 21st century.

ScienceTalks became a platform where modern science of Uzbekistan came to life – without barriers and stereotypes. The format of open dialogue and living language made knowledge accessible, and the profession of a scientist – attractive for the new generation.

Festival visitors also had a unique opportunity to get to know better what scientists in various disciplines actually do, from biology to archeology. Guests not only listened to lectures, but also personally participated in events in interactive zones, becoming participants in real experiments, laboratory demonstrations, and even mini-expeditions to scientific stands. Many of them admitted that they saw science live for the first time and were able to ask questions directly to researchers.

"We just came for a walk, but ended up staying the whole day – my son saw how a real scientific experiment is conducted for the first time. Now he wants to become a chemist!" – says Madina Akhmedova, a guest of the festival. According to her, such events do not just entertain, but inspire and change the idea of the future.

Particular attention was paid to the role of women in science: as part of the # SheScience session organized by Bir Kun Podcast vs Nodira Said, the partici-

pants discussed the challenges and opportunities for girls in science. The panel discussion was attended by Vice President of the Uzbekistan Academy of Sciences of Shakhlo Turdikulova, UNFPA representative in Uzbekistan Nigina Abaszade, executive director of the "El-Yurt Umidi" Foundation Gulnoza Ismailova and gender expert Kamola Aliyeva. A platform on women in science, developed with the support of the Asian Development Bank, was also presented – it was presented by Nargiza Alikulova, ADB Communications Specialist in Uzbekistan.

"Science needs talents, not stereotypes. Every girl who chooses the path of science is a step towards new breakthroughs and ideas," emphasized Shakhlo Turdikulova, Vice President of the Uzbekistan Academy of Sciences.

Viewers were also delighted by the scientific film corner organized by the Retro community Film Club. In the open air, sitting on comfortable bean bags, viewers were able to enjoy films about great ancestors – scientists and scholars who worked on our land – Mirzo Ulugbek, Abu Ali Ibn Sina, and the first academician of the Uzbekistan Academy of Sciences Tashmukhammad Kary-Niyazov.

"Scientific cinema is not just screen art, it is a bridge between the past and the future. Through the camera lens, we preserve the memory of great scientists, inspire young people and form a culture of respect for knowledge. In every frame there is a story of discoveries, in every film there is a step towards a society based on reason and progress," says Sardor Iskhakov, founder of Retro Film Club.

A special highlight of the festival was the intellectual game Zakovat, where scientists and scholars from the Academy of Sciences united into 24 teams to compete in knowledge, logic and erudition. The tournament brought together some of the best minds in the country and became a real celebration of intelligence, showing that science is not only laboratories, but also passion, team spirit and live communication.

Formula 2025 Science Festival was the first such event in the history of the country, and the Uzbekistan Academy of Sciences plans to make the festival an annual tradition, expanding its scale, geography of participants and influence on the scientific and educational environment.

Physical electronics towards new technologies

Khotam Ashurov,
doctor of technical sciences

First of all, it is necessary to show readers what Physical Electronics is as one of the important areas of modern physical science. According to generally accepted concepts, Physical Electronics is one of the main sections of physics, which studies various phenomena associated with the processes of interaction of atomic particles in gases, plasma, solids and on their surfaces. It is known that Physical Electronics is the basis for the development of many areas of modern electronics, including radio electronics, quantum electronics, semiconductor electronics, micro- and nano-electronics, industrial electronics and its other types.

Physical Electronics studies elementary processes of interaction of charged particles in vacuum, gases, solids and structures, including processes of excitation, ionization, scattering, emission, sputtering of atomic particles, as well as disintegration of polyatomic particles and clusters. The main practical purpose of Physical Electronics is the development and creation of corpuscular methods and highly sensitive devices for analyzing the properties of materials, as well as new effective technologies based on the use of various atomic particles. The role of Physical Electronics in modern science and technology is rapidly increasing, and at present the number of research areas of Physical Electronics is more than 30 titles.

In this regard, it is necessary first of all to show what phenomena and substances are studied by Physical Electronics. One of the most relevant areas of Physical Electronics is the study of the processes of interaction of accelerated charged particles with the surface of a solid, which are closely related to the physics of condensed matter, materials and physical chemistry of the surface. Here it is necessary to especially note that the existing differences in the properties of atoms and molecules located on the surface from their properties in an isolated state or in the volume of a solid lead to the specificity of the processes of interaction of particles on the surface. The study of these processes is of fundamental importance for the further development of solid-state physics and materials science, methods of diagnostics and surface analysis. And the priority results obtained by scientists form the basis of such sections of science and technology as emission, thin-film and nano-electronics, heterogeneous catalysis, high-vacuum technologies, semiconductor, nuclear, reactor and space materials science.

The study of physicochemical processes on the surface and in the near-surface region of various materials (metals, dielectrics, semiconductors, crystalline and film structures) using atomic particles is one of the priority areas of corpuscular diagnostics, carried out by various methods of physical electronics. For the purposes of analysis and diagnostics of materials, primary beams of electrons, positively charged ions, including multiply charged, negative ions, clusters, as well as flows of plasma particles and quanta of ultraviolet and laser radiation are used, bombarding the surface at different angles of incidence and with different energies (from 10 electron volts to tens of kiloelectron volts). As a result of the interaction of flows of these primary particles and high-density radiation quanta with atoms and molecules located on the surface and in the near-surface region of materials, a number of elementary processes occur simultaneously. This includes elastic and inelastic scattering of the primary particles themselves, as well as excitation, ionization, and emission from the surface of secondary particles - electrons, sputtered or desorbed atoms and ions, as well as mono-element, binary, and multi-element clusters that emerge from the surface with different energies and at different angles and are recorded by highly sensitive analytical instruments.

The transition in Physical Electronics in recent decades from fairly advanced traditional studies of simple pair interactions of atomic particles to the study of interactions of complexes of atomic particles in the near-surface region of a solid has led to the development of its new modern directions and corpuscular

technologies. This has also determined the transition in materials science from traditional micro-technology to nano-technology in the nanometer range and the study of the related phenomena of adsorption, ionization and condensation of complex polyatomic molecules (including organic and bioorganic), as well as the interfaces of the solid and gas-plasma phases. And the progress in materials science that has occurred in recent decades has been directly related to the development and improvement of methods and technologies for modifying the properties of solid-state materials by bombarding them, cleaning, strengthening and alloying the near-surface region with ions of various elements (gases, metals, etc.).

Let us consider the features of the development of Physical Electronics in Uzbekistan and the most significant scientific and practically important results of domestic scientists - electronics engineers. In the 1950s - 1960s, thanks to the pioneering work carried out in the field of Physical Electronics by the scientific school created at the Uzbekistan Academy of Sciences (Physical and Technical Institute and the Institute of Nuclear Physics) under the leadership of world-famous scientists, Academicians U.A. Arifov and S.V. Starodubtsev, Tashkent is today one of the major world centers of advanced research and development in the field of electron-ion, ion-plasma, vacuum arc, ion beam and laser technologies. The priority research carried out by domestic scientists and the important results they obtained in the field of Physical Electronics served as the basis for the creation in 1967 of a multidisciplinary research Institute of Electronics of the Uzbekistan Academy of Sciences, specialized in this field. In subsequent years, this Scientific School of physicists and electronics engineers received a worthy replenishment from among creatively gifted young scientists, many of whom became doctors of science, and four scientists - T.D. Rajabov, U.Kh. Rasulev, N.Yu. Turaev and T.B. Usmanov headed new scientific directions in Physical Electronics, created their own scientific schools and were elected Academicians of the Uzbekistan Academy of Sciences.

Further development of research in the field of Physical Electronics during the period of independence and sovereignty of Uzbekistan took place at the Institute of Ion-Plasma and Laser Technologies named after U.A. Arifov of the Uzbekistan Academy of Sciences, which was created by merging the former Institute of Electronics and the Department of Thermal Physics of the Uzbekistan Academy of Sciences. Their combined scientific and experimental base served the development of new scientific areas and the implementation of relevant research and promising developments. In recent years, scientists of Uzbekistan in the field of Physical Electronics have published a large number of scientific articles in prestigious international journals, as well as monographs, and patents of the Republic of Uzbekistan and many leading countries of the world have been received for their original inventions, technologies, devices and instruments. And therefore, it is no coincidence that the Scientific School of Physical Electronics and Ion-Beam Technologies, created in Uzbekistan, is today widely known and recognized in the world for its priority results of fundamental research and applied developments. And the researchers themselves have been awarded a number of state and international prizes and awards.

The most significant results include priority scientific developments and new technologies of the Institute, created in the following areas of Physical Electronics.

Thus, in the laboratory of "Adsorption and emission phenomena", created by Academician U.Kh. Rasulev scientific research was focused on the study of the interaction of polyatomic particles with the surface of a solid body at thermal particle velocities. In this case, the processes of adsorption of polyatomic molecules, their chemical transformations during adsorption on the hot surface of the emitter, as well as surface ionization and thermally stimulated desorption of ions, including polyatomic positive ions, were studied using highly sensitive mass spectrometers.

For example, patterns of surface ionization of nitrogen-containing compounds were established, allowing for a number of classes of these compounds to predict the composition of ions and their current densities, which served as the basis for new highly sensitive methods of surface ionization mass spectrometry, as well as the creation of a new direction in gas analytical instrumentation at the Institute.

Thanks to this, pioneering studies of the interaction of polyatomic molecules of biologically active organic compounds - natural and synthetic narcotic substances, psychotropic drugs, pesticides and toxins with the surface of a solid at thermal velocities began. This transition in research was dictated by the need to create innovative methods and detector technologies for detecting and analyzing small or trace amounts of physiologically active organic compounds in various samples. Based on fundamental research, scientists developed highly sensitive and highly selective detectors for gas chromatography, gas analyzers of nitrogen-containing organic compounds - drift spectrometers, ion mobility spectrometers, and mass spectrometers that have no analogues, which are used today in the practice of analytical laboratories.

A surface ionization detector for gas chromatography was developed and accepted for industrial production, exceeding the existing flame ionization detectors in sensitivity by 3-4 times of magnitude. A

Mass spectrometer MI-1201V, modernized for studying surface ionization

new thermal desorption surface ionization method and device - an indicator of narcotic and psychotropic substances - the Iskovich complex, allowing to detect and identify their trace amounts in various samples, were also developed, and a small series of this highly sensitive device was also launched. At present, these devices are successfully used in the healthcare sector of Uzbekistan, in the Bureau of Forensic Medicine, as well as in drug treatment centers in all regions of the country.

It is known that equipping law enforcement, drug addiction and toxicology laboratories with modern import-substituting domestic analytical equipment has become an important state task. For this purpose, the Institute's scientists also created a highly sensitive thermal desorption spectrometer with a surface ionization detector for the detection and analysis of trace amounts of new psychotropic and narcotic substances in various samples and in environmental samples. In 2022-2024, comprehensive tests of this spectrometer were carried out directly in the physicochemical laboratory of law enforcement agencies (State Expertise and Analysis Center of the Ministry of Internal Affairs of the Republic of Uzbekistan). Samples of drugs (opium, cannabis, etc.) received by this laboratory and new psychoactive substances - synthetic cannabinoids were used as objects of research. (spice), cathinone derivatives and psychotropic drugs (tropicamide, carbamazepine, lyrica, tramadol, etc.). The results of the test trials of this device were highly appreciated by forensic experts. It was found that this method and device, despite its simplicity, compare favorably with known traditional methods and devices in its rapidity (the time of one analysis is about 3 minutes), selectivity of the detection limits of the amount of substances (from 0.1 pmol depending on the physicochemical nature of the molecules) and high ionization efficiency (up to 100 C/mol), and the analysis of substances on this device is carried out directly in the air.

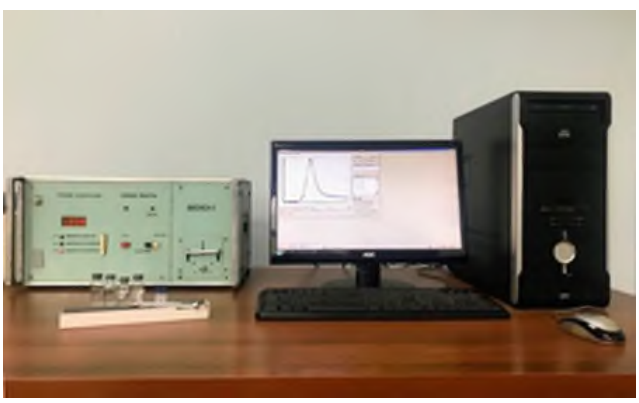
An important area of the Institute's research in recent years, conducted by the method of secondary-ion mass spectrometry (SIMS), has become the phenomena of formation of multiparticle clusters on the surface of materials and their sputtering. For this purpose, scientists created a universal mass spectrometer with double focusing of sputtered cluster particles, which was subsequently industrially mastered (plant in Sumy, Ukraine). Thus, for the first time, the emission of quasi-thermal ions was detected during cluster bombardment of the surface of materials, which caused a significant increase in the interest of foreign scientists in the study of the low-energy region of secondary-ion emission. For the first time, a method of surface ionization of particles on oxidized surfaces of refractory metals with a high work function was developed to detect the neutral component of sputtering of some metals.

It should be especially noted that at present many well-known achievements in microelectronics, the creation of semiconductor heterostructures and solar energy converters, new nano-materials, thin-film structures, etc., as well as in the field of electron-ion beam and ion-plasma technologies, as well as electron-ion instrumentation are unthinkable without the use of high-precision corpuscular methods of analysis, diagnostics and control of various materials and thin films, carried out by various elementary particles at the atomic level.

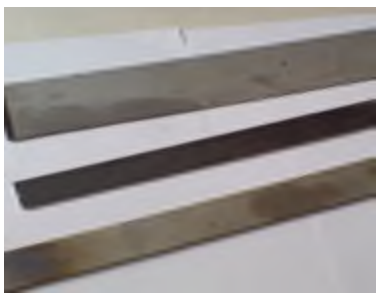
For these purposes, methods of secondary ion mass spectrometry, as well as theoretical analysis of various elementary processes of interaction and decay of polyatomic particles during their time-of-flight motion from the surface under study, are becoming increasingly important. Recently, significant interest has increased in studying the nature and properties of multiparticle clusters and nanoparticles, which are like a transition state between individual atoms and a solid body, which seems important both for the development of fundamental research and for solving applied problems in the field of Physical Electronics.

Thus, the Institute conducts pioneering studies of the properties of thin films of metal silicides, the interface region between the thin film and crystalline silicon, and also studies the change in the electronic structure and their chemical composition. The interest shown in ion synthesis is due to the possibility of creating nanolayers of chemical compounds and multilayer structures, as well as protective film coatings and insulating layers in the manufacture of integrated circuits. The advantages of this method (high purity, controlled penetration depth and amount of the introduced element) allow creating the required concentration of the impurity component in the solid phase at low temperatures on the surface or in the volume of the crystalline substrate. Thus, the unique millisecond mass spectrometer of secondary negative atoms and clusters created at the Institute made it possible to develop a new technology for low-temperature vacuum cleaning of the surface of silicon and silicon carbide, which was tested at JSC Foton in the production of semiconductor power diodes.

The priority direction of the Institute in the field of Physical Electronics is the study of current problems of vacuum-arc discharge, including: - the influence of discharge parameters on the process of particle ionization; - processes occurring in cathode spots; - structural changes in the cathode surface due to the high-temperature effect of these cathode spots, - as well as the technological possibilities of using this discharge in materials science.



"Iskovich" thermal desorption surface ionization measuring complex

Technological installation for electric arc cleaning of metal products

The targeted use of the obtained results of fundamental research into the physics of arc discharge in a vacuum in the development of technologies with the aim of introducing them into production, predetermined the advanced development at the Institute of methods for cleaning the surface of ferrous and non-ferrous metals from various contaminants that have no analogues in the world, as well as the creation of plasma torches for applying multifunctional, protective coatings and obtaining multilayer and composite materials with specified properties.

Thus, the technologies developed at the Institute allow the following types of processing of metal products:

- cleaning the surface of conductive materials of welding wire, rods, internal and external surfaces of pipes of various diameters;
- complex processing, strengthening of materials and application of protective coatings to their surface in one technological cycle;
- application of protective, wear-resistant, special and decorative coatings using vacuum-arc and ion-plasma methods;
- and also obtain new materials and products from them with special characteristics and properties based on multilayer coatings of appropriate material compositions.

On this basis, a special vacuum installation and electric arc processing technology were created for modifying the surface of metal products. This technology is designed to remove scale, oxide films, rust and other contaminants from the surface of rolled metal products, as well as to improve the surface properties and strengthen these products. In this case, the microhardness of the surface layer after arc treatment increases by 1.5-1.7 times, corrosion resistance - by 10 times or more compared to an untreated surface. Ion-plasma installations created at the Institute and products treated on them are shown in the photo.

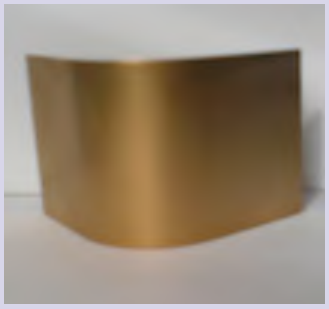
The results of priority developments and research by scientists in the field of creating effective technologies for ion-plasma cleaning and surface hardening, implantation, vacuum-arc deposition of coatings have been published in leading journals, and various types of these technologies and devices for their implementation are protected by patents of the EU, Australia and Japan, four patents of Russia and 10 patents of Uzbekistan.

The Institute's current focus is research on the development and optimization of technologies for creating new semiconductor structures and synthesizing materials that can improve the efficiency of solar cells. In this area, priority is also given to research on optimizing technologies for synthesizing monosilane, which is the main starting material in the production of silicon-based solar cells for modules of photovoltaic solar installations and panels of solar power plants of various capacities. In this regard, the Institute of the Uzbekistan Academy of Sciences has created an original domestic technology for obtaining polycrystalline silicon from metallurgical silicon.

As part of this work, the Institute has developed an effective monosilane technology for producing polycrystalline silicon in a continuous mode of the technological synthesis process with activation of the reaction medium during its implementation and ensuring the purification of monosilane from harmful impurities. One of the main differences of this original monosilane technology is the complete exclusion of the so-called induction period of the direct reaction of metallurgical silicon and alcohol without the formation of an oxide film on the surface of silicon when interacting with atmospheric oxygen. At the same time, monosilane technology allows eliminat-

Technology of electric arc cleaning and application of protective coating on the inner surface of metal pipes.





Technological installation for ion-plasma deposition and synthesis by ion bombardment of strengthening titanium nitride coatings.

ing aggressive precursors and semi-finished products of chemical reactions in the process of monosilane synthesis. This also provides the possibility of optimizing the technological process by eliminating a number of procedures for separating intermediate reaction products, without their negative impact on the quality of the final product.

It should be especially noted that the results obtained in the course of these scientific studies ensured the successful fulfillment of the contract between the Institute and the OC company (South Korea) for the development of monosilane technology for obtaining polycrystalline silicon and the creation of an experimental setup for this purpose. And the main results of the optimization of the technological process of monosilane synthesis are protected by 4 patents of the Republic of Uzbekistan and 15 foreign patents obtained in the USA, Japan, China, South Korea, Russia, Taiwan and the European Union.

The high level of the conducted scientific research and applied developments of the Institute is ensured, among other things, by the modern material and technical base, including unique installations, on which the processes of gas-phase, ion-stimulated vacuum and plasma-chemical production of semiconductor materials, micro- and nano-sized films are implemented. In addition, a technological complex for the synthesis of monosilane and for electrophysical measurements of the parameters of semiconductors and analysis of their composition, a chemical laboratory with the corresponding equipment, as well as a class 1000 “clean room” with an area of 84 square meters have been created. In this practically sterile room, designed to provide conditions for the clean implementation of the created technologies, in addition to year-round air filtration from dust particles, stable temperature, pressure and air humidity are also provided. Inside this clean room there are growth installations for atomic layer and chemical deposition with a vacuum gateway, a spectral ellipsometer, work tables for performing work that requires especially clean conditions.

t should be said that at present, scientists from the Institute conduct research not only on the scientific equipment they have created. In order to obtain world-class scientific research results, scientists also use the corresponding modern analytical equipment. The Institute’s management pays special attention to this issue. Thus, according to the government decree, in 2002, a unique scientific research and technological complex was created at the Institute, the capabilities of which are constantly increasing, thanks

General view of the clean room of the Institute for conducting research

to the purchased modern devices of foreign manufacture. On the basis of this complex, which today corresponds to the best world analogues, the Centre for the collective use of unique scientific equipment was organized at the Institute. Moreover, the park of analytical equipment of this Centre includes a number of modern highly sensitive analytical devices of foreign manufacture. This allows scientists to use the entire research potential of highly sensitive analytical equipment not only to solve the problems of the Institute, but also other interested organizations of Uzbekistan.

Thus, the direction of Physical Electronics in Uzbekistan, which has passed a fruitful path based on many years of creative activity of leading scientists and gifted young specialists, has become one of the main ones in domestic physics and has led to the creation of many new highly sensitive analytical corpuscular methods and effective technologies that have no world analogues, based on the use of a wide class of atomic particles. Undoubtedly, this creative path of Physical Electronics will be continued and will lead to new scientific and practically significant achievements. And I would like to wish new successes to scientists in this.

Growth setup – cluster of atomic layer, chemical and plasma-enhanced chemical vapor deposition (PEALD, PECVD) with vacuum loading lock

Low-power electric systems based on solar photoelements

Ramiz Muminov,
academician,
Khabibullo Sabirov,
professor,
Mukhamad Tursunov,
doctor of technical sciences

Solar energy is an environmentally friendly and renewable energy source that is increasingly used. Photovoltaic systems based on solar cells are technical devices that convert solar radiation energy into electrical energy. In regions remote from main power lines, providing this energy is expensive or often simply impossible. At the same time, low-power solar photovoltaic systems and devices provide autonomous stable power supply to remote consumers even in unstable weather conditions. Solar batteries and photovoltaic devices provide electricity for lighting, communications, scientific and household appliances, and can power water pumps and other equipment at water treatment plants located in remote or mountainous areas. The use of solar batteries and solar modules is especially promising in regions with high levels of solar radiation. Therefore, in Uzbekistan, with its abundance of sunny days, solar photovoltaic systems and power plants are finding increasing application.

The main elements of solar photovoltaic systems, installations, modules and panels of various purposes and power are solar photovoltaic cells, inverter, charge controller, batteries and necessary infrastructure elements. Let's briefly consider their purpose.

Solar photovoltaic cells are devices that are made of various semiconductor materials. Most modern solar photovoltaic cells are made of silicon, which is a widely used semiconductor material in microelectronics and photoelectronics. The basis of solar photovoltaic cells is the photovoltaic effect, in which semiconductors, under the influence of solar radiation, generate direct electric current by converting

sunlight energy into electrical energy. To increase the output power, solar photovoltaic cells are combined into multi-element cascades - modules, batteries or solar panels. Solar modules and batteries are connected to other components necessary for creating power sources (inverters, controllers, batteries, etc.) and together form a working photovoltaic system (Fig. 1).

An inverter is an electrical device that converts direct current received from solar batteries, modules or panels into alternating current corresponding to the parameters of the electrical network, which is used in household electrical appliances. The inverter receives direct current from a power source, for example, from a photovoltaic battery (during the day) or a battery (mainly at night). Inside the inverter, there is a special electronic circuit that converts this direct current by modulation into alternating current of high industrial frequency of 50 Hz. The alternating current created in this way in the inverter can be used

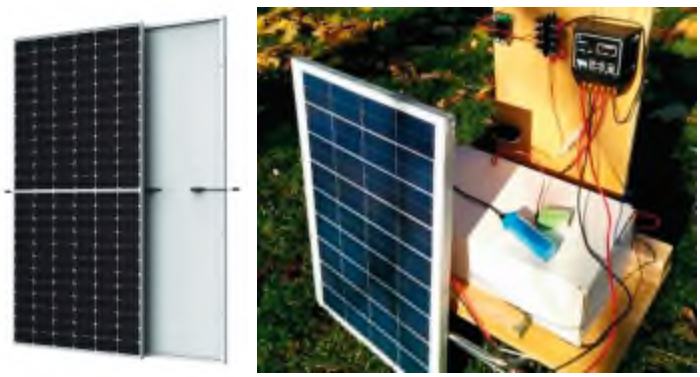


Fig. 1. Photovoltaic module (left) and photovoltaic installation (right).

to power various electrical devices (Fig. 2). Inverters are indispensable devices in solar energy and allow the use of stored energy from batteries and renewable energy sources to power various devices. The correct choice of an inverter ensures a reliable and uninterrupted power supply to low-power consumers in almost any conditions.

The charge controller manages the process of charging batteries, protecting them from overload and deep discharge. The controller receives direct electric current generated by photovoltaic modules, batteries or panels (see Fig. 2). The controller regulates its strength and voltage, adapting them to the needs of the battery. The current adjusted in this way charges the battery. The controller also constantly monitors or tracks the state of the battery and switches off its charging when charging is complete, preventing its damage and uncontrolled discharge.

The battery is designed to accumulate and store excess energy received during the day from solar batteries, modules or panels (Fig. 2) for its use by consumers at night or in cloudy weather, when solar radiation is insufficient to generate electrical energy. Currently, gel batteries are widely used in photovoltaic systems. Due to the gel electrolyte, gel batteries practically do not emit gases and are safe to use.

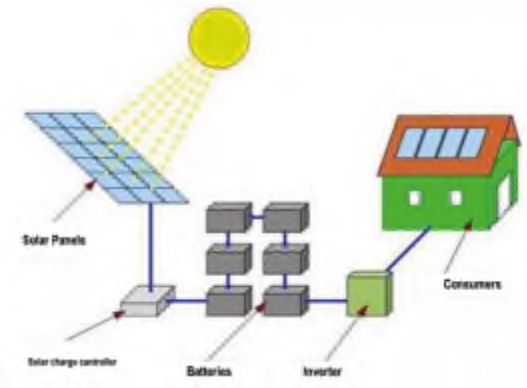


Fig. 2. Schematic diagram of a solar photovoltaic installation.

An integral part of modern solar devices is a monitoring system. Monitoring allows continuous tracking of solar energy production and consumption, which makes it possible to quickly assess the efficiency of solar panels and inverters and optimize the operation of the solar system, increasing its efficiency and reliability. A wide range of semiconductor materials are used to create photovoltaic installations for various purposes. The efficiency of converting solar radiation energy into electrical energy in these materials varies and is associated with the band gap of the semiconductor material, which determines which wavelengths of the solar spectrum the material can effectively absorb. At the same time, the quality, purity and structure of semiconductor materials significantly affect the efficiency of their generation of direct electric current.

High light absorption coefficient of the semiconductor material ensures efficient use of the solar spectrum and increases the efficiency of converting solar energy into electrical energy. To increase the efficiency of solar photovoltaic cells, it is important that the semiconductor material has a high light absorption coefficient over the entire range of wavelengths corresponding to the solar spectrum. The choice of semiconductor material depends on a number of factors, including its cost, energy conversion efficiency, operational stability, and the influence of climatic and environmental conditions. The most common material for solar cells, modules, and panels is crystalline silicon. It has good stability, temperature resistance, and relatively high efficiency. There are 2 types of crystalline silicon: monocrystalline and polycrystalline. Monocrystalline silicon has a higher energy conversion efficiency, but is also more expensive. Polycrystalline silicon is cheaper but less efficient. Silicon is able to absorb a significant portion of the photons of the solar spectrum, especially in the range of light wavelengths up to 1.1 μm. This range covers most of the visible and near infrared solar radiation. However, silicon is a semiconductor material with an indirect band gap. Because of this, and also because of the relatively low absorption coefficient of light near the edge of its spectrum, fairly thick silicon layers (about 250 μm or more) are required for efficient absorption

of light. Thick silicon wafers increase the consumption of material, which in turn increases the cost of solar cells. In this regard, the development of thin-film silicon-based solar cells is an important task for reducing their cost and material intensity.

On the other hand, knowledge of the light reflectivity of the surface of the semiconductor material is also very important for the creation of efficient solar cells based on it. The absorption and reflection spectra of solar radiation also allow one to determine the purity of semiconductor materials, the presence of impurities and defects in them. This is critically important for ensuring stable characteristics of photovoltaic devices for various technical purposes. As an example, we will cite some solar photovoltaic systems developed and manufactured at the S.A. Azimov Physical-Technical Institute of the Uzbekistan Academy of Sciences (PTI UAS).

Photovoltaic drip irrigation system for agricultural crops on slopes. The lack of traditional power sources and the requirement for irrigated irrigation in remote mountainous areas make it difficult to develop new areas suitable for growing agricultural crops, such as hills and mountain slopes. In order to solve this problem, a solar photovoltaic battery was developed to provide energy for drip irrigation systems in horticulture and field crop production, especially in mountainous areas, Fig. 1 (- Fig. 1 was already on page 2 - is this different?? - A.Kh.). With drip irrigation, water is supplied directly to the root system of plants, providing them with the necessary amount of moisture for growth and development, and water consumption is reduced compared to traditional irrigation methods. The use of drip irrigation does not disturb the soil structure, and plants do not die from strong sunlight when water droplets fall on the leaves. To solve the problem of drip irrigation of mountainous areas and waterless territories, a solar photovoltaic device was created, which is located on the territory of the Helio-polygon of the Physical-Technical Institute of the Uzbekistan Academy of Sciences, as well as in an industrial version on the territory of the farm “Khamkorlik Chorbogi” of the Urgut district of the Samarkand region at the foot of a mountain slope with a slope of 45°. At the bottom of this slope, a pool with a volume of 80 m3 of water was created, next to which this device was installed (Fig. 3).

The pool is filled with water from natural sources: seasonal rains, melted snow, and small mountain streams, which is then used for drip irrigation. This drip irrigation system uses hydrostatic water pressure. To do this, a 250 W water pump, powered by a solar photovoltaic battery, lifts the water collected in the pool into the upper reservoir, with a volume of 6 m3, which is installed on an elevated slope, and an electric pump pumps water from the lower pool into this reservoir. This creates the necessary pressure to supply water from this reservoir down to the pre-terraced slope without using additional energy.

On the mountain slope (Fig. 4a) of this farm, vineyard bushes were planted in the fall. The following year, at the end of spring, the slope turned green, and the young vines of the vineyard successfully took root (Fig. 4b). Then, with the help of this drip irrigation system, the vineyard was irrigated throughout the hot season thanks to a solar photovoltaic device.

This experiment with the use of a solar photovoltaic energy source opens up new opportunities for the development of agricultural production in hard-to-reach mountainous and hilly areas of Uzbekistan.

A portable photovoltaic heating device of low power.

In settlements where there is no centralized power supply, diesel generators and traditional methods of heating water using wood or coal are still common solutions. However, diesel generators have high operating costs. In addition, heating water using wood or coal can lead to air pollution and create fire hazards. The portable photovoltaic heating device developed by scientists is capable of providing low-power household consumers with electricity and can also be used in parallel to obtain the required amount of hot water. This is a cost-effective solution for providing a home with the necessary resources - electricity and hot water (Fig. 5).

An industrial model with a power of 60 W and an efficiency of 20% was chosen as the basis for the photovoltaic heating device. The total surface area of the heat collector is the same as the surface area of the photovoltaic battery. Vertical reflectors of sunlight, installed at an optimal angle to the surface, help to increase the density of the solar radiation flux by 1.5-1.8 times; as a result, concentrated solar radiation creates additional thermal energy, which is transferred to a special heat collector attached to the back of the battery, which allows us to get hot water with a temperature of up to 55-60°C. The hot water obtained in this way is collected in special containers and can be used for household needs. This device can produce 50 litres of hot water with a temperature of 60°C per day.

The controller consumes electricity from the photovoltaic battery during the day and from the battery at night. The inverter in the device is designed for consumers with a power of up to 2000 W. At night, a fully charged battery provides 220 V AC power for a laptop, TV, and other devices via an inverter, as well as electric lighting for 4-6 hours.

The developed new type of heat collector based on cellular polycarbonate allows for an increase in the electrical parameters of the solar photothermal bat-

Fig. 3. A pool with a volume of 80 m3 and a photovoltaic system for drip irrigation.

Fig. 4. a - the mountain slope selected for planting crops;
b - after planting the vineyard and using drip irrigation.

tery. The device provides guaranteed electricity and hot water to residents of mountainous and desert areas remote from a centralised power supply.

Studies were conducted on the short-circuit current, direct voltage, useful power, sunlight intensity, and air temperature of this solar photovoltaic installation over time, which showed the stable preservation of its parameters.

Installation of electric lighting from a photovoltaic battery.

For the autonomous supply of low-power (up to 100 W) energy consumers (summer houses, farms and peasant farms, livestock yurts, experimental research stations, night road lighting, etc.), mobile, portable, quickly disassemblable, and lightweight photovoltaic power sources are needed.

The power and output electrical parameters of such an autonomous photovoltaic battery (PVB) must be sufficient for its joint use with a storage battery or direct connection to energy consumers. Experimental samples of a portable electric lighting installation from a PVB were developed and manufactured, which includes the following components: a photovoltaic battery with a power of 8-15 W, a storage battery (SBA) with an electrical capacity of 10-15 A h, a charge level controller, as well as fluorescent lamps of the LDS type or their analogues, with a high-frequency current converter built into the housing (Fig. 6).

The basis for choosing the power of the solar photovoltaic battery were the following factors:

- guaranteed provision of the stored energy of the battery for 6-8 hours of continuous operation of fluorescent lamps per day, with the minimum possible weight and dimensions;

- the power of the solar photovoltaic battery should be sufficient to replenish the energy used by the battery per day, as well as the energy spent on power supply of low-power household appliances, such as radio and television receivers, laptops, etc.

To determine the potential of the photovoltaic installation for the generated power in natural condi-

Fig. 5. Solar photovoltaic heating device.

tions, various energy consumers with a capacity of up to 200 W were connected. The developed photovoltaic power plant is easy to operate and can be used in all regions of Uzbekistan as a small-sized, low-power source of electrical power.

It should be especially noted that the solar photovoltaic devices presented above were developed taking into account the need for their easy transportation and installation in various places to provide electrical energy to various consumers. These characteristics make them indispensable in situations where mobility and rapid deployment of a power source play a key role, including for use in remote areas, at temporary sites, on expeditions, and in mountainous and field conditions.

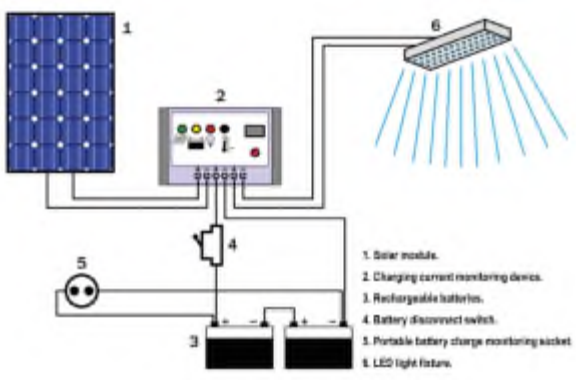


Fig. 6. Connection diagram of the solar photovoltaic battery for lighting.

Is the growth of myna population in cities dangerous?

Bakhtiyor Kholmatov,
professor,
Javlon Yakubov,
junior research fellow

In the process of evolution, the emergence, survival or extinction of any species of flora and fauna occurs continuously. Sometimes species firmly establish themselves in the environment based on natural selection, competition for survival and genetic variability. They carry out various types of adaptation to changing conditions and even expand their range at a certain speed and in a certain direction. An important and decisive role in the speed of the evolutionary process is played by the influence of environmental factors. With the emergence of mankind, its ties with nature strengthened and intensified throughout its historical development. Later, with the increase in the number of people on Earth, they not only used nature wisely, but also began to influence it. Human impact first began to be felt in places of residence, and gradually in adjacent territories. This affected the course of natural processes and even led to an imbalance. As a result of the increasing negative impact of man, the composition of flora and fauna on Earth changed, some species completely disappeared, the range of most plants and animals decreased, and they acquired the status of species in need of protection at the global and local levels.

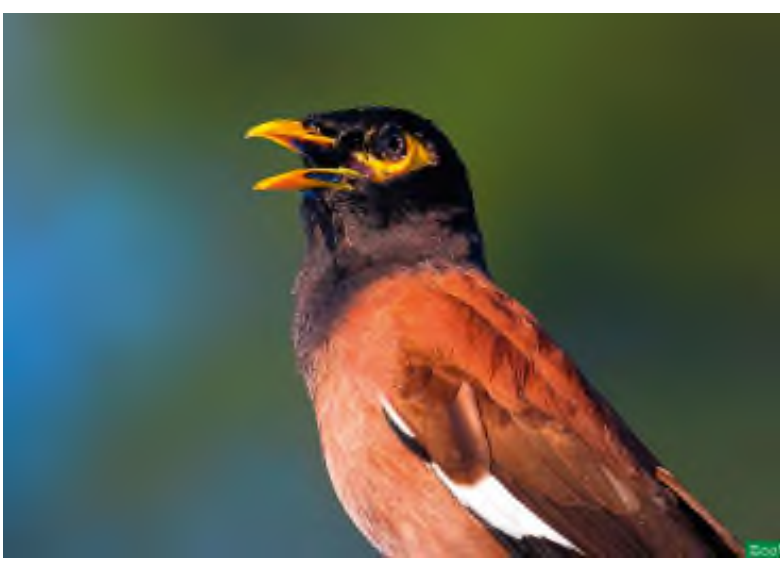
The acceleration of urbanization or the process of urban development has led to the abandonment of these territories by some species of birds or a sharp reduction in their numbers, as they are not adapted to this environment.

Urbanization is a complex process that can be explained by a number of factors, including the demands of the times, demographic growth and growing needs of the population, followed by the expansion of cities, the growth in the number of high-rise buildings, the expansion of roads, an increase in areas covered with concrete or asphalt, an annual reduction in areas for growing plants, the replacement of berry, fruit trees, shrubs and wild grasses with decorative trees and artificial plants (lawns) and synthetic surfaces, an increase in the number of vehicles and people on the streets, constant noise.

Planting on streets, in courtyards and around administrative buildings seedlings of non-local origin juniper, pine, honey locust, maple, maclura, catalpa, albizia, Japanese saphora and other trees and shrubs that provide shade or produce fungicides has radically changed the appearance of cities, and every year in different regions of our country the beautiful urban landscape pleases the eye more and more. The growing number of buildings and structures, multi-storey buildings with a modern appearance can surprise and even make these areas unrecognizable to people who have not been here for 5-10 years. However, the negative impact on the animal world that historically inhabited these territories (native species) is manifested in a sharp reduction in their diversity and numbers. A natural process is their replacement by eurybiont animals that can quickly adapt to multifaceted complex changes in the external environment. Such species are called in science as having “high ecological valence”. An example is the myna, which today appears to be a certain “problem”. A number of adaptability features of this species in nutrition, reproduction and behavior have allowed it to spread widely in residential areas, villages and cities, successfully reproduce and survive for a long time.

Myna (*Acridotheres tristis*) is a species that is rapidly expanding its range in anthropogenic landscapes. This bird entered Central Asia through Afghanistan at the beginning of the 20th century and began to spread widely here. Even today, its distribution continues through penetration into new territories.

Myna, as a migratory bird that arrived in the territory of Uzbekistan, was first recorded by N.A. Zarudny in 1912 in the Termez region. Kh.S. Salikhbaev reports that in the Surkhandarya valley, in the Jarkurgan, Denau, Sariasiya and Sherabad districts in 1927-1929 it was already a common bird species. According to R.N. Meklenburtsev for 1958, myna, as a nesting bird, was known in Kelif, Termez and Sherabad in 1935, and in the Karshi, Shakhrisabz and Kitab regions in 1954. According to another source, myna made nests in Shakhrisabz as early as 1942. According to O.P. Bogdanov, the myna entered the Zerafshan Valley through Charjui (Charjou). In 1949, it reached Samarkand and



Common Mayna (Acridotheres tristis)

Afghan starlings

expanded its range at a rate of 30 km per year. At the end of 1951, it was observed in the vicinity of Jizzakh, and in 1953 – in the Zaamin district. Kh.S. Salikhbaev recorded the myna in 1959 in the Chirchik River valley near Chinaz, and in October – in the Toytepa district of the Tashkent region. In 1960, it was encountered in the Kibray district. The myna was observed on May 30, 1961 in the village of Pap in the central part of the Fergana Valley. In the southern part of the Kyzylkum Desert, this bird was first discovered by T.Z. Zakhidov in June 1945. In scientific sources it was listed in 1954 as a common species in many settlements of the desert region. In the summer of 1959, the myna was discovered in a number of villages and auls near Tamdy, Uzunkuduk, Tabankul . Nesting of the myna in Central Kyzylkum was established by G.I. Ishunin in May-June 1969. Later, its distribution in the territory of Karakalpakstan was reported by M. Ametov in his scientific work published in 1981.

The myna's permanent habitat is the cultural landscape, where it finds food all year round in cultivated fields, along the banks of rivers, canals, in populated areas and places containing anthropogenic elements. For reproduction, it uses tree hollows, rock crevices, abandoned nests of other birds. During the day, the myna flies to agricultural landscapes alternating with gardens and large groves, pastures for cattle and often feeds in small flocks, and sometimes in pairs. Closer to evening, it returns to populated areas and in small, medium and large flocks settle down for the night in trees or under the roofs of various buildings. During the breeding season, the parent birds spend the night near the nest.

Like other starlings, they live in peace not only in flocks with other individuals of their own species, but also with crows, jays, magpies, pigeons, turtledoves, starlings, sparrows and other birds. When the chicks leave the nest, they first live with their families and then unite into flocks.

During the breeding season in summer, the myna looks for food within a radius of 1-2 km from the nest. In autumn and, especially, in winter, it covers a distance of up to 5-10 km from the place of overnight stay. Usually, with the arrival of winter, the myna migrates from open areas and fields to areas closer to human habitation. At this time, their numbers increase in villages, district centers and cities, and their share in the bird community increases. Birds quickly get used to the nesting and breeding site and use it not only during one breeding cycle, but also every year in a given season. New generations of birds look for nesting sites and thus continue to expand the distribution area of the myna. In the same way, they do not change their overnight stays for many years.

Myna spends most of its time searching for food on the ground, and the birds do this by taking long strides and sometimes making short flights. They dive freely into puddles and wash their body and feathers. Then, perched on a tree branch or a high place, the myna dries its feathers. The myna's flight is heavy, di-

Mayna

rect and fast. Myna is active during the day in search of food for its chicks, and in hot weather it brings less food than in the morning or evening hours. Myna is a fairly trusting bird. If left alone, it treats people with trust. When feeding in a flock, one or more individuals ensure its safety. If it detects any danger, it immediately warns the members of the flock by making a sound indicating a threat. Myna is a rather noisy bird, especially in roosting areas it makes noise for a long time. Both males and females make the same sounds.

Although the study of the myna's diet in Uzbekistan has been conducted for many years, it has not yet been fully completed. According to N.M.Yudin, in summer, adults and young individuals feed mainly on insects, primarily orthopterans (grasshoppers). A.R. Raimov, who conducted research in South-West Kyzylkum, confirmed that the myna is a useful bird for the agricultural landscape.

In particular, the myna's food spectrum changes depending on the season and habitat: in spring, myna feeding in various agrocenoses feeds on 55 species (43 animal species (78%), 12 plant species (22%), in summer – 50 species (37 animal species (74%), 13 plant species (26%), in autumn – 55 species (31 animal species (56%), 24 plant species (44%), and in winter – only 30 plant species. In winter, 28 types of food were found in the food spectrum of birds living in cities and regional centers, of which 15 species (53%) are seeds of cultivated plants, 13 species (47%) are fruits and food waste. In natural conditions, the myna's diet is more extensive: when examining two individuals caught in the Sangzor River area, mollusks, water beetles and tadpoles were found in the stomachs of the birds. Although the above data are incomplete or insufficient, they indicate that the myna feeds on both plant and animal food, and in spring and summer it feeds more on insects.

Although the myna is a sedentary bird, it makes vertical and horizontal migrations depending on the season. Vertical migrations are from the mountains to the plains, and horizontal migrations are from agricultural landscapes or cultivated areas to settlements and cities.

Orchards, agricultural fields interspersed with shrubs and forest plantations, grazing and livestock areas, trees around ditches, canals and other bodies of water, river banks, ravines and cliffs are attractive nesting sites for mynas. Mynas use tree hollows, rock crevices, old nests of other birds (cuckoo, owl, buzzard, woodpecker), roofs of buildings, cracks in the walls of houses, cattle yards and other places as nesting sites. In urban areas, they nest in old street lamps, air conditioners, gas and electric meter panels, various parts of unfinished buildings and among building materials. Experiments conducted in the Bukhara region have shown that mynas easily occupy artificial nests and tree hollows. In the first years after arriving in Uzbekistan, mynas built nests and reproduced in colonies. For example, 12 nests were found on 5 plane trees near Shakhrisabz. Nests of woodpeckers, hoopoes, turtle doves and shrikes were also found on these trees. Mynas easily and quickly build nests in 2-3 days. They repair last year's nest. To build a nest, they use dry grass stems, leaves, bird feathers, pieces of wool, cotton, as well as cellophane, polyethylene, hemp threads and other artificial materials. The pair begins building a nest early. During one season, a pair of mynas hatches chicks up to 3 times. Each clutch contains 4 to 7 eggs, usually 4-6. The female incubates the eggs for 14-16 days, and the chicks fly out of the nest after 20-22 days. During the first days, the parents feed their chicks, protect them from various dangers and introduce them to feeding places.

Based on the research of N.M.Yudin and A.R.Raimov, it can be said that the myna is beneficial to agriculture, destroying many harmful insects and their larvae, and partly orthoptera. When studying mynas in the Bukhara oasis, plant seeds were found in their stomachs, including grapes, mulberries, etc. The scale and causes of damage to horticulture and agricultural products have not been fully studied. Ticks, mealybugs and blood-sucking parasites were found on adult mynas and chicks. In general, in modern Uzbekistan it is important to study the ecology of the myna and its role in the economy in more detail.

The increase in the number of mynas in regional centers and cities over the past 20-30 years has caused a public outcry about their impact on biodiversity and the decline in the number of other useful birds in their habitats, including sparrows and other species. A group of activists even began to express the opinion that this bird should be completely exterminated in Uzbekistan. In fact, the myna has practically nothing to do with the decline in the bird population in cities. As can be seen from the information provided above, the myna feeds together with other species and reproduces, nesting nearby.

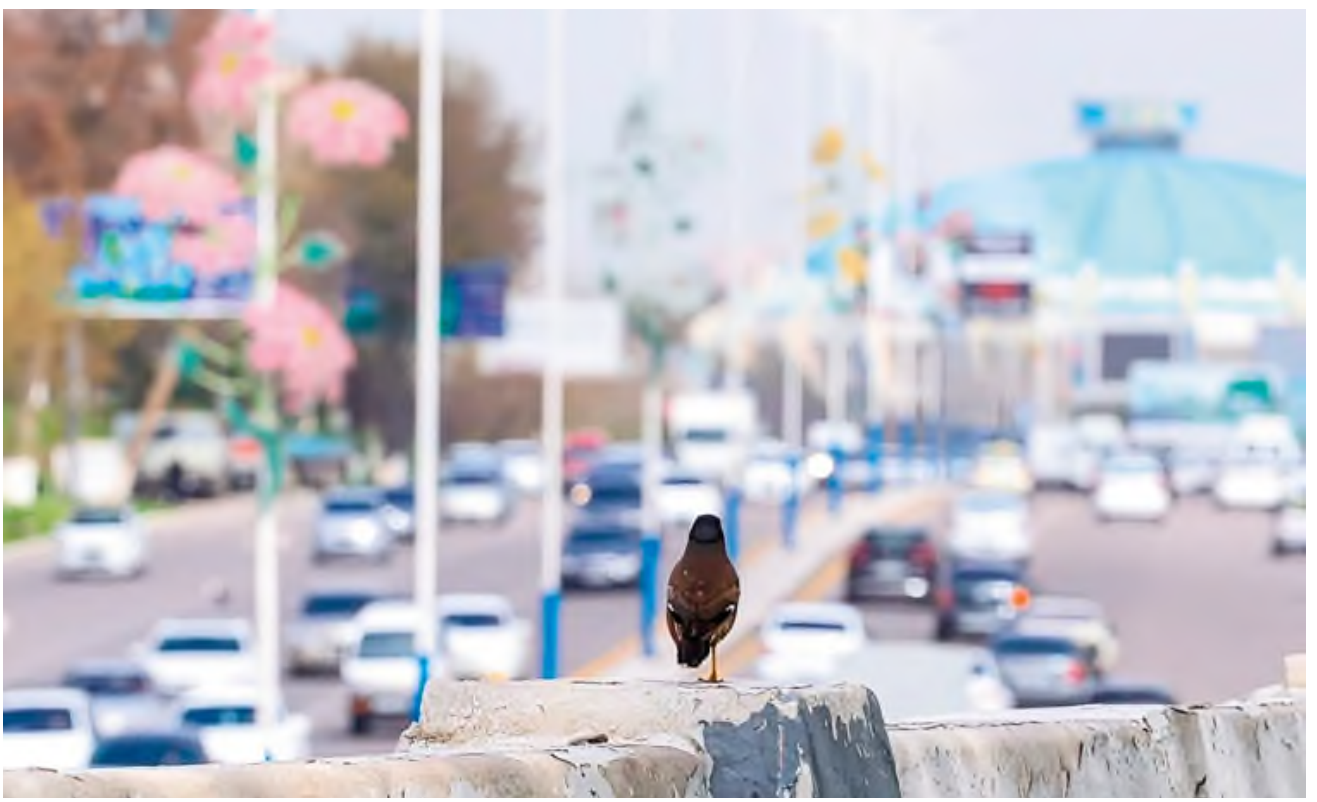
Any change in nature has certain causes. The complex impact of negative changes in the environment, urban infrastructure, the increase in the amount of transport and population, air pollution and many other factors on the animal world of the region directly or indirectly affects its diversity and leads to an increase in the number of some bird species, including polyphagous, eurybionts, such as myna.

In addition, pollution of densely populated areas with various food remains and long-term accumulation of garbage in unauthorized places attract birds with a wide range of food, such as myna, magpie, crow, to the cities, creating opportunities for them to survive in this area for a long time, especially in winter, when natural food is scarce.

It is wrong to publicly condemn the myna as a harmful bird species and call on people to fight it and exterminate it. In the current civilized time, it is not a problem to bring any species to extinction. However, it is important to consider its consequences and the problems it can cause. A similar situation took place in the history of China, and the consequences of the extermination of sparrows as "pests" cost the state dearly. Therefore, it is advisable to look for scientifically based solutions to reduce the number of birds in cities, rather than destroy them. Because the myna has many useful qualities in natural zones and large agricultural landscapes. In our opinion, the most correct and useful solution would be to find ways to resettle this bird from the city to agricultural landscapes or developed territories.

Although achieving results in this area may take a long time (5-10 years), from the point of view of environmental safety and in today's era of advanced science, solving the "problem" in a simple way is very dangerous, and the consequences will be felt for a long time. Since mynahs live in populated areas, regional centers or cities and perform a certain function, the extermination of birds will undoubtedly lead to a violation of the number and balance of harmful insects on which they feed.

In order to conduct an in-depth study of the bio-ecological characteristics of the myna using modern methods, the reasons for its synanthropization, and a detailed disclosure of its functions in nature, one of the urgent tasks is the implementation of complex fundamental projects, analysis of the results of scientific research and decision-making on this basis.



Mayna walking on poles along the road from Peoples' Friendship Square to Khadra Square in Tashkent. Photo: "Daryo" / Madina Nurman

The unique treasury of the Amu Darya

Zokir Rajabov,
PhD (in Agriculture)

The Greater and Lesser Amu Darya Shovelnose Sturgeons (two species of sturgeon belonging to the genus Pseudoscaphirhynchus that live in the Amu Darya) are endemic to the Amu Darya and are among the most unusual and rare fish in the world. There are two species of shovelnose sturgeons in the Amu Darya: the Greater Amu Darya Shovelnose Sturgeon (Pseudoscaphirhynchus kaufmanni) and the especially rare Lesser Amu Darya Shovelnose Sturgeon (Pseudoscaphirhynchus hermanni). The Greater Amu Darya Shovelnose Sturgeon has two forms, conventionally called the "Large Broad-Muzzled" and the "Small (Dwarf) Narrow-Muzzled," as they differ in size and head shape. It is difficult to assess the population status of the Amu Darya shovelnose sturgeon and its population dynamics without special studies of its feeding and spawning grounds, especially since the spawning grounds of the Amu Darya shovelnose sturgeon are not yet reliably known. The most important area of conservation of the Amu Darya shovelnose sturgeon is the development of a method for its breeding in fish farms and its introduction into the aquaculture of Uzbekistan, along with another species that once inhabited the Aral Sea, Amu Darya and Syr Darya—the Aral Sea shovelnose sturgeon. The sections of the Amu Darya River below the Tuyamuyun hydroelectric power station are the most convenient area for researchers, scientists, and fish farmers.

The Amu Darya flows through the Khorezm region, where both species of Amu Darya shovelnose sturgeons were found, and research data indicate that individual specimens may inhabit these areas. Monitoring conducted by the Khorezm National Nature Park in the lower reaches of the Amu Darya, in the territory of the Khanka district, near the territory of the Urgench district, revealed populations of both forms (small narrow-snouted and large broad-snouted) of the greater Amu Darya shovelnose sturgeon (Pseudoscaphirhynchus kaufmanni), as well as the lesser Amu Darya shovelnose sturgeon (Pseudoscaphirhynchus hermanni). Individuals of the greater Amu Darya shovelnose sturgeon of different ages and stages of sexual maturity were caught and then released into the natural habitat (length 11 cm, excluding the caudal fin), including a mature female of the greater narrow-snouted greater Amu Darya shovelnose sturgeon (maturity stage 3+), from which eggs were obtained (hormonal stimulation), and adult ones of the lesser Amu Darya shovelnose sturgeon were also studied.

Studies of the middle and lower reaches of the Amu Darya have shown that the lower reaches of the river contain spawning grounds for the shovelnose sturgeon. It is known that sturgeons (Acipenseridae) lay their eggs on hard ground, mainly on rocks. The middle and lower reaches of the Amu Darya are characterized by the fact that the river carries in its

Small Amu Darya spoonbill in aquaculture at the Khorezm Academy of Ma'mun Academy of Sciences of the Republic of Uzbekistan

Large Amu Darya spoonbill in aquaculture at the Khorezm Ma'mun Academy of the Academy of Sciences of the Republic of UzbekistanМаьмуна

fast waters a large number of suspended particles (a mixture of sand and silt), which get into the water as a result of coastal erosion. The structure of the river bed is constantly changing as a result of sedimentation. Sturgeon eggs must develop for a week, stuck to the bottom and washed by water until the fry hatch from them, and such a bottom structure is unsuitable for fertilization. In this regard, we searched for and tried to find areas in the lower reaches of the Amu Darya that have a rocky or sandy bottom (which is rare for this river) and do not affect the formation of sediments due to the features of the relief and flow. Since 2018, staff of the Khorezm Mamun Academy and volunteers from Russia, with the support of WWF Russia, have conducted searches and identified such places in some areas of the lower reaches of the Amu Darya. When studying areas with a rocky bottom in the Tuprakkala area of the Khorezm National Nature Park and near the Tuyamuyun hydroelectric power station, we found that these areas are suitable for sturgeon reproduction. According to our research and the data obtained, small-scale poaching of the Amu Darya shovelnose sturgeon is carried out in this part of the Amu Darya (shovelnose sturgeons are used by the local population only for "medicinal" purposes, to treat infertility in women). A second rocky area of the Amu Darya bottom was discovered in the Karatau region (Karatau Range) of Karakalpakstan, downstream from the Urgench region, and, according to fishermen in this area, adult shovelnose sturgeons are also an object of fishing. It should be noted that, according to local fishermen, the Amu Darya shovelnose sturgeon has not been encountered in the Amu Darya downstream of the Urgench district and upstream of Karatau (for example, in the Badai-Tugai Reserve). Based on studies conducted by our colleagues from Turkmenistan and the USA (V.B. Salnikov—National Institute of Deserts, Flora and Fauna of the Ministry of Nature Protection of Turkmenistan; B.R. Kuhayda (University of Alabama, USA, R.L. Maiden (Saint Louis University, USA), this can be logically explained by the relatively short migrations of shovelnose sturgeons along the river from their spawning grounds in search of feeding grounds. We see that the biotopic distribution and migration activity of the large shovelnose sturgeon in the Amu Darya were recorded in their 2006 report using modern fish tagging methods.

The results of the monitoring conducted over the past year indicate that the studies conducted in the lower Amu Darya are preliminary, but they have at least allowed us to estimate what the structure of the adult population of the Amu Darya shovelnose sturgeon living in the lower Amu Darya in the Pitnak-Karatau area may be. The most promising way to test these assumptions and identify the spawning grounds of the shovelnose sturgeon in the lower Amu Darya is to carefully capture large numbers of shovelnose sturgeon (monitoring without removing them from the wild for testing purposes) during the spawning period in specific areas with rocky bottoms.

Taking into account the available data on the optimal temperature for the development of eggs of the large Amu Darya shovelnose sturgeon obtained by Russian researchers in 2012-2013 in the lower Vakhsh River in Tajikistan, their sexual development was carefully studied between March and May using ultrasound equipment. Studies have shown that during the spawning period, individuals ready to lay eggs gather in large numbers near the spawning grounds or are on their way to them. An Uzbek-Russian group of scientists engaged in the scientific study of shovelnose sturgeons in their spawning grounds monitors and tracks individuals of different ages in certain areas of the Amu Darya River in the autumn-winter period. Information was collected on the feeding of fish and their subsequent feeding. In the autumn-winter period, fish of different ages gained weight and continued to feed at low temperatures (+ 4-5 C). During the monitoring, experimental work is being carried

out to develop a method for breeding a small, narrow-snout form of the large Amu Darya shovelnose sturgeon. In this activity, the Eurasian Association of Regional Zoos and Aquariums (EARAZA) provides comprehensive support to these studies as part of its programme for the conservation of rare fish species in Eurasia, and Russian ichthyologists provide scientific and practical assistance. The results of the monitoring allow us to understand how to work with the Amu Darya shovelnose sturgeon, how to identify mature males and females of the small form of the Amu Darya shovelnose sturgeon, what hormonal injection schemes can be used, what is the optimal temperature regime for incubating eggs and other parameters. Previous studies have yielded results on the extraction, fertilization, incubation and storage of eggs of the Amu Darya shovelnose sturgeon up to the stage of its active feeding. Khorezm National Nature Park continues to study the structure of the adult population of the Amu Darya shovelnose sturgeon in the lower reaches of the Amu Darya, in particular, to identify spawning sites for the shovelnose sturgeon, as well as to develop a method for breeding adult fish and juveniles.

The Greater Amu Darya Shovelnose Sturgeon and the Lesser Amu Darya Shovelnose Sturgeon are fish belonging to the ancient sturgeon family (Acipenseridae) of the Amu Darya and Syr Darya rivers. These are the Greater Amu Darya Shovelnose Sturgeon (Pseudoscaphirhynchus kaufmanni) and the Lesser Amu Darya Shovelnose Sturgeon (Pseudoscaphirhynchus hermanni). The population of both species has significantly decreased. Their lifestyle is adapted to living in the muddy and fast waters of the rivers of the plains and foothills. They avoid reservoirs, sections of rivers and canals with very slow currents and are very sensitive to chemical and organic pollution of the water, as well as to high levels of ammonium and nitrites. Structure: externally, both species are distinguished by large and strong vertebral spines on the upper side of the body, which are curved backwards and can number up to 9 pieces, as well as the upper part of the tail bones elongated into a long caudal fin. The standard body length (without tail) of the greater Amu Darya shovelnose sturgeon reaches 50-55 cm, and its weight is 1.5 kg. The greater Amu Darya shovelnose sturgeon reproduces in the spring - in April-May, laying eggs under stones on the river bottom. Fertilization is not annual. In the wild, it feeds mainly on invertebrates, mosquito larvae, dragonflies and caddis flies. The large, broad-snouted form of the greater Amu Darya shovelnose sturgeon switches to feeding on small fish as it grows and matures. As an endangered species, the greater and lesser Amu Darya shovelnose sturgeon are listed in the Red Books of Uzbekistan, Turkmenistan and Tajikistan, the IUCN Red List and Appendix II of CITES. Commercial and recreational fishing for this species is completely prohibited.

Large Amudarya shovelnose

Illustration by artist I. Soin

Possibilities of the digital future

This article was prepared by the journal based on the materials of the 3rd International Conference "InnoCyberLawWeek–2025: Empowering the Digital Future", held on April 1-5, 2025 in Tashkent.

As is known, the term "digitalization" has appeared in widespread use relatively recently and is mainly associated with the widespread transition to digital forms of recording in the world. On a global scale, digitalization describes the concept of economic activity based on digital technologies implemented and used in various spheres of life and production. At present, it can be reasonably said that the 21st century began an era directly related to digitalization. Therefore, holding international forums with the participation of scientists, representatives of government agencies, education, business, production, as well as the general public, dedicated to various areas of application of the digitalization concept is undoubtedly relevant.

One of such representative forums was also the International Conference "InnoCyberLawWeek: Empowering the Digital Future", held in Tashkent from April 1 to 5, 2025 for the third time in recent years. Holding such international conferences in Uzbekistan testifies to the worldwide recognition of domestic scientists and legal experts. This International Conference was organized by the Tashkent State University of Law (TSUL) and the Ministry of Justice of the Republic of Uzbekistan with the support and sponsorship of about 30 interested organizations from a number of countries, including Uzbekistan. The opening and Plenary Session of the Conference were held on April 2, 2025 at TSUL, and in the following 3 days, panel meetings were held according to the approved programme.

More than 200 specialists participated in the Conference, including 30 speakers – scientists and experts

Presidium of the breakout session of the Conference, from left to right: Associate Professor Naim Rakha (Uzbekistan), Prof. Tiberio Graziani (Italy), Prof. Edvardas Juchniavicius (Poland), Prof. Marcin Michal Wiszowaty (Poland), Prof. Said Gulyamov (Uzbekistan)

Master - class conducted by professors of the University of Gdansk (Poland)

from foreign countries, as well as many domestic scientists – lawyers and students of TSUL. At the first plenary session, the participants of the Conference were welcomed by the Minister of Justice of the Republic of Uzbekistan A.D.Tashkulov and other heads of the Ministries of Justice, Higher Education, Science and Innovation, Culture, as well as a number of organizations and famous foreign scientists and experts – lawyers. During the Conference, a Memorandum of Understanding was signed between TSUL and the University of Münster (Germany) and a Presentation of the Department of Cyber Law of TSUL was held.

The plenary and panel sessions featured 33 reports on current issues and legal frameworks in the areas of digitalization, artificial intelligence, cybersecurity, including the legislative framework existing in the EU, Japan, India, the USA, Turkey, Russia and Uzbekistan. Diplomas were also awarded to students who completed academic exchange internships at foreign universities. The Conference included master classes by key speakers demonstrating foreign experience, and discussion panels with presentations by participants on issues of digitalization and the use of artificial intelligence methods.

During the preparation and holding of the International Conference, interviews were taken with a number of leading domestic and foreign scientists in the field of legislative foundations of digitalization, who noted the most pressing problems in the development of this area, and also gave examples of specific initiatives and legal acts in their countries:

Professor Said Gulyamov (Head of the Department of Cyber Law, TSUL, Uzbekistan), a renowned cybersecurity expert and Conference organizer, spoke at her opening and said – today we have gathered outstanding representatives of world legal science, government agencies and educational institutions to discuss the most important issues of legal regulation in the digital sphere. Over the course of three days, we will have 8 thematic sessions, speeches by more than 30 speakers from 15 countries, where topical issues of legal regulation of artificial intelligence, cybersecurity, data protection and digital financial instruments will be considered. Our conference is not just a scientific forum, but also a practical platform, its results will be used to improve the legislation of Uzbekistan. The conference will bring together leading global experts, government officials, academia and practicing lawyers to discuss current legal issues of artificial intelligence, cybersecurity, data protection and digital financial instruments. After the opening ceremony of the Conference, we will sign a Memorandum of Understanding with the University of Münster and award prizes to talented students of TSUL.

Professor Thomas Höhren (Director of the Institute for Information, Telecommunications and Media Law at the Westphalian Wilhelms University Münster, Germany), a leading European expert in cyber law and information law, said that in Germany and the European Union we are actively developing the legal framework for regulating artificial intelligence, data protection and ensuring digital sovereignty. The EU has adopted a number of important pieces of legislation in the field of regulation of the digital space

and sustainable digital development – the General Data Protection Regulation, the Digital Markets Act, the Digital Services Act, the Artificial Intelligence Act (AI) 2024 – creating a comprehensive legal framework for the protection of human rights in the digital age while stimulating innovation. Our Institute has developed an interdisciplinary approach combining legal science, computer science, economics and ethics to address the legal challenges of the digital society. We see significant potential for deepening our cooperation, and the signing of the Memorandum of Understanding between our University and TSUL is an important step in this direction. Together, we will be able to create a legal basis for *a sustainable and human-centric digital future.*

Professor Takashi Kubota (Waseda University, Japan), one of the leading Asian experts in the field of legal regulation of digital technologies, noted that Japan is actively developing the concept of «Society 5.0» as a new model of socio-economic development, in which digital technologies, including artificial intelligence, the Internet of Things and big data, are integrated into all spheres of life to solve social problems and improve the quality of life. Japan has adopted a number of important legislative acts aimed at regulating the digital sphere, including the Personal Information Protection Act, the Digital Transformation Act of Public Administration, the Digital Platform Regulation Act, they form a modern legal infrastructure for a digital society. In 2022, the Japanese government adopted the Concept of «Principles of Human-Centered Artificial Intelligence», establishing an ethical and legal framework for the development and application of AI. We are developing mechanisms to ensure the transparency of algorithms, the responsibility of developers and the protection of user rights.

Professor Giorgio Resta (Vice-Rector of the University of Roma Tre (Italy), a recognized expert in the field of personal data protection and digital law, noted that Italy actively uses the European approach to regulating digital technologies, based on the concept of «digital humanism» – the idea that technological development should serve people and society, and not subordinate them to itself. This philosophy is reflected in a number of key EU legislative acts that form the modern architecture of European digital law. The General Data Protection Regulation (GDPR, 2018) established a new global standard for the protection of personal data, strengthening citizens' control over their information and increasing the responsibility of organizations for its processing. The «GDPR effect» has gone far beyond Europe, influencing data protection legislation in Japan, Brazil, the United States and other countries. In 2022, Italy adopted the National AI Strategy for the development of the AI sector while observing ethical and legal principles. The creation of a European Center of Excellence in this area at TSUL seems to be a promising project, and Roma Tre University is ready to actively participate in its implementation.

Professor Evgeniy Kolenko (Head of the Academy of the Prosecutor General's Office of the Republic of Uzbekistan), who has extensive experience in implementing digital technologies in law enforcement, said that we have created the Unified Information System «E-Sud», which ensures electronic interaction between judicial and law enforcement agencies, as well as the «E-Huquq» system, which allows for the automation of consideration of appeals from citizens and legal entities. Methods for investigating new types of crimes committed using digital technologies have been developed. The issues discussed at the Conference are of practical importance for improving law enforcement in the digital era. We actively cooperate with the Department of Cyber Law of TSUL in this area.

Professor Marcin Michał Wiszowaty (Vice-Dean of the Faculty of Law, University of Gdańsk, Poland), a renowned expert in constitutional law and its adaptation to the challenges of the digital age, said that Poland is actively developing the Concept of «Digital Constitutionalism». This concept includes legal principles and norms that ensure the implementation of constitutional values in the digital space and the implementation of legal norms in various areas of modern society. We proceed from the fact that fundamental constitutional principles should retain their significance in the digital age. The Constitutional Tribunal of Poland has formulated important legal positions regarding constitutional guarantees in the digital space. With particular pleasure and pride, I would like to talk about the result of our long-term cooperation with TSUL. As part of this cooperation, in September 2025 we will open a joint master's program «Master of Laws (LLM) in Cyber Law and Artificial Intelligence». The training format will be combined: some classes will be held in Tashkent, some in Gdansk, online modules with the participation of leading experts from other countries are provided. The programme has also received EU accreditation, ensuring that graduates receive degrees recognised within the EU.

Professor Purvi Pokhariyal (Dean, School of Law, Judicial Justice and Policy Studies, National University of Forensic Sciences, India), is a renowned expert in cyber law and digital forensics and said in an online interview that we are implementing the Digital India program, which creates innovative legal mechanisms that ensure a balance between digital development, protection of citizens' rights and national interests. Over the past five years, India has significantly updated its legislation in the field of personal data, cybersecurity and digital services. The Digital Personal Data Protection Act 2023 establishes a comprehensive system for protecting citizens' data, stimulating their innovation. We have also adopted new rules regulating the activities of digital intermediaries, e-commerce and the use of AI. We pay special attention to the creation of specialized judicial mechanisms for dealing with cases related to digital technologies. The National University of Forensic Sciences of India is ready to share its experience and participate in joint scientific and educational projects with TSUL.

Professor Neslihan Karataş Durmus (Dean of the Faculty of Law, Ankara Yıldırım Beyazit University, Turkey), is a recognized expert in the field of financial law and its transformation in the digital era, and in an online interview she said that Turkey has adopted a number of important legislative acts regulating the digital sphere. Including the Law on the Protection of Personal Data, the Law on Payment Systems and Electronic Money, the Law on Cryptoassets, which create a legal infrastructure for the development of the digital economy. We pay special attention to the legal regulation of financial technologies. Turkey was one of the first countries in our region to create a comprehensive regulatory framework for cryptoassets and blockchain technologies. The Central Bank of the Republic of Turkey is actively working on the digital Turkish lira project based on legal mechanisms. The Faculty of Law of Ankara Yıldırım Beyazit University is ready to develop cooperation with TSUL in such areas as legal regulation of digital finance, data protection, e-commerce and cybersecurity.

At the final session of the International Conference, it was especially noted that the Conference programme was successfully implemented, and its plenary and panel sessions included vivid thematic reports and master classes on current issues of digitalization by a number of leading scientists and experts – lawyers of foreign countries, as well as fruitful panel discussions, exchange of experience and generation of new ideas that will serve the development of legal science and practice in priority areas of digitalization, creation of digital databases, widespread use of artificial intelligence and activation of the educational process of training highly qualified lawyers in Uzbekistan. And most importantly, the Conference will give a new impetus to the development of opportunities for the digital future in the Republic of Uzbekistan.

On the relevance of the creative economy

Saidahror Gulyamov,
academician

In the 21st century, creativity and innovation, new opportunities for using artificial intelligence and digitalization methods are becoming the most important factors in socio-economic development. In this context, the economy of Uzbekistan has undergone a significant transformation since 2017 and continues to develop steadily. This period was characterized by large-scale reforms and modernization of production, while the creative economy took one of the central places in the development strategy of the New Uzbekistan.

An important event on this path was the adoption in 2024 of the Law of the Republic of Uzbekistan "On the Creative Economy" (No. ZRU-970 dated 03.10.2024). This Law created the basis for the development of the creative economy and support for creative industries in the country.

As world experience shows, the creative economy forms priority development directions and opens new paths for sustainable growth of various industries and spheres of production, creation of jobs and socio-economic development. Therefore, the importance of studying the ways of forming the foundations of the creative economy and the priority role of modern education in this process cannot be overestimated.

It is important to define the main features, stages of development, areas and types of activities covered by the creative economy, as well as the role of education in the development of the creative economy. It should be noted that the formation of the Concept of the Creative Economy marks a significant shift in understanding the mutual influence of the concepts of culture, education and creative work of people, as well as the values of economic development.

International organizations UNESCO, UNCTAD (United Nations Conference on Trade and Development) and the WIPO (World Intellectual Property Organization) played an important role in promoting and clarifying the foundations of this Concept. This led to its implementation in government decisions in many countries of the world. The creative economy in its modern sense covers a wide range of human activities, from traditional arts and crafts to innovative methods of artificial intelligence and advanced digital technologies, uniting creativity and people, who are the main source of generation and promotion of socio-economic values.

The origins and background of the concept of "creative economy". The concept of "creative economy" means "economy of creativity", "economy of creation" or "creative economy". According to the generally accepted understanding, the Concept of creative economy began to take shape in the late twentieth century, reflecting the growing recognition of the economic value of human creativity. This was the culmination of a decade of development of the thought process of scientists in the field of cultural economics, creative creativity and innovative technologies. That is, the meaning of "creative economy" and its Concept were formed in connection with the increasing importance of innovative activities of people and innovative technologies, including innovative methods and techniques in the field of culture, literary creativity, fine arts, individual technological and craft production and the latest technologies. And as a result, there was an obvious need to somehow integrally reflect these innovations in the conceptual apparatus of a multi-sector economy.

It is generally accepted that it was early scientific developments in the field of cultural economics that laid the foundation for understanding the importance of the economic dimensions of creative activity, challenging traditional ideas about creation, innovation, and multidimensional culture as something separate from economic conditions. Thus, in the 1980s and

1990s, attention also increased to the role of creativity in the urban environment, economic development of cities, and the educational process. And such large European cities as Glasgow and Barcelona became early examples of their development strategies based on high educational and cultural values.

The turn of the 20th and 21st centuries saw a decisive moment in the development of the Creative Economy Concept, when fundamental scientific publications appeared in which this Concept was clearly defined. And the important role of creative industries in economic development was emphasized. During this period, the first attempts were also made to quantify the economic significance and contribution of creative industries, with pioneering research in the UK and Australia creating their methodological foundations.

Thus, the origins of the formation of the Concept of Creative Economy reflect the complex interaction of economic, educational, cultural and technological factors, preparing the ground for the expansion of the scope of its application in subsequent years.

Spheres of creative activity of people, united by the Concept of creative economy. In the first decade and 2000s there was a significant development and clarification provisions of the Creative Economy Framework. At that time, government reports, international research and academic studies were released that defined and expanded the scope of the creative economy to cover a wider range of industries and types of creative activity. For example, the UK Department for Culture, Media and Sport (DCMS) played a fundamental role in expanding the Framework by publishing a landmark report setting out a framework for defining the scope and measurement of the creative industries. This ground-breaking report was the first attempt to define and quantify the creative industries in the UK. It identified 13 sectors that make up the creative industries and provided the first estimates of their economic contribution. This Report laid the foundation for creative industries policy in the UK and classified sectors of the creative economy such as advertising, architecture, art and antiques markets, crafts, design, designer fashion, film and video, interactive leisure software, music, performing arts, publishing, software and computer services, and television and radio as integral parts of the creative industries. This not only influenced UK economic pol-

icy but also served as a model for other countries developing creative sectors.

At the same time, international organizations have also begun to recognize the global significance of the creative economy. UNCTAD's Creative Economy Reports, first published in 2008, provided a global perspective and potential for developing countries. These reports have played an important role in expanding the Concept beyond its initial focus on developed economies and have shown how creativity can stimulate economic growth and social inclusion in other parts of the world.

Moreover, academic contributions during this period deepened theoretical understanding of the creative economy by exploring the interactions between creativity, culture and economic systems. Scholars such as David Throsby and Andy Pratt made significant contributions to the field by exploring the economics of culture and the spatial dynamics of creative industries. This research led to more sophisticated models of how knowledge-based creative activity contributes to economic and social development. In doing so, methods were developed to quantify the creative economy, leading to a more accurate determination of its contribution to gross domestic product, employment, trade and urban development.

Characteristics of the creative economy sector. Between 2010 and 2020, there was an important shift from conceptual discussions to the practical implementation of the Concept. Governments around the world developed national strategies to promote and develop their creative sectors. And the importance of the Concept has grown significantly. For example, South Korea, Colombia and Nigeria have developed policies to support creative industries, recognizing them as engines of innovation and economic diversification. An example of this are also the guidelines developed by UNESCO - the Culture for Development Indicators and the EU Cultural and Creative Cities Monitor, which have developed standardized approaches and methods for measuring and comparing the creative economy in different areas. This Monitor is a tool for promoting mutual exchange and learning between cities in order to stimulate culture-based development. It provides comparable data on how European cities are performing across nine proposed dimensions, including «Cultural Activity», «Creative Economy» and «Enabling Environment», organized into 29 indicators. The Monitor covers 168 cities in 30 European countries, helping policymakers identify local strengths and opportunities and benchmark their cities against others. As a result, many European countries have adopted creative city concepts that develop cultural quarters, innovation districts and creative clusters to attract talent and stimulate economic growth. The success of cities such as Berlin, Montreal and Melbourne in using their creative sectors to drive urban regeneration has inspired similar initiatives around the world, strengthening the place of the creative economy in urban policy.

These innovations also contributed to a more accurate assessment of the contribution of the creative economy to sustainable development and social cohesion of urban population. Moreover, these creative urban clusters became centers of innovation and social interaction, contributing to the improvement of the population's life and the attractiveness of cities. The modern UN Sustainable Development Goals define the creative economy as a key driver of innovation, cultural diversity and social integration. Its distinctive features are intellectual property, innovation, cultural and economic impact, high education and the unique dynamics of creative work.

The main drivers of the creative economy are:

- ***Intellectual property (IP),*** as a source of value creation in the creative economy, is the key element

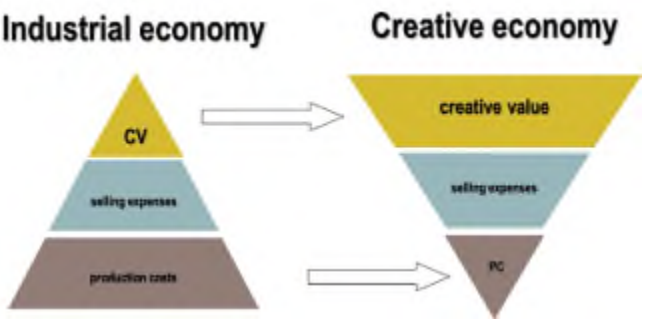
through which creative ideas are transformed into marketable assets. The concept of IP in the creative economy thus extends beyond traditional copyright to include trademarks, patents and design rights. This broader understanding of IP reflects the diverse nature of the creative industries, encompassing not only artistic and cultural works but also technological innovations and brand identities. Managing this complex IP landscape requires the development of new strategies that balance IP protection with the need for creative collaboration and cultural exchange. The confluence of creativity and technology is driving continuous innovation in sectors of the creative economy, from fashion and design to advertising and entertainment. Case studies from leading creative economies in the UK, South Korea and Canada show how public policy can help creative economies thrive while simultaneously addressing IP protection in the digital age and the relative precarity of creative work. WIPO also bases its definition of the creative economy on copyright-based concepts. This approach emphasizes the role of IP rights in creating value from the creative work of its creators. WIPO also defines publishing, music and film as areas of copyright.

- Pervasive digitalization. The digital transformation of the creative industries has become a central focus, applying technologies such as artificial intelligence, virtual reality and blockchain to creative production, distribution and consumption. This technological dimension includes new areas of the creative economy such as interactive media and digital design. Recent research has also focused on the resilience of the creative industries in changing economic conditions, especially in light of global challenges such as the COVID-19 pandemic. The adaptability of the creative sectors during this global crisis has highlighted their importance as a source of sustainable growth that also addresses significant societal issues.

Today's technological integration has erased traditional boundaries between creators, producers and consumers of value, fostering a more interactive and creative economic system, while also raising profound questions about the nature of creativity and authorship. Digital platforms and marketplaces have lowered entry barriers for many creative professionals, enabling direct-to-consumer models that bypass traditional intermediaries.

- Integration of technologies. Technological integration in the creative economy is also important for the development of market structures and competition. The creative economy uniquely combines cultural significance with economic value, contributing to both economic growth and cultural diversity. It is this dual nature that distinguishes it from other economic sectors as a key factor in sustainable development. Creative technologies have already demonstrated their significant potential in creating jobs, especially for young people and in urban areas, promoting economic sustainability and social inclusion.

Creative industries also create a multiplier effect, stimulating growth and development in related



sectors such as education, technology and tourism. In the cultural sector, the creative economy plays a vital role in preserving and promoting cultural heritage, and fostering innovation and intercultural dialogue, as well as cultural diplomacy in international relations. The creative economy labour market has its own characteristics that distinguish it from traditional employment sectors. For example, a high proportion of freelance and project-based individual work is common, reflecting the flexible and often temporary nature of creative projects. This economy model offers new opportunities for autonomy and varied work experience, but also poses challenges in terms of job security, benefits and career development. New technologies such as artificial intelligence, digitalisation and automation are significantly changing creative processes and the job roles of their participants, requiring them to take increasingly new approaches to developing their educational skills and career planning. At the same time, growing recognition of the importance of the creative economy is leading to new opportunities in areas such as cultural management, creative entrepreneurship and creative education.

- Educational resource of the creative economy. As we have already shown, the rapid pace of technological change in the creative sectors requires continuous training of people and development of their creative skills. Moreover, workers often have to master new tools, methods and opportunities throughout their lives. Of course, educational institutions and courses of additional training are adapting to meet these rapidly changing needs, developing flexible curricula that combine creative disciplines and basic knowledge with modern digital and innovative technologies, entrepreneurship and management.

In this regard, there is a need to develop a new form of education – creative education. The concept of "creative education" can be defined as education aimed at developing a person's creative abilities, which is carried out on an ongoing basis throughout his or her creative life. That is, it is a form of education that motivates people to independently comprehend reality, transform knowledge into the potential for thinking and self-development. At the same time, it is important to develop creative thinking in people, as one of the main features of creative education. Creative thinking is the ability of people, based on their knowledge, skills and abilities, to create or creatively implement something new, be it a solution to some important problem, a method, a device, an artistic object or a form of work activity.

Moreover, the cultural component gives another new perspective on the learning process in the creative economy period. At the same time, the importance of cultural values of works, goods and services is emphasized, such as their authorial nature and problems of measuring their value, issues of public support for the arts and cultural heritage. As well as the form of development of creative education on the examples of national cultural values and intellectual property objects. It should be especially noted that in the field of creative economy, many theoretical and practically significant studies have been carried out, monographs and textbooks have been written, educational and practical manuals have been created, numerous thematic forums and training courses are held. That is, creative education is not being implemented out of thin air, but is actually becoming an in-

tegral part of modern education of people in general.

In his address to the Parliament of the country on January 24, 2020, the President of the Republic of Uzbekistan Sh.M.Mirziyoyev emphasized that «the main source of wealth is intelligence and knowledge.» We believe that for the successful implementation of these qualities, it is necessary to identify and develop the individual abilities of each citizen, taking into account international standards and teaching methods, as well as analyze the factors of his creative development. Moreover, in the modern education system, it is not enough to give knowledge, but people should be taught to apply it in practical activities. And in order to become successful in creativity and a creative citizen, useful to society and ensuring the growth of their educational level and well-being, it is necessary to constantly improve and replenish their knowledge and innate creative abilities.

Thus, we have tried to show that the so-called «Brain Capital» of people, or their level of education, as the main source of the creative economy, requires its constant development, activation of their creative thinking and constructive activity. That is, the factor of constant increase in the level of education and knowledge of citizens is one of the most important in the era of the creative economy.

Summarizing the above, the creative economy can be characterized as an independent part of the world economy, covering economic, cultural, social and educational spheres directly related to the creative constructive activity of people. This understanding defines the creative economy as a «multifaceted system of interconnected economic activities based on the personal creativity of people who create innovations, intellectual property and produce economic and cultural value.» Therefore, it can be rightly said that the creative economy is an economy based on knowledge. It covers the sphere of interaction between the creative activity of educated people, culture, economics and innovative technologies, using creative approaches for the modern development of countries of the world.

In relation to the programme of building a New Uzbekistan that is being implemented today, the creative economy has become one of the most important factors in ensuring the socio-economic and cultural-moral development of our country in the era of the ongoing Third Renaissance.

The relevance of creating modern history

Feruza Usarova,
PhD (Political sciences)

Each country demonstrates its achievements for a certain period, its place in the world, economic potential, growth of science, material wealth, cultural and spiritual values, processes of growth of welfare and intellectual potential of the population and pays serious attention to fixing on the pages of history details and particulars of events that took place during this period. Therefore, the issue of creating modern history is relevant.

Over the past six or seven years, the intensity of reforms in all spheres of life in our society has increased, and colossal shifts in our thinking are taking place. It is no coincidence that the concept of "New Uzbekistan" has appeared in modern political vocabulary.

It should be noted that the need for modern historical science will only increase if it is created transparently and objectively, inseparably from the development of society. Today, our country, boldly following the path of independent development, is experiencing precisely such times. Objective study and truthful coverage of its modern history are becoming a priority task.

It is also worth noting that the study and coverage of history is not only the task of historians. Since each of us is related to history, we are all equally responsible for its transmission to future generations in its original form. In this sense, we pay special attention to the involvement of specialists of all fields in the process of scientific research conducted in this direction by the Coordination and Methodological Center for the Issues of the Modern History of Uzbekistan.

In accordance with the Presidential Decree of February 17, 2017 «On measures to further improve the activities of the Academy of Sciences, organization, management and financing of research work», our Center was transferred to the jurisdiction of the national Academy of Sciences. By the Decree of the Head of State of June 30, 2017 "On the organization of the activities of the Public Council on the Modern History of Uzbekistan under the Uzbekistan Academy of Sciences", the foundations of the Center's activities were laid.

It would be no exaggeration to say that the adoption of these resolutions marked the beginning of a new stage in the scientific and practical activities of our center, the development of interdisciplinary research. Today, the center employs more than twenty renowned scholars and young researchers. In 2021–2024, the Center published 14 monographs, 5 of which were published abroad and 2 in Scopus. 9 textbooks and teaching aids (4 textbooks, 5 teaching aids), 6 scientific collections; 134 scientific articles were published, including 51 abroad, 4 in Scopus, 30

in the Russian Science Citation Index, 12 in Web of Science, 6 of which were indexed, 33 in eLibrary, 33 publications and references in international scientific databases, including BASE (Bielefeld Academic Search Engine), DNB (Deutsche National Biliothek), Scopus/Elsevier; 27 scientific articles were published in journals included in the list of the Higher Attestation Commission.

It should be especially noted that 5 copyright certificates and patents were received for 4 textbooks and 5 innovative teaching aids published at the Center.

Our research staff conducts interdisciplinary research on scientific projects. For example, within the framework of the practical project on the topic of «Uzbekistan during the World War II", the publishing house "Uzbekistan" released 5 book-albums (in Uzbek, Russian and English) under the title "The Contribution of the People of Uzbekistan to the Victory over Fascism". In this regard, expanding the cooperation of our center with foreign research institutions is of great importance. In addition, the book-album immortalizes the courage of our unknown soldiers. In this matter, family archives of the population played an important role.

It is known that during the World War II about 2 million of our compatriots went to the front. More than 500 thousand of them died. In recent years, our country has carried out a great deal of work on the comprehensive study and popularization of the enormous contribution of our people to the Victory. In this regard, the publication of previously closed archival documents, strengthening cooperation with archival organizations, museums and foundations, scientists and specialists, and the general public in the former Soviet republics and abroad are of great importance.

Within the framework of the fundamental project "New Uzbekistan: Foreign Policy Strategy of Systemic Liberalization and Strengthening Stability in Central Asia", the research team of the Center published

the textbook "Modern History of Uzbekistan", a special issue on Uzbekistan for July-December 2023 and a special issue on Central Asia for 2024 in the journal "Himalayan and Central Asian Studies", which is included in the prestigious international ProQuest database in India. Within the framework of the fundamental project, new information is introduced into scientific circulation on the relationship between the history of Uzbekistan and world trends, features of bilateral and multilateral interstate relations, as well as political liberalization, institutional changes, the main directions of reforms taking place in New Uzbekistan, new trends in international relations.

Our center also successfully integrates science with scientific and higher educational institutions of our country. Such contacts allow us to strengthen the integration of education and science. A new innovative interactive manual created as a result of our scientific research is widely used in teaching history in higher educational institutions. Currently, methodological manuals for history teachers of higher educational institutions have been prepared, such as «Teaching the Modern History of Uzbekistan Using Interactive Methods» and «Teaching the History of State Institutions of Uzbekistan Using Interactive Methods» for the faculty of universities.

Another new edition is the book «The Newest History of Uzbekistan», which is one of the first textbooks on modern history in the CIS countries. A revised and supplemented 2nd edition has also been published. The textbook, using foreign experience, analyzes the features of political, economic, socio-cultural transformations in the Republic of Uzbekistan, as well as international relations.

The Development Strategy defines important tasks to take the study and popularization of the history of Uzbekistan to a new level. The scope of scientific research on the implementation of these measures is expanding. In this process, we pay special attention to expanding international cooperation, since many sources and information about our history are stored in foreign archives and libraries. Their study will be an important factor in revealing unknown aspects of our history.

To achieve these goals, in 2022, our Center signed a Memorandum of Cooperation with the Moscow National Research Institute for the Development of Communications, and in 2024 – with the University of Foreign Languages at the Shanghai Academy of International Studies and the R.B. Suleimenov Institute of Oriental Studies of the Ministry of Science and Higher Education of the Republic of Kazakhstan. This means that the opportunities for encouraging young people to engage in science, exchange researchers and study new scientific topics in modern history will be further expanded.

These are undoubtedly our achievements. At the same time, we face many important tasks. Their implementation requires constant searches, efforts and improvement of scientific research. We are confident that the modern conditions created today for the development of science in our country will become an important factor in the impartial and truthful study of our history and its communication to our people.

Children's piano music by Rustam Abdullaev

Aliya Sidikova,
researcher of the Institute of Art History of the Uzbekistan Academy of Sciences

Rustam Abdullaev is one of the most famous composers of Uzbekistan, whose work also covers other important areas of musical culture, education and enlightenment. The composer's incessant creative search is expressed in the genre diversity and originality of his works, in which the composer's style is manifested in programmatic, harmonious form, melodic and rhythmic expressiveness. An important role in his aesthetics is played by the reliance on folk song and dance samples, primarily associated with the musical heritage of his "small homeland" - Khorezm.

The vivid dramatic and associative imagery inherent in R. Abdullaev's style, the sense of a deep national foundation, noted by experts in all the genres he developed (song, opera, vocal-instrumental, symphonic, chamber, etc.) are also reflected in his children's piano music.

The composer's "Prelude" (2022), the "Five Children's Miniatures" (1993) and "Fairy Tales" (2008) cycles, intended for young pianists of different ages, are "music for children" and "music about children" [1, 97–109], where the world of childhood is closely connected with the feelings and reflections of an adult – a "biographical author" (L. Kazantseva's term), recreating in musical images a kaleidoscope of his childhood impressions and emotions from contact with the world of epic tales (*dastans*), native nature and national traditional culture.

It seems that it was the content of the music that determined both the genre (a piano miniature as part of a cycle) and the form of the children's piano compositions under consideration. Most likely, this feature stems from the individual manner of musical expression of R. Abdullaev, thanks to which his music is recognizable [2, 34-35]. Thus, S. Yuldasheva noted the composer's love of combining vocal compositions into cycles and the embodiment of musical thought in the form of a miniature (in vocal music), which reveals a deep national origin inherent in Eastern poetic and pictorial miniatures [2, 87,89]. Speaking about the laconicism and compactness of the form, let us also recall the first and second piano concertos, written in one-part form.

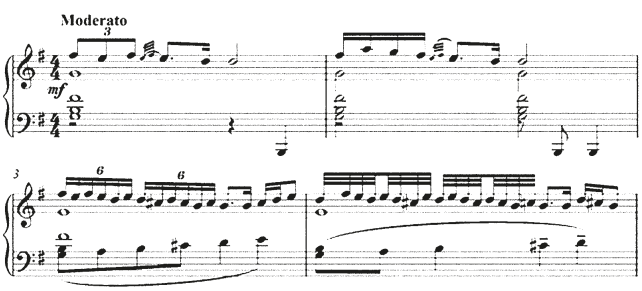


Figure 1. Fairy Tale Fragment (pp.1-4)

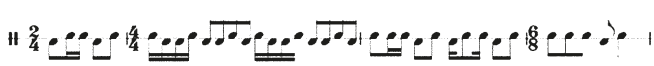


Figure 2. Usuls

In turn, the characteristic and fundamental national features of the formation and development of the thematics – repetition, variability and variation of the development of the central melody ("grain motif"), the location of the culmination in the third quarter of the form (the golden section point) [3, 297-314], the principle of improvisation – are clearly traced in all the analyzed piano miniatures. Let us give an example – an excerpt from the miniature "Storyteller's Tale" [1]:

A rich national metro-rhythmic organization is another feature of R. Abdullaev's compositional style,

[1] When performing the miniature, an association arises with the beginning of a bakhshi accompanying himself on a dutar or dombra.

which is expressed in a wide variety *of usul* rhythmic patterns that underlie works of various genres. It should be emphasized that children's piano music is no exception. The key role in determining the genre and content of piano works for children is also played by the chosen rhythmic formula. Let's look at *usul* and children's miniatures.

It can be assumed that it was this or that rhythmic formula that served as the basis, the stimulus for further intonational and melodic development.

It should be noted that the composer's "adult" music has a number of modal-harmonic features (variable, two- and three-component natural-modal mixes) directly related to national traditions, the specifics of Uzbek musical melos and the polyphonic means of its reflection developed by the composer's school of Uzbekistan. Natural modes, variation of the initial melodic cell, whimsical melismatics, quart-fifth leaps inherent in Uzbek folk music are characteristic of his romances [2, 130]. This polysystemic nature of R. Abdullaev's modal thinking is also manifested in his piano music for children.

For example, the pieces of the cycle "Five Children's Miniatures" do not have one key sustained from beginning to end (which is more common for children's music by European composers), on the contrary, they demonstrate a combination of modal varieties (Aeolian/Dorian/Phrygian modes on the tonic E in Miniature No. 5, natural and harmonic F major in Miniature No. 2), which is more in keeping with the nature of Uzbek monody. Among them there is also a miniature built on a pentatonic scale (D-F-G-A-C), which is not typical of Uzbek melodies, but it reflects the composer's long-standing interest in southeastern music and in this regard echoes his Third Piano Concerto "Thai Tunes", the vocal cycle "Hiroshima", "Pieces on Japanese and Korean Themes".

The pieces from the cycle "Fairy Tales" are even more varied in terms of tonalities – they are literally full of changes in tonalities, evoking associations with a child's kaleidoscope and the richness of the color shades of oriental fabrics.

Another feature of R. Abdullaev's children's piano compositions is the richness of the musical texture with polyphonic elements (canonical imitations, ostinato presentation, subvoice and "hidden" polyphony) and their various combinations. This also reflects the features of the composer's style, manifested, for example, in the Trio for flute, clarinet and piano, the symphonic poem "In Memory of Alisher Navoi", the

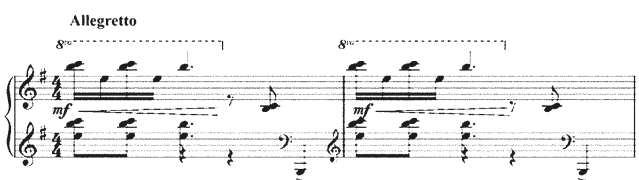


Figure 3. Fragment of Miniature No5 (pp.1-2))

vocal cycle "Sizni sevgan edim", where in the piano part polyphony is organically combined with *usul* rhythmic formulas [2, 90]. In connection with these observations, we will cite the opinion of a specialist that "the monodic nature of Uzbek melodies, with their characteristic smoothness, fluidity of development, mono-imagery, mono-intonation, bring it closer to polyphonic melody and determine the polyphonic principles of development as the most organic" [4, 62].

Speaking about the sound-pictorial nature of R. Abdullaev's composer's writing, it seems appropriate to mention that "borrowed" intonation turns of various instruments, ornamental structures (passages, figurations, etc.) migrate into piano texts in the form of clichés and carry information about technical and articulatory techniques of performance on imaginary instruments. Obviously, the timbre-acoustic possibilities and technique of sound extraction on instru-

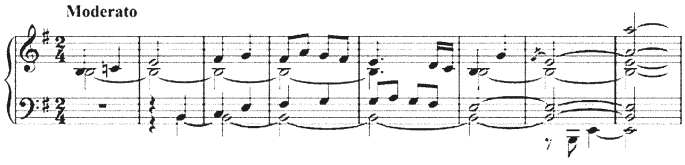


Figure 4: Fragment of the Dance of the Eagles (vols. 1-8)

ments largely determined the motivic composition and logic of melodic development [5, 93]. Based on this, we note that in almost all of the composer's piano miniatures, rhythmic, textural, timbre and intonation figurations evoke allusions to the sound of the *doira*, associate with the characteristic intonations of the *bulaman* (an instrument found only in Khorezm) or *qoshnay*.

The textural and intonational clichés (pure fifths, fourths, octaves, dissonant minor seconds, major sevenths, unisons) of the episodes are reminiscent of the "strumming" of the strings of the *dutar* or *tar* in the miniatures "Caravan", "Dance of Flowers", "Miniature No. 5", "Prelude".

The choice of these Uzbek folk instruments to create an artistic image is by no means accidental – these instruments are part of the ensemble of performers of Khorezm dastans – a kind of fairy tales and legends for adult listeners, and the composer's favorite instrument, the piano, in turn, allows him to embody the facets of his ethnic hearing in his own work [2, 162].

Summarizing the observations, we emphasize that the author's style of "adult" music by R. Abdullaev, widely covered in domestic musicology, naturally manifested itself in piano compositions for children – figuratively vivid, deeply national mood pieces, impression pieces, fantasy pieces, sketch pieces. Despite all their external complexity, they can be successfully studied and performed by children of different ages, provided that the focus of the teacher and student will be an understanding of the composer's musical language and the desire for artistic transmission of the content of his music.

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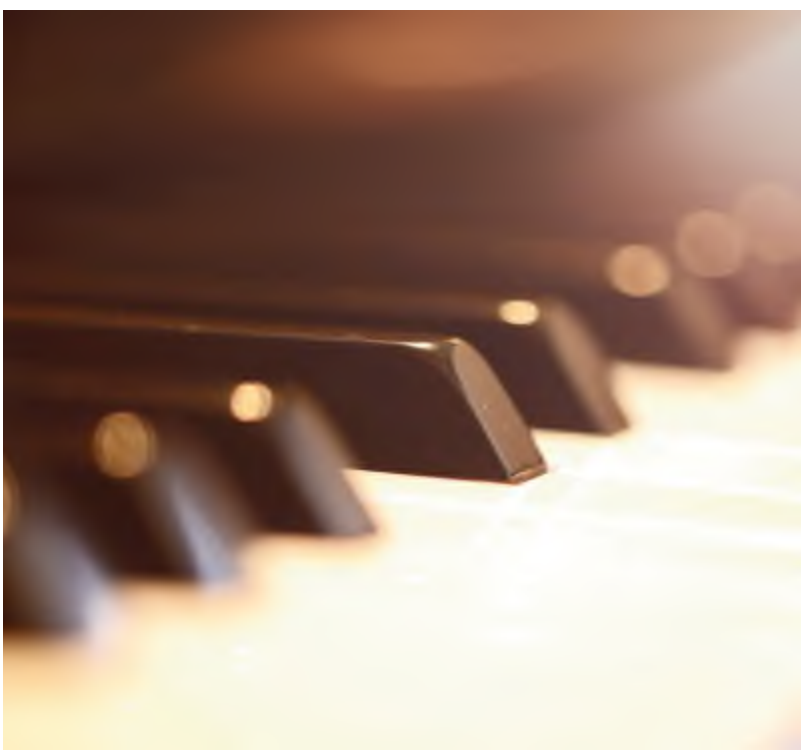

Khivan princes

Dilafuza Begaliyeva,
PhD (in history)

In the history of Uzbek statehood, the selection and education of heirs to the throne were carried out on the basis of certain criteria. The above criteria include such issues as improving military skills, knowledge of the domestic and foreign policy of the state.

It is known from history that the rule of the Bukhara and Kokand khanates was not much different from the Khiva Khanate, since it resulted from the division of a single state, a single country into three parts. Through systematization and theoretical analysis of available information on public administration, we can highlight the following points and analyze the criteria for choosing the crown prince, characteristic of the Khiva Khanate. In this regard, it is appropriate to highlight such aspects as the mental health and spiritual maturity of the prince; his seniority in age among the princes; physical health, military skill and leadership abilities.

One of the main conditions was the mental and physical health of the prince claiming the throne. If the crown prince was mentally disabled, either by birth or for some other reason, then in such cases, the measures were taken depending on the situation. In particular, although Sultan Sanjar, a representative of the Shaybanid dynasty, officially ruled for 25 years, a biy named Kulmuhammad conducted affairs on his behalf. A similar case occurred with Poyanda Muhammad, the eldest son of Dinmuhammad ibn Avanish-khan (1538-1540), one of the rulers of Khiva. Due to his mental disability, the younger son, Abul Muhammad, was proclaimed crown prince while his father was still alive. Interesting information about this is provided in his work, “Shajarayi Turk (Genealogy of the Turks),” by the Khivan ruler Abulgazi Khan (1645-1663). As stated in this source, Poyanda Muhammad puzzled his father by wanting to know why he was called «Sultan» and his brother Abul Muhammad was called «Khan», even though he was the eldest son. Then, with the Khan’s permission, one of his biys answered this question with ingenuity, saying: «When you were born, your father was a Sultan, and when he became a Khan, your brother was born; therefore, you and your brother were given such titles.» The young Sultan was satisfied with this answer and smiled. Considering that Sultan Poyanda Muhammad addressed such a question to his father, it can be assumed that his mother or other court factions interested in the accession of the young and mentally disabled Sultan stood behind him.

As mentioned above, the physical health and military prowess of the crown prince were also considered important. Conflicting opinions about the suitability of Dost Muhammad Khan (1557-1558) to occupy the throne of the rulers of Khiva show that in addition to the fact that he was the eldest son, attention was also paid to his moral qualities. The work “Shajarayi Turk” mentions that Dost Muhammad Khan (Dost Sultan) was “a poor fellow and a dervish”, and his younger brother Eshmuhammad (Esh Sultan) was “a man of great courage, who did not spare his property for the warriors”. In this case, it is obvious that the mental, physical and moral qualities of both sultans were compared. Sultan Eshmuhammad is described in the source as a man of “average intelligence”, a bad Muslim (“there was little Muslim in him”) and unkind to the families of his close people, and Dostmuhammad was elevated to the throne.

It may be noted here that the criteria for selecting the crown prince that existed during the Sheibanid period remained virtually unchanged during the Kungrat dynasty. However, as an exception, if the eldest prince died, his younger brother or someone from the same clan was elevated to the throne. For example, when Muhammad Amin Khan died during his campaign against Khorasan in 1855, his nephew Abdullah Bek was elevated to the throne. His eldest son Musa-tura also died in this battle. Since his second son, Said Muhammad-tura, became addicted to smoking opium (teryak), the khan’s nephew Abdullah was declared khan, as he was famous for his bravery and military skill. At the same time, such a situation can be explained by the need to prevent intrigues on the part of the opposing forces and immediately proclaim a new khan. The Crown Prince was obliged to show mercy and kindness to the officials, military personnel and ordinary people under him, regardless of their social origin. The Shajarai Turk states that “the sign of a prince’s wealth is his kindness to his servants, and the sign of a man’s wealth is his kindness to his relatives.” When Muhammad Amin Inak

Khiva Khan Asfandiya: Khan with state officials and Russian soldiers. 1913 Петербург

Asfandiyar Khan of Khiva

(1770-1790), one of the rulers of Khiva, appointed his son Avazbiy as Crown Prince, he especially instructed him to “do good” to his brothers and follow the rules of close kinship.

In addition to literature, poetry and music, special attention was paid to other subjects in the education of the heirs to the throne. They were carefully taught the exact and natural sciences, including geometry, geography and astronomy, since in the future, as rulers, they needed to be able to communicate with people of all classes. The princes were brought up in the spirit of justice, honesty and activity for the benefit of the people. In particular, 15-year-old Temur Sultan, the son of Agatay (1547-1556), a representative of the Sheibanid dynasty, was severely punished by the khan for visiting the house of one person with his navkars. It is alleged that the khan told his son: “I have turned 50 years old, I have never been a guest anywhere outside the palace, you are not even 15, and you prefer to eat lamb, when you turn 20 - you will want a camel; how will your navkars behave looking at you? “, and personally gave his son 100 lashes.

Considering the upbringing of the heir and other princes, their role in the life of the country, it is appropriate to dwell on the issue of the property, territories and uluses assigned directly to them. According to the traditions that existed in Turkestan, the crown prince had to perform the duties of a governor or Inak in the region allocated to him for a certain period. For example, such a region in the Bukhara Khanate was mainly Balkh, in the Kokand Khanate - Margilan (later Tashkent), in the Khiva Khanate - Khazarasp. These possessions were distinguished by the fact that they were surrounded by powerful defensive walls and had important strategic significance. In particular, Khazarasp was considered the main trade route connecting not only Khiva with Bukhara, but also with the Transcaspian regions of the Russian Empire. Therefore, the crown princes, before ascending the throne, performed the functions of Inak (or viceroy) in Khazarasp.

According to sources, Isfandiyar Sultan (1623-1643), the heir of Arab Muhammad Khan, received control of Khazarasp at the age of thirteen, and Anusha Sultan (1663-1687), the son of Abulgazi Khan, at the age of fourteen. In particular, before ascending the throne, Rahimkuli Khan also held the position of governor in Khazarasp.

Representatives of the khan’s family capable of governing were given various provinces and cities or a certain territorial unit by the khan. As noted in the “Shajarai Turk”, when the princes reached adulthood, they needed “provinces, people and property”. This

Muhammad Rahim Khan II with his close courtiers

Son of Asfandiyerkhan Temurgazi-tura

indicates that at the beginning of the 16th century, the khanate was divided into small uluses.

Here we can dwell on the issue of temporary governance of the state, which played a key role in the education of the princes. When rulers went on hajj, hunting, war or travel for various periods of time, they usually appointed the crown prince or one of the trusted princes as the temporary ruler of the state. At the same time, they assigned proven and trustworthy officials to them. This practice contributed to the formation of the potential of princes in governing the state. For example, the ruler of Khiva Anusha Khan (1663-1687), when going on hajj, appointed his son Khudaidad as the ruler together with Said Muhammad Inak; the khan of Khiva Allakulikhan (1825-1842) during his campaign against Iran - Rahimkuli Inak Sultan; the khan of Khiva Said Muhammad Khan (1856-1865) during the suppression of the uprising in the Aral Sea region - Said Mahmud Tura; and Muhammad Rahim Khan II (1864-1910) appointed Said Mahmud Tura as temporary ruler when he went hunting in Dargan-Ata.

Also, when Muhammad Rahim Khan II went to St. Petersburg for several months in 1897, he left Prince Ubaidullah Tura in his place, attaching Said Abdullah Khoja to him as an adviser.

It can be said that the activities of the heirs to the throne and princes as temporary rulers allowed them to pass the “exam” in state administration.

In conclusion, it can be said that in the Late Middle Ages, the selection and education of heirs to the throne were carried out on the basis of certain criteria.

These criteria were determined by the mental and physical health of the crown prince, his spiritual maturity, military valour and leadership skills. At the same time, he was the eldest of the princes, and in many cases, the khans appointed the heir to the throne during their lifetime. This was done to preserve the power of the ruling dynasty and prevent various intrigues after receiving news of the death of the ruler. Studying them, one can trace the changes that took place in the socio-political, cultural and spiritual life of the Khiva Khanate. Considering the issue from this point of view, as one of the least studied problems of the history of the Khiva Khanate, to some extent fills the existing gap to some extent. These ceremonies, which have ancient historical roots, were of great importance in the spiritual, moral, military and physical development of princes, in preparing them for governing the state. In turn, this issue has great practical significance in educating the current young generation as mature individuals, in educating them in the spirit of our historical traditions and values.

Russian trade and economic policy in Turkestan

Khushnud Abdurasulov,
Researcher at the Institute of Oriental Studies,
Uzbekistan Academy of Sciences

The Russian and British Empires, as the largest world powers, engaged in large-scale military, political and economic rivalry throughout the 19th and early 20th centuries in much of the East, especially in Central Asia. In historical science, this confrontation was called the "Great Game". The consequence of this geopolitical struggle was the conquest of the southern and central regions of Central Asia by the Russian Empire, including the three Uzbek khanates. Thus, Central Asia, previously considered a "no man's land" – a supposed buffer between the geopolitical interests of the Russian and British Empires – was drawn into the sphere of Russian political and economic interests. As a result, in the second half of the 19th century, the Russian Empire finally established itself in Central Asia, formalizing the system of governance through the Turkestan Governorship-General. The subordination of Khiva, Bukhara and Kokand opened up the vast resources of the region to St. Petersburg, and with them the opportunity for a profound transformation of the economic structure in the interests of the empire. One of the most important directions of policy in Turkestan was the trade and economic integration of the region into the orbit of the Russian economy. This integration was largely colonial in nature: the local economic system was reorganized to meet the needs of the metropolis, primarily in raw materials, as well as to expand sales markets for Russian industrial goods.

In this context, it seems highly relevant to analyze the trade and economic policy of the Russian Empire in the Turkestan Governorship-General in the 1870s–1890s based on some works by foreign authors. Valuable evidence of the forms and consequences of this policy was left by Western researchers who traveled through the region in the 1870s–1890s. Among them are the American diplomat and orientalist Eugene Schuyler, the Anglican priest and traveler Henry Lansdell, as well as the British politician and geographer George N. Curzon [1]. Their works provide an important source for analyzing not only official Russian policy, but also real economic practices and the structure of everyday trade in Central Asia at that time.

As the contemporary British historian A. Morrison writes: – Apart from Curzon's work, the most significant book in English that touches on Russian Central Asia in the period under review is Eugene Schuyler's "Turkestan". An American consul stationed in St. Petersburg, Schuyler emerges as a profound and well-informed researcher who carefully observed the formation of the Russian administration under General von Kaufman during his expedition of 1871-1872. His work demonstrates a profound understanding that he witnessed only a small part of the vast process of European conquest and expansion of influence [2].

The trade and economic policy of the Russian Empire in Turkestan was based on a combination of several interrelated principles. Firstly, the desire to control foreign trade. This was expressed in limiting the region's traditional ties with China, India and Persia, as well as in establishing barriers to competition with British goods, primarily through the regulation of duties and the development of a state monopoly in key industries [3].

Secondly, a policy of transforming transport infrastructure was pursued. According to Schyler, one of the priority tasks of the Russian administration was the development of communication routes – caravan routs, inns, post stations - with the aim of facilitating the supply of raw materials from the interior regions of Central Asia to the Russian Empire [4]. Schuyler noted that the development of the postal system and the introduction of the Russian metric system of weights and measures were aimed at standardizing trade and simplifying control.

The third direction was the encouragement of sedentary trade and the elimination of independent caravan trade controlled by local elites. Henry Lansdell, describing the cities of Verny, Kuldja and Tashkent, recorded that a significant part of the trade was in the hands of Russian merchants or Tatar settlers operating within the framework of the

[1] Eugene Schuyler. *Turkistan: Notes of a Journey in Russian Turkistan, Khoqand, Bukhara, and Kuldja*, Vol. I, New York, 1877; Henry Lansdell. *Through Central Asia: Vol. I*, London, 1887; George N. Curzon. *Russia in Central Asia in 1889 and the Anglo-Russian Question*, London, 1889.

[2] Alexander Morrison. *Russian Rule in Samarkand, 1865-1910: A Comparison with British India*. Oxford University Press. 2008. P.8

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Bazaar in front of Bibi Khanum Mosque. Samarkand

Russian administrative system. At the same time, the indigenous population – the Sarts and Kirghiz – were gradually forced out of the most profitable sectors of trade [5].

George Curzon viewed this strategy as a conscious effort to subordinate the region to the economic interests of the metropolis. In his opinion, the Russian Empire created Turkestan's dependence on the import of Russian industrial goods, while simultaneously ensuring the export of cotton, wool, and leather. Curzon pointed out that the region had almost no production capacity, since priority was given to the export of raw materials and the creation of infrastructure that was primarily beneficial to Russian interests. This approach ensured the formal development of trade, but in reality, it reinforced the monocultural, dependent nature of the Turkestan economy. Russia turned the region into a sales market and a source of resources, which corresponded to the general logic of the imperial periphery.

One of the most important components of the Russian Empire's trade and economic policy in Turkestan was the development and control of trade infrastructure – bazaars, shopping arcades, caravanserais and fairs. These facilities not only provided physical space for commerce, but also served as instruments of political and economic influence on the local population. As Eugene Schuyler noted, bazaars in cities such as Tashkent, Kokand and Samarkand were not just places of trade, but also the centre of social and administrative life in the region [6].

According to Henry Lansdell, by the end of the 1870s there were tens of thousands of objects related to trade and production in Tashkent. In the Asian part of the city alone, he counted 13,260 private houses, 23 caravanserais with 519 shops, 2,324 shops in the main bazaar, and 594 tents, not counting the objects in the Russian quarter [7]. This indicates a significant concentration of trade activity and a developed urban economy, although the structure of this economy was increasingly subordinated to the interests of the Russian colonial administration.

Particular attention was paid to the creation of "new", "European-organized" bazaars – such as, for example, in Russian Tashkent. Lansdell noted that the native bazaar in the new part of the city was distinguished by greater cleanliness, a variety of products, and control by the authorities. Here, in addition to local fruits and handicrafts, carpets from Bukhara and Kashgar were sold, as well as Sart shawls, handkerchiefs, and silk, which were traded, among others, by Jews. These goods, he noted, were oriented not so much toward the local consumer as toward visitors, including Europeans and officials [8].

However, despite the apparent prosperity of trade, Lansdell was critical of its scale. Thus, describing the Kuldja bazaar, he pointed out that the presence of 650 shops does not reflect the real economic weight of the city: trade here was small, and activity was supported mainly by visitors – Sarts from Tashkent, Kokand, Kashgar and Tatars from Verny and Kopal [9]. A similar

[5] George N. Curzon. *Russia in Central Asia in 1889 and the Anglo-Russian Question*, London, 1889

[6] Schuyler. *Turkey, Vol. I.* P. 125-132

[7] Henry Lansdell. *Through Central Asia: Vol. I* , London, 1887. pp. 440

[8] Henry Lansdell. *Through Central Asia: Vol. I.* Pp . 458-459

[9] Ibid . P. 16

situation was observed in Verny, where there were two bazaars – Russian and Sart – with a clear division not only by ethnic composition, but also by type of trade. This division reflected inequality in access to resources and administrative support: Russian and "official" bazaars received more attention and investment.

Fairs, as the highest form of centralized trade, also became an object of imperial policy. Spring and autumn fairs in Tashkent required significant expenditures from the administration: in 1879, the maintenance of the fair cost 1,103 pounds sterling for rent, salaries of employees and other needs, including cleaning the territory and supplying water [10]. Despite these investments, according to Schuyler, the fair was not a great success, which indicates that artificially created trade forms did not always meet the needs and habits of the local population.

George Curzon also noted that Russia actively created the conditions for the transition from nomadic and caravan exchange to sedentary trade under administrative control. He describes bazaar rows built on Russian models and the replacement of traditional forms of trade with new, more standardized ones – often at the expense of local initiative and self-government. This reconstruction of the urban economy was part of a broader strategy: to structure the market so that it would facilitate the export of raw materials and the import of Russian goods, and to reduce the role of independent traders and middlemen [11].

Thus, the trade infrastructure in Turkestan not only ensured trade turnover, but also served as a mechanism for colonial transformation. By controlling bazaars, creating new trading spaces, and regulating fairs, the Russian Empire sought to introduce new business models that strengthened its presence and weakened the autonomy of local communities. Bazaars became an arena in which the interests of the colonial administration, local traders, and the population, as well as external factors such as British competition or Chinese trade, collided and intertwined.

One of the central goals of the Russian Empire's economic policy in Turkestan was to include the region in transregional trade networks that spanned Siberia, Central Asia, China, and inner Russia. This corresponded to imperial interests in creating a stable economic dependence of the outskirts on the center and using Turkestan as an intermediate link between Russia and the East.

Schyler emphasized that trade in Turkestan during the colonial period had a clearly expressed transit character. Goods from Kashgar, Kuldja, Bukhara and Samarkand via Tashkent reached Orenburg, Kazan and further to the European part of Russia. The main export items were cotton, dried fruits, skins, as well as handicrafts – fabrics, carpets, jewelry [12]. Imported mainly were Russian manufactories, metal, sugar, matches and alcohol. Thus, the region acted as a consumer of Russian products and a supplier of raw materials, especially cotton, which from the early 1870s became a strategically important commodity.

Henry Lansdell noted that not only Tashkent, but also Kuldja, Verny (modern Almaty), and Petropavlovsk were major trading centers. Verny, in particular, became a major point for the cattle trade, linked to the nomadic Kirghiz tribes. Lansdell wrote that "animals were purchased from the Kirghiz not only to supply Tashkent and Kuldja, but also Petropavlovsk, more than 800 miles away[13]". This emphasizes the importance of the steppe trade and the coverage of vast territories through a single economic network, which Russia was trying to bring under administrative control.

One area of particular concern for Russia was trade with China, especially through Ghulja and Kashgar. According to Curzon, Russia sought to increase its economic expansion into Eastern Turkestan (Xinjiang) in order to intercept the trade flows that had previously been routed through India and Kashmir. He wrote: "Whatever China can offer in exchange for Russian goods finds a market in Tashkent and beyond [14]". Turkestan was thus becoming an arena for geo-economic competition between the two empires – the Russian and the British.

The Russian administration did not limit itself to passive observation. It actively regulated trade flows: duties were introduced, privileges were created for Russian merchants, and railway projects were developed. One of the goals of the construction of the Central Asian Railway was to ensure the stable export of cotton to Russia and the movement of Russian goods deep into Turkestan [15]. As Schyler emphasizes, there were also administrative preferences: Russian merchants received the best places in the trading rows, had access to judicial protection, while local traders (especially Sarts) were often discriminated against [16].

It is also interesting to note the social aspect of cross-border trade. According to Lansdell's observations, settlers – Tatars, Jews, Dungans, Uyghurs – played a significant role in trade. In particular, he describes them as active participants in bazaar life, engaged in both production and sales of goods [17]. This speaks of the multinational composition of the trading class and the openness of the Turkestan economy to various ethno-confessional groups, despite attempts at imperial unification.

Thus, Turkestan's foreign trade in the second half of the 19th century was not only an economic but also a strategic instrument. It served both the goal of integrating the region into the Russian economic space and the task of competing with Great Britain and China. By expanding trade routes, creating infrastructure and legislative regulation, Russia

[10] Ibid. P. 462
[11] Curzon. *Russia in Central Asia*. P. 212-218
[12] Schuyler, *Turkistan*, *Vol. I.* P. 198–210
[13] Lansdell, *Through Central Asia*. Vol. I. S. 278
[14] Curzon, *Russia in Central Asia*. P. 314–320
[15] Curzon, *Russia in Central Asia*. P. 330–342
[16] Schuyler, *Turkistan*, Vol. I. S. 41-49
[17] Lansdell, *Through Central Asia*, Vol. I. S. 459-462

Old Bukhara. Book trade

consolidated its influence, turning Turkestan into an integral part of its colonial economic organism. The trade and economic policy of the Russian Empire in the Turkestan Governorship-General in the second half of the 19th century left a deep mark on the social and economic life of the region, forming new structures and dependencies that determined the fate of Central Asia in the colonial era.

First of all, the introduction of Russian models of trade and bazaar management significantly changed traditional economic relations. As the observations of Eugene Schuyler and Henry Lansdell show, bazaars and fairs ceased to be exclusively places of free trade and acquired the features of regulated administrative objects. The Russian administration controlled the places of trade, imposed duties and licensed merchants, which narrowed the opportunities of traditional traders, primarily the Sarts and other local groups, increasing the economic dependence of the region on Russia [18].

The economy of Turkestan became increasingly focused on the export of raw materials – cotton, wool, cattle – to Russian industry, while simultaneously becoming a market for Russian manufactured goods. This process was accompanied not only by technical and infrastructural changes, but also by significant social transformations. The growth of cities and trade centers such as Tashkent was accompanied by the migration of various ethnic groups – Russians, Tatars, Jews (both Bukharan and Ashkenazi from the inner provinces of the empire) and others – which brought diversity to the region and at the same time caused social tension[19]. Of particular importance was the policy of encouraging Russian merchants and investors, who received access to resources and benefits, while local entrepreneurs were often deprived of support. As George Curzon wrote, these measures contributed to the "integration of Turkestan into the empire through economic dependence," turning the region into a semi-colony with limited economic independence[20].

The influence of trade and economic policy was also felt in rural areas, where changes in demand and the emergence of new market relations affected traditional forms of management. Serfdom and natural relations gradually transformed into monetary ones, which led to a change in the social structure of the peasantry and steppe nomads [21].

Overall, the Russian Empire's policy in Turkestan ensured strategic control over the region by creating an economic infrastructure that served the interests of the metropolis. However, these transformations were not painless and caused resistance from both the local trading classes and traditional elites.

(Based on materials from foreign publications)

[18] Lansdell, *Through Central Asia*, Vol. I. P. 462

[19] Schuyler, *Turkistan*, Vol. I. Pp. 310-325

[20] Curzon, *Russia in Central Asia*. Pp. 400-410

[21] Ibid. Pp. 380-395

Scientists on the fate of Gurumsaray ceramics

Dilnozahon Muydinova,
doctoral student of Namangan State University

In April 2025, Namangan State University organized an International Scientific and Practical Conference on the topic "Revival of the Ancient Traditions of the Gurumsaray School of Artistic Ceramics and Prospects for the Training of Highly Qualified Personnel in the Field of Artistic Pottery Education." This scientific event is the subject of this article.

Preservation of pottery traditions, which have long been developed as one of the components of our national values, increasing its importance at the international level, widely promoting its importance in every family, team, institution and organization, worthy encouragement of the creativity of folk craftsmen are of great importance. In this regard, scientific analysis and research conducted in various countries of the world in the field of support and development of pottery are very relevant for Uzbekistan.

Gurumsaray, one of the main centers of the Fergana School of Artistic Ceramics, continues to promote our national values, preserves the traditions of artistic ceramics through the "Master to Student School", and is an ancient center of pottery craftsmanship with deep historical roots, and where many generations of pottery masters have grown up.

Gurumsaray ceramics is closely related to the traditions of Rishtan and Andijan ceramics in terms of the shape of the dishes, manufacturing technology and the motifs used, but at the same time, it is unique. Gurumsaray ceramics stands out among other schools with its rich range of colors. A distinctive feature of the school is the reflective "mirror" patterns made in blue and brown tones on a white background, and reflecting the shine of the alkaline glaze. For centuries, craftsmen made vases, bowls, large jugs, plates, teapots and similar household items, giving them exquisite shapes and finishes, and received well-deserved recognition for their bright colors and unique style.

According to the research of art historians and historians, as well as source data, the Gurumsar pottery school was founded in the 1700s by master Kuki, who moved from Khujand, lived and worked here. By the 1970-1980s, the scientific community became interested in the pottery of the Fergana Valley and scientific research began. At that time, M. Rakhimov, M.Turapov, H.Khakimov, H.Satimov worked in Gurumsarai.

However, over time, by these years, in Gurumsaray, as in other schools of pottery, an artistic crisis began to be observed. The aggravation of political processes, the introduction of some bans on private workshops and problems in the processes of selling products had an increasingly serious impact on pottery. As a result, potters stopped their work and closed their workshops. Most of them lost faith in the future of pottery and its social usefulness. The younger generation, the children of masters, did not want to engage in this craft; the number of those intending to continue the

traditions of pottery was very small. One of such students was Vakhobjon Buvaev.

Master potter Vakhobjon Buvaev, who continues the centuries-old traditions of Gurumsaray ceramics, works as a single link in the transfer of this art to students of the next generation. During his creative activity, the master organized several personal exhibitions at the State Museum of Applied Arts and Crafts of Uzbekistan. He also actively participates in competitions, festivals and forums held in France, Germany, Russia and in our country.

The master, who received professional education in the field of fine arts, currently carries out teaching and research activities at the Department of Art History of Namangan State University, and has been implementing various projects in the field of preserving and developing pottery traditions for many years. In order to support this direction, on his initiative, an international scientific and practical conference was organized on April 17-18, 2025, dedicated to the problems of preserving and prospects for the development of Gurumsaray ceramics. Along with leading art historians of the Institute of Art History of the Uzbekistan Academy of Sciences, representatives of the teaching staff, researchers and talented young scientists from the USA, Russia, Turkey, Slovakia, the Republic of Korea and Kyrgyzstan took part in the conference.

Within the framework of the conference, a meeting of talented young people studying art history - students, postgraduates, scientific researchers - with Academician Akbar A. Khakimov was organized. During the meeting, Academician A. Khakimov made a report on the topic "Applied Art of Uzbekistan: Formation and Stages of Development". The scientist gave detailed answers to questions of interest to participants in this area.

The conference featured lively discussions and debates on such topical issues as the study of the integration of artistic ceramics traditions with contemporary approaches to them, as well as on problems and solutions related to professional education in other arts.

The conference participants presented their theses in four areas:

Section 1 - Integration of traditional and modern approaches in education in the field of fine arts;

Section 2 - Current problems and solutions in applied arts, traditions of artistic ceramics and their teaching;

Section 3 - Modern approaches to musical art and its teaching;

4 - Problems related to professional education and their innovative solutions.

As part of the conference, an exhibition of creative works by the master's students and talented students studying at the department under the guidance of V. Buvaev was opened. The exhibition featured more than 50 works of artistic ceramics made by the master over many years of his work, as well as works in traditional and modern styles made by students of the masters of the Rishtan Pottery Center studying at the department. Also, creative works of students taking their first steps on the path of creativity in the fine arts in the field of painting, miniature and calligraphy demonstrated the high potential of the department to invited art historians, professors and teachers. The participants were greatly impressed by the exhibition of fine and applied art organized on the occasion of the conference.

Presentations of the monograph "Gurumsaray Center of Traditional Ceramics", published on the basis of scientific research by V. Buvaev, and the book "The Works of Gurumsaray Potter Vakhobjon Buvaev" by B. Jabbarov was also held. These sources are of great importance for studying the history of pottery art in Gurumsaray.

At the conference, special attention was paid to the further expansion of practical work on the development of the traditions of Gurumsaray ceramics with talented students of the University.

Creative innovations of Latif Sadriddinov

Maftuna Olimjonova,
doctoral student of Namangan State University

The beauty of Uzbek traditional embroidery, with its numerous masters and centers, testifies to the antiquity and richness of this craft.

The Fergana Valley embroidery school has one of the richest and most diverse traditions in Uzbek folk applied art. The centres of this school are the Fergana, Namangan, and Andijan regions. The traditional embroidery of each region is distinguished by its artistic features within the Fergana traditional school of embroidery. A common feature of this school is that the design elements are made in a minimalist style, leaving the background free.

The art of embroidery, which originated and developed in the Namangan region of Uzbekistan, is distinguished by elegance, unique patterns, and the harmony of colours.

Namangan embroidery is traditionally done with silk threads on satin, adras and other silk fabrics. Patterns often depict flowers, leaves, and fruit trees, personifying the beauty of nature and life. The most commonly used sewing methods are “bosma”, “iroqi”, “yurma”, “zanjira”. These techniques guarantee the clarity of each thread movement and the clarity of the pattern.

Historically, the art of embroidery in the region was passed down from generation to generation by women. This craft had not only aesthetic but also social and spiritual significance and was used in everyday life, as a wedding gift to the groom, during ceremonies and holidays.

With the beginning of the mass import of Chinese goods at the beginning of the 21st century, traditional embroidered products began to be displaced from everyday life, and the traditional art of embroidery began to practically disappear. Today, there are only a few masters left who continue and revive traditions on a new creative basis, one of whom is the master embroiderer Latif Sadriddinov. Latif Sadriddinov is a famous master of embroidery from Namangan, combining the ancient traditions of our national art with an innovative approach.

L. Sadriddinov was born on April 26, 1968 in the city of Namangan in a family of artisans. His mother, Dilbarkhon opa, embroidered the popular at that time skullcaps “iroqi duppi”, handkerchiefs, and dowries for brides in the “canva” style in her free time. Young Latifjon became interested in this craft, watching his mother at work. His father was a skilled craftsman. He worked at the shoe factory “Sharq” that existed at that time in Namangan. He received semi-finished products from the factory to order and sewed the products at home. He also sewed Uzbek soft boots - “makhsi”, and was engaged in cutting products. Young Latifjon, who grew up in a family of artisans, after finishing 8 grades of secondary school, entered the secondary vocational school in the Chartaq district of the Namangan region. And in 1987, he entered the Theatre and Art Institute named after Mannon Uygur. Here he studied in the department of “Design and ar-

rangement of interior and exterior decoration of the house". Since the use of textiles was also part of the training in this department and because of his special love for this craft, he began to carefully study the art of embroidery. During his studies, his favourite pastime was embroidery.

When L. Sadriddinov began to engage in this craft, he tried to find his own style and create new styles, referring to the ornaments in the embroidery of different peoples.

In 2004, he became a member of the regional union of artisans, after which he began taking part in exhibitions and festivals in the Republic and abroad.

According to L. Sadriddinov, at one of the festivals he met Doctor of Art History, Professor Akbar Khakimov, who advised him to revive traditional embroidery. "Meeting A. Khakimov and the advice he gave me became a turning point in my work. The role of this person in finding my path is immeasurable. After that, I began to embroider using samples of national and traditional ornaments," he recalls. After that, traditional motifs were added to his modern designer embroidery samples. He begins to revive traditional embroidery.

Sadriddinov's embroidery is distinguished by the "ilma" technique. This technique gives the embroidery a relief and volumetric look. In his works, he prefers silk threads and satin fabrics made of silk and cotton.

In the Namangan region, the most famous traditional embroidery patterns are called "Ofarin". The central part of such embroidery is occupied by plant motifs resembling a pyramid in shape, and the edges

are framed by decorative elements called "kungura" (zigzag shape) and "ova" (resembles a dot). In the region, various, sharply contrasting colours have long been used for this pattern.

L. Sadriddinov creates beautiful versions of this type of pattern, including multi-coloured, monochrome and classic. At the same time, in his traditional embroidery we can see motifs of almond and pomegranate flowers.

In addition to traditional patterns, the master creates compositions using ornamental patterns inherent in national embroidery schools such as Nurata, Shakhrisabz, Samarkand, as well as patterns used by masters of Turkey, Iran, Loqai, the ancient state of the Samanids. At the same time, he creates his compositions using the patterns "islimi" and "grih", as well as

stylised images of various plants, birds, and animals. Accordingly, his work can be divided into three types: traditional, mixed, and free creative style.

In the embroidery created in the traditional style, the master uses traditional plant motifs "ofarin nuskha", patterns in the form of pomegranate, pepper, which have long been widely used in the Namangan region. In particular, he creates various contrasting, monochrome versions of "ofarin nuskha", as well as new versions of patterns in the form of pepper. In the samples of embroidery of the mixed style, we can see embroidery compositions using samples of traditional embroidery of Nurata, Shakhrisabz, Samarkand, Turkey, Iran, etc. In his embroidery called "Otash Aroba" ("Fire Cart"), a traditional ornament inherent in the Samarkand school of embroidery was used, created in imitation of a steam locomotive. The fact that the pattern is divided into two equal parts and two different contrasting colours are used in the work also refers to the round-the-clock movement of the steam locomotive. This design uses the "Wheel" motif to depict the "Fire Cart" and also uses elements of the pattern resembling smoke.

In his free-style works, we can see unique compositions using plants such as pomegranate, raspberry, apple, grapes, stylised images of birds, "islimi" patterns, "girih" patterns, and traditional patterns of various schools.

Among his products, you can see both old traditional suzani, semi-suzani, sandalwood covers, and innovatively designed pillowcases, bags, and clothes in the "boha" style that meet the requirements of today.

When embroidering on clothes and bags, the items are first cut out, but not cut. Asymmetrical patterns are more often used in clothing.

In his products, the master uses silk threads and satin fabric. Today, in the Namangan region, there are several private enterprises producing silk, which, compared to the products of other regions, stands out for its unique quality, and therefore is currently in great demand. L. Sadriddinov also buys silk threads made to his order at private factories in Namangan. But he dyes them himself.

When examining his works, we see in the embroidery the presence of a transition from one colour to another, or a change from light to dark tones. This is directly related to the technique of dyeing the thread, which is carried out in several stages.

During the process of boiling the dyes, when they still have a light shade, one end of the thread is dipped into the dye; the colour of the dye gradually darkens, and the middle part of the thread is dipped into it. Finally, when the colour becomes as dark as possible, the remaining part of the thread is dipped into it. In this way, gradient-coloured threads are obtained. These colours can vary from light to dark, or even include another colour between them. For example, by mixing blue and yellow colours, you can create combinations such as green, turquoise or light blue. Therefore, when L. Sadriddinov uses such threads in embroidery, a variety of colours is obtained.

In dyeing white satin fabric, natural colours are mainly used. To obtain a cream colour, walnut and pomegranate peels are boiled together, and then the fabric is dipped in the resulting dye. It is important not to make a mistake in their concentration and quantitative ratio. If you add more walnut peels, the colour may acquire a brown, dark shade.

When embroidering on cream-colored fabric, it is usually dyed after the embroidery is applied to the white fabric. When using other colours, the fabric is first dyed, and then the embroidery is applied.

Today, the master, together with his family members - his wife and children Nasibakhon, Naimakhon and Sadriddin - teaches the craft to more than 50 students.

Usually, the patterns are created by the master on paper. The finished pattern composition is placed on glass, under which a lamp is installed, and then the fabric is placed on the pattern template. This is how the pattern is copied onto the fabric. The master's wife helps him in every process, whether it is transferring the pattern sketch to the fabric, sewing, or dyeing the threads. It is worth noting that in the past, female craftswomen drew patterns directly on the fabric and began embroidery. This skill was developed by them as a result of repeatedly drawing the same traditional pattern.

The master's work is beginning to bear fruit. Currently, L. Sadriddinov's products are exported to a number of foreign countries, including the USA, Japan, Korea, and Russia, and he also supplies custom-made products to regions such as Bukhara and Samarkand.

Working with clients, L. Sadriddinov first sketches the embroidery composition and presents it to them. After choosing a suitable option, the embroidery process begins. "In the process of working with a client, various cases occur. There were also incidents when the customer did not like the work done following his wishes. In such a case, I washed the colours of the composition with chemicals and created another product. This work, done in a different form, also found its owner," he says, recalling the events of his work. According to the master, working with clients gave him a huge experience. Latif Sadriddinov is one of the brightest representatives of modern Uzbek embroidery. His works make a significant contribution to the preservation and development of our national heritage. The designs he developed use famous motifs of the Namangan embroidery tradition and also show the influence of other famous schools, such as Bukhara and Samarkand. Common patterns in his works include stylised almond shapes, sun symbols and intertwined plant motifs. Sadriddinov's embroidery reflects a combination of traditional styles and modern market demands, has cultural significance and commercial value.

Historic breakthrough – Uzbekistan at Sotheby's and Christ's auctions

Akbar Khakimov,
academician

In the spring of 2025, a historic event took place – a delegation from Uzbekistan participated for the first time in the auctions of Sotheby's and Christie's auction houses, which carried out an unprecedented purchase of unique artifacts in terms of artistic significance and financial volume, directly related to the cultural heritage of our country. True masterpieces of art and culture of world significance were returned to the Motherland, and this important cultural practice will be continued with the support of the leadership of Uzbekistan.

On April 25, 2025, a group of experts from Uzbekistan (led by Firdavs Abdukhalikov, including other members of the delegation such as Akbar Khakimov and Rustam Jabbarov) flew to London to participate in the auctions of the auction houses Sotheby's and Christie's with the aim of replenishing the exposition of the Centre of Islamic Civilization in Uzbekistan (hereinafter – the Centre). The trip took place on behalf of the government of the country, which financed the participation and purchase of artifacts of the heritage of Uzbekistan. Before flying to London, preliminary work was carried out on the selection of artifacts exhibited at the auction based on the materials of the websites of these auction houses on April 29 (The Magnificent Philippe-Raquillier Collection of Islamic Weapons), April 30 (Islamic Art and India) at Sotheby's and May 1 at Christie's (Art of the Islamic and Indian Worlds).

Representatives of Uzbekistan took part in the auction within the specified timeframe. The results of the purchases were quite successful and represent a historic breakthrough for Uzbekistan in returning masterpieces directly related to its cultural and artistic past to its homeland. The total number of artefacts purchased at Sotheby's and Christie's is 48 lots, consisting of 85 items. An important factor in developing approaches to the selection of artefacts was that the

1. Leaf of the Quran. Syria. 9th century

2. Leaf of the Quran. Yemen. 13-14 centuries.

Pictured are members of the Uzbek delegation with Jacqueline Coulter (second left) and Mariam Kohn (far right), consultant of Sotheby's Carpet and Textile Department, after the auction at Sotheby's on April 30, 2025.

3. Leaf of the Quran. Egypt. 1310

purchase had a targeted purpose and was intended for the exposition of the Centre. This exposition includes the Quran Hall, the Pre-Islamic Civilization Hall, as well as two halls of the First (9th-12th centuries) and Second Renaissance (14th-16th centuries), as well as the era of the Baburids (also known as the Mughals) and the period of the Uzbek khanates (17th-early 20th centuries).

Of particular importance was the series of calligraphic Qur'anic texts on individual pages acquired at auction, relating to various regions of the Islamic world – from Egypt, Syria, Tunisia, Yemen to Spain. This material is important for the exhibition halls intended to show the evolution of Qur'anic calligraphy and the forms in which Islamic teachings were disseminated.

A passage of a leaf of the Baysungur Quran (the size of which was 2x1.5 meters) acquired as a result of an intense auction battle. There is a convincing version that this impressive-sized Quran was made in Samarkand during the time of Amir Temur (possibly by order of Sahibqiran himself or his grandson Mirzo Ulugbek at the beginning of the 15th century and executed by the master copyist Umar al-Akta) and was intended to be installed on a huge granite book-stand, a stand specially created for this purpose by order of Ulugbek, installed in front of the grandiose monument to Bibi Khanum.

A line from the "Quran of Amir Temur", attributed to Umar al-Aqta, Herat or Samarkand, circa 1400.

In approaches to the procurement of artifacts, especially items where scholars have difficulty in accurately determining the place of manufacture (most often we are talking about artistic metal items), for example, in Iran or Central Asia, a common approach was also agreed upon. The regional principle of Sogd or Iran, Maverannahr or Khorasan was supplemented dynastical-state criterion – Samanids, Ghaznavids, Karakhanids, Seljuks, Khorezmshahs, Temurids, Baburids, etc. Thus, the geographical range of acquired artifacts created within the boundaries of certain state entities associated with the historical and cultural territories of historical Uzbekistan was expanded.

The auction resulted in the acquisition of truly unique examples of toreutics from the 7th to the 13th centuries – an unusual round dish from the 7th century with an image of a royal pheasant on the entire surface. Characteristic of the iconography of this image

5. Silver gilded dish with a bird. Iran. 6th – 8th centuries

are the specific curls of the tail, a round halo against the background of which the head of the bird is depicted, a scarlet *ashkharavand* - a ribbon as a symbol of royal power, etc.

As noted in the description of the dish, along with Sasanian iconography, similar images of birds were found in other centers along the Silk Road. Very similar is the image of the same bird on a fragment of Sogdian fabric – a samite with an image of the same birds in round medallions bought at an auction at Christie's. The "halo" is clearly visible on them, and the similar interpretation of the curls of the tail and a similar profile angle of the image are also noteworthy. This suggests that this dish could have been made in Sogd. The description of the dish notes that the dat-

4. Line from the Baysungur Quran. Samarkand. 15th century.

6. Silver vessel. Iran or Central Asia. Khorezmshah era. 12th-13th centuries.

ing of the dish to the post-Sasanian period was disputed in 2024 by D. Rabi and can be dated to the time of the Umayyad reign.

At the auction in Sotheby's a rare silver vessel for that time was acquired with the image of peacocks, a figure on horseback and a fox against a background of curls. The decor of the vessel is masterfully executed. The content of the Kufic inscriptions in the form of good wishes to the customer – the manufacturer of pillows and beds – is noteworthy - «Glory, prosperity, wealth and happiness to Abu Bakr Muhammad... Isa an- Najad (maker of pillows and beds).» The value of the vessel is that in the museums of Uzbekistan there is not a single silver item of this time, and the only silver and gilded tray with the name of Khorezmshah Ibrahim, related to our cultural heritage, is kept in the Hermitage. There is an opinion that in the world there are less than a hundred exquisite silver items of this time, which certainly gives special museum significance to the silver vessel acquired by us.

In terms of shape, size (diameter - 18.1 cm, height - 9.1 cm) and decor, the most common type of product is the bronze stand we acquired from the 12th-13th centuries with legs in the form of elephant figures with riders. There are several examples of this type of stand in the museums of Uzbekistan, but without cast figures of elephants with riders, which were probably attached later.

The inscriptions on the tray around the base and on the side are of a good-wishing nature for the owner of the dish, but without mentioning his name: "Fame and fortune, happiness and prosperity" and 'Fame... wealth (?) ... and a series of fortune and prosperity (?)'

7. Bronze tray. Central Asia or Iran. 12th-13th centuries.

The gold hoard from the Seljuk era of the 11th-12th centuries was purchased as a single lot. However, the hoard includes over 130 different gold ornaments and objects – various earrings, chains, bracelets, clasps, rings with turquoise and pearl stones, made with virtuoso craftsmanship. Considering that Khorezm was part of the Seljuk Empire, the presence of items from this hoard in the exhibition of the Centre was considered a legitimate acquisition. T This is a Sogdian *samit* fabric from the 7th century with an image of a royal pheasant, an unusual Mongolian "golden cloth" made of silk and metal thread, and unique *suzani* from Pskent, Bukhara, Shakhrisabz, Kerman and Kattakurgan of 18th - late 19th century from the collection of the famous Italian collector Ignacio Vok. The amount spent on the collection of 18th – 19th century embroideries of 5 pieces (4 *suzani* and 1 *nimsuzani* from the collection of Ignacio Vok). Chronologically, the earliest purchased sample of artistic textiles in terms of production time is a large fragment of a Sogdian silk *samite*, the place of production of which is indicated as Central Asia. It dates back to the 7th – 8th centuries. It should be noted that up to this point, none of the museums in Uzbekistan had samples of early medieval Sogdian fabrics.

8. Gold bracelet. Central Asia or Golden Horde. 13th-14th centuries.

The fabric is woven from red, black, blue and tinted silk – the general background is reddish. In the centre of the fragment is one large medallion with a pair of pheasants facing each other, against a background of plant ornament in the centre. The image of birds such as pheasants or peacocks, both in single form and in pairs, was part of the range of images and motifs characteristic of the early medieval art of Sogd. In view of the large size of the medallions, it is unlikely that this fabric was intended for clothing

9. Gold chest medal. Central Asia or Golden Horde. 13th-14th centuries. This pectoral is an exquisite example of jewelry of the Golden Horde, the zone of cultural interaction with which included the territory of Khorezm.

10. Sword of Nawab Asaf Ad-Daula. India. Late 18th century

10. Nawab's Sabre Asaf Ad-Daula. India. Late 18th century

12. Portrait of Prince Baburid Murad Bakhsha. India. 1700.

or a dress; most likely, this piece of fabric served as a pillow case or was used as a bedspread or curtains in wealthy houses of that time.

Among the samples of artistic textiles purchased at the Christie's auction is an unusual "golden fabric" made of silk and metal threads in the form of diamond-shaped geometric patterns that form hexagonal star pattern when intersected.

The peculiarity and artistic significance of this panel lies in the complex technique of combining silk and gilded threads, as well as in the unusual geometric pattern for textiles – *girih*, which is more often found in stucco or wood carving, decoration of metal products, etc. This panel reveals the possibilities of studying the genesis of Uzbek gold embroidery art. The style and technique of the fabric are very rare for the Middle East region and are more often found in Muslim Spain, Egypt and Syria.

The largest and most complete collection we purchased at the auction at Sotheby's on April 30, 2025, is a series of large Central Asian embroideries of the 18th-19th centuries from the collection of the Italian Ignacio Vok.

It is known that in the collections of our museums the earliest in terms of creation is the Nurata *suzani* from the collection of the Museum of Arts of Uzbekistan, which is conditionally dated to 1827-1832.

In this regard, the *nimsuzani* purchased at auction, embroidered by craftswomen from Kattakurgan and dating back to 1800, can now be considered the earliest embroidery in the collections of Uzbekistan. Moreover, this is the only known embroidery from Kattakurgan. The significance of this *suzani* is determined by its high artistic qualities – the dynamic play of five large and two small star-shaped medallions and the life-giving blue-light blue color masterfully

13. Large fragment of a Sogdian silk samite. Central Asia. 7th- 8th centuries. The fabric is displayed by stretching it on a frame measuring 76 cm x 104 cm.

14. Mongolian "golden fabric" made of silk. Iran. Late 13th – early 14th centuries. The size of the panel is 30x55 cm.

introduced into the space of the embroidery, "creating a feeling of water murmuring on the ground."

Significant in terms of artistic quality and place of production is the 270 x 238 cm *suzani* we purchased, created by Pskent craftswomen in the mid-19th century. The peculiarity of the *suzani* texture is that the base is completely covered with yellow embroidery. The play of hot yellow and red colors conveys the feeling of a sultry Central Asian summer, star-shaped medallions create mobility and spatial dynamics.

One of the most significant acquisitions in the group of embroideries, and in general in the entire purchased collection of artifacts, is a *suzani* with a large diamond-shaped medallion in the centre, which in English-language literature is called Large Medaillon *Suzani*. The *suzani* has an impressive size - 266x165 cm and an unusual composition. Despite the fact that it was embroidered presumably in Bukhara or Samarkand and is an integral part of our artistic heritage, there are no such embroideries in the museums of Uzbekistan. This *suzani* has several variations. In 1995, 23 variants of *suzani* with a large medallion were known, of which only 8 quite accurately corresponded to the composition of this *suzani* and were

15. Nimsuzani. Kattakurgan. Circa 1800.

stored mainly in museum collections in Germany and Switzerland. In 2000, the number of variations increased to 54 and now amounts to approximately 70 known samples, which are divided by researchers into 10 subgroups.

17. Suzani with large medallion. Bukhara, Samarkand or Shakhrisabz??. 18th century

18. Suzani with large medallion. Bukhara, Samarkand or Shakhrisabz?? Mid-19th century

During the auction at Sotheby's, our group set a mandatory goal to acquire this *suzani* due to its artistic significance and absence in domestic museums. The competition for this *suzani* was quite intense. Thus, historical justice was restored – one of a series of embroidery masterpieces of world significance was returned to its homeland. Just like the Kattakurgan *nimsuzani*, this *suzani* is now the earliest example of large embroidery in the collections of Uzbekistan.

At the Sotheby's auction we bought another version of *suzani* with a large medallion, which has a completely different figurative sound. Its size is approximately the same - 252 by 180 cm, but the nature of the solution to the idea of placing a diamond-shaped figure in the center is implemented with a striking individual interpretation. Our gaze is immediately drawn to the dynamically curling snake-like line, into which the motif of "cordi osh" - a kitchen knife - has turned. Enveloping large and small medallions, this S shaped spiral creates an atmosphere of constant movement and emotional tension.

Kermana suzani is made in the same dynamic, baroque style, the composition of which is three vertical rows of star-shaped and solar medallions, as if captured by the same serpentine vine as on the previous *suzani* with a large medallion. The absence of a diamond-shaped medallion in the centre does not prevent us from seeing the similarity in the design and coloring of these two *suzani* and, considering the approximately same time of manufacture, we can assume that both *suzani*, if not by the hand of the same designer, are in any case made in the same centre and belong to the same school of embroidery. A wonderful description of this *suzani* is given by researchers of this masterpiece: "The spirit of baroque" of this *suzani* with its rich ornamentation, striking color combinations and brilliance testifies to the almost decadent golden age of *suzani* embroidery". In fact, the mid- 19th century in Uzbek embroidery represents the classics of Central Asian – more broadly Eastern art.

* * *

In three days, Sotheby's and Christie's acquired artefacts (46 lots in total, 85 items). This is a truly significant amount and, in this regard, the Uzbek participants in the auction faced a difficult task – to be very delicate with the people's money.

However, the matter is not only in the material, but to a greater extent – in the historical, cultural and artistic significance of the purchased art facts. It was necessary to restore historical justice and return to the Motherland masterpieces of art and culture, which by right should occupy a place in the exposition and repositories of domestic museums.

This high level of evaluation is largely determined by the generally recognized international status of auction houses. Sotheby's and Christie's as guarantors of the uniqueness of the cultural and artistic objects presented at auction. This gives grounds to believe that all the artifacts we purchased are undoubtedly world-class masterpieces.

Important achievement of encyclopedic science of Uzbekistan

Maksud Asadov,
PhD (Philology)

The processes of renewal and freedom taking place in social life of New Uzbekistan are also reflected in Navoi studies. The four-volume «Encyclopedia of Alisher Navoi» was published at the expense of the Uzbek Language Development Fund under the Cabinet of Ministers in accordance with the Presidential Decree of October 19, 2020 «On the broad celebration of the 580th anniversary of the birth of the great poet and thinker Alisher Navoi». The book was prepared for publication in 2021-2024 by the Institute of Uzbek Language, Literature and Folklore of the Uzbekistan Academy of Sciences.

«The Encyclopedia of Alisher Navoi», created and published for the first time in the history of science, culture and literature of our country, is a unique achievement of Uzbek encyclopedic science. The encyclopedia of four volumes comprehensively covers all information related to the great poet and thinker, major statesman and public figure Alisher Navoi. It also covers a wide range of topics, including history, religion, Sufism, knowledge and spiritual perfection.

The articles in the encyclopedia are arranged in the order of the letters of the Uzbek alphabet in Latin. At the end of each volume there are annotations containing detailed information in Russian and English, as well as abbreviations, a table with the names, academic degrees and titles of the authors whose articles are used in the encyclopedia is attached. It is worth paying special attention to the fact that among the 78 authors there are not only Uzbek literary scholars and famous specialists in the field of Navoi studies, but also scientists from Azerbaijan, Tajikistan, Turkey, the Kyrgyz Republic, and the USA. The encyclopedia contains about 200 articles related to foreign research in the field of Navoi studies. In addition to information on the study of the life and work of Navoi in English, French, German, Russian, Belarusian, Ukrainian and Persian, special attention is paid to the research on Navoi studies by hundreds of foreign scholars, such as L. Buvat, Jan Schmidt, Remi Dor, Jean-Paul Roux, Barbara Kellner Henkel, Jurgen Paul, E.E. Bertels, S.N. Ivanov, N.I. Konrad, Pave de Courteille, E. Brown, V.V. Barthold, A.N. Samoilovich, B. Vahabzade, Elias John Wilkinson Gibb, Edward Brown, Maria Eva Subtelny.

The encyclopedia includes editions of the great poet's works from different years, their translations into foreign languages, manuscripts and lithographs stored in the treasuries of domestic and world libraries. The encyclopedia also includes articles on the reflection of Alisher Navoi's image in such forms of art as painting, sculpture, theater and cinema, and provides an analysis of some lyrical works. The publication devotes a large space to articles on the flourishing of literary life during the time of Alisher Navoi and the factors that determined it. This allows us to understand the vital force of the Second Renaissance - the Temurid Renaissance and to realize the role of Alisher Navoi in this process.

The book includes a number of articles about the Turkic clans and tribes that lived in Herat during the reign of Shah Hussein Baykara (Navoi lists several of them in his work «Waqfiya" - M.A.), about their customs and position at the ruler's court. The encyclopedia also contains a number of scientifically significant pieces of information about the poet's family, his relatives, friends, colleagues, teachers and students, and the people who surrounded him.

The study of Navoi's life and work has been passed down from century to century, from generation to generation. The study of his work, begun during the poet's lifetime by scholars and writers such as Mirkhond, Khondamir, Davlatshah Samarkandi, Zakhiriddin Muhammad Babur, Zayniddin Vasifi, was continued by prominent scholars – Navoiists (those who study the literary heritage by Navoi). Among them are Sadriddin Aini, Olim Sharafiddinov, Abdurauf Fitrat, Oybek, Maqsud Shaikhzada, Vokhid Abdullayev, Vokhid Zokhidov, Abduqadir Khaitmetov, Suyuma Ghanieva, Alibek Rustamov, Azizkhon Qayumov, Nadjmiddin Komilov, Abdurashid Abdugafurov, Yakub-

jan Iskhakov, Ibrahim Khaqqul, Porso Shamsiev and Hamid Suleimanov. The Alisher Navoi Encyclopedia provides extensive information about their contribution to the development of Navoi studies.

Today, new opportunities are opening up for studying the heritage of Navoi, understanding the spiritual roots of the great thinker and poet's work. This is reflected in the scientific research of a number of literary scholars, including Shukhrat Siradjiddinov, Muslikhiddin Mukhiddinov, Dilorom Salokhi, Olim Davlatov, Maqsud Asadov, Qodirjon Ergashev, Nurboy Jabbarov, Saifiddin Rafiddinov, Ergash Achilov, Burobiya Rajabova, Boqijon Tukhliev, Dilnavoz Yusupova, Karomat Mullakhojaeva, Nusratulla Jumakhoji, Usmon Qobilov. The "Encyclopedia of Alisher Navoi" also pays special attention to the popularization of their achievements.

At present, European libraries contain poetry and prose masterpieces of Alisher Navoi, consisting of 240 thousand stanzas. Library collections around the world, in particular, in the libraries of Iran and Turkey, the National Library of France, the University of Toronto in Canada, the Royal Library in Vienna, the Hungarian Academy of Sciences, the British Museum, the libraries of the universities of Berlin, Venice and Oxford, contain complete copies of Khamsa and individual copies of the four epics included in this work; numerous manuscripts of Chor Divan; a collection organized on the basis of Navoi's works rewritten in different periods, as well as ancient manuscripts with numerous copies of the works *Lison ut-tayr*, *Majolis un-nafois*, *Nasoyim ul-muhabbat*, *Tarikhi mulki ajam*, *Mukhamat ul-lughayn*, *Devoni foniy*, *Hamsat ul-mutayyirin*. Among them are many copies that were copied during the life of the great poet and are of great scientific value. Articles on these topics are also included in the encyclopedia.

The authors also did not ignore information about toponyms, enterprises and organizations named in honor of Alisher Navoi. As is known, a region, city, university, State Library in Tashkent, State Literary Museum of the Uzbekistan Academy of Sciences, the Grand Academic Opera and Ballet Theater in Tashkent, the Palace of Arts, a metro station in Tashkent, dozens of streets are named in honor of the great poet. The encyclopedia contains articles dedicated to them, as well as various photographs. In particular, the first volume contains images of dozens of sculptures erected in honor of the poet in famous cities of the world, the second volume - miniatures from different periods created based on his works, the third volume - scenes from performances based on "Khamsa", and the fourth volume - photographs showing that the genius of Navoi as an immortal image is embodied in films, videos, music and fine art.

"The Encyclopedia of Alisher Navoi" contains more than 2500 encyclopedic articles (in the 1st volume - 536, in the 3d - 658, in the 3rd - 649 and in the 4th volume - 578 articles). The following researchers from the Department of History of Uzbek Classical Literature of the Institute of Uzbek Language, Literature and Folklore of the Uzbekistan Academy of Sciences took an active part in the creation of this publication: Maqsud Asadov, Qodirjon Ergashev, Saifiddin Rafiddinov, Burobiya Rajabova, Zulaykho Rahmonova, Syrdaryokhon Utanova. The introductory article to the publication was co-authored by the late literary scholar, renowned scientist, Doctor of Philology, Professor Ibrahim Khaqqul and Doctor of Philology, Professor Maqsud Asadov. A separate group of reviewers was assigned to each volume, and based on their positive reviews, the encyclopedia was recommended for publication.

The encyclopedia begins with the article «*Alisher Navoi*», which clearly illustrates the personality of Alisher Navoi, the general scope of his work, the principles of development of Navoi studies, as well as the attention and respect shown to the great thinker in Uzbekistan at different times. The articles in alphabetical order begin with « *AAZZ* «. For example: « *AAZZ* (*Arabic. The most dear and respected, the most honorable*). *In his 288th ghazal in the divan "Badoe' ul Wasat» Navoi addresses the Prophet Muhammad through the phrase «the honor of people», and in a couplet he refers to the Prophet's hadith, which says: «A contented person is noble, and a greedy person is humiliated in all respects»:*

Haqdin azizliq tilasang, eldin uz tama,
Kim xalqning aazzi dedi: "azza man qana'"

Each article is accompanied by a list of references and the name of the author of the article.

«Alisher Navoi's Encyclopedia» is intended for secondary school students, university students, teachers, intellectuals, creative people, and a wide range of readers.

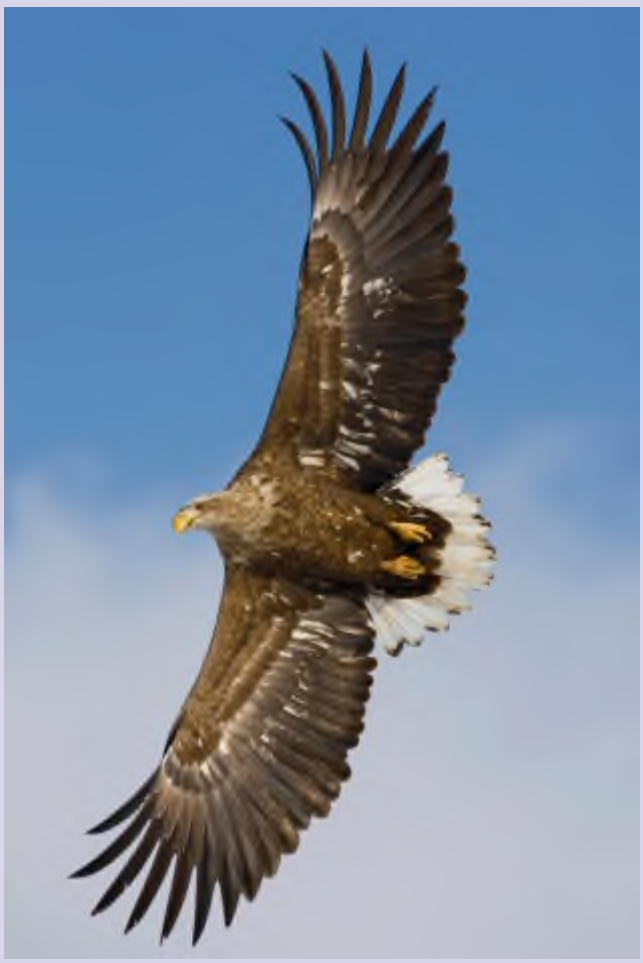
Why do birds fly but people don't?

Since childhood, people look at the sky and dream of flying like birds. Some build paper airplanes, some become pilots, and some become scientists studying the secrets of flight. But why can birds fly into the sky and humans cannot? It's all about the structure of their bodies. Birds have special adaptations that make flight possible. First, they have a light but strong skeleton. Birds' bones are hollow inside, like thin tubes. This helps reduce body weight. Second, birds have strong chest muscles that raise and lower their wings. People don't have such muscles - we are not designed to fly.

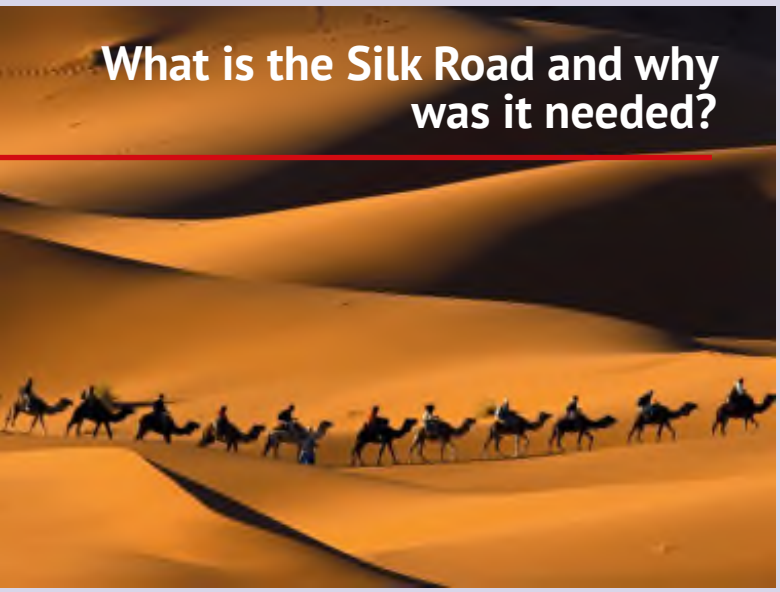
Wings are also designed in a special way. The upper part of a bird's wing is longer than the lower part. When air passes over the wing, it moves faster than below, creating lift. This is the force that helps a bird rise into the air. Airplane wings are built on the same principle. But there is another important reason - energy. It takes a lot of energy to fly. Birds eat food rich in calories, and their body quickly converts it into energy.

A bird's heart beats very quickly, and its respiratory system supplies its muscles with oxygen almost without interruption. Even the most enduring athletes cannot breathe and move at such a speed. Man cannot fly on his own, but he has found a way to rise into the sky with the help of science and technology. Airplanes, airships, helicopters - all these are examples of how people used the laws of nature to make an ancient dream come true.

Interestingly, it was bird watching that helped people create the first flying machines. For example, Leonardo da Vinci studied the flight of birds in the 15th century and tried to design a machine with wings. And in the 19th century, the Wright brothers were the first scientists to lift a real airplane into the air. Does this mean that man will ever be able to fly on his own, without machines? It is impossible for now. But who knows what the technologies of the future will be like? Maybe when you grow up, you yourself will come up with a way to fly without an airplane!



What is the Silk Road and why was it needed?



Have you ever heard of the Silk Road? It is not a road paved with silk, as its name might suggest. The Silk Road is an ancient trade network that connected East and West, Asia and Europe. Not only were goods transported along this road, but also knowledge, religions, inventions and even... fashion were passed on.

It all began more than 2,000 years ago, when the Chinese began trading with other nations. One of the most popular goods was silk – a light and shiny fabric that only China could make. People in the Roman Empire were delighted with this material and were ready to pay gold for it.

But the journey from China to Europe was very long and dangerous. Caravans – long columns of camels and people – walked through deserts, mountains and steppes. They crossed countries such as Uzbekistan, Iran, India and Turkey. To get from China to the Mediterranean Sea, it was necessary to travel thousands of kilometers. Sometimes the journey lasted a whole year!

Silk was not the only traded product on the Silk Road. They carried spices, paper, glass, precious stones, tea, gunpowder, porcelain and medicines. But even more importantly, ideas spread along with the goods. Buddhism, for example, came from India to China via the Silk Road. And the invention of paper came from the East to the West, and Europe began printing books.

Uzbekistan was a very important part of the Silk Road. Cities such as Samarkand, Bukhara and Khiva were like huge markets where merchants from all over the world met. Here they exchanged not only goods, but also stories, languages and cultures. That is why Uzbekistan is a real treasure trove for historians.

Sometimes there were bandit attacks, wars and natural disasters along the way. But despite the difficulties, the Silk Road continued to operate for almost 1,500 years. Only when sea routes appeared, ships began to transport goods faster, and the land route was gradually forgotten.

Today, the Silk Road is of interest again. Scientists, archaeologists and even travelers study ancient routes, restore maps and find ancient objects. And some countries even dream of building new trade routes between China and Europe, like in ancient times.

So the Silk Road is not just history. It is living proof of how people from different parts of the world can be connected to each other through trade, knowledge and friendship.

Prepared by Sayyora Asatullayeva
based on Internet materials

CENTRE FOR PROMOTION OF SCIENCE UZBEKISTAN ACADEMY OF SCIENCES

"Fan va turmush". A quarterly popular science journal.

Issues since 1933
For 12 years old and beyond.
Founder: Uzbekistan Academyof Sciences
Journal is published in Uzbek, Russian and English.
Journal is registered on December 6, 2006 by Uzbekistan Republic Press and Information Agency.
Certificate: No. 0022.

English language editor **– K.Kh. Abdullayeva**
Translator from Uzbek to English – **K.Kh. Abdullayeva**
Page designer – **N.M. Vyatkina**
Managers: **O. Aliev**
Photographer: **V. Goncharenko**
Pictures courtesy of **V. Vyatkin, A. Khakimov**.

Our address: 100047, Tashkent, Ya.Gulomov street, 70.
Phone: 71 2334305:
Electronic mail: fanturmush@gmail.com
Journal web page : www.fvat.uz

The journal is published in the "SILVER STAR PRINT" LLC printing hause.

Address of the printing hause: Tashkent, Olmazor district, Qorasaroy str. (Ibrohim ota str.) 322 B
Phone: 99 019 24 00
Permission granted to print: 12.08.2025

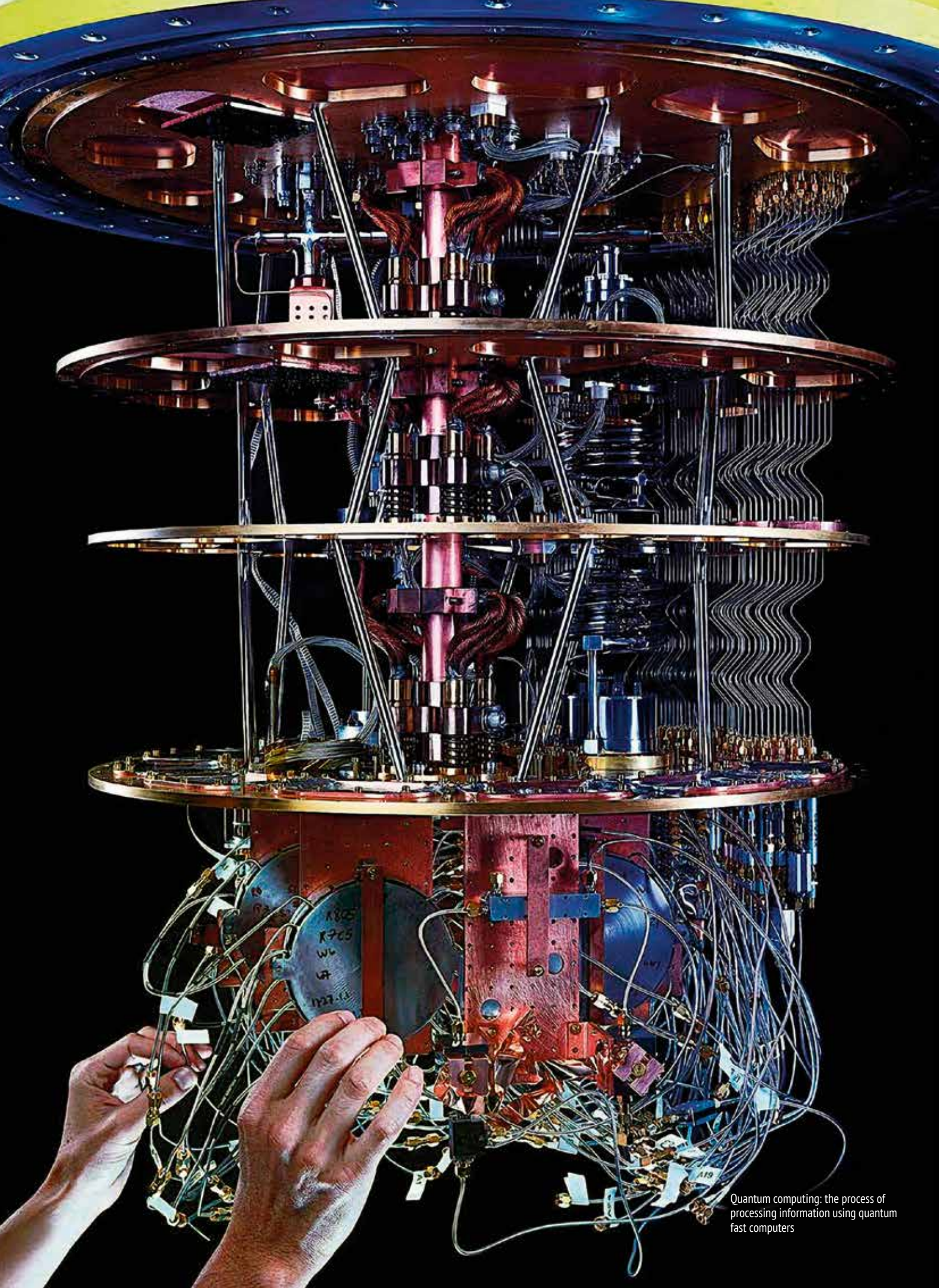
"Fan va turmush" Issue No. 2 (605), 2025
Paper size: 60x84 1/8. Size: 8 sheets. Circulation: 200 copies.

Subscription to the journal is available in the editorial office, at any post office through the representative offices of subscription agencies or online: http://www.pochta.uz/subscribe/

Index: 1407
ISSN- 0135-4560
Contract price

On the cover: Observe the world closely

Silver gilded dish with the image of a bird.
Iran. VI-VIII centuries



Quantum computing: the process of processing information using quantum fast computers