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FAN VA TURMUSH

«Science and Life» popular science journal

Centre for Promotion of Science Uzbekistan Academy of Sciences

3/2023

TO THE 80th ANNIVERSARY OF THE UZBEKISTAN ACADEMY OF SCIENCES

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Congratulations of the President of the Republic of Uzbekistan Shavkat Mirziyoyev on the occasion of the 80th anniversary of the establishment of the Uzbekistan Academy of Sciences of

Dear compatriots!
Dear representatives of the field of science!

I sincerely, from the bottom of my heart, congratulate you - tireless scientists and academicians, talented researchers, doctoral students, all scientific workers of the country on today's wonderful date - the 80th anniversary of the formation of the Uzbekistan Academy of Sciences.

The words of the great thinker Mahmud Kashgari, which contain deep wisdom: "The work of a scientist is harder than stone," because people of science conduct their research, persistently overcoming difficulties, and live, illuminating the world with the light of knowledge are, undoubtedly, close and understandable to you.

We see in you just such selfless people, painstakingly collecting knowledge bit by bit, creating new research and development, increasing the scientific and intellectual potential of New Uzbekistan.

On this wonderful holiday, we gratefully note the enormous contribution of the Uzbekistan Academy of Sciences, which has gone through an extremely difficult and glorious journey of 80 years, in educating hundreds of outstanding scientists and academicians in our country, and creating authoritative scientific schools in various fields.

During the years of independence, especially in recent years, you are enriching these achievements, following the glorious traditions, the foundations of which were laid by our great ancestors, and raising the development of science in our country to a new level.

Fundamental reforms are being carried out in the Academy system. New scientific organizations have been opened within its structure, the number of institutions in the system has increased almost 1.5 times. A procedure for their direct financing from the state budget has been introduced.

Our focus is always on supporting the activities and scientific research of leading scientists, talented young scientists, and improving the status of scientists in society. Thus, remuneration for representatives of the sphere and stipends for doctoral students increased by 3 times, fees for academicians - more than 2 times, and a system of paying a bonus of up to 60 percent to the salary of scientific workers with an academic degree was introduced.

Systemic measures are also being implemented to improve social and living conditions and improve the health of members of the Academy of Sciences. Researchers working in the system were allocated apartments on a preferential basis, and young family doctoral students were provided with free housing.

The Academy has intensified cooperation with authoritative international organizations and scientific centers of developed countries, as a result of which the scale of joint scientific research has expanded two to three times.

The institute of trainees has been renewed, and the quality of training of gifted young researchers has been improved. Currently, among the over 30 thousand researchers engaged in science in Uzbekistan, more than half are young people, which means the future of the sphere is in good hands.

Dear compatriots!

As you know, the basis of the First and Second Renaissance, which left a bright mark on our national history, is primarily scientific achievements. The foundation of the Third Renaissance, which we are creating today, will undoubtedly also be based on human capital, science, innovation, and new discoveries.

As part of the "Uzbekistan 2030" Strategy, we have outlined large-scale measures to create a modern infrastructure for scientific and innovative activities, and expand the integration of science into production. In particular, by 2025 we intend to increase the share of funds allocated to science in the gross domestic product by 6 times, and by 2030 – by 10 times.

In implementing such strategic tasks, we primarily rely on the colossal potential of scientists such as you. We will continue to use all the necessary forces and capabilities to fully support scientists and researchers and strengthen the material and technical base of the country's scientific institutions.

Dear participants of the celebration!

Once again, I sincerely congratulate you and, in your person, everyone who selflessly works for the development of national science, on today's wonderful holiday.

I wish you good health, happiness, inexhaustible energy and new successes in fulfilling your honorable mission.

Shavkat Mirziyoyev,
President of the Republic of Uzbekistan

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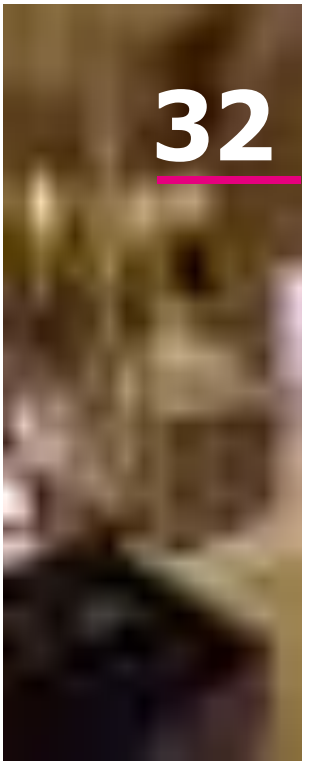

TO THE 80th ANNIVERSARY OF THE UZBEKISTAN ACADEMY OF SCIENCES

Gairat Bakhadirov,
Uzbekistan Academy of Sciences
Chief Academic Secretary

In November - December 2023, our country has widely been celebrating a significant event in the history of national science - 80 years passed since the Solemn meeting of lead scientists of the country, who founded the Uzbekistan Academy of Sciences in 1943.

During its development, academic science in Uzbekistan has gone through a number of stages of varying length and significance: – from the moment of its formation in the first decades of the twentieth century; - further as part of the Academy of Sciences in the WWII and post-war years, - then during the period of activity associated with the development of the national economy of the Uzbek SSR in the 1950s and until the beginning of the 1990s - as well as the last 32 years - during the period of economic development of the independent sovereign Republic of Uzbekistan.

Over the 80-year period of its activity, the Uzbekistan Academy of Sciences has gone through a long and fruitful path of formation and development; it has become the true headquarters of republican science, enjoying well-deserved authority, recognition and respect of the world and national science community.

In the system of research institutions of the Academy of Sciences over the past eight decades, several generations of highly qualified scientists and specialists have been trained, authoritative world-class scientific schools have been formed in many areas of science, a modern material and technical base of research institutes and centers has been created, including a number of unique scientific complexes and facilities, which became the basis for the implementation of current innovative and international scientific programs, as well as joint research with leading scientists from foreign countries.

The Academy of Sciences played a significant role in the formation and training of the national cadre of scientists needed by the country, successfully working in the system of public and higher education, science and technology, innovative production, economics and culture. The names of many scientists of Uzbekistan have become widely known far beyond the borders of our Motherland.

According to historical sources, direct preparations for the opening of the Uzbekistan Academy of Sciences go back to the early 1930s. Thus, in 1932, in Leningrad, on the initiative of the government of Uzbekistan, with the participation of many prominent scientists and together with the Council for the Study of Productive Forces of the USSR Academy of Sciences, an important Conference on the study of the productive forces of Uzbekistan was held. The text of the resolution adopted at the end of the Conference read: “Taking into account the presence in the Uzbek SSR of a significant number of research institutions, large library collections and a large number of highly qualified scientists in general and from among the indigenous population, in particular, the Conference welcomes the raising of the issue of creating an Uzbek Academy of Sciences».

By the beginning 1932, more than 50 research institutions were already successfully functioning in the country, including 9 dealing with problems of crop production, 9 with livestock farming, 11 with medicine, 4 with industry, 6 with geophysics, and 13 with problems of cultural construction. The next important step towards the creation of the Academy of Sciences was the formation on October 11, 1932 of the Republican Committee for the management of this extensive network of scientific research institutions of Uzbekistan (briefly - the Committee of Sciences) as “the highest scientific center of the republic, working

From the archives of the Academy of Sciences

in all branches of theoretical knowledge and in every possible way promoting the development of scientific research thought.» The Committee of Sciences was created under the Central Executive Committee (CEC) of the Soviets of the Uzbek SSR, which gave it the status of the main authorized state body for organizing national science and coordinating scientific research.

In the Committee of Sciences in 1930s to 1940s, large scientific divisions for that time were organized on important economic, scientific and technical problems - departments of hydrology, energy, soil science and others. In 1933, the Karakalpak Commission of the Committee of Sciences was created to coordinate scientific research in the Karakalpak Autonomous Republic.

As a priority task, the Committee of Sciences was instructed to carry out organizational work to create the material base of the future Academy of Sciences of the country by organizing and equipping laboratories, institutes, and other departments, as well as training the scientific personnel necessary for the republic in order to successfully carry out the further transformation of the Committee of Sciences into Uzbekistan Academy of Sciences.

At the same time, the successful implementation by the Committee of Sciences of the tasks assigned to it already went beyond the scope of its activities as a coordinating center. This was the reason for the subsequent transformation of the Committee of Sciences on January 9, 1940 into the Uzbek branch of the USSR Academy of Sciences in Tashkent (UzFAN), which was the immediate predecessor of the future Uzbekistan Academy of Sciences. The Chairman of the Presidium of UzFAN was the famous mathematician, teacher, popularizer of science and statesman Tashmukhamed Kary-Niyazov, who before this appointment had headed the Committee of Sciences since August 1937.

However, the established course of the entire economic, scientific, social and cultural life of Uzbekistan was sharply disrupted by the outbreak of the World War II. It is known that many scientists of Uzbekistan were drafted to the front, and not all of them returned from the war fields.

It should be especially noted that the most significant importance during the war period was assigned to the only specialized Time Service of the Tashkent Astronomical Observatory, which continued to operate in the USSR, whose unique main clock, working around the clock at a constant temperature, became the main source for the uninterrupted determination of the exact time and the corresponding adjustment of clock readings in the country. Moreover, the radio station installed on the territory of the Tashkent Astronomical Observatory broadcasted 7 series of precise time signals every day, necessary for planning front-line operations, as well as ensuring the activities of enterprises of the rear and the needs of the population of the entire country. This was an important contribution of astronomers of Uzbekistan to ensuring victory over the enemy.

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It is also known that in the first years of the war, many scientific institutions from Russia, Ukraine and Belarus were evacuated to Uzbekistan, which united 375 researchers, including many major and well-known world-famous scientists. All of them immediately became involved in the activities of UzFAN and other research institutions and universities of the country, working in close creative contact with full mutual understanding and mutual support with the main contingent of scientists in Uzbekistan in order to solve the main problems of the war period. By the time of the formation of the Uzbekistan Academy of Sciences, 19 research institutes, 23 scientific stations, 11 museums and 6 other scientific institutions functioned in the country.

A remarkable and particularly significant event of those years for national science was that in the midst of the war, on September 27, 1943, the Resolution of the Council of People's Commissars of the USSR "On the reorganization of the Uzbek branch of the USSR Academy of Sciences in Tashkent into the Academy of Sciences of the Uzbek SSR" was adopted with instructions to the Council of People's Commissars of the UzSSR and the Presidium of the USSR Academy of Sciences to carry out all the preparatory work for the organization of the Academy of Sciences of the UzSSR.»

Soon, on November 4, 1943, the main event for the implementation of this Resolution was organized and held in Tashkent - the grand opening of the Academy of Sciences of the Uzbek SSR took place. The par-

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ticipants of this Solemn meeting noted that: - "even in the harsh years of war all the conditions for fruitful work on problems of primary national economic importance were created for scientists", and also - ... "the culture of the Uzbek people ... received the broadest opportunities for its powerful lift.»

The first staff of the established Uzbekistan Academy of Sciences included 29 lead researchers of the country (11 full members and 18 corresponding members), of which 21 people represented natural sciences and 8 people represented the humanities, including:

- 11 scientists, academicians - founders who became the first full members of the Academy of Sciences of the UzSSR - mathematician T.N. Kary-Niyazov, writer M.T. Oybek, ethnographer M.S. Andreev, irrigator and hydroelectric power engineer A.N. Askochenskiy, popular poet G.G. Gulyamov (Ghafur Ghulom), irrigator and hydrologist V.V. Poslavsky, mathematicians V.I. Romanovsky and T.A. Sarymsakov, geologist A.S. Uklonsky, physicist S.U. Umarov and agronomist-breeder R. R. Schroeder;

and 18 scientists who became the first corresponding members of the Academy of Sciences of the UzSSR - geologist Kh.M. Abdullaev, physician G.G. Abdullaev, land reclamation specialist R.A. Alimov, physician A.A. Askarov, philologist and orientalist A.K. Borovkov, physicist I.I. Islamov, breeder S.S. Kanash, hydrologist B.D. Korzhavin, geobotanist and ecologist E.P. Korovin, breeder A.M. Maltsev, philosopher I.M.Muminov, poet M.A. Nasreddinov, ethnographer and archaeologist A.A. Semenov, physician M.I. Slonim, poet Hamid Olimjon, chemist I.P. Tsukervanik, economist G.N. Cherdantsev and literary critic O. Sharafiddinov.

The writer S.S. Aini, as well as folk artisans Usto Shirin Muradov and Yusuf Ali Musaev were elected honorary academicians of the Academy of Sciences of the UzSSR. One of the prominent scientists of the republic, a graduate of the Tashkent mathematical ¬school, Tashmuhamed Niyazovich Kary-Niyazov, whose activities were closely connected with the "prehistory" and preparatory period of the creation of the Academy of Sciences of Uzbekistan, was elected president of the Academy of Sciences of Uzbekistan. Authoritative scientists were elected vice-presidents of the Academy of Sciences of the Uzbek SSR - mathematician T.A. Sarymsakov and irrigator V.V. Poslavsky.

The First General Meeting of full and corresponding members of the Academy of Sciences of Uzbekistan appealed to the intelligentsia of the republic to rally around its academic scientific headquarters and work even more productively for the benefit of the people.

In 1943-1944, the Academy of Sciences included 10 institutes: - Geology, - Physical and Technical Sciences, - Botany and Zoology, - Soil Science and Geobotany, - Energy, - Chemistry, - Economics, - History and Archeology, - Language and Literature, - Tash-

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kent Astronomical Observatory with the Kitab Latitude Station, as well as the Botanical Garden, Museum of History, Fundamental Library and Publishing House of Scientific Literature. In 1944, the Institute of Mathematics and Mechanics and the Institute for the Study of Oriental Manuscripts were organized as part of the Academy of Sciences of Uzbekistan. The focus of the team of the Academy of Sciences of Uzbekistan (210 researchers, including 28 doctors and 57 candidates of science) was on the most important scientific and technical problems, the significance of which was determined, first of all, by the primary tasks and demands of the war years.

Thus, in 1944, an expedition from the Institute of Geology discovered iron ore deposits, which made it possible to carry out the construction of the first stage of the metallurgical plant in Bekabad. Many previously unknown deposits of coal, oil, gas, various metals, refractories, kaolin clays, and building materials were also discovered. The Vannovsky oil refinery was built on the basis of the oil fields of the Fergana Valley. The problem of using local mineral raw materials to obtain various grades of cement and the development of the construction industry was studied. The Institute of Chemistry has developed a technology for extracting sulfur from local petroleum products, and created a method for extracting copper from the ore of the Almalyk deposits. For the first time, the physical and chemical characteristics of the Kattakurgan and Fergana reservoirs were compiled. A number of new therapeutic drugs have been created.

Research by the Institute of Soil Science and Geobotany has enriched knowledge about the genesis and physical and chemical properties of the soils of the Mirzachul (Hungry) Steppe, and the reclamation state of the lands of the Khorezm oasis. Economists focused on the issues of distribution of productive forces, calculations of national economic plans and republican economic measures.

It should also be particularly noted that historians began working on the preparation of the first large consolidated work on the history of the peoples of Uzbekistan, covering the period from ancient times to the present day, which was published in the post-war period. The first scientific session of its kind on the ethnogenesis of the peoples of Central Asia, held in Tashkent with the participation of the country's most prominent scientists, left a noticeable mark.

New pages in the chronicle of the Uzbekistan Academy of Sciences opened at the end of the WWII. The scope of its activities steadily expanded, the role of fundamental scientific research in new scientific directions increased, and the network of scientific institutions expanded. By 1947, the staff of the Academy of Sciences had more than doubled and reached 440 people (including 46 doctors and 145 candidates of science).

A scientific session (June 9-14, 1947) was devoted to the results of the first years of activity of the Academy of Sciences, which witnessed the increasing importance of the Academy of Sciences as the main scientific center of Uzbekistan, and also discussed the priority and promising results of the work of scientists.

During this period, the efforts of the Academy of Sciences were aimed at ensuring the participation of scientists in the development of the national economy, at expanding scientific work on a deep and comprehensive study and activation of the productive forces of the country, as well as solving problems of the socio-cultural development of Uzbekistan.

For this purpose, in 1951, under the Presidium of the Academy of Sciences, the Council for the Study of the Productive Forces of Uzbekistan (CSPF) was formed and the Commission for the Study of the Productive Forces of the Karakalpak Autonomous Republic operated. New institutes of the Academy of Sciences were created: - Constructions (1947 г.), - Botany (1950 г.), - Zoology and parasitology (1950) and a number of laboratories.

In subsequent years, the country's Academy of Sciences continued its progressive development, including in the field of natural sciences. Thus, in 1956, the Institute of Nuclear Physics was created as part of the Academy of Sciences with the first research nuclear reactor VVR-SM in the East and a complex of unique nuclear physics facilities for the development of new nuclear technologies, nuclear materials science, methods of radio activation analysis and the production of radioactive isotopes. Also, in 1956, the Institute of Chemistry of Plant Substances was created with the aim of studying the structure, synthesis of substances of natural and synthetic origin, and creating medicines. And in 1959, the Karakalpak branch of the Uzbekistan Academy of Sciences was opened.

In 1965, the Institute of Microbiology was created to study the diversity of the world of microorganisms and develop microbiological technologies. In 1966, the Astronomical Institute was established on the basis of the Tashkent Astronomical Observatory - the oldest scientific institution in the Turkestan region and Central Asia (established in 1873 and celebrating its 150th anniversary in 2023) to study the problems of astronomy and astrophysics of the planets of the Solar system and the Universe. In 1967, the Institute of Electronics was created to develop methods of physical electronics, corpuscular diagnostics of materials and solving problems of industrial electronics.

Teams of scientists from academic institutions have achieved significant results in priority areas of natural, technical, social and human sciences. And the Uzbekistan Academy of Sciences has rightfully acquired the status of a leading authoritative research, scientific, organizational and science coordinating center of the country. In this regard, and for services in the development of science, economics and culture, and the training of highly qualified scientific personnel, the Uzbekistan Academy of Sciences was awarded the Order of Friendship of Peoples in 1975.

In subsequent years, the Academy of Sciences continued to create new institutions to solve current and practically important scientific, technical and social problems, including the Institutes of Bioorganic Chemistry (1977), Chemistry and Physics of Polymers (1981), and Immunology (1985), Materials Studies (1991), Genetics and Experimental Biology of Plants (1997), as well as the Khorezm Mamun Academy (1997), Computer Science (2004), Center for Genomics and Bioinformatics (2012), Navoi regional department (2017), Scientific and Technical Center with Design Bureau and EP (2018), Institute of State and Law (2020) and a number of others.

Currently, the Uzbekistan Academy of Sciences has authoritative scientific schools, a large galaxy of creatively gifted young scientists and doctoral students, as well as a solid material and technical base, which allows researchers to successfully solve many pressing problems of sustainable socio-economic development of the country. Today, academic science in Uzbekistan is concentrating efforts on creating the scientific foundations of modern technologies in such vital sectors of the economy as waste-free and efficient processing of mineral resources, materials studies, including nuclear, radiation and nanotechnology, energy, including the conversion and use of solar and other alternative types of energy, scientific and special instrument making, electronics, mechanics of machines and structures, computer science, chemical technology, biotechnology, genetic engineering and genetics, ecology, highly productive agricultural production, pharmaceuticals, medical diagnostics, nuclear medicine and others. At the same time, much attention is paid to the study of scientific problems of history, archeology, preservation and enhancement of the cultural heritage of the peoples of Uzbekistan, linguistics and literary studies, art history, jurisprudence and museum affairs.

Today, scientific institutions of the Uzbekistan Academy of Sciences are developing current scientific and innovative projects, as well as breakthrough intersectoral innovation programs, and on the basis of created scientific developments and patents, they are introducing scientific achievements and high-tech technologies into practice and ensuring the effective integration of science, education and production.

For decades, scientific teams of the Academy of Sciences have been actively involved in the development of international scientific and technical cooperation and the establishment of fruitful relations with many academies of sciences of foreign countries, with leading scientific organizations, research centers and universities in many countries of the world, as well as in the implementation of international and joint bilateral scientific programs and projects.

The structure of the Uzbekistan Academy of Sciences currently includes 3 departments in branches of science (physical and mathematical, chemical-biological and social-humanitarian), 3 regional departments (Karakalpak, Khorezm Mamun Academy and Navoi), 30 large research institutes and centers for areas of science relevant to the country, as well as 3 state museums, the Scientific Literature Publishing House «FAN», the Fundamental Library and the Center for the Promotion of Science. The personnel of the Uzbekistan Academy of Sciences include 62 full members (academicians). The total number of the Academy of Sciences is 5,405 employees, including: - 2,830 researchers, including 488 doctors of science and 831 candidates of science/PhDs; - 2424 engineering, technical and service workers; - 150 research interns. The total number of doctoral students at the national re-

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search institutes of the Uzbekistan Academy of Sciences is 785 people. 137 independent applicants for the scientific degree of Doctor of Science are working on their dissertations.

Scientists of the Academy of Sciences are making today and will continue to make a significant contribution to the realization of the eternal dream of the Uzbek people about a bright and great future based on the achievements of scientific thought and advanced scientific knowledge. It is towards achieving these program goals that the adopted laws of the Republic of Uzbekistan "On Science and Scientific Activities" and "On Innovation Activities", "The Concept for the Development of Science in the Republic of Uzbekistan until 2030", as well as many dozens of Decrees and Resolutions of the President of the Republic of Uzbekistan and Government Decrees are aimed in the field of science and innovation. Measures are being consistently implemented for comprehensive state support and development of academic science and for decent material support for scientists of the country. Today, representatives of the older generation of scientists and creative scientific youth are joining forces in the name of the prosperity of domestic science, the achievement of a bright future for Uzbekistan, the well-being and decent livelihood of our people.

President of Uzbekistan Sh.M. Mirziyoyev announced a strategic plan for the development of human capital to achieve the ambitious goal of making Uzbekistan one of the leading countries in the world on the global innovation index by 2030. The task of the Academy of Sciences is to adapt updated academic science to modern requirements and achieve high practically important results with the participation of scientists in the scientific and technical support of tasks carried out as part of the implementation of measures to implement the Strategies, Concepts, Programs and other directive documents adopted by the state.

Paying due tribute today and expressing my deep respect to the older generations of scientists who laid the foundations and created the diversified potential of the country's academic science, on behalf of the members of the Presidium of the Uzbekistan Academy of Sciences, I cordially congratulate the Uzbekistan Academy of Sciences on the glorious historical anniversary in its life and creative path - the 80th anniversary of its foundation, and also wish all its scientists and workers new creative achievements and successful fruitful work for the benefit of the development of domestic science and for the sake of the prosperity of sovereign Uzbekistan, as well as good health, happiness and prosperity in life!

PRESIDENTS OF THE ACADEMY OF SCIENCES OF UZBEKISTAN

Kary-Niyazov Tashmuhamed Niyazovich

First President of the Uzbekistan Academy of Sciences (1943 – 1947).
Academician of the Uzbekistan Academy of Sciences (1943),
Doctor of Physical and Mathematical Sciences.
Mathematics scientist, one of the founders of the Uzbekistan Academy of Sciences, Hero of Labor,
Laureate of state awards.
Years of life 1896 – 1970

Abdullaev Khabib Muhamedovich

President of the Uzbekistan Academy of Sciences (1956 – 1962).
Academician of the Uzbekistan Academy of Sciences (1947),
Corresponding Member of the USSR Academy of Sciences (1958),
Doctor of Geological and Mineralogical Sciences.
Scientist in the field of geology,
Laureate of the Lenin Prize (1959) and state prize.
Years of life 1912 – 1962

Arifov Ubay Arifovich

President of the Uzbekistan Academy of Sciences (1962 – 1966)
Academician of the Uzbekistan Academy of Sciences (1956),
Doctor of Physical and Mathematical Sciences.
Physics scientist
State Prize laureate.
Years of life 1909 – 1976

Salakhitdinov Makhmud Salakhitdinovich

President of the Uzbekistan Academy of Sciences (1988 – 1994).
Academician of the Uzbekistan Academy of Sciences (1974),
Doctor of Physical and Mathematical Sciences.
Scientist in the field of mathematics,
State Prize laureate.
Years of life 1933 – 2018

Juraev Tukhtamurad Juraevich

President of the Uzbekistan Academy of Sciences (1995 – 2000).
Academician of the Uzbekistan Academy of Sciences (1989),
Doctor of Physical and Mathematical Sciences.
Scientist in the field of mathematics,
State Prize laureate.
Years of life 1934 – 2009

Sarymsakov Tashmuhamed Alievich

President of the Uzbekistan Academy of Sciences (1947 – 1952).
Academician of the Uzbekistan Academy of Sciences (1943),
Doctor of Physical and Mathematical Sciences.
Mathematics scientist, one of the founders of the Uzbekistan Academy of Sciences, Hero of Labor,
Laureate of state awards.
Years of life 1915 – 1995

Zakhidov Tesha Zakhidovich

President of the Uzbekistan Academy of Sciences (1952 – 1956).
Academician of the Uzbekistan Academy of Sciences (1952),
Doctor of Biological Sciences.
Scientist in the field of zoology,
State Prize laureate.
Years of life 1906 – 1981

Sadykov Abid Sadykovich

President of the Uzbekistan Academy of Sciences (1966 – 1984).
Academician of the Uzbekistan Academy of Sciences (1947),
Academician of the USSR Academy of Sciences (1972),
Doctor of Chemical Sciences.
Scientist in the field of bioorganic chemistry, Hero of Labor,
State Prize laureate.
Years of life 1913 – 1987

Khabibullaev Pulat Kirgizbaevich

President of the Uzbekistan Academy of Sciences (1984 – 1988).
Academician of the Uzbekistan Academy of Sciences (1984),
Corresponding Member of the USSR Academy of Sciences (1984),
Doctor of Physical and Mathematical Sciences.
Physics scientist
State Prize laureate.
Years of life 1936 – 2010

Salikhov Shavkat Ismailovich

President of the Uzbekistan Academy of Sciences (from March 12, 2006 - to January 10, 2017)
Academician of the Uzbekistan Academy of Sciences (1995),
Foreign Member of the Chinese Academy of Sciences (2017),
Doctor of Biological Sciences, Professor.
Scientist in the field of bioorganic chemistry.
Born December 12, 1944

Yuldashev Bekhzod Sadykovich

President of the Uzbekistan Academy of Sciences (2000 - 2005 and from January 10, 2017 to the present)
Academician of the Uzbekistan Academy of Sciences (2000),
Foreign member of the Russian Academy of Sciences (2022)
Doctor of Physical and Mathematical Sciences, Professor.
Scientist in the field of nuclear and radiation physics,
State Prize laureate
Born May 9, 1945

PHYSICS, MATHEMATICS AND TECHNICAL DEPARTMENT OF THE ACADEMY OF SCIENCES

Sirojiddin Mirzayev,
Vice President of the Academy of Sciences

For several centuries, Central Asia was the intellectual center of the world, where exact and natural sciences developed widely. During the period of the first and second Renaissance, the land of Transoxiana gave the world a galaxy of great scientists.

Scientific research of Muhammad al-Khwarizmi, Ahmad al- Ferghani, Abu Nasr Farabi, Abu Reyhan Biruni, Mahmud Kashgari, Abu Ali ibn Sina, Nasriddin Tusi, Kaziz ad Rumi, Jamshid Kashi, Mirzo Ulugbek, Ali Kushchi and other Eastern scientists and scholars made a huge contribution to the development of world science.

Worthily, continuing the scientific traditions of the great ancestors, since the 1940s, in the process of development of physics, mathematics and technology, scientific schools were created in Uzbekistan, and it is especially important to note that the first President of the Uzbekistan Academy of Sciences was Doctor of Physical and Mathematical Sciences, Academician T.N. .Kary -Niyazov, and among the first institutes in the structure of the Academy of Sciences, the Institutes of Mathematics and Mechanics, Physico-Technical, Energy and the Tashkent Astronomical Observatory with the Kitab Latitudinal Station were created.

Famous mathematicians and physicists of the Uzbekistan Academy of Sciences, who created famous scientific schools, played an important role in the formation of the most important scientific directions. Developing theoretical and experimental directions, the physical and mathematical school of our country has made a great contribution to world science in

«Sun» solar complex - solar oven

the field of solid state physics, nuclear physics, semiconductor physics, laser physics and thermal physics, probability theory, mathematical statistics and algebra, their representatives have been awarded international awards and were elected members of foreign academies.

Currently, the structure of the Physico-mathematical and Technical Department of the Uzbekistan Academy of Sciences includes the Institute of Nuclear Physics, the Mirzo Ulugbek Astronomical Institute, the V.I. Romanovsky Institute of Mathematics, the Institute of Physics and Technology, the Institute of Materials Science, the U.A. Arifov Institute of Ion-Plasma and Laser Technologies named, the M.T. Urazbaeva Institute of Mechanics and Seismic Stability of Structures, G.A. Mavlyanov Institute of Seismology, Institute of Energy Problems, Scientific and Technical Center with a design bureau and pilot production and Radio Astronomy Observatory RT-70. The list is supplemented, among other things, by unique scientific objects of the Academy of Sciences - Research nuclear reactor, Complex of nuclear physics installations, Maydanak high-mountain and Kitab latitudinal astronomical observatories, Large solar furnace with a capacity of 1000 kW, etc.

Today, the scientific staff of the Physics, Mathematics and Engineering Department includes more than 900 researchers, as many as 187 Doctors of Science and 261 holders of PhD and Candidates of Science degrees. The number of PhD applicants and research trainees is 247 and 26 people, respectively, and the number of Doctors of Science is 26.

The Institutes of the Department publish 5 thematic journals in the main scientific areas: “Uzbek Physical Journal”, “Bulletin of the Institute of Mathematics”, “Journal of Problems of Mechanics”, “Journal of Problems of Seismology”, as well as the international scientific journal in the field of solar energy and renewable energy “Solar Engineering - Applied Solar Energy”, which is translated and published in English by Allerton Press Inc.

The development of physical, mathematical and technical sciences is inextricably linked with the tasks set before New Uzbekistan, including the creation of an innovative and competitive economy in the realities of a changing world. The regulations adopted by the state gave a powerful impetus to the development of mathematics, physics and technology. Thus, in recent years, Resolution No. PP-4387 dated July 9, 2019 “On measures of state support for the further development of mathematical education and science, as well as radical improvement of the activities of the V.I. Romanovsky Institute of Mathematics of the Uzbekistan Academy of Sciences” was ad-

From the work process of the Institute of Nuclear Physics

opted; Resolution No. PP-4526 dated November 21, 2019 "On measures to support research activities of the Institute of Nuclear Physics"; Resolution of the President of the Republic of Uzbekistan No. PP-5032 dated March 19, 2021 "On measures to improve the quality of education and improve scientific research in the field of physics", Resolution No. PP-4794 dated July 30, 2020 "On measures to radically improve the seismic support system safety of the population and territory of the Republic of Uzbekistan", Resolution No. PP-5063 dated April 9, 2021 "On measures for the development of renewable and hydrogen energy in the Republic of Uzbekistan", Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. PKM-273 dated May 4, 2021 " On creation of the Institute of Energy Problems of the Uzbekistan Academy" which defined a range of tasks for scientists aimed at solving pressing problems of sustainable development of real sectors of the country's economy, introducing developments and innovative projects of scientists, as well as import substitution and export of high-tech products.

Among the most important results of applied research obtained by the Institutes of the Physics, Mathematics and Engineering Department, carried out in these scientific areas, the following can be highlighted:

Dozens of types of devices have been developed for the needs of medicine, industry and science, such as the installation of neutron radiography and tomography to study the internal structure of archaeological, paleontological, industrial products, various samples, geological, mineralogical, geophysical and biological objects, an automated chemical water treatment system using nanocomposite cation resin for use in mini-boiler houses throughout the country, as well as in organizations operating injection molding machines, extruders, steam generators and cooling towers;

Enzyme immunoassay test systems have been developed to determine markers of viral hepatitis B and C, as well as AIDS, and technologies for obtaining labeled compounds and production of radioisotope products, including:

cyclotron radionuclides: Co-57, Zn-65, Ga-67, Ge-68, Pd-103, Ce-139;

reactor radionuclides : P-32, P-33, S-35, Cr-51, Mn-54, Fe-55, Co-58, Co-60, Mo-99, Y-90, I-125, I-131, Pm-147, Ta-182, W-188, Ir-192; Sm-153; Lu-177.

radionuclide generators: Ge-68®Ga-68, Mo-99®Tc-99m, Sn-113®In-113m, W-188®Re-188;

Health care institutions of the country are fully provided with medical radionuclides, the export of radionuclide products to Russia, Germany, the USA, Canada, Great Britain, Italy, Poland, China, Thailand, India, Iran and Ukraine has been established in the amount of tens of billions of Uzbek soums per year;

Of morganites and sky-blue color of topazes without inducing radioactivity have been introduced into production; an industrial technology for refining semi-precious minerals based on a nuclear reactor has been mastered;

Current issues of ordered and non-associative algebras have been developed in relation to solving a number of problems of non-commutative integration, quantum theory, which have received worldwide recognition, a new mathematical model of the heat exchange process in rotating regenerative air heaters of thermal power stations has been developed. Based on the model, a computer program was created that allows you to control the operating mode of air heaters of thermal power plants, and new methods for assessing the modeling ability of samples when constructing a "structure-activity" model in drug development were investigated. New predictive models of activity for a number of alkaloids were obtained;

Based on data on COVID-19 in Uzbekistan, mathematical models for predicting severe forms

Photo from the work process of the Institute of Materials Science

Photo from the work process. «Sun» solar complex

of COVID-19 have been developed. Thus, machine learning methods enable doctors to identify patients at high risk of developing severe disease, begin the right treatment at an early stage and reduce the number of unknown cases, reduce the "number of severe cases of the disease" or "deaths".

Methods have been developed for solving the main boundary value problems for third-order equations in multidimensional infinite domains, computer programs have been developed to automate research work on dynamic systems, allowing the construction of phase portraits of two-dimensional and three-dimensional dynamic systems through interactive control of the image of the phase portrait, a mathematical model of the thermodynamic process has been developed heat transfer in three-layer rotating regenerative air heaters in the form of discrete dynamic systems, the qualitative properties of the solutions of the resulting discrete system have been established, new methods have been developed for stochastic and statistical analysis of random processes, including models that describe real phenomena;

Scientific and educational astronomical observatories for Samarkand, Andijan, Karshi and National Universities, as well as for the Tashkent and Nukus Pedagogical Institutes, united into a single network, have been put into operation. In 2012, the International Astronomical Union assigned a name "Maidanak" to a minor planet - asteroid No. 22948 in honor of the astronomical observatory of the Maidanak Astronomical Institute, which is a famous research center;

A technology has been developed for the synthesis on the Large Solar Furnace of high-temperature superconductors based on Bi-Pb-Sr-Ca-Cu-O, which have a fine microstructure and exhibit unique properties;

An original thermoregulating nanocomposite film has been created that converts ultraviolet radiation from sunlight into the red and infrared range. Thanks to this, without additional heating, even at low external temperatures, the internal temperature is ensured in the range of -3-7 o C, up to +5 + 7 o C (0 + 2 o C in conventional films). As the number of photons in the red range increases, plants develop 1.5-2 times faster;

To produce green hydrogen, a method has been developed by splitting water using concentrated solar radiation. Pilot industrial samples of photo-thermochemical reactors have been created. For the safe storage of hydrogen, nanoporous material has been developed from available zeolite raw materials, the hydrogen absorption of which reaches 10% (the best indicator of world analogues is 5%). For the first time

in Uzbekistan, a sample of a fuel cell for generating electrical energy has been created;

A fundamentally new technology for producing carbon fiber has been proposed (the material is 5 times stronger than steel, 10 times lighter), necessary for high-tech industries. The use of "green and cheap" concentrated solar energy will significantly increase the competitiveness of carbon fiber. The first samples of green carbon fiber were obtained;

12 brands of activating fluxes have been developed, intended for welding all types of steels, titanium and their alloys, as well as nickel-based alloys, with a thickness of 4 mm or more, used in the construction of industrial and economic facilities (pipelines, bridges, technological structures, etc.) ;

The production of import-substituting ceramic inert heat-resistant balls of various sizes has been organized, used in the technological lines of gas production and gas processing enterprises for purifying natural gas from sulfur impurities, as well as in adsorbers for zeolite gas drying. A technology for obtaining oleic acid from technical vegetable oils (cottonseed, safflower, rapeseed) has been developed and its production has been established;

A vacuum-arc processing technology has been developed to modify the surface of metal products. The technology is intended to remove scale, oxide films, rust and other surface contaminants from the surface of rolled metal products, as well as to improve the surface properties of products;

A dry fire-retardant coating composition has been developed based on local raw materials with a wide temperature range for activation of fire retardant properties, the ability to control rheological properties, high decorative quality of surface coating and a long shelf life;

A phototherapeutic device has been developed based on a three-color semiconductor laser with three lasing wavelengths (405 nm, 520 nm and 635 nm) and sufficiently high power and UV sources for clinical use in dermatology.

A new technology for producing monosilane has been developed, allowing the production of highly efficient solar cells;

A strategy has been developed to reduce damage from the consequences of possible earthquakes, as well as to increase the level of safety for the population, rational and targeted distribution of material and technical resources. For the cities of Samarkand, Namangan, Khiva, a set of preventive measures and recommendations has been developed to reduce seismic risk for the housing stock, taking into account

From the work process of the Institute of Nuclear Physics

From the work process of the Institute of Nuclear Physics

the specifics of traditional construction and local building materials, which have been transferred to local authorities to take measures in case of possible earthquakes;

A mobile engineering seismometric station has been developed to conduct laboratory and field experimental studies of object vibrations during dynamic processes. A mobile engineering seismometric station was tested in field conditions to assess the impact of seismic blast waves on buildings and their soil foundations during explosions in the Shavazsay quarry, Akhangaran region;

A set of maps of "General seismic zoning of the territory of Uzbekistan" has been developed with an assessment of the potential seismic hazard of the territories of Uzbekistan in points and physical quantities (accelerations, spectra) on a probabilistic basis;

Research was carried out on seismic microzoning of the territories of more than 300 large construction projects in Uzbekistan, including all gas pipeline lines, the international business center "Tashkent City", residential complexes "Olmazor City", "Akay City", construction sites for new hydraulic structures;

A "Map of desertification in the arid zone of Uzbekistan", on a scale of 1:1000000, and a "Map of the danger of desertification in the arid zone of Uzbekistan", on a scale of 1:350000, have been created. These maps have been introduced for use in the Ministry of Agriculture, the Ministry of Water Resources, and the State Committee for Nature Protection.

Today, the physico-mathematical and technical department of the Uzbekistan Academy of Sciences of unites large-scale scientific and research institutions that concentrate great scientific and intellectual potential. However, in our time, taking into account the further economic development of the country, scientists face new challenges and complex tasks. An important role is played by long-term traditions of organizing scientific work and rich intellectual and personnel potential, which have already become a source of significant achievements. Regardless of the complexity of the tasks facing scientists, the experience and knowledge accumulated over 80 years serve as a reliable foundation for continuing successful research for the benefit of the further development of Uzbekistan.

AT THE CONTACT OF INTERESTS OF SCIENCE, EDUCATION AND PRODUCTION

Prof. Dr. **Abdurazak Mirzaev,**
Fevzi Istablaev,
senior researcher

Resolution of the President of the Republic of Uzbekistan dated June 15, 2017 No. PP-3059 "On measures to organize the activities of the Navoi Branch of the Academy of Sciences of the Republic of Uzbekistan" was adopted in order to increase the efficiency of the real sector of the economy of the Navoi region through the development and implementation of innovative projects, which became a major event of scientific significance for the region. The Navoi branch is the youngest regional branch in the system of the Uzbekistan Academy of Sciences. However, despite such a young age, the Department already has achievements that are worthy of public attention.

The Navoi branch is carrying out fruitful work aimed at integrating science, education and production, which laid the foundation for a unique Navoi scientific school and becomes the basis for the creation of a mining and metallurgical scientific, educational and innovation cluster.

Thus, the Interdepartmental Scientific and Technical Council (ISTC) was formed at the Navoi branch, at extended working meetings (Fig. 1) of which scientists and specialists from industrial enterprises and the agricultural sector discuss current scientific and technical problems and their implementation.

As part of the VI extended meeting of the ISTS, a three-day study tour of participants to the production facilities of the Navoi Mining and Metallurgical Complex was organized for the first time. More than 40 leading researchers and doctoral students from 11 research institutes of the Academy of Sciences, universities and research centers of Uzbekistan had the opportunity to become familiar with production processes directly at the facilities of the Central and Northern Mining Departments of the Navoi MMC. More than 50 specific proposals of scientists aimed at solving production problems of industrial enterprises in the Navoi region were discussed, of which 22 proposals were approved and are currently being implemented.

During the VII extended meeting of the ISTS, based on the results of the Department of System Analysis of Industries of the Navoi Region, problematic issues of the Navoi MMC, Navoiyazot JSC and Qizilqumsement JSC were identified. Over the past years more than 250 problematic issues of industrial enterprises and the agricultural sector of the region were discussed at the meetings of the ISTS at the Navoi branch and recommendations were given for conducting scientific research aimed at solving them.

Systematic work is being carried out in this direction. For example, in 2018-2021, about 20 business agreements with a total value of 24 billion soums were signed between the institutes of the Academy

Extended workshops of the ISTS

Process of beneficiation of graphite ore of the Taskazgan deposit in laboratory conditions

Presentation of biodegradable cups and other vermiculite products

Harvesting wheat grown on rainfed lands using technology developed by the Navoi department

of Sciences, universities and the Navoi MMC, and the scientific results of scientists are successfully implemented into production.

As a result of the scientifically based recommendations of scientists from the Navoi Department, an agreement was concluded between the State Enterprise "Navoiyuran" and the State Institution "Institute of Mineral Resources" in January 2023 to conduct research worth about 4.5 billion soums; all this work is carried out efficiently and on time.

Over the past years, the Navoi branch, together with research institutes and universities, has carried out practical work on 2 innovative, 5 applied and 1 fundamental projects, as well as 3 commercialization projects and 2 under business contracts. As a result of this work, a radiometer based on large-diameter silicon surface-barrier detectors was developed to measure the volumetric activity of radon and radium content in the studied environment, a technology for purifying soot from ash content to obtain a commercial product - carbon black, cost-effective polymer composite materials based on secondary products and local materials for drilling oil and gas wells, as well as gene diagnostic methods based on studying the genome of purebred Karakul sheep.

In addition, scientific research has been carried out to develop a technology for enriching graphite ores of the Taskazgan deposit (Fig. 2a) in order to obtain lubricating oils based on graphite, graphite electrodes, refractory and other import-substituting materials. A new method has been developed for the combined production of magnesium oxide from dolomite from the Vaush deposit, which is widely used in the production of mineral fertilizers, building materials and refractory products, as well as in pharmaceutical production and medicine. Scientists of the Department have improved the technology for producing expanded vermiculite by deep processing of vermiculite raw materials, developed technologies for the production of biodegradable cups (Fig. 2b) saturated with essential organo-mineral nutrients used in growing seedlings for agriculture in greenhouses, as well as vermiculite heat-resistant fireproof boards for the construction industry.

Rice. 2. a – process of enrichment of graphite ore from the Taskazgan deposit in laboratory conditions; b – presentation of biodegradable cups and other vermiculite products

Scientists at the Navoi branch also conduct scientific research in the field of agriculture, which makes it possible to significantly increase crop yields. Thus, an innovative method was developed for preparing agricultural seeds for sowing by encapsulating them with bentonite clay powder (Fig. 3a). Field tests were carried out on 396 hectares of cotton fields of a number of farms in Navoi, Namangan, Surkhandarya and Tashkent regions, and it was shown that the yield of raw cotton increased by 15-20%. In addition, the method developed by the scientists of the Department of using a 2% suspension of bentonite clays when foliar feeding crops with fertilizers also showed an increase in yield by 10-15%, and covering the needs of plants for irrigation water by up to 40% due to water vapor in the atmosphere.

Scientists at the Navoi branch have created a new approach to the commercialization of scientific developments. For example, an initiative group was created to organize the production and cultivation of wheat on rain-fed, non-irrigated lands (Fig. 3b) using

Laboratory for genodiagnostic assessment of breeding Karakul sheep

innovative technologies based on bentonite clays. This initiative group, with their personal savings and shared participation, included scientific employees of the Department.

Rice. 3. a – the process of encapsulating cotton seeds with bentonite clay powder before sowing; b – harvesting wheat grown on rainfed lands using technology developed by the Navoi department

In 2023, work was carried out to sow wheat on 56 hectares of rain-fed land in the Nurata region, where the experimental field plot of the Navoi branch is located. It should be noted that plant growth stimulants created by the Institutes of Genetics and Experimental Plant Biology, Microbiology and General and Inorganic Chemistry of the Academy of Sciences are being tested at this experimental site. It should be noted that water-saving innovative technologies of the Navoi branch are also being tested on peas, watermelons and other agricultural crops. On May 3, 2023, at this experimental field site of the Navoi branch, an on-site scientific and practical training seminar was held on the topic "Prospects for the use of water-saving technologies developed by scientists of the Navoi branch in agricultural crops," dedicated to the 80th anniversary of the foundation of Uzbekistan Academy of Sciences. This seminar was attended by management, researchers and doctoral students of the Navoi branch, as well as specialists from local agricultural organizations and farmers with many years of experience.

The Navoi branch also pays great attention to the development of international cooperation. More than 60 international memoranda of cooperation have been concluded and are being implemented with research institutes and universities in Russia, China, USA, Belarus, Bulgaria, Latvia, Poland, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, India, Iran, and joint work is being carried out.

For example, at the Aznek phosphorite deposit, in the Kanimekh district of the Navoi region, the Latvian company BAO has begun mining operations. Based on a memorandum of cooperation between the Navoi branch and BAO, work is underway aimed at creating an innovative technology for the enrichment of phosphate ore.

Since 2022, the Navoi branch has been implementing a project to create paulownia plantations on the rain-fed lands of the Nurata region using drip irrigation technology (Fig. 4a).

In March, two thousand cuttings and a thousand seedlings of paulownia were received from Bulgaria. They were provided free of charge, with transportation costs covered, by the Bulgarian LLC «Paulownia BG» and paulownia seedlings were planted on an area of 1 hectare, as well as a seedling nursery was organized and the necessary agrotechnological measures were carried out. Together with Bulgarian partners, it is planned to create a paulownia plantation on an area of 50 hectares, and to implement this plan in 2022 - 2023. 17 young specialists from the Nurata region completed an internship at paulownia plantations in Bulgaria at the expense of the Bulgarian side.

Fig. 4. a – paulownia plantation on rain-fed lands of the Nurata region;

b – laboratory for genodiagnostic assessment of breeding Karakul sheep

Events dedicated to the 5th anniversary of the founding of the Navoi branch of the Uzbekistan Academy of Sciences

On the basis of the Memorandum of Cooperation with JSC JV "Electrochemical Plant", an "Experimental Production Site" of the Navoi Branch was created on its territory and joint production of import-substituting drugs for agriculture was established from local raw materials - plant growth regulator stimulants "Kaliy-UM", paste "LGMK", the Hektar and ElSMiK complex, bentonite sulfur and the suspension insecticide SIP-70, all of these preparations passed field tests and showed an increase in yield by 15%.

As part of the Navoi department, a specialized laboratory has been created to determine the chemical composition of the soil of experimental fields and irrigation waters, modern equipment for which was received with the sponsorship of the Embassy of the People's Republic of China in Uzbekistan. When implementing the project "Obtaining graphite concentrate from ore of the Taskazgan deposit for its further use in electrical engineering, metallurgical and chemical industries," the necessary laboratory equipment was also purchased at the expense of funds allocated by the Chinese Embassy in Uzbekistan.

In 2022 for the first time in Uzbekistan, in the Navoi department, a specialized laboratory was created to conduct the study "Methods of gene diagnostic assessment of breeding Karakul sheep" (Fig. 4b).

On June 9-10, 2022, the Navoi branch organized an Exhibition of developments of the institutes of the Uzbekistan Academy of Sciences, as well as an International scientific and practical conference on the topic "Integration of science, education and production - the key to progress and prosperity", dedicated to the 5th anniversary of the founding of the Navoi branch of the Uzbekistan Academy of Sciences (Fig. 5).

Fig. 5. Events dedicated to the 5th anniversary of the founding of the Navoi branch of the Uzbekistan Academy of Sciences

Events dedicated to the 5th anniversary of the founding of the Navoi branch of the Uzbekistan Academy of Sciences

Working hours at the Center for Genomics and Bioinformatics

In 2018, the "Center for providing practical assistance and consulting services to farmers" and the "Club of Farmers and Scientists" were organized at the Navoi branch. At the Navoi branch there is a "Club of Inventors and Innovators", which unites creative youth, a "Club of Young Scientists" and a "Council of Scientific Mentors and Honorary Labor Veterans". The research of young scientists of the Department is aimed at solving current production and environmental problems of the region.

In addition, the State Unitary Enterprise "Kyzylkum Research Station" was created at the Department, designed to effectively use the gene pool of pasture Karakul sheep and develop colored astrakhan sheep breeding in accordance with international requirements.

It is also worth noting that the Navoi department is also carrying out work in the field of humanities. In particular, the project "History of the shrines of the steppe population of the Navoi region and associated legends" is being effectively implemented. Based on its results, it is planned to create an information collection for organizing pilgrimage and ethnographic tourism.

Researchers and doctoral students of the Navoi Department published 6 monographs and 5 textbooks, received 6 patents of the Republic of Uzbekistan, 7 certificates for computer programs and submitted applications for patents of the Republic of Uzbekistan for 15 innovative developments.

In brief, the Navoi branch of the Uzbekistan Academy of Sciences today acts as a driver of academic scientific thought and turns the existing potential of fundamental and applied developments into one of the key resources for the sustainable development of the region.

DEVELOPMENT OF CHEMICAL AND BIOLOGICAL SCIENCES

Bakhtiyar Ibragimov,
academician

The basis of the scientific potential of the Republic of Uzbekistan is the Academy of Sciences - the leading scientific and experimental center of the country. Uzbekistan Academy of Sciences (UAS) is the largest and most significant state scientific organization in Uzbekistan. The Academy of Sciences carries out a wide range of fundamental and applied research in current scientific areas, develops priority scientific, technical and innovation programs for the republic, trains highly qualified scientific personnel, ensures the implementation of scientific research results and new high-tech technologies in practice, which contributes to the development and improvement of economic , intellectual and spiritual potential of the country.

By the beginning of the 1940s, 19 research institutes, 23 scientific stations, 11 museums and a number of other institutions functioned in the republic. As a result of the extensive organizational work carried out, on September 27, 1943, a Resolution of the Council of People's Commissars of the USSR was adopted on the reorganization of the Uzbek branch of the USSR Academy of Sciences into the Uzbekistan Academy of Sciences, and on November 4, 1943, a solemn meeting of the scientific community of the republic was held in Tashkent, at which the Uzbekistan Academy of Sciences was established.

The initial staff of the Uzbekistan Academy of Sciences included 29 leading scientists of the republic, of which 21 represented natural sciences and 8 represented the humanities. One of its organizers, Academician Kary-Niyazov Tashmukhamed Niyazovich, D.Sc. in Physical and mathematical sciences, was elected the first president of the Uzbekistan Academy of Sciences.

In 1943–1944, the Academy of Sciences included 10 research institutes, including Botany and Zoology, Soil Science and Geobotany, Chemistry, and the Botanical Garden. At that time, 210 researchers worked in all scientific institutions of the Academy of Sciences, including 28 doctors (equivalent of D.Sc.) and 57 candidates of science (equivalent of Ph.D.).

Currently, the structure of the Uzbekistan Academy of Sciences includes 3 departments: - physical, mathematical and technical sciences, - chemical and biological sciences, - social and humanitarian sciences, 3 regional departments - Karakalpak, Navoi and Khorezm Mamun Academy, as well as 33 scientific-research institutions, including 26 institutes, 4 scientific centers, 3 state museums, as well as the «Fan» Scientific and Technical Literature Publishing House and the Fundamental Library.

The list of unique, scientific complexes and objects of the Uzbekistan Academy of Sciences of global significance includes 40 items, including the Tashkent and Ellikqal'a botanical gardens, the National Herbarium, the Ustyurt Desert and Muynak Biological Stations, national collections of the cotton gene pool, botanical plants, microorganisms, phytopathogens, etc.

The Academy of Sciences publishes and participates in the publication of 20 thematic journals in the main scientific areas, including Reports of the Academy of Sciences, international scientific journals in the field of natural sciences: "Chemistry of Natural Compounds" and "Plant Diversity of Central Asia" (PDCA), which publishes the results of research by botanists from Central Asian countries.

The legislative and organizational measures adopted by the state and the activities implemented on their basis have made it possible to significantly strengthen the human resources, material, technical and financial base of academic research and orient them towards the implementation of the country's

Working hours at the Center for Genomics and Bioinformatics

Working hours at the Center for Genomics and Bioinformatics

current socio-economic problems and the most important scientific and innovative developments.

Over the past 5 years, research organizations of the Uzbekistan Academy of Sciences have completed and sent to the Intellectual Property Agency of the Republic of Uzbekistan over 500 applications for protective documents - patents for inventions and certificates for software products. More than 250 patents of the Republic of Uzbekistan for inventions and certificates for software products have been received.

For the first time in the country, the "Scientific and Technological Center for developing technologies for the production of medicinal substances according to the requirements of GMP (Good management practice)" was created at the Institute of Chemistry of Plant Substances of the Uzbekistan Academy of Sciences. The center implements new innovative developments created on the basis of fundamental research by scientists of the country for their further transfer to pharmaceutical enterprises, including ready-made technologies for the production of substances of more than 40 import-substituting and export-oriented drug substances, the most popular generics; develops new technologies for the production of medicines; - and also provides domestic pharmaceutical enterprises with drug substances. In the future, the Center will ensure an increase in capacity and compliance of manufactured pharmaceuticals with international requirements. In 2020, the Republic of Uzbekistan became an associated member of the Global Biodiversity Information Portal (GBIF system). The leading performer of work on biodiversity is the Institute of Botany with the Botanical Garden of the national Academy of Sciences.

In the field of chemistry, scientists from the Department of Chemical and Biological Sciences have obtained the following most important results in recent years.

10 volumes of the unique scientific and applied Directory «Natural Compounds», which is the world's first encyclopedia in the field of chemistry of plant substances was prepared by the Institute of Chemistry of Plant Substances of the country's Academy of Sciences and for the first time published in English by the «Springer» scientific book publishing house.

In the field of supramolecular chemistry, a new natural phenomenon has been discovered that establishes a connection between the structure and conditions of formation of polymorphic "host-guest" complexes ("Ibragimov's rule") and for the first time, based on the method of X-ray structural analysis of supramolecular complexes, a new universal rule for the chemistry of clathrates has been established.

New types of import-substituting fertilizers and defoliants have been created for chemical indus-

try enterprises, and, since 2013, cotton growing in Uzbekistan has been fully supplied with domestic low-toxic defoliants.

Based on local hydrocarbon raw materials - oil and gas condensate, for the first time among the CIS countries, a domestic technology for producing high-quality aviation fuel «Jet A-1» for Boeing, Airbus, etc. airliners has been developed and put into production.

In order to reduce the evaporation of light fractions of petroleum products, 67 thousand floating pontoons were developed and produced, which were transferred for use to Uzbekneftegaz enterprises.

In the field of increasing the efficiency of agricultural production, scientists have completed and implemented the following most important developments.

The largest scientific achievement of recent years in the country's cotton growing was the creation for the first time, using gene knockout technology, of a unique transgenic cotton variety (Porlok 1 - Porlok 8 series), which has a wide range of economically useful traits, such as high yield, length, high fiber quality (1-2 types), precocity, salt tolerance, etc. A joint patent has been issued for this technology with the University of Texas, USA (Uzbekistan's share is 70%), and patents have also been received from Russia, Egypt and China, and the protection of this technology extends to 140 countries around the world.

Based on the developments of a team of scientists, a new scientific Center for Genomics and Bioinformatics of the Uzbekistan Academy of Sciences was created for the development of biotechnology of cotton and wheat.

Photo of the work process at the Institute of Genetics and Experimental Plant Biology

For the first time, primary genetic passports of 203 cotton varieties of Central Asian selection have been compiled.

A number of new highly effective breeding varieties of cotton have been created, suitable for cultivation in various climatic zones of the country.

In the field of pharmaceuticals, scientists have created more than 30 new original domestic drugs

based on local plant materials, which have antiviral, antiarrhythmic, analgesic and other medicinal properties.

The domestic immunostimulating drug Rutan was created, medically tested and transferred for production, which is recommended for strengthening human immunity in case of widespread viral diseases, including for preventive treatment during the Covid-19 pandemic.

A set of viral RNA samples from biological samples and a kit for PCR diagnostics of blood diseases have been created.

In the field of bioecology, scientists have obtained a number of new scientific and practically important results.

The foundations for preserving the biodiversity of the flora and fauna of the country have been created, including in the zone of environmental disaster - the Aral Sea region, as well as in the desert and mountain regions of Uzbekistan. A team of authors prepared, published and republished the Red Book of Uzbekistan in two volumes - flora and fauna, which presented the entire diversity of flora and fauna of the republic, including their first discovered and also practically disappearing representatives.

Development of international cooperation

In recent years, joint Uzbek-Chinese scientific laboratories have been created in the country's Academy of Sciences to develop new drugs based on modern technologies using local raw materials (Research Institute of Chemistry of Plant Substances and Research Institute of Bioorganic Chemistry of the Uzbekistan Academy of Sciences) and on plant taxonomy (Research Institute of Botany of the Uzbekistan Academy of Sciences).

International scientific and technical cooperation of the national Academy of Sciences and its scientific organizations with academies of sciences, research centers and leading universities around the world on current issues of mutual interest will be further developed in the coming years.

Scientific institutions of the Uzbekistan Academy of Sciences began to work more purposefully and productively on the priority and most important scientific and technical problems for the country, focusing their main scientific potential on them. The leading scientific schools created in the scientific institutions of the Academy were further developed, the results of which have wide international recognition.

Every year the number of important practical results and scientific and technical developments created by scientists, both in demand by the production of the country and representing the subject of export to foreign countries, is increasing.

Current issues of the development of academic science, determining priority scientific directions

During the experiment

and optimizing the structure of research institutes and centers are resolved by the scientific institutions themselves and problem scientific councils of the Uzbekistan Academy of Sciences. At the same time, the responsibility of coordinators of scientific areas, as well as scientific leaders and implementers of programs and projects for achieving a high level of ongoing scientific research and innovative development, as well as for the effective practical use of their results, has increased significantly.

Scientists from the institutes of the Chemical-Biological Department of the Academy of Sciences, true to their traditions, continue creative work for the benefit of the state and for the benefit of the people of Uzbekistan, they are ready to make a worthy contribution to the development of domestic and world science and civilization with their new scientific achievements.

Workflow in the Center for Genomics and Bioinformatics

NUCLEAR MEDICINE AND PROSPECTS FOR ITS DEVELOPMENT IN UZBEKISTAN

Dr. **Gairat Kulabdullaev,**
Prof., D.Sc. **Mikhail Kremkov**

Modern life is almost impossible to imagine without nuclear technology. It is in medicine that nuclear technologies have found their most popular practical application. With their help, completely new methods for diagnosing and treating various diseases emerged, which led to the emergence of a new direction - nuclear medicine. Using nuclear medicine methods, examinations and treatment of many human organs are carried out: metabolic organs, internal organs, lymphatic system, brain and spinal cord, bones, heart and circulatory system, digestive organs and others.

Nuclear medicine is one of the important branches of clinical medicine, which deals with the use of various radionuclide pharmaceuticals in the diagnosis and treatment of a number of diseases using the achievements of nuclear and radiation physics. Sometimes methods of external beam radiation therapy are also referred to as nuclear medicine. Diagnostics uses mainly single-photon emission computed tomographs (SPECT, which detect gamma radiation) and positron emission tomographs (PET scanners), and radioiodine therapy predominates in treatment.

Nuclear medicine received official status as a branch of medicine in the 1970-1980s. Nuclear medicine methods are used mainly in cardiac (46%), oncological (34%) and neurological (10%) diseases. More than half of the radioactive isotopes produced worldwide are consumed for these purposes. The USA, Japan and some European countries are leaders in the development and application of nuclear medicine methods. The global volume of the nuclear medicine market from 2014 to 2020 increased one and a half times, from 16.3 billion US$ to 24 billion US$. It is expected that by 2030 it will reach 43 billion US$.

In oncology (radiobiology of tumors), nuclear medicine performs tasks such as identifying tumors, metastases and relapses, determining the extent of the tumor process, conducting differential diagnostics, treating tumor formations and assessing the effectiveness of antitumor therapy.

The main sections of nuclear medicine are: - Radioisotope diagnostics, associated with the visualization of pathological processes in the human body using radiopharmaceuticals (RP); - Radioisotope therapy, using open sources of β- and α- radiation to create high doses of radiation in the target organ without damaging surrounding normal tissues; - Radiation therapy, based on the use of high-energy electrons, protons, neutrons and gamma rays to “burn out” cancer tumors in the early stages of the disease.

Modern radionuclide diagnostics is based on the registration of γ -quanta, either emitted directly by radioactive nuclides during their decay (scintigraphy,

President of the Academy of Sciences B. Yuldashev presents a new book

Research nuclear reactor VVR-SM of the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences

SPECT), or formed during the interaction of positrons emitted by a radionuclide with electrons of surrounding atoms; the positron emission tomography (PET) method is based on this phenomenon.

Computer (PET) tomography (or CPET) has the following advantages: - high spatial resolution; - relatively short research time: - as well as layer-by-layer imaging of the organs being examined. The diagnostic capabilities of CPET are implemented to analyze diseases of the following organs: - brain, - spine and spinal cord, - lungs, - liver, - kidneys, - pancreas, - adrenal glands, - aorta and pulmonary artery, as well as, if necessary, a number of other organs. For the creation of the computer positron emission tomography method, scientists Godfrey Hounsfield and Allan Cormack were awarded the Nobel Prize in Physiology and Medicine in 1979.

The first radionuclide for medicine was the iodine isotope 131I , which was obtained either from a mixture of uranium fission products or from tellurium irradiated with slow neutrons. Other radioisotopes used in medicine include the isotopes of technetium ^{99m}Tc , iodine ^{123}I , gallium ^{67}Ga and tellurium ^{201}Tl . Radioisotopes are obtained in nuclear reactor, including at the research nuclear reactor VVR-SM of the Institute of Nuclear Physics of the Uzbekistan Academy (INP AS RUz), as well as at charged particle accelerators, cyclotrons, and with the help of radionuclide generators.

Research nuclear reactor VVR-SM BINP AS RUz, which produces reactor radionuclides, including phosphorus P -32, P -33, sulfur S -35, molybdenum Mo-99, iodine I -125 and I -131, samarium Sm -153, lutetium Lu -177 and a number of others. These produced radioisotopes fully meet the needs of medical institutions in Uzbekistan and are exported.

Currently, radionuclides are most often obtained through the use of generators - portable devices with local radiation protection for the rapid production of short-lived radionuclides in medical institutions. The principle of operation of the generator is based on the fact that the decay of some unstable elements does not end with the formation of a stable isotope, but with the creation of a daughter, new unstable element.

Ge-68 ®Ga-68, Mo-99 ®Tc-99m, produced at the Institute of Nuclear Physics of the Academy of Sciences of the Republic of Uzbekistan ,

Sn-113 ®In-113m, W-188 ®Re-188 and cyclotron radionuclides

So-57 , Zn-65, Ga-67, Ge-68, Pd-103 and Ce-139, stored in special labeled containers .

The use of radiopharmaceuticals (RPs) in diagnostics is based on their advantages and real possibilities in the field of medical diagnostics. These capabilities include assessing the functional state of

various organs and systems, as well as pathological conditions, taking into account the assessment of the effectiveness of the treatment. The advantages of using radiopharmaceuticals are the effective detection of functional disorders of organs and systems, from the early stages of the disease to the development of pathological manifestations. Moreover, the radiation dose to the patient is significantly lower than with traditional X-ray examination.

The advantages of radionuclide therapy over other types of radiation therapy are the following: - high tolerance of normal tissues; - minor side effects; - complete realization of the energy of β particles at distances of no more than a few millimeters, and α-particles at distances of several tens of microns; - the possibility of forming large absorbed doses (100-1000 Gy) in pathological foci .

In recent years, Radioimmunotherapy has been increasingly used - targeted delivery of radionuclides to various organs of cancer patients using the so-called "Targeted Therapy" method. Radioimmunotherapy of malignant neoplasms is carried out using conjugates of genetically engineered antibodies with radionuclides. The method is based on the synthesis of special nanoparticles equipped with antibodies to specific biomarkers, characteristic primarily of malignant cells. These nanoparticles are delivered into the human body by local injection methods, or injection into the bloodstream, and are concentrated in cancer-damaged tissue. When the radionuclide Lu -177 decays, high-energy -particles are emitted β, which destroy the cancer cell exposed to them. Other methods of radionuclide therapy are also being actively developed.

In connection with the above, it becomes clear why in recent years the Uzbekistan Academy of Sciences has paid so much attention to the development and practical application of nuclear medicine methods and drugs in healthcare. One of the important decisions for the development of domestic academic science can be considered the creation in 2017 of the Laboratory of Nuclear Medicine at the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences (INP AS RUz) in accordance with measures to implement the Resolution of the President of Uzbekistan dated 02/17/2017 PP-2789 «On measures on further improvement of the activities of the Academy of Sciences, organization, management and financing of research activities.»

The scientific team of the Laboratory of Nuclear Medicine included employees of the former Laboratory of Nuclear Problems (NP) of the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences under the leadership of Ph.D. G. Kulabdullaeva. Immediately after the establishment of this Laboratory, scientific work in the development of binary radiotherapy

technologies was resumed. This direction was based on the achievements, scientific results and developments of the NP Laboratory.

It should be noted that back in 2003, on the initiative of Academician of the Uzbekistan Academy of Sciences B.S. Yuldashev, research on the development of neutron capture therapy (NCT) was started at the Laboratory of Nuclear Research at the Institute of Nuclear Physics, which culminated in the creation of a beam of epithermal neutrons in the horizontal channel of the research nuclear reactor VVR- CM. The development of the NRT technique requires providing a flux of epithermal neutrons with an energy in the range of up to 10 keV and a density of at least (10^8 -10^9) neutron/cm^2 s. This technically complex problem was successfully solved on the horizontal channel of the VVR-SM reactor, and a flux of epithermal neutrons with the characteristics necessary for the NCT method was obtained from the energy spectrum of reactor neutrons.

An irradiation box with biological protection was also developed and equipped, ensuring safe work of personnel with the extracted neutron beam in the reactor hall. The figures below show the external and internal views of the created radiation box for NRT experiments and a group of employees of the laboratory of nuclear problems.

External view of the radiation box Internal view of the radiation box for NRT

Thus, all the necessary conditions were created for conducting medical and biological research in the field of NRT using nuclear medicine.

The Laboratory of Nuclear Medicine of the Institute of Nuclear Physics of the Uzbekistan Academy of also developed methods, algorithms and software for carrying out accurate calculations when modeling exposure to epithermal neutrons

A group of laboratory workers and biological objects.

YAM INP AS RUz

Pharmaceutical basis of binary radiotherapy technologies.

To date, a number of effective techniques that form the basis of nuclear medicine have been developed and used. The physical principles of binary radiotherapy show that the key to its successful use is the availability of tumor-specific drugs capable of delivering the required amount of the required drug directly to the tumor area, and at the same time deliver as little of it as possible to the surrounding tissues during irradiation. Among them, special mention should be made of Neutron Capture Therapy and Photon Capture Therapy. Let us briefly describe these types of radiation therapy in nuclear medicine.

Neutron capture therapy (NCT).

A huge number of different boron-containing substances have been tested for NRT, from simple boric acid to complex boron-containing conjugates and nanoparticles. However, only 2 substances have proven therapeutic effectiveness in NRT, namely (L)-4-dihydroxyborylphenylalanine (BPA) and sodium mercaptoundecahydro-closo-dodecaborate (BSH), and it is BPA that was approved as a drug in 2020 under the name Steboronine (Stella Pharma, Japan).

Photon capture therapy (ECT).

One of the methods for increasing the effectiveness of radiotherapy is the preliminary saturation of the tumor with elements with a high atomic number Z (Z ⩾53) and subsequent X-ray irradiation. The resulting release of energy is localized in biological tissue in accordance with the distribution of the drug containing these “heavy” elements. Selective accumulation of the element in tumor tissue and its interaction with X-ray radiation is accompanied by the release of secondary radiation and contributes to the precise escalation of the absorbed dose, creating a tumoricidal effect. For this method, the term “photon capture therapy” was proposed by analogy with the processes occurring during neutron capture therapy. Abroad, the term Photon Activation Therapy (PAT) is more common, which is proposed as a therapeutic method for the treatment of malignant neoplasms, in particular, an extremely severe malignant brain tumor - glioblastoma multimorpha. PAT technology was first proposed in 1985 and involves, during irradiation of a biological organ, the inclusion of “heavy” atoms in the DNA structure with the subsequent activation of these atoms by photons with energy inducing the photoelectric effect and an accompanying cascade of excitation and electron transitions. In experiments in vitro with an iodine-based preparation, this theory received experimental confirmation in a study of the survival of biological cells when irradiated with monochromatic X-ray radiation (radiosensitization of tissues by atoms of heavy elements). Recently, there has been considerable interest in the use of nanoparticles for this purpose.

Medical and biological research.

Previously, at the Laboratory of Nuclear Problems of the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences, experimental studies were carried out on the effect of irradiation with epithermal neutrons on biological objects, including on the binding ability of human serum proteins, both in the presence of a boron-containing drug, as well as in the presence of a borate buffer.

As a result of these studies, it was found that irradiation of human blood serum with an epithermal neutron beam at the VVR-SM nuclear reactor for 1 hour changes the characteristics of the binding of tri-

During the experiment. Institute of Human Immunology and Genomics

tium-labeled pharmacological drugs to transport proteins of human blood serum. The destructive effect of the neutron capture reaction of gadolinium on human erythrocytes in vitro was also discovered.

In studies of mice grafted with C-180 sarcoma, a significant decrease in tumor was found in both groups, i.e. tumor growth was suppressed by exposure to epithermal neutron irradiation in mice in vivo. Suppression of tumor growth in the main group was 94–97 % and 82–86% in the control group, which proved the effectiveness of the use of gadolinium in the method of neutron capture therapy. At the same time, results obtained in animals cannot always be directly extrapolated to humans. Therefore, the Laboratory of Nuclear Medicine (NM) of the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences was tasked with creating a simple model of brain tumors, convenient for experiments, as close as possible to human brain tumors. To solve this problem, a scientific group of specialists of various profiles from the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences and the Republican Scientific Center of Neurosurgery (RSNC) of the Uzbekistan Ministry of Health was created in the Laboratory of Nuclear Medicine. This group united by an agreement on scientific cooperation between the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences and the Center for Scientific Chemistry, included neurosurgeons (MD Kadyrbekov R.T., doctoral student Kadyrbekov N.R., Prof. Akhmediev M.M.), histologist Beknazarov Kh. and clinical pharmacologist Prof. Mavlyanov I.R. Through joint efforts, the problem was successfully solved and a method was created for using live sections of brain tumors.

The essence of the method is that during a planned surgical operation, the patient's tumor tissue is removed. Fragments of this tumor are preserved and used alive in experiments involving irradiation with different types of radiation and different absorbed doses. After irradiation, these sections are incubated for 24 hours, and after this a histological analysis of the degree of damage (necrosis) of the tumor tissue is carried out. Based on the data obtained, a conclusion is made about the degree of sensitivity or resistance of a particular tumor to different doses of radiation. The developed method was patented in Uzbekistan (Patent for invention No. UZIAP 06855, with priority dated March 18, 2020), and currently this method is used in medical and biological research at the Laboratory of Nuclear Mathematics, Institute of Nuclear Physics, Uzbekistan Academy of Sciences.

In recent years, successful studies of radioresistance of grade 3 and 4 glioma tumors, anaplastic astrocytes and glioblastomas have been carried out at the Nuclear Mathematics Laboratory of the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences. Data were obtained on the individual radioresistance of these types of tumors, which are the basis for the development of individual approaches to the use of radiation therapy in patients who have undergone surgical removal of anaplastic brain tumors. These studies have shown that the developed method allows for a wide range of biomedical and clinical laboratory studies in the field of neurosurgery, neuro-oncology and radiation therapy.

As we have already noted, in recent years, Uzbekistan Academy of Sciences has paid special attention to the development and application of highly effective nuclear technologies and domestic radioactive drugs in the field of medicine, based on projects carried out jointly with medical centers of Uzbekistan and other countries. Evidence of this was the major International Conference on Nuclear Medicine held in Bukhara on October 3-5, 2023, dedicated to the 80th anniversary of the Uzbekistan Academy of Sciences. The conference was organized by the Academy of Sciences, Institute of Nuclear Physics of the Uzbekistan Academy of Sciences, Uzbekistan Ministry of Health, Bukhara State University and the Bukhara Medical Institute with the sponsorship of the New Life Medical Diagnostic Center, domestic enterprises Radiopreparat, Tezlatgich at the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences and Gamma Systematics Ltd. More than 200 renowned scientists from Russia, Kazakhstan, Turkey, Poland, China, Uzbekistan and other countries took part in the conference. The plenary reports of the President of the Uzbekistan Academy of Sciences, Academician B.S. Yuldashev, aroused particular interest among the participants about domestic radiopharmaceuticals, Academician of the Russian Academy of Sciences Kaprin A.D. about nuclear medicine technologies, as

Reactor water treatment complex of the Institute of Nuclear Physics of the Russian Academy of Sciences

Photo of the work process at the Institute of Human Immunology and Genomics

well as professors Kusuk N.O. (Turkey) and Szazhka P. (Poland) on current problems of nuclear medicine that are being studied in their countries.

At the conference, discussion platforms were organized in current areas: - Diagnosis and treatment of diseases using nuclear methods; - Production of radioisotopes for medical needs. This provided an opportunity for private participants to substantively discuss issues of combined complex treatment and diagnosis of cancer, the use of modern nuclear medicine technologies, the development and production of radiopharmaceuticals, and others. Important joint projects were also planned for implementation, including the creation of a Training Center for Nuclear Medicine on the basis of the Bukhara Medical Institute with the participation of foreign specialists. As part of the conference program, the Bukhara branch of the Institute of Human Immunology and Genomics of the Uzbekistan Academy of Sciences was opened to realize the possibilities of human immunology and genetics using modern technologies, methods of diagnosis and treatment of diseases in the specific conditions of a sharply continental climate.

Participants of the conference at the opening of the Bukhara branch of the Institute of Human Immunology and Genomics of the Uzbekistan Science of the Academy of Sciences

The Conference participants especially noted that the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences has all the conditions for conducting current research in the field of nuclear medicine: the necessary nuclear physics equipment, a wide range of radiopharmaceuticals produced jointly with the enterprises “Radiopreparat” and “Tezlatgich”, developed by the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences, nuclear specialists who fruitfully work with specialized medical scientists of the country, as well as a model of human brain tumors developed and protected by a patent. All this creates new opportunities for the development of cooperation in the field of nuclear medicine between scientists of Uzbekistan and colleagues from nuclear and medical centers around the world in order to conduct joint research and treatment of oncological diseases.

VIRTUAL PRESENTATION OF THE EXHIBITS OF THE "DARUL MUSEUM HIKMAT WAL MAORIF" USING COMPUTER MODELING METHODS

Dr. **Jamolkhan Jumanov,**
PhD **Masharib Abdullayev,**
researcher **Temur Khudayberganov**

One of the important issues is the innovative technical and technological integration of interaction with various spheres of society based on the world's developing computer graphics and engineering geometry, virtual reality technologies, digital model environments, including cinema and television, trade and industry, medicine and chemistry, tourism, military sphere, as well as virtualization of museum exhibits in the field of art and culture. In this regard, within the framework of large-scale projects, much attention is paid to the development, based on computer graphics, of methods and tools for the wider use of virtual reality environments and the transition to three-dimensional technologies for in-depth study of digital museum exhibits. Popularization of unique works of culture and art, increasing the activity of scientists and visitors through the creation of a digital museum using virtual reality is one of the pressing issues in the activities of such famous museums as 3D Petrie Museum (Egyptian archaeology), British Arch Museum, Louvre Museum, Smithsonian X3D», Dresden Galery, Hermitage 3D, Pergamons Museum.

After our country gained independence, special attention is paid to the introduction by public and private organizations of virtual reality tools in the study of culture and art, spiritual and historical monuments, display of exhibits in three-dimensional projection, video and electronic format, improvement of the digital software of the virtual museum based on engineering geometry and computer graphics, development of a national virtual environment for museums. In particular, the decree of the President of the Republic of Uzbekistan on the approval of the "Digital Uzbekistan-2030" strategy and measures for its effective implementation defines a number of tasks, including "...studying the possibility of using virtual reality and imagination, artificial intelligence and thinking, machine learning, analysis of large databases and "cloud" computing technologies in economic sectors and their implementation", "...development and stimulation of research work in the field of digital technologies, improvement of their organizational mechanisms".

In this regard, with the rapid development of technics and technology, the use of the virtual museum world is of great interest to many people. The demand for electronic catalogs for preserving copies of cultural and artistic monuments, spiritual and historical monuments based on applied geometry and computer graphics based on virtual reality tools has also increased, and one of the important tasks is the development of software for automating the virtual environment using these methods, digital models and algorithms.

Creating virtual images of original museum exhibits based on engineering geometry and computer graphics, based on their exact geometric dimensions, colors, angles and directions of incidence of light, figurative and semantic features, comprehensive description and study - this is the creation of a research object. For the purposes of theoretical and scientific-practical study, it is necessary to: carry out digitalization of museum exhibits, scanning to create their virtual model or three-dimensional copy of cultural monuments, use photo and video recording devices, a recording method with halogen lighting, develop algorithms and solutions, present them in a presentable manner to public, create storage technologies and software tools for digital processing.

A museum is a non-profit cultural institution created by the state to store, study and display to the public museum objects, exhibits and collections, as well as to achieve other goals determined by the laws of the country. A virtual museum is an interactive multimedia software product that displays museum collections and exhibits in electronic form.

The main criterion for including a software product in the concept of "Virtual Museum" is the implementation of the following well-known mechanisms of interaction between visitors and exhibitors:

- exhibition feeding mechanism;
- exhibition presentation process;
- structures for providing additional information;
- increase the international index of the language and local exhibits;
- increasing the share of exhibition buildings presented in the virtual museum format in the total number of museum exhibits;

- an indicator of the share of objects of the museum fund presented in the format of a virtual museum from the total number of objects in the exhibition halls presented in the format of a virtual museum;

- accessibility indicators for people with disabilities, people with disabilities and the elderly.

Before starting modeling, it is necessary to answer the question of creating a conceptual model: what class model should be created to meet the requirements of the field of knowledge in which further work with the model will be carried out.

When studying the creation of a virtual environment, the following complex tasks were sequentially performed:

designing three-dimensional models of a collection of cultural monuments and developing a conceptual model for creating a virtual museum based on engineering geometry;

development of methods and algorithms that increase the accuracy of the structure of the database of digital exhibits, the geometric shape, size and color texture of data when creating three-dimensional models;

development of visualization methods based on computer graphics, algorithms for calculating ideal parameters when creating a three-dimensional model of cultural heritage objects;

development of a software module that accepts photo, audio and video file formats to display graphical data in real time in a virtual museum environment when creating a three-dimensional model;

designing a logical functional structure of three-dimensional models of national objects in a virtual museum environment, creating software for the virtual museum of the Mamun Academy ;

In traditional information geometric models implemented in computer environments and based on set theory, the description of cultural heritage objects (CHOs), based on the above, can be formally represented by the following set of attributes:

here is a cultural heritage project, i.e. recording the unit value of a digital image in a database, representing the record with time information; - a data set describing the spatial representation (metrics and topology) of the object; - a set of data describing the texture and colorimetry of the surface of an object; - a set of text data that, as a rule, represents the most detailed description (semantics) of an object; t is the time of acceptance of the CHOs or entry of its digital model into the database. The semantic part of this complex information resource has been developed comprehensively and implemented in many of its systems (registries, electronic catalogs, databases, etc.

The semantic part of this complex information resource has been developed comprehensively and implemented in many systems (registries, electronic catalogs, databases, etc. Formally, the size of data of this type, as well as data on the time of description of the object, are equal.

In virtual reality, objects, images, and patterns are modeled geometrically as binomial polynomials with arithmetic properties. The Earth was rendered using custom rendering system “Google’s Earth Ray”. The object is created and configured based on the module for binding and matching light sources based on the coordinates provided by this system. With its help, a real environment was simulated as a view of the Earth from space.

The next step was visualization using a real camera, positioned appropriately, allowing it to be used to accurately measure and adjust the parameters of the object. It should be noted that a feature of this project is the use of the most advanced methods and technologies for presenting information in the most understandable and visual form.

Initially, a visual modeling of the building in which the museum is located was carried out, fundamental documents about the buildings were scanned and modeling was performed based on cartographic and photographic data, its location on the globe and latitude. Since in images from space almost all buildings are built according to the same principle - the binding of a polygonal object to the terrain based on x, y coordinates in GPS systems is based on geomodeling, Figure 1 shows a geomodel of the museum building obtained on an image from space.

At the next stage, work was carried out to create schematic views of the area on the map. After modeling the landscape, roads, houses and the exterior of the museum building, as well as other elements with the display of individual geometric shapes, the stage of assembling all models into one base file was completed. In turn, after assembling the schematic map on the landscape model, placing the walls and doorways in their places as buffer models, parts of the interior were added (Fig. 2).

For this we used a special plugin « Wall» Pack” designed by “3 d max Tools», and the “Blender” program. Using this plugin, surfaces and objects with various national patterns were created.

The design of museum exhibits includes:

- copying, pre-processing of several versions of similar objects;

- creation of computer “drawings” with orthogonal projections of a virtual object, taking into account recycled material;

- geometric modeling itself, that is, creating three-dimensional elements with their help, and then constructing surfaces with their help;

- assessment of the properties of simulation objects: curvature, continuity of curvature, light distribution, etc.;

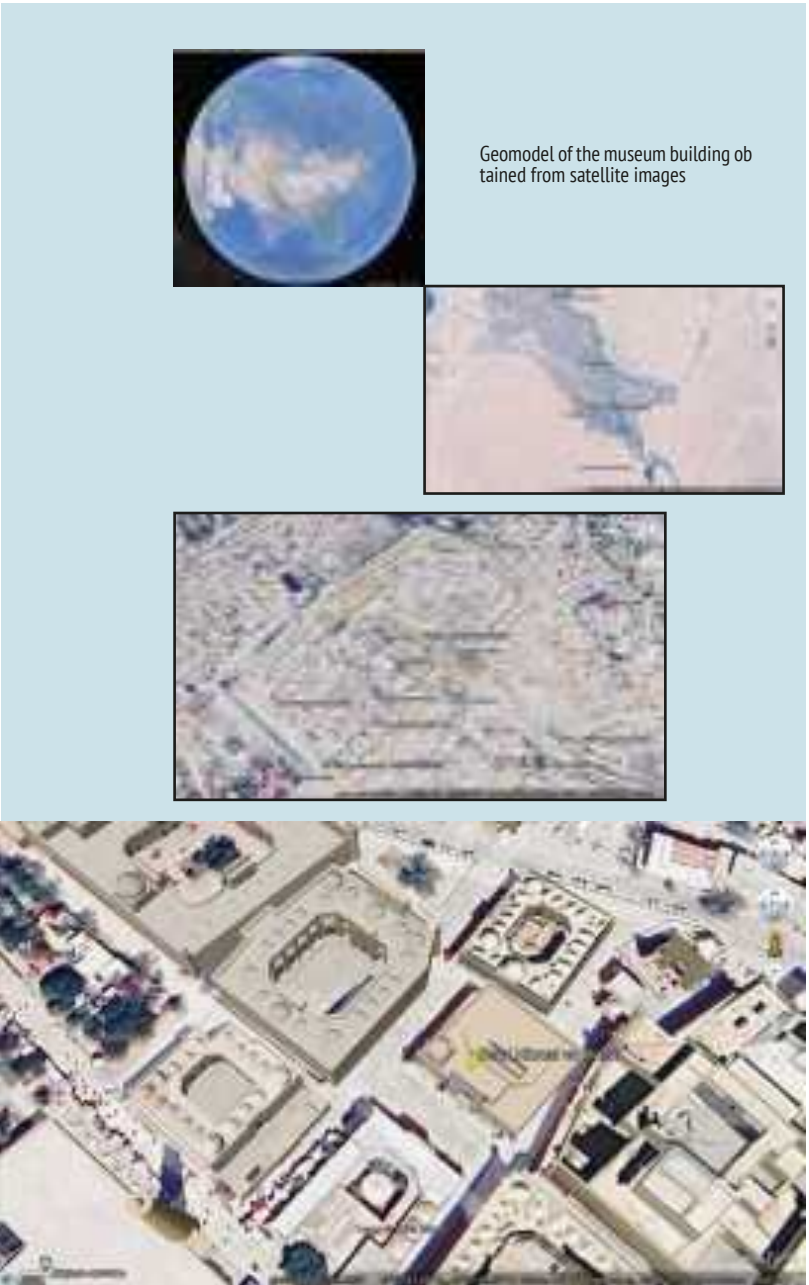
- further development of the internal structure of the object, preparation of a three-dimensional model of the object, design calculations, drawing documentation, etc .;

- optimal placement of exhibits (optical properties of surfaces), selection and ordering of light sources, adjustment of environmental characteristics, choice of background, accurate calculation of a scene constructed with a high level of photorealism, culminating in the virtualization of objects of spirituality and art through computer graphics based on algorithms that describe the relative position in space and the intersection of geometric shapes and surfaces.

The development of information and communication technologies, 3D technologies, virtual reality and the Internet has created the opportunity to form images and organize interaction with them at a new, previously inaccessible level, as a result, in the traditional areas of museum activities of national monuments using new ways of using these technologies has led to the emergence of a "virtual museum.» This, in turn, serves as the basis for the preservation of cultural and historical values.

Existing historical and archaeological virtual museums were analyzed, the basic requirements for a virtual museum were formulated, exhibit, text and graphic information about the virtual museum "Dorul Hikmat wa Maorif" was collected, the design, structure and composition of the virtual museum, as well as its website, were developed (Figure 4). The result was the creation, based on methods, models and algorithms of computer graphics and engineering geometry, of more than 25 exhibits, and a virtual museum was created, including images of more than 10 scientists, as well as more than 20 books and writings posted in virtual space.

CONCLUSION. As a result of the experiment, virtual models of the object and image were built, which are models in visualization (3D). From a scientific point of view, a comparative analysis of the adaptation of visual reflection, digitization of exhibits, virtualization methods, and photogrammetric methods was carried out to achieve consistency between 3D models. Identifying visual differences, such as the appearance of colors and images, schematization



Geomodel of the museum building ob tained from satellite images

3D design of the building and walls of the museum

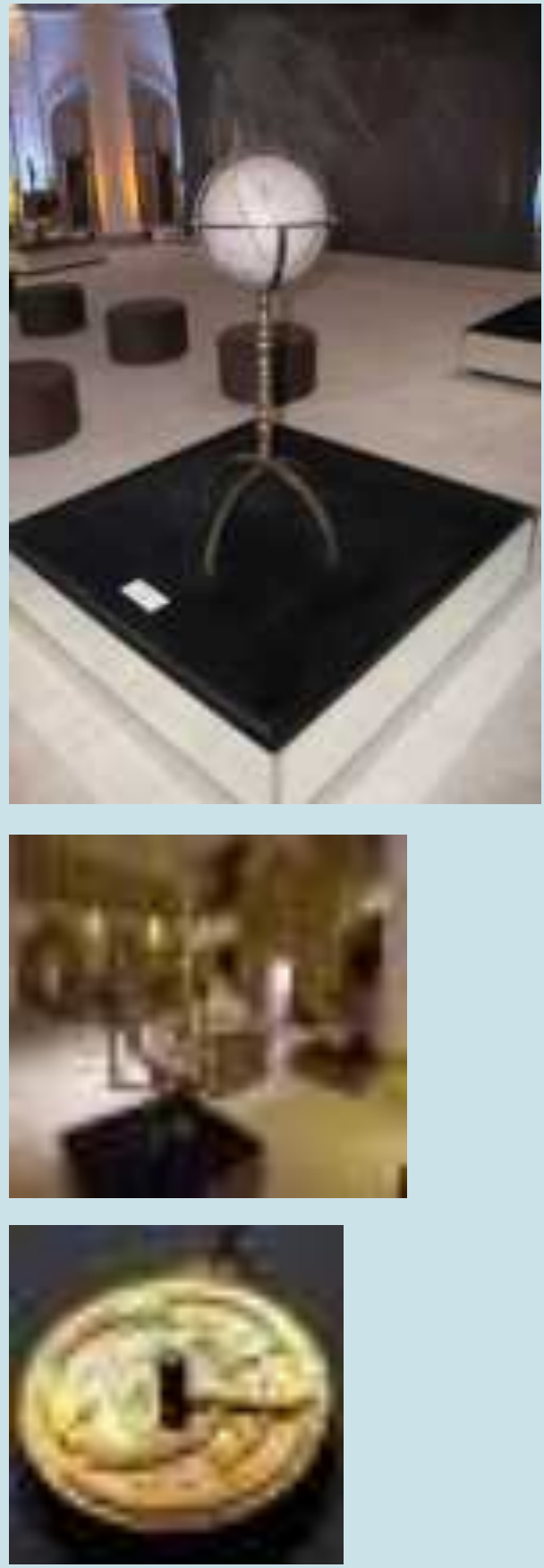
Process of virtual presentation of muse um exhibits

of images and models, forms further challenges for high-quality digitization of light holograms.

The significance of the virtual museum “Dorul Hikmat wa Maorif ”dedicated to antiquity, namely the presentation to the attention of the whole world of the exhibits contained on the site platform, benefits students studying the history of the region, anyone interested in this topic, and professionals conducting research in the virtual space.

To obtain a perfect example of a virtual model, video was recorded from different angles, photographic images were processed, it is planned to build and design a holographic model of ¾ objects.

To obtain 3D models of historically significant objects in graphics, the photogrammetry method can be used, but it requires significant improvements.



Fragments of a virtual view of museum exhibits

DEPARTMENT OF SOCIAL SCIENCES AND HUMANITIES

Bakhrom Abdukhalimov,
Vice-President of the Academy of Sciences

It would not be an exaggeration to say that recent years have become a period of change for the Department of Social Sciences and Humanities of the Academy of Sciences. The important results achieved by our scientists working in the social and humanitarian sphere are recognized not only in our country, but also by the scientific community of the world.

Philologists of our country make a significant contribution to the development of linguistics, literary studies, and folkloristics. Research has been carried out in the field of modern Uzbek language, linguistics, sociolinguistics, lexicography, history of language and dialectology. Our linguistic scientists have invested a lot of work in creating an updated Uzbek alphabet based on the Latin alphabet and the "Glossary of the Uzbek Language".

The "Glossary of the Uzbek Language" was published in five volumes in Cyrillic, and in six volumes in Latin. In 2020, philologists published the updated first volume of the "Glossary of the Works by Alisher Navoi", as well as the "Explanatory and Illustrative Dictionary of the Elements of International Terminology", "Office work in the state language."

Today, our archaeologists carry out such urgent tasks as the scientific and methodological substantiation of archaeological research carried out on the territory of the country, the widespread use of modern research methods of natural sciences in archaeological research, the organization of the relationship of complex archaeological expeditions with the practice of industry education with the widespread use of innovative technologies, training scientific basis for transforming archaeological sites into open-air museums.

In 2017, the earliest carved wooden panel in the history of Uzbekistan, dating back to the 7th-8th centuries, was recorded at the Kafirkala monument (Samarkand). At the Tashbulak monument, located on a mountain in the Zaamin district of the Jizzakh region, for the first time in Central Asia, the influence of a settlement located in a high mountain region on the ecology was studied, and the diet of the medieval nomadic and sedentary urban population was determined by isotope analysis of human bones. It has been established that in the 9th-12th centuries the territory of the capital, the city of Akhsiket, reached 400 hectares, that is, it was a kind of "metropolis" of its time. The wall that protected the Bukhara oasis, Kampirdevor, was studied. The first construction of the wall dates back to the 5th century, it was intended not only to protect the oasis from attacks by nomads, but also to protect the population from raids. During archaeological excavations in Kafirkala, a large number of bullae were recorded, unique historical sources relating to the early medieval history of Sogd.

The research project "Study of the archaeological landscapes of Uzbekistan and Iraq using modern approaches", developed by the National Center for Archeology together with the University of Munich (Germany) and the University of Bologna (Italy), won the Volkswagen Foundation competition and received funding in the amount of 1 million 200 thousand euros for 2022-2025. In 2022, according to the project plan, an international scientific expedition conducted research at the archaeological site of Kafirkala in Samarkand.

The Abu Rayhan Beruni Institute of Oriental Studies carries out fruitful work on scientifically based storage, enrichment and cataloging of written sources in the repository of Oriental manuscripts, scientifically annotated translation and publication of original sources on various topics in Oriental languages,

The process of restoration of the manuscript at the Institute of Oriental Studies

and the study of the history of science and culture of the peoples of the East.

In order to enrich the manuscript fund, the institute organized archaeographic expeditions to the regions of Uzbekistan. As of today, 826 manuscripts, 284 lithographs, and 250 historical documents have been acquired from the population.

Our scholars, based on the study of inscriptions on all architectural monuments located on the territory of Uzbekistan, took part in the creation of the 13-volume *"Architectural Epigraphy of Uzbekistan"*, published in Uzbek, Russian and English.

In order to popularize the handwritten heritage stored in the funds of the Institute of Oriental Studies, catalogs and albums entitled "Historical Works and Documents", "Literature", "Exact and Natural Sciences", "Islam, Philosophy and Sufism" and " Oriental miniatures" with a volume of 450 pages each, were published in Uzbek, Russian and English within the framework of the Cultural Heritage of Uzbekistan. As the latest news in this area, we can mention the creation by our oriental scholars of a web catalog containing descriptions of 13,000 handwritten works, the publication of a facsimile of the author's copy of the commentary "Mawahibi Aliya" (15th century) by Hussein Waiz Kashifi in Persian, and 8 volumes of selected works by Abu Rayhan Beruni. It included such works as "Relics of Ancient Peoples", "India", and

Miniature kept in the manuscript collection of the Institute of Oriental Studies.

Employees of the Alisher Navoi State Literary Museum

The process of restoration of the manuscript at the Institute of Oriental Studies

"Geodesy".

As part of research devoted to the history, culture and development of science of the era of Amir Temur and the Temurids, the works "Sultan Abu Said Mirza", "Melodies of the era of Amir Temur and the Temurids", "Socio-political views and spiritual courage of Amir Temur" were published.

Much work is being done in the field of art history. Trends have been identified and a holistic, comprehensive approach has been developed in determining the features and general patterns of development of culture and art of ancient and medieval historical and cultural formations on the territory of Uzbekistan. New data were also obtained on the material and non-material culture of the cities of Bactria-Tokharistan, Sogd, Khorezm, Shash and Fergana during the period of antiquity and the Middle Ages; on the basis of new research, the significance of ancient Termez as a major center of Buddhism in ancient Central Asia was determined. The processes of development of national fine and decorative arts are described and analyzed. Modern theater and cinema of Uzbekistan have been studied, the influence of socio-cultural processes of the period of independence on the features of the formation and essence of national film and theatrical art has been revealed.

Based on early medieval Chinese sources, "Information on the history of the peoples of Central Asia (translations and studies of ancient and early medieval Chinese sources)" was presented. The monographs entitled "Alexander the Great in Transoxiana: campaigns, historical geography, culture", "Signs on ceramics in Ancient Khorezm", "Pre-Islamic *tamgas* of Central Asia" (in Russian and English), and "Islamic art of Uzbekistan: philosophy and artistic peculiarities" dedicated to medieval culture, arts and architecture were published. art of Uzbekistan: philosophy and artistic features", "Melodies of the era of Amir Temur and Temurids", "Temurid Renaissance and Babur-name", "Bukhara: The city of Qubbat ul-Islam" and a number of others.

A map of the "State of Zahiriddin Muhammad Babur" was created. In accordance with the Law of the Republic of Uzbekistan "On Inventions, Utility Models and Industrial Designs" an invention patent was issued by the Ministry of Justice of the Republic of Uzbekistan No. SAP 02278 for the industrial design of the map "State of Zahiriddin Muhammad Babur".

In connection with the 75th anniversary of the victory in WWII, which became a symbol of courage, perseverance and humanism of our people, in 2020 for the first time we took part in the publication of the illustrated book "The contribution of the people of Uzbekistan to the victory over fascism". This work was continued, and now illustrated books, supplemented with new materials, are published annually on this topic.

4 books entitled "Chronicle of New Uzbekistan" were published, reflecting the large-scale reforms being carried out in New Uzbekistan, changes in the socio-economic, cultural and educational sphere.

By government decree in 2020, the Institute of State and Law was created within the Academy of Sciences. It is necessary to especially note the active work of the Institute in the processes of organizing advisory and expert assistance to legal reforms carried out in the field of social and state construction, judicial, legal and socio-economic spheres.

Based on a scientific and practical analysis of the legal foundations of administrative proceedings in Uzbekistan and the experience of countries around the world, 3 volumes of the book "Constitutional Re-

Team of the State Museum of Timurid History

forms: Experience the Country of the World" were published.

Scholars and scientists from the Research Institute of Social Sciences of the Karakalpak branch make a significant contribution to the development of the sphere. They published an illustrated book "Genre features and poetics of Karakalpak folk tales", an illustrated book "Between the Aral and Amu: the art of the Karakalpak people", dedicated to the culture and art of the Karakalpak people.

The role of the museums of the Academy of Sciences in the popularization of the rich material and spiritual heritage of Uzbekistan is invaluable. The Alisher Navoi State Museum of Literature carries out a lot of work on the scientific study and research of unique manuscripts and lithographs, the scientific description of the archive of poets and writers of Uzbekistan, research and demonstrations at exhibitions of samples of Uzbek oral poetry and written literature. More than 2000 oriental manuscripts stored in the manuscript collection have undergone primary processing. A 2-volume catalog with a scientific description of 800 manuscripts was published in Uzbek and English and introduced into scientific circulation. An archive has been created of more than 60,000 documents of writers and poets who lived and worked in

Working hours at the Institute of Oriental Studies

10 volumes of Beruni's works

the 19th-20th centuries. The team of the State Museum of History of the Timurids carries out a lot of work in the field of scientific and practical research devoted to the leading directions of development of history, culture and science of the era of Amir Temur and the Temurids, familiarizing the public of the country and foreign countries with the history of the era of Amir Temur and the Temurids, and conducts research work in our country and abroad to collect sources relating to the period of Temurid history. A museum mobile application (in Uzbek, Russian and English) and a QR code for 148 unique exhibits (in Uzbek, Russian and English) have been created. In 2020, "smart technologies" were introduced in the museum." The work "Development of the art of miniatures from the times of the Temurids and Baburids", the catalog "Masterpieces of the State Museum of Temurid History" were published in Uzbek, Russian, and English. In recent years, the State Museum of History of Uzbekistan has prepared scientific publications within the framework of the project "New directions and prospects for the development of museums in Uzbekistan in the 21st century." Also, on the initiative of the Head of our state, the Tashkent Museum was created as a branch of the State Museum of History of Uzbekistan.

A branch of the Department of Museum Affairs of the Kamaliddin Behzad National Institute of Painting and Design has been opened at the State Museum of History of Uzbekistan. Practical classes in such disci-

Employees of the State Museum of Timurid History inspect the exhibits

Alisher Navoi State Museum of Literature

plines as “Excursion management”, “Museum interior design”, “Fundamentals of museum work” are held in the museum exhibition and storage facilities.

In the area of social and human sciences, a number of new textbooks and teaching aids have been published for higher and secondary educational institutions, secondary schools, e.g. such textbooks as “Modern History of Uzbekistan”, “History of the Ancient East”, “Archival Studies”, “Source Studies”, “Methods of Historical Research” , textbook “Museum Studies”, “World History”, “History of Uzbekistan”.

Scientists from the Academy of Sciences are in constant cooperation with the “Uzbekistan Tarikhi (History of Uzbekistan)” TV channel, created with the aim of broad coverage of the ancient and rich history of Uzbekistan.

Over the past years, international scientific relations have actively developed, cooperation agreements and memorandums have been signed with a number of leading foreign universities and research centers. As part of the cooperation, international conferences, seminars and round tables were held, and joint publications were published.

In order to demonstrate to the world the cultural heritage of our country, scholars of the social and humanitarian department of the Academy of Sciences, together with the Foundation for the Development of Culture and Art, actively participated in organizing exhibitions of rare artifacts, museum exhibits and collections stored in museums and foundations of Uzbekistan, at the 1st International Biennale of Islamic Art in 2021 year in the French Louvre, the Venice International Biennale 2022 in Italy, the 1st International Biennale of Islamic Art 2023 in Jeddah, as well as the James Simon Gallery in Germany and the Neues Museum in Berlin.

KARAKALPAK BRANCH OF THE UZBEKISTAN ACADEMY OF SCIENCES

Chairman - **Ahmed Reymov,**
Nagmet Aimbetov, Academician

The history of the creation and development of the Karakalpak branch of the Uzbekistan Academy of Sciences goes back 65 years, it is the largest and leading scientific institution of the Republic of Karakalpakstan and the oldest regional scientific institution of the Uzbekistan Academy of Sciences. First, in 1959, on the basis of the Karakalpak Integrated Research Institute, the Karakalpak branch of the Uzbekistan Academy of Sciences was organized, which was the first academic scientific institution of the Republic of Karakalpakstan. The opening of a branch of the Uzbekistan Academy of Sciences in Nukus made it possible to coordinate fundamental scientific research conducted in the republic. The topics of scientific work covered almost the entire spectrum of sectors of the national economy of Karakalpakstan, as well as environmental issues in connection with the drying out of the Aral Sea and the desertification of its bottom. Academic publications on the history of Karakalpakstan, Karakalpak language and literature were published, and a 20-volume work "Karakalpak folklore" was published.

Library of the Social and Humanitarian Institute

In 1991, the Karakalpak branch of the Uzbekistan Academy of Sciences received the status of the Karakalpak regional branch of the Uzbekistan Academy of Sciences. Over the years of independence, the Karakalpak regional branch has risen to new levels of development. New institutes and divisions were organized within the Department: Institute of Language and Literature named after N. Davkarayev, Institute of History, Archeology and Ethnography, Institute of Socio-Economic Problems of the Aral Sea Region, Complex Institute of Natural Sciences, Institute of Bioecology, as well as the Botanical Garden, Ustyurt Desert Station, Muynak international biological station, Karakalpak branch of the scientific and methodological center "FANUM", fundamental library, editorial office of the journal "Vestnik" KO ANRUz.

According to the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 33 dated February 7, 2012 "On measures to further optimize the structure and improve the activities of scientific institutions of the Uzbekistan Academy of Sciences", the scientific divisions of the Karakalpak branch of the Uzbekistan Academy of Sciences were also reorganized, including the creation of 2 large research institutes:

- Karakalpak Research Institute of Natural Sciences of the KKB Uzbekistan Academy of Sciences on the basis of the Complex Institute of Natural Sciences, the Institute of Bioecology and the Institute of Socio-Economic Problems of the Aral Sea Region of the Uzbekistan Academy of Sciences;

- Karakalpak Research Institute of Humanities of the KKB of the Uzbekistan Academy of Sciences on the basis of the Institute of Language and Literature named after N. Davkaraev and the Institute of History, Archeology and Ethnography of the KKB of the Uzbekistan Academy of Sciences.

The chairmen of the Karakalpak branch of the Uzbekistan Academy of Sciences in various years were:

1959-1961 - Nurmukhamedov Marat Koptleovich (1930 - 1986), Doctor of Philology, Professor, Academician of the Uzbekistan Academy of Sciences, literary criticism.

1961-1996 - Kamalov Sabir Kamalovich (1924 - 2009), Doctor of Historical Sciences, Professor, Academician of the Uzbekistan Academy of Sciences, history.

1996-1997 - Abdirov Charzhau Abdirovich (1933 - 1997), Doctor of Biological Sciences, Professor, Ac-

Scientific personnel of the Karakalpakstan department

ademician of the Uzbekistan Academy of Sciences, microbiology.

1997-2004 - Yeshanov Tursunbay Boyzhanovich (1940 - 2004), Doctor of Medical Sciences, Professor, Academician of the Uzbekistan Academy of Sciences, ecology.

2004-2022 - Nagmet Kallievich Aimbetov (born 1955), Doctor of Economics, Professor, Academician of the Uzbekistan Academy of Sciences, economics, modeling.

From 2023 to the present – Acting Chairman Reimov Akhmet Mambetkarimovich, Doctor of Technical Sciences, Professor, chemical technologies of inorganic substances and mineral fertilizers.

Karakalpak Research Institute of Natural Sciences (KKNIIEN) KKB of the Uzbekistan Academy of Sciences unites all scientific laboratories and departments of the former three natural science institutes, with the aim of developing fundamental and applied research in the field of natural sciences, studying the environmental consequences of anthropogenic impact on the natural environment of the Aral Basin, modeling of environmental processes in the Southern Aral Sea region and socio-economic processes of the Republic of Karakalpakstan.

The main areas of CCNI research are:

In the field of physical and mathematical sciences - mathematical modeling and forecasting of socio-economic processes in the Aral Sea region, as well as the study of problems of electronics, semiconductor and organic compounds.

In the field of chemical sciences and earth sciences - improving the efficiency of the use of building materials through the optimal selection of the composition of microfillers and additives; Development of resource-saving technologies for the production of materials and mineral fertilizers on the basis of local mineral raw materials and waste products of productions; study of geological structure and oil and gas content of the territory of Karakalpakstan.

In the fields of biology, ecology and agricultural sciences - study of medicinal and technical plants of Karakalpakstan; study of problems of conservation of biological diversity and biosecurity in the conditions of desertification of the Southern Aral Sea; problems of environmental protection, Conservation and rational use of the natural resources of the Aral Sea region; study of the ecological foundations of sustainability of natural complexes, biodiversity, conservation of rare and endangered species of the genofund of the Aral Sea region, their protection and reproduction.

In 1959, under the Presidium of the Karakalpak branch of the Academy of Sciences of the UzSSR, the Botanical Garden was created as a laboratory, in 1991 it was given the status of an independent scientific institution, and then it was included in the Karakalpak Research Institute of Natural Sciences of the KKB of the Uzbekistan Academy of Sciences. The main objective of the Botanical Garden is to enrich the flora of Karakalpakstan with new species of woody, fruit and herbaceous plants from various geographical zones and regions of the world, select the most valuable and promising species from among introduced species for use in the national economy, study and preserve the gene pool of rare and endangered plant species and nature protection of the region, carrying out educational, pedagogical and scientific-educa-

Work process in the restoration laboratory of the Institute of Social Sciences and Humanities

Akchakhan Kala archaeological site

tional work in the field of botany and nature conservation in extreme soil and climatic conditions.

The Ustyurt desert and Muynak biological stations, operating as part of the Karakalpak regional branch of the Uzbekistan Academy of Sciences, are unique scientific objects and are of great scientific importance for the study of the ecosystems of the Ustyurt desert, the dried bottom of the Aral Sea and the Aral Sea regions.

The Ustyurt desert station was organized in 1964 by resolution of the Presidium of the Uzbekistan Academy of Sciences in the central part of the Ustyurt plateau, 18 km northeast of the Jaslyk railway station in the Kungrad region (350 km from the city of Nukus). The station is the only scientific institution located in the desert. Research and experimental work is being carried out on flora and fauna and soil. Unique, useful, rare and endangered plant species are introduced into cultivation to preserve their biodiversity.

The Station's herbarium preserves 1,052 species of higher plants collected from arid areas of Central Asia and Europe. Unique specimens of plant species that have now disappeared from the flora of Karakalpakstan are stored here. The seed fund contains seeds of 102 species of desert plants, of which 29 species are wild relatives of cultivated plants, which are important for obtaining new varieties of cultivated plants.

From the research processes of the Institute of Natural Sciences

The Muynak biological station was created in 1994 in the center of the Aral environmental disaster near the Aral collective farm on the dried bottom of the Aral Sea (198 km from the city of Nukus). The station's employees conduct scientific research on the patterns of formation of ecosystems of the dried

Exposition of archaeological exhibits of the Institute of Social Sciences and Humanities

bottom of the Aral Sea, which have no analogues in the world, carry out work on acclimatization and introduction of useful wild and cultivated plants for the further development of the dried bottom of the sea and improve the ecosystems of the Aral Sea region. A seed nursery of drought-salt-tolerant plants has been created for further phytomelioration work. Currently, work is underway to reconstruct the biological station, thanks to the sponsorship and support of the Xinjiang Institute of Ecology and Geography of the PRC Academy of Sciences and the Research Center for Ecology and Environment of Central Asia of the PRC Academy of Sciences.

Starting from September 2023, international cooperation with Slovak scientists began. A connection has been established with the Pavel Josef Safarik University in Kosice (Slovakia). The first joint field expeditions to Karakalpakstan in the field of paleontology have already been carried out. A corresponding scientific project is being prepared to expand work in this direction.

The Karakalpak Research Institute of Humanities (KKNIIGN) of the Karakalpak branch of the Uzbekistan Academy of Sciences unites the scientific departments of two former institutes - the Institute of Language and Literature named after N. Davkarayev and the Institute of History, Archeology and Ethnography, which have undergone structural changes in order to optimize their research structure.

The pride of the Karakalpak regional branch is the department of rare handwritten and early printed books. The manuscript fund contains oriental manuscripts, lithographs for the publication of a large collection of Karakalpak folklore, as well as expedition materials, microfilms, rare books, field notes of researchers and national heritage - dastans recorded from the lips of the Karakalpak people, folk tales, riddles, proverbs and sayings; previously unpublished materials on historical archeology, linguistics, literary criticism and natural sciences, dissertations, abstracts, encyclopedias. The manuscript collection also contains books in Arabic, Turkic, Farsi, Uzbek and Karakalpak languages, which contain classic works of oriental literature, treatises on grammar, mathematics, philosophy, medicine and other branches of science. In total, more than 7000 copies have been accumulated in the manuscript collection. A fund of oriental manuscripts and early printed books in Arabic, Persian and Old Turkic languages was also created, containing more than 700 copies of manuscripts and lithographic Arabographic publications, including 560 titles.

The largest fundamental project is the published 100-volume collection “Karakalpak folklore” (2007–2023), and volumes 101-106 of the collection have also been prepared for printing; textbook for university students “Introduction to Turkic Philology” (2008); “Problems of modern folklore” (2006); Collected works by Ajiniyaz (2015) and Berdakh (2017). More than 2000 manuscripts were analyzed and 2 volumes of “Karakalpak folk lyrical songs” were prepared; recordings of 552 Karakalpak folk melodies and 10 dastans stored in the funds of the Institute were restored and re-recorded on CDs.

From the research processes of the Institute of Natural Sciences

Important scientific achievements have been made in the fields of history, archeology and ethnography. Unique scientific objects include the “Collection of archaeological, anthropological and numismatic collections with the Aral Sea Archeology Museum”, on the basis of which fundamental and applied scientific research in the region is carried out. The exhibition presents a unique source base for research.

The most important practical developments of CCNIIEN KKO AN RUZ

Forecasts of geomorphology of the Aral Sea and coastal zone (till 2050), vegetation cover status of the Southern Aral Sea region (till 2050) have been received;

Databases of the Republic of Karakalpakstan on economic zones and the demographic status of the region have been developed;

Methods have been developed for assessing the socio-economic and environmental situation in the Aral Sea region;

The concept of ecological macro-modeling has been developed, which allows to quantify the influence of the Aral Sea, vegetation cover and salt aerosol from postaqual land on the soil and atmosphere on the basis of the accumulated empirical material.

With the help of the created macro-models it is possible to study not only perennial, but also seasonal, monthly and decadal dynamics of this impact.

Scientific foundations, methods and technologies for the production of a number of binder and build-

Hero of Uzbekistan, archaeologist Gairaddin Khojaniyazov

ing materials based on local raw materials, including silicate bricks, have been developed. Effective methods for producing 1,3-benzodioxol and its derivatives have been developed. The features and nature of influence of industrial aerosols on the vegetation state have been determined and a comprehensive analysis of irrigated agriculture and the agricultural sector of the economy of the Republic of Karakalpakstan has been conducted.

There is a pond base for experimental work on carp fish breeding and the organization of pasture fish farming on the natural waters of Karakalpakstan.

Sites have been identified for work to enhance the effect of revegetation during reforestation (saxaul, zhuzgun, astragal) on the former Aral Sea bottom. A comprehensive analysis of irrigated agriculture and the agricultural sector of the economy of the Republic of Karakalpakstan was conducted. The state and ecological conditions of the Amu Darya delta area have been determined.

Methods for harmonizing time series of ecological transformations and analytical expressions of links between ecosystem components and climatic changes have been developed with a view to quantifying trends in the development of the Southern Aral Sea biota and correlation with changes in the external environment milieu.

The vegetation cover of Ustyurt is studied, which consists of 5 species of trees, 34 shrubs, 5 shrubs, 13 semi-shrubs, 254 herbaceous plants. With deteriorating environmental conditions, xerophilic halophilic plants expand their range, replacing mesophilic plants. The vegetation consists mainly of biyurguna, wormwood, dreadful and black-saxon formations. There are 8 red book, 3 endemic, 12 subendemic, 15 relict, 76 medicinal, 8 ether and 29 species of wild relatives of cultural plants.

In the Karakalpak part of Ustyurt the composition of 31 species of mammals has been studied: 2 of them are insectivorous, 3 are bat-headed, 17 are rodents, 7 are predators, 2 are ungulates.

Prospects for the development of scientific research. Research will continue in the following scientific areas: - Studying the sustainability of aquatic ecosystems, decoding the mechanisms of transformation of organic and nutrient substances in the aquatic ecosystems of the Southern Aral Sea region.

- Theoretical bases of economic use of animal populations and conservation of their biodiversity in the Southern Aral Sea region.

- Study of methods of regeneration of saline soils by biomelination.

- Introduction of plants from different geograph-

ical zones and regions, study and conservation of rare and endangered species of flora of Karakalpakstan.

- Assessment of the potential of fish resources of the Amu Darya delta zone and development of biotechnologies to increase their fish productivity.

- Study of vegetation of salt flats in the Southern Aral Sea region.

- Microbial bioresources of the Southern Aral Sea region and their future use.

- Research of physico-chemical bases of hydration structures regulation of disperse binder systems and production of modern building materials.

- Development of highly efficient technologies for the production of chemical and construction materials based on local raw materials;

- Study of biologically active substances of low-molecular and high-molecular compounds of plant, animal and microbial origin for identification of their producers,

- Development of technologies for the production of food additives and medicines based on natural compounds.

The Museum of Archeology of the Aral Sea region operates at the KKNIIGN of the Karakalpak branch of the Uzbekistan Academy of Sciences. Its basis was formed by archaeological collections collected over a long period by archaeological expeditions of the Institute, and stored in its funds from the mounds of the ancient and medieval nomadic, pastoral population: Massagetians, Sarmatians, Pechenegs, Oguzes and Kipchaks.

The materials of many years of work carried out by scientists of the Institute together with archaeologists from the University of Sydney (Australia) and representing the culture and art of the ancient Khorezmian civilization and, in particular, wall paintings from the temple of the 2nd - 1st centuries BCE were also reflected at the ancient settlement of Kazakly-yatkan (Akshakhan kala). The materials of the "Kerder culture" are presented - one of the three archaeological early medieval cultures of the Aral region, associated with the ethnogenesis of the Karakalpak people.

Publications of the Karakalpak department

Employees of the KKNIIGN of the Karakalpak branch of the Uzbekistan Academy of Sciences published the photo album "Karakalpak Costume" (2013) and the monograph "Son of the Fatherland" (2018), the issue of "Archaeology of the Aral Sea region", the collective work "New History of Karakalpakstan - 1991 - 2015)".

Building of the Karakalpak branch of the Uzbekistan Academy of Sciences

KHOREZM MAMUN ACADEMY

Chairman, Prof. **Ikrom Abdullaev**

The Khorezm Mamun Academy of the Uzbekistan Academy of Sciences was founded in 1997 by Decree of the President of the Republic of Uzbekistan I.A. Karimov No. PF-1880, November 11, 1997 and is a regional branch of the Uzbekistan Academy of Sciences.

Main areas of research:

- ***History:*** study in continuous sequence of the ancient history of Khorezm, unique civilization and culture, research into the role of its rich scientific potential in the development of world science and culture;

- ***Archeology:*** conducting archaeological expeditions to study archaeological monuments located in Khorezm, systematic organization of ethnological research and source studies, as well as widespread promotion of the results obtained among the scientific community;

- ***Architecture:*** development and practical implementation of scientific principles for the protection of architectural monuments of Khorezm from biological, physical and various natural factors;

- ***Ecology and biology:*** carrying out constant scientific monitoring of the ecological state of the Khorezm oasis, effective use of land, water and biological resources, studying the issues of preventing salinization and desertification through acclimatization of crops suitable for the soil and climatic conditions of the Khorezm oasis, developing innovative techniques in the field of agriculture and fish farming based on the existing experimental base;

- ***Mathematics:*** conducting fundamental scientific research in the field of mathematics, taking into account the historical traditions of Khorezm;

- ***Technologies:*** creation and widespread introduction into production of scientific foundations for the processing of local mineral resources.

The most important results of fundamental research:

Studying in continuous sequence the ancient history of Khorezm, its unique civilization and culture, exploring the role of its rich scientific potential in the development of world science and culture.

Agahi's translation of the work "Ahloq-ul muhsiniin" into Turkic was prepared for printing and published.

The work by Abu Rayhan Beruni "Tafhim" was translated from Arabic into Uzbek and introduced into scientific circulation.

Mahmud Zamakhshari's "Muqaddimat ul-adab" was translated into Uzbek and published.

The work "Jaloliddin Manguberdi – buyuk vatanparvar sarkarda (Jalaliddin Manguberdi as a patriot and a warlord)" was written and published.

Conducting permanent archaeological expeditions to study archaeological monuments located in Khorezm, systematic organization of ethnological research and source studies.

Burial monuments on the territory of the Meshekli necropolis were studied and the remains of 12 similar objects were excavated, two of them are aboveground crypts belonging to early burials dating back to the Early Saka period (8th – 7th centuries BCE)

The burial structures of the Early Saka period in the mound groups of the Meshekli burial ground are represented by single mounds, next to which burials of the archaic and ancient times were later built. The other two studied structures represent a new type of construction, previously unknown in Khorezm. One of them contained human skeletal bones, previously cleared of muscle tissue. The burial things found there allow us to date them to the mid-5th century

Information and resource center of the Khorezm Mamun Academy

BCE. This burial rite can confidently be considered Zoroastrian. The obtained materials provide unique material, previously unknown to science, associated with the cult, ritual and burial practices of Zoroastrianism.

A Bronze Age burial place, Arafat, was found in the Tuprakkala area of the Khazarasp district. Research by an archaeological expedition led by Sergey Baratov was carried out on monuments dating back to the ancient and medieval periods of Tash-kala-2, as well as on the hill of Uch Ochaq and Meshekli. At the site of Tash-kala-2, a previously unknown unique temple complex of the 3rd century BCE – mid – 8th century CE was discovered and explored, where fragments of unique architectural decoration and sculpture of the 6th – 7th centuries CE were found.

A monograph "Khorezm in the history of statehood of Uzbekistan" was prepared and published (edited by Academician E.V. Rtveladze, Prof. D.A. Alimova), Tashkent, 2013, 336 pp.

Discovered remains of a *dakhma* (ossuary) from the 8th – 7th centuries BCE, a monumental structure associated with the performance of Zoroastrian funeral rituals, as well as a Zoroastrian temple and a cult fire temple of the 6th century BCE at the Khumbuztepa monument are the oldest and unique among similar structures discovered by archaeologists and known to archaeological science.

Studies of the *dakhma* and the Zoroastrian temple with the cult fire temple at the settlement of Khumbuztepe have shown that they are unique and the only structures of the 7th–4th centuries BCE on the territory of Khorezm and throughout the Mazdean ecumene, associated with the Zoroastrian religion, its funeral rites and rituals and confirm the opinion of Uzbek scientists that ancient Khorezm has every right to be called the cradle of Zoroastrianism.

Laboratory for analysis of grain crops and grain products

Conducting fundamental scientific research in the field of mathematics, taking into account the historical traditions of Khorezm

Functions with countable singularities on parallel sections, integration of the nonlinear modified Korteweg de Vries equation with a source in the case of finite density, meromorphic continuation of separate-meromorphic functions and integration of the nonlinear Schrödinger equation with a source were studied.

In order to study special sets of m-subharmonic functions, the concept of -capacity was introduced and its properties were investigated.

Building of the Khorezm Mamun Academy

Permanent exhibition «Culture and history of Khorezm»

Conducting constant scientific monitoring of the ecological state of the Khorezm oasis, effective use of land, water and biological resources, studying the issues of preventing salinization and desertification through acclimatization of crops in the soil and climatic conditions of the Khorezm oasis, developing innovative techniques in the field of agriculture and fish farming

Using an insectarium, the biological properties of *Myopardalis pardalina* (melon fly) were studied in the field. A schematic map of the melon fields of the Khiva, Khazarasp, Bagat and Yangiaryk districts has been compiled. Individuals of insects of different ages found in the melon agrocenosis were collected. The species affiliation of insects in the melon agrocenosis has been established. A monograph "On the bioecological characteristics of the melon fly and the grocenosis of melons in the Khorezm oasis" has been published.

Based on the results of the research, the best five varieties, most well adapted to the soil and climatic conditions of the Khorezm oasis, were selected from 20 new varieties of cotton. Cotton varieties Rakhmad, Khorezm-127, AN-514, AN-60, Beshkahramon and Fan-1 showed the best results in terms of morphological, physiological properties, as well as adaptability to low positive temperatures, water deficiency and resistance to soil salinity .

At the experimental base of the Khorezm Mamun Academy, two new cotton varieties "NIYAT" and "HURMA", well adapted to the soil and climatic conditions of the Khorezm oasis, were grown, their field tests were carried out and applications for patents were submitted (registration numbers NAP 20170013 and NAP 20160015). A patent for the "NIYAT" variety was received and cultivation of this variety began on farms in the Khorezm region.

Results of applied research and practical developments in recent years:

Studying the ancient history of Khorezm, its unique civilization and culture, exploring the role of its rich scientific potential in the development of world science and culture

The commentary written on the work by Abu Nasr ibn Iraq "Manalaus" was translated from Arabic into Uzbek and analyzed from a scientific point of view. The work by Abu Rayhan Beruni "Tafhim" was translated from Arabic into Uzbek and introduced into scientific circulation.

A catalog of archival documents of the Khiva khans has been created. The trade and diplomatic relations of the Khiva Khanate with neighboring states have been studied. Charters (labels) and written orders on donations (*farmon inoyatnoma*) of the Khiva khans dating back to 1694-1882 were studied. A catalog of 660 inventories of the F-125 collection was created.

A review has been written of the currently available literary sources about the life, scientific and medical activities of Abu Sahl Isa Ibn Yahya al-Masihi al-Jurjani. A list and bibliography of al-Masihi's scientific works have been compiled, the history of mentoring among scientists of the Khorezm Mamun Academy, its scientific and organizational signifi-

Meetings of the Khorezm Mamun Academy

cance have been studied. 1-36 chapters of the book by al-Masihi "Kutub al-mi`a-fi-sinaat at-tibbiyya" (A book consisting of 100 chapters on medical art) total 428 pages, were translated from Arabic into Uzbek, which were then studied in comparison with the corresponding chapters of "The Canon of Medical Science" by Ibn Sina and "Zahirai Khorezmshahi" by Ismail Jurjani.

The catalog "Rare manuscripts of the Khorezm Mamun Academy" was created, including complete information about the collection of unique manuscripts of the Academy, which tells about the rich past of the Khorezm school of calligraphy.

Development and implementation of scientific principles for the protection of architectural monuments of Khorezm from biological, physical and various negative factors

Comprehensive scientific and experimental studies were carried out to examine the technical condition of architectural monuments of Khorezm. To establish the causes of cracks in the stone structures of the above-ground part of the research objects, monitoring of architectural monuments was carried out and a classification was compiled according to the degree of their wear, and a "data bank" was created on the architectural monuments of Khorezm. The technical condition of 54 architectural monuments of Khiva was examined, and in 31 of them a wide distribution of termite populations was established.

Regime geophysical studies were carried out to expand the possibilities of determining humidity and deformation conditions at the monuments of the Ichan-Kala complex in Khiva.

Monitoring was carried out to analyze and review the technical condition of some historical heritage sites of Khorezm: the Ullikhovli complex in the Urgench district, the fortress walls of Dishan Kala, *pakhsa* (adobe) structures of the mid- 18th century, the Shahimardan complex, the monument "Khorezmshahlar madrasasi", "Tort Shovvoz Bobo" complex and "Bikajan Bika" madrasah.

A special thermal treatment of the walls of adobe architectural monuments was carried out by introducing "Modified Alumina" into the walls, and an increase in the strength of ancient walls by 30% was determined. At the same time, the improvement of seismic and natural research methods has led to a reduction in the acting inertial forces due to the location of low-resistance diagonal connections between the basement pillars of multi-story buildings, and

Laboratory for analysis of grain crops and grain products

Research of archaeological finds

methods have been developed to increase the seismic resistance of buildings, and the replacement of the curved frame connection with a "plug" connection has been proposed .

The extinction of the majority (almost 100%) of termites during laboratory infection with the fungus *Beauveriya tenella* was determined. Other fungi *(Alternaria alternate, Cladosporium brevi-compactum, Scopulariopsis brevicaulis, A.orysae, Aspergillus flavus*) are virulent to termites, their effectiveness was observed in the range of 4 to 60%. The fungus *Beauveriya tenella* causes disease in all termite castes except adults. Once this fungus enters the body, the termite dies within 4 days. Based on this development, a patent for the utility model "Anti-termite bait" was obtained. The comparative effectiveness of these anti-termite baits was studied by attaching them to the ceiling, between walls and on the ceiling using clay. As a result, the effectiveness of baits attached to the wall and ceiling using clay was established.

Conducting constant scientific monitoring of the ecological state of the Khorezm oasis, effective use of land, water and biological resources, studying the issues of preventing salinization and desertification through acclimatization of crops suitable for the soil and climatic conditions of the Khorezm oasis, developing innovative techniques in the field of agriculture and fish farming

New cotton varieties "Rakhmad" and "Darham " have been developed , the advantage of which is their competitiveness in a set of economic traits, especially in productivity and adaptation to the soil and climatic conditions of cultivation of these varieties in the Khorezm region.

The properties of a number of bacteria stored in the museum of the Institute of Microbiology of the Uzbekistan Academy of Sciences were studied. A new strain of microorganisms has been obtained that are capable of mobilizing phosphorus compounds in the conditions of saline soils in the Khorezm region.

The stability and productivity of medicinal plants in the saline soils of the oasis were determined, and a technology for growing introduced medicinal plants, hay *(Cassia acutifolia Del.)* and milk thistle (*Silybum marianum L.*), was developed. In particular, the phy-

tochemical composition of medicinal chamomile and milk thistle was studied using the methods of physicochemical analysis, a qualitative reaction was carried out on flavonoids in the extract of medicinal chamomile petals, the content of flavolignin and silybin in the vegetative organs of milk thistle was determined, it was established that in the conditions of the Khorezm region the content of flavolignin is 2.9 %.

Prospects for the development of scientific research:

Carrying out a comprehensive scientifically based analysis of strength characteristics, seismic resistance and negative impacts of environmental factors on adobe architectural monuments of Khorezm and Karakalpakstan. Creation of a “data bank” on adobe architectural monuments of Khorezm and Karakalpakstan that require conservation and restoration .

Conducting research to increase the amount of gluten in winter wheat grains. At the same time, given that the main diet of the local population is made from wheat flour, scientific research is being conducted to prevent ferrum deficiency anemia by increasing the iron content in wheat grain.

The flora of Khorezm has not been sufficiently studied, and scientific research in this direction will make it possible to assess the current state of the flora of the Khorezm oasis and preserve rare and endangered plant species.

The fund of unique ancient manuscripts of the Khorezm Mamun Academy includes 133 titles of manuscripts and lithographic sources. Their translation and research will allow a deeper study of the rich history of Khorezm, acquainting the general public with the works of scientists who worked in the territory of the Khorezm region of Uzbekistan.

Measure the fiber length of a new variety of cotton

Studying the problem of the feed supply, finding ways to reduce the cost of feed, taking into account the sharp increase in development in the field of cattle breeding, poultry farming and fish farming.

Team of the Khorezm Mamun Academy

THINKER IN THE EYES OF ARTISTS

Azizkhon IMAMOV,
Researcher Institute of Art History of the Uzbekistan Academy of Sciences

If you look at the history of the search in the painting of Uzbekistan to create the image of the polymath Abu Rayhan Beruni, you can see that this process includes original creative interpretations. The personality, multifaceted activities and discoveries of the scientist, who has become one of the luminaries of world science, have always been one of the interesting topics for the artist community. Below, an attempt was made to consider the practical development of creative experiments carried out in this direction.

The first attempts to reveal the historical image of the great thinker from Khorezm are made in the years after the World War II. The increased attention paid during this period to the heroes of the past, who fought for the freedom of the Motherland, made it possible to hold anniversaries dedicated to the glorious dates of great poets and scientists. In particular, the wide celebration of the 500th anniversary of the birth of Alisher Navoi throughout the country has become one of the important social factors that stimulated research in the historical genre. One of the first successful works created in the course of this process, "Portrait of Alisher Navoi" (1947) by V. Kaydalov, served as an iconographic basis for artists who painted the portraits of Eastern scientists.

In 1949, in connection with the anniversary of Beruni, the Uzbekistan Academy of Sciences announced a special competition. It should be noted that more than thirty artists, including those from other republics, took part in it. However, there were no sources that could give a real idea of the image of Beruni, such as valuable material presented by medieval miniatures depicting Navoi. Therefore, in the process of recreating the image of a great scientist, most authors relied on the general stereotypes characteristic of Muslim scientists.

From among the works submitted to the competition, "Portrait of Abu Rayhan Beruni" (1949) by the young artist Malik Nabiev was chosen as the work that most fully conveys his image. The members of the commission noted the need for further development of the ethnic type found for the portrait and suggested that the artist study the bust of Beruni by the sculptor E.Martinenko. In 1950, M. Nabiev presented a revised sample of a historical portrait. It depicts Beruni in an oriental-style room working on a manuscript; whereby the artist tried to reveal the image of a spiritual scientist, absorbed in science. Unfortunately, the author had to confine himself to a generalized image of a scientist, which was considered acceptable for the Soviet ideology.

For this reason, M. Nabiev continued his search in this direction. In 1973, for the competition dedicated to the 1000th anniversary of the birth of Beruni, the artist submitted one of his most famous historical portraits. By this time, having managed to accumulate extensive experience in the historical genre, the artist set himself the task of creating a realistic image of Beruni with his inherent individual qualities. Having preserved the composition characteristic of the portrait created in 1950, M. Nabiev achieves greater realism in the image of the scientist, improvement of the historical interior, and revitalization of the overall color of the work. He interpreted the image of a scientist as a person devoted to science in body and soul, possessing a

Malik Nabiyev. Portrait of Abu Rayhan Beruni. 1972

Chingiz Akhmarov. Beruni and Ibn Sina. 1981

powerful spiritual force. The ethnic features of the image, oriental impressiveness allow us to note that the portrait depicts one of the great ancestors of the Uzbek people.

This work, which eventually became the winner of the competition, was accepted as one of the classic portraits of the great thinker and placed on the cover of the UNESCO Courier magazine, published in 1974 specifically for the anniversary of Beruni. In addition, M. Nabiyev also made several successful interpretations of this portrait, intended for the museums of the country.

In the second half of the twentieth century, a number of other artists also began painting the image of Beruni. For example, "Portrait of Beruni" (1960) by Ural Tansykbaev can be characterized as a work created within the framework of traditional ideas associated with Eastern scholars. The portrait, created according to a classical composition, depicts the scholar against the backdrop of an open-air city. However, in the work there is a lack of an inextricable connection between the historical interior and the spiritual world of the hero. Among the works with an interesting interpretation of the theme, "Beruni" (1968) by Tura Kuryazov should be noted. In it, the artist, deviating from the general figurative form characteristic of Muslim scholars, embodied Beruni as a prominent representative of the cultural environment of Khorezm. He is depicted in his hujra, wearing a black Khorezm headdress and a blue checkmen, and the polymath's facial features bear clear signs of ethnicity. In M. Pashkovskaya's painting "Ibn Sina, Beruni and Masihi" (1969), based on a symbolic approach, it is noted that a historical motif associated with Beruni's contemporaries began to develop in national painting.

By the 1970s, as a result of increased attention to Beruni's personality, a need arose for a deeper understanding in art of the historical period in which the scholar lived. In particular, in Ruzi Choriev's work "Beruni" (1973) we see a dramatic image of a thinker living in a complex time rich in contradictions. Beruni in white clothes is depicted in a manner characteristic of Ruzi Choriev - at full height, holding a book in his hand. He appears to the viewer as a thinker spreading knowledge in the darkness of the night, and is presented as a hero at the epicenter of the eternal struggle between ignorance and enlightenment.

Among the artists who paid great attention to the scientists of the East, Chingiz Akhmarov should be especially noted. The artistic culture of the Medieval East, which served as an inexhaustible source of inspiration for the artist, was clearly reflected in numerous historical portraits and paintings of a monumental nature. One of them, the work "Ibn Sina and Beruni" (1981), is distinguished by its exquisite oriental poetics. The painting depicts a conversation between two outstanding scholars who worked at the Mamun Academy in Khorezm. The light, cold coloring and ornamented blue lines chosen for the work further enhance the feeling of deep contemplation and spiritual perfection in the images of the heroes. At the same time, we see that the artist sought to enrich the iconography of Beruni. The great Khorezmian scholar is depicted in the painting showing Ibn Sina drawings confirming the relationship between the Moon and the Earth. It can be assumed that Chingiz Akhmarov also worked on an individual portrait of Beruni during this period. The sketch made for the "Portrait of Beruni" (1972-1973), which is now kept in the local history

T. Kuryazov. Beruni. 1968

museum of the city of Troitsk, Chelyabinsk region of Russia, shows that the artist painted the great Khorezm scholar much earlier.

In the 1970s and 1980s, thematic paintings were also created telling about the activities of the great polymath - works by R. Rizamukhamedov ("Ibn Sina and Beruni on the eve of a solar eclipse," 1979-1980), R. Limakov (" Beruni supervises the construction of the Academy", 1989). At the same time, a new trend is emerging in painting, aimed at further revealing the role of Central Asian scholars in world science. In the composition by J. Umarbekov "Human Ingenuity" (1980) and the wall painting by B. Jalolov "Feast of Human Thought" (1988) Beruni is depicted next to world-famous scholars of the East and West. In both works, the image of Beruni as one of the many characters in the picture interprets the figure of the thinker on a universal human scale.

The artistic processes analyzed above show that studies of the image of Beruni in national painting developed under the influence of socio-cultural factors. Since the second half of the twentieth century, as a result of creative experiments carried out in this direction, artists of different generations have developed their own forms of interpretation. Along with historical and realistic approaches, symbolic and poetic as well as philosophical solutions also prevailed among them.

Of course, research in this regard did not lose its importance even in the years of national independence. The desire to realize national identity through the restoration of historical memory in society prompted us to pay attention, first of all, to the images of the great figures of the nation. However, we cannot claim that in recent years large-scale experiments have been carried out in the field of contemporary art that reveal the image of Beruni. In most paintings depicting a polymath, old approaches and patterns continue to be traced.

The current situation confirms the relevance of rethinking in modern Uzbek painting on the basis of new historical sources and styles of artistic expression of the image of Abu Rayhan Beruni, one of the brightest representatives of the Eastern Renaissance.

Ch. Akhmarov. Portrait of Beruni. sketch. 1972-1973.

R. Rizamukhamedov. Ibn Sina and Beruniy on the eve of the solar eclipse. 1979-1980

COUNCIL OF YOUNG SCIENTISTS

Prof. **Said Gulyamov,** Chairman Council of Young Sciensts

From the activities of the Council of Young Scientists

The Council of Young Scientists (CYS) of the Uzbekistan Academy of Sciences of the Republic of is a permanent collegial advisory body at the Academy, whose activities are aimed at promoting the effective implementation of the creative potential of young scientists, doctoral students and specialists, searching for new ways to solve organizational scientific and technical problems, and also expressing the interests of scientific youth in the professional sphere and solving the most important social problems.

The CYS includes representatives of various institutions of the Academy of Sciences engaged in fundamental and applied research in the field of natural, technical and human sciences. The structure of the CYS includes the Chairman (S.S. Gulyamov), deputy chairman, sector chairmen, secretary and members of the Council.

The main objectives of the Council are to support and develop the scientific activities of the younger generation, coordinate the activities of young scientists, exchange experience, attract new talents and promote the scientific achievements of young people at the international level. A specific tool for implementing these tasks is the science journal "**Bulletin of Young Scientists**", where young, promising scientists of our republic and foreign colleagues publish their articles, reviews and news. The journal serves as a scientific platform for young scientists to test their developments and exchange experiences.

Also, the scope of activities of CYS includes the following.

First. Promoting the professional growth of young scientists of the Uzbekistan Academy of Sciences, combining their efforts to develop current scientific problems and solve priority scientific problems, developing the innovative activities of young scientists. As an example, we can cite the holding of traditional spring and autumn scientific and scientific-technical conferences on the topics: "**The 21st century is the century of scientific youth**" and "**The role of youth in the development of science and education of the New Uzbekistan**", within the framework of which various competitions are held (the best article, the best presentation, the best report, etc.) which stimulate applicants' work.

Second. Promoting the training of scientific personnel, the development of academic science, and ensuring the continuity of scientific schools. As a means of solving these issues, we regularly conduct round tables and webinars with full members of the Uzbekistan Academy of Sciences as well as scientists and scholars of the older generation.

Third. Uniting and representing the interests of young scientists to improve the conditions for scientific thought in Uzbekistan. In this direction, several projects have been developed for cooperation with the Councils of Young Scientists of the CIS countries and far abroad. One example is the "Week of Innovative Insights of Young Scientists: Shaping the Future of Science and Technology," dedicated to the 80th anniversary of the national Academy of Sciences, which will be held from October 30 to November 3, 2023 in a number of cities of Uzbekistan.

Fourth. Contributing to improving the living standards of young scientists and specialists in Uzbekistan. Thanks to the policy of the President of Uzbekistan Shavkat Mirziyoyev, the situation in the scientific sphere of the country has improved significantly. Decree of the President of the Republic of Uzbekistan, dated 01/04/2021 No. PP-5047 "On measures to further improve state policy in the field of science and public administration in the

From the activities of the Council of Young Scientists

field of innovative development", Decree of the President of the Republic of Uzbekistan, dated 28/01/2022 No. UP-60 "On the development strategy of the New Uzbekistan for 2022 - 2026", Resolution of the Cabinet of Ministers of the Republic of Uzbekistan, dated 19/04/2021 No. 222 "On measures to support talented youth engaged in scientific and innovative activities", working conditions and salaries of young scientists have become more attractive, which contributes to the influx of talented young people into science. Thanks to the above documents, over the past 4 years, more than 30 young scientists of the Academy of Sciences have received new apartments for free and on credit for their services to the state. To popularize science among young people, various events are held, such as science festivals, olympiads, competitions, exhibitions, popular science lectures and round tables, as well as open days in scientific institutions.

The level of scientific training of scientists in the country is quite high, and there is potential for further development. Therefore, in the field of science, it is necessary to ensure participation in international programs and internships, as well as access to modern resources and technologies to improve the quality of scientific research.

The Council of Young Scientists of the Uzbekistan Academy of Sciences actively participates in the development and implementation of advanced training programs, organization of scientific events, creation of mentoring programs and support of youth scientific clubs.

I would like to note that an interdisciplinary approach plays a significant role in scientific research. We try to encourage projects that bring together representatives of different scientific fields to solve complex and pressing problems, which will increase the efficiency and innovative potential of our science.

In recent years, CYS has supported many projects related to innovation and the development of new materials, young scientists have taken part in international scientific conferences.

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There are also a number of public and private programs and projects aimed at supporting young scientists, including grants, scholarships, scientific work competitions, scientific internships and exchanges.

The leadership of the Academy of Sciences actively involves young people in scientific research, provides the necessary resources and assistance in obtaining grants.

CYS's plans for the near future include the development of new and existing scientific areas, active cooperation with international scientific organizations, expansion of programs to support young scientists and popularization of science among young people.

We try to involve older generation of scientists in joint projects with young researchers, organize scientific events where young scientists can learn from experienced colleagues, and support their participation in the development of curricula and courses for doctoral students.

Mentors play a huge role in shaping the scientific elite of the younger generation. They share their knowledge, experience and skills, inspire young scientists to achieve scientific success and develop the scientific potential of Uzbekistan. The scientific community of Uzbekistan faces a number of problems, such as insufficient funding, the complexity of the grant system, lagging scientific infrastructure, limited access to modern technologies and international publications, as well as the need to improve the system of scientific training and retraining.

The Council of Young Scientists cooperates with various government organizations and government representatives through regular consultations, providing recommendations for improving science policy, participating in the development of legislation and strategies for the development of science and education.

Thanks to productive interaction, funding for the Council and research in general comes from a variety of sources, including government budgets, grants, private investment, international programs and funds, as well as funds from enterprises and commercial organizations.

Productive work is being carried out in this direction, promoting the development of scientific activity in Uzbekistan, supporting talented youth and promoting their achievements.

There are also a number of public and private programs and projects aimed at supporting young scientists, including grants, scholarships, scientific work competitions, scientific internships and exchanges. The leadership of the Academy of Sciences actively involves young people in scientific research, provides the necessary resources and assistance in obtaining grants. In turn, we want to thank for desire to develop science, education and support young talents in the country.

From the activities of the Council of Young Scientists

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.

Uzbek language editor – **M.S. Abdullayev, PhD**
English language editor **– K.Kh. Abdullayeva**
Translator from Russian to **Uzbek – S.Sh. Aliyeva, DSc**
Translator from Uzbek to English – **K.Kh. Abdullayeva**
Page designer – **N.M. Vyatkina**
Managers: **Z.S. Mukhsinova, Kh. Kholmuradov**
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 "PRINT MAKON" LLC printing house.

Address of the printing house: Tashkent,
Uchtepa district, 23-47-45
Permission granted to print: 25.12.2023

"Fan va turmush" Issue No. 3 (598), 2023
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

Contract price

Index: 1407