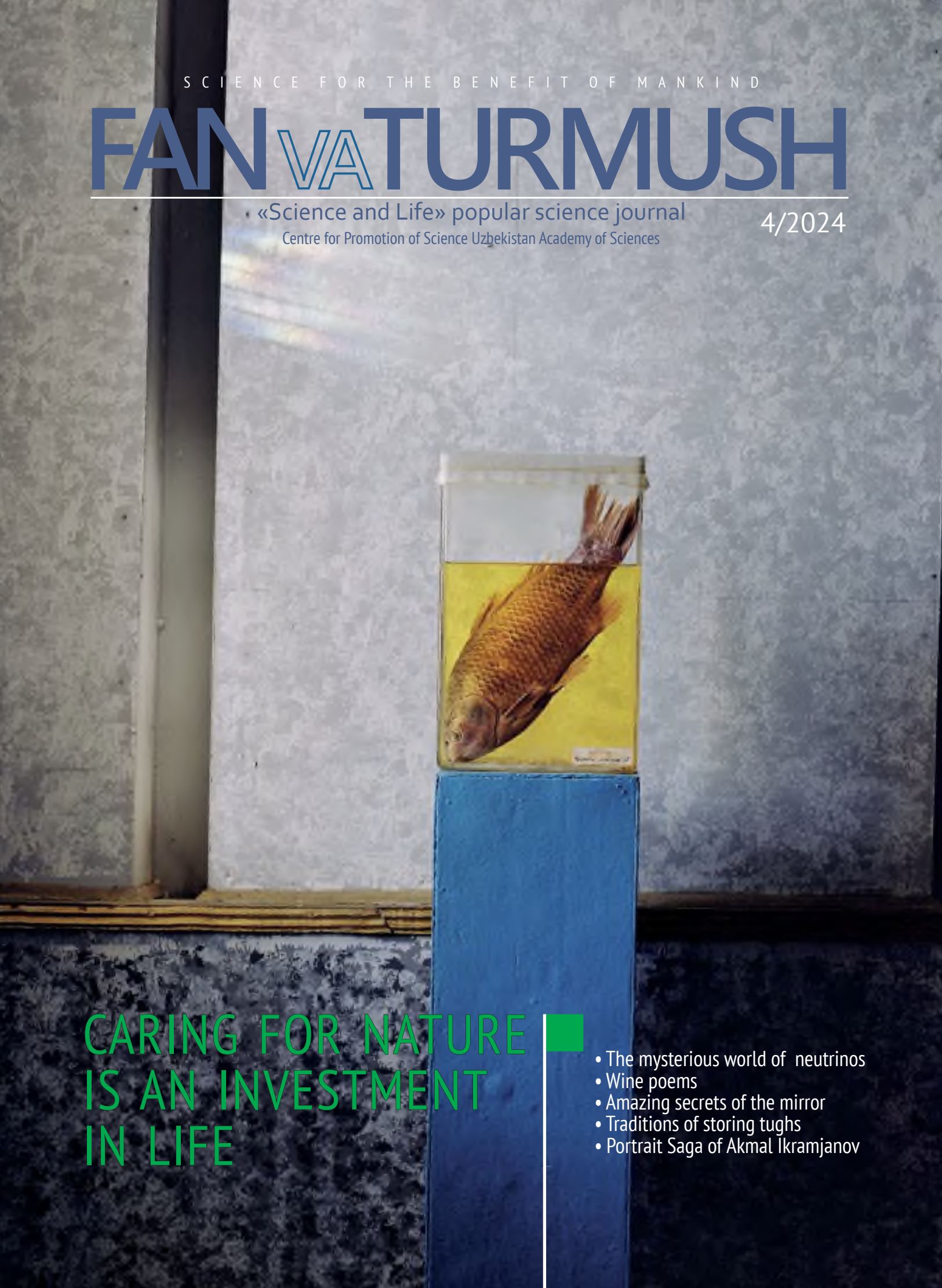
SCIENCE FOR THE BENEFIT OF MANKIND

FAN VA TURMUSH

«Science and Life» popular science journal
Centre for Promotion of Science Uzbekistan Academy of Sciences
4/2024



CARING FOR NATURE IS AN INVESTMENT IN LIFE

- The mysterious world of neutrinos
- Wine poems
- Amazing secrets of the mirror
- Traditions of storing tughs
- Portrait Saga of Akmal Ikramjanov

Akmal Ikramjonov. Glory to Piero Della Francesca! The Portrait of Academician A. Khakimov. 2012

EDITORIAL

Dear readers!

We wish you enjoy reading the next issue of our journal, "Fan va turmush". The current issue completes 2024. Thus, after over 2 years of work in the new format, 8 journal issues have been released. It should be noted that each issue is published in 3 languages: Uzbek, English and Russian, that is, the total number of 8 journal issues is 24 separate publications. Each of them requires additional efforts of a translator, designer, and editor and is a labor-intensive and independent work.

An important aspect of the journal's activities is the invitation to the cooperation of scientists and scholars in various fields of science. For the most part, these are representatives of science in Uzbekistan, working both in the system of the Academy of Sciences and in universities or other scientific divisions of the country. Often, articles by foreign scientists and specialists are published in our journal.

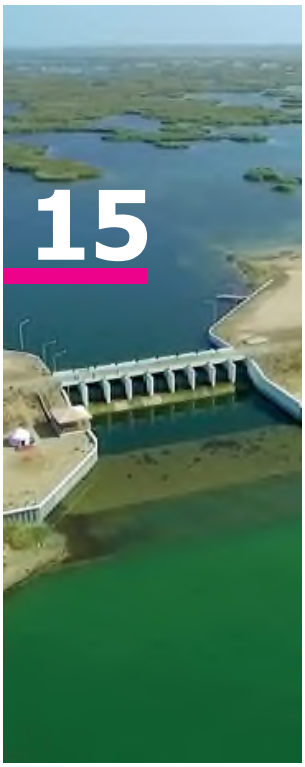
Over the past two years, a mechanism for selecting articles and their publication in the journal has been established. The journal staff carefully selects articles for publication; this is done by employees responsible for various areas of scientific disciplines. Our journal includes articles devoted to topical issues of academic science in Uzbekistan and also introduces the reader to the most important achievements of world science. The number of articles on the problems of domestic science prevails; we need to acquaint the reader with the achievements of our scientists in various fields of science. One of the main criteria for choosing topics and articles is the relevance, scientific significance and novelty of the provisions of the articles. At the same time, it is very important, while preserving the essence of scientific findings and analytical ideas, to convey them in a language accessible to the general reader.

In 2024, there was a change in the leadership of the Uzbekistan Academy of Sciences; at the end of the year, Academician, Hero of Uzbekistan Shavkat Abdullaevich Ayupov was elected President of the Academy of Sciences. In this issue, we publish an interview with him, which touches upon topical issues of the strategy and tactics of the development of academic science at the present stage and its role in the implementation of the tasks put forward by the country's leadership to the scientists of the country. The journal retains its previous structure: 4 main headings and several additional sections, in particular, "Tribune of the Young", "Memories", etc. This allows us to expand the genre boundaries of publications. In this issue, in the "Numbers Rule the World" section, we publish articles devoted to the problems of superconductivity and mysterious neutrino particles. Both topics will be of interest to readers since they analyze current aspects of physics based on the latest scientific data.

Despite the large number of publications on the Aral Sea problem, this topic continues to excite the general public and scientists since it has a global impact on the environment of all of Central Asia and even beyond. The article by Karakalpak scientists B. Tleumuratova and E. Urazymbetova provides important and positive data on reducing dust emissions from desert areas. Technology enthusiasts will enjoy the collective article by scientists on the history of diesel locomotives. We hope that the articles in the "Society, History, Culture" section, containing new data on various aspects of the history and culture of Uzbekistan, will be of particular interest to readers. In this regard, it is worth mentioning the articles devoted to the history of the burial of the Bukhara emirs and the secrets of the *tugh*—a pole with a horse's tail, installed over the graves of individuals of special social or religious status. The topic of the article and the analytical conclusions contained in it by the author B. Babajanov, dedicated to the so-called "wine verses" on ceramics of the 12th century, are unique. Important aspects of the development of modern theatrical and fine arts in Uzbekistan are covered in the articles by the authors A. Ismailov on socio-psychological dramas and A. Khakimov on a new series of portraits of figures of science and culture, created by the People's Artist of Uzbekistan, Academician of the Academy of Arts of Uzbekistan Akmal Ikramjanov.

P.S. Not to advertise the editor-in-chief of the journal, but to give the reader a more complete idea of the creative style of the artist A. Ikramjanov, the second page of the magazine presents a reproduction of the ironic portrait of the Academician A. Khakimov painted by him back in 2012 in the style of the famous Italian artist Piero della Francesca. The painting is called "The Glory of Piero della Francesca. Irony. Portrait of Academician A. Khakimov.»

CONTENT



I. NUMBERS RULE THE WORLD

II. THE NATURE AND MAN

III. THE WORLD OF ENGINEERING AND INFORMATION TECHNOLOGY

IV. SOCIETY, HISTORY, CULTURE

HEADINGS:

Academy of Sciences of Uzbekistan: New Horizons

Interview of the president of the Uzbekistan Academy of Sciences, Hero of Uzbekistan, Academician Shavkat Ayupov to the Editor -in - chief of the journal "Fan va turmush", director of the Center for the Promotion of Science, Academician Akbar Khakimov

A. Khakimov: Dear Shavkat Abdullaevich, on behalf of the Center for the Promotion of Science and the journal "Fan va turmush", I congratulate you on your election to the post of President of the Uzbekistan Academy of Sciences. How did you perceive the decision of the general meeting of the Academy of Sciences to elect you as president of the Academy of Sciences?

Sh. Ayupov: I have been working in the system of the Academy of Sciences for many years, I am the head of the V. I. Romanovsky Institute of Mathematics, I am well acquainted with the successes and problems of science in Uzbekistan. And therefore, both close colleagues who work with me and some employees of the Presidium of the Academy of Sciences have repeatedly expressed to me the wishes that my candidacy be considered for the post of the president of the Academy of Sciences. Apparently, the fact that in recent years the country's leadership and, especially, our President Shavkat Miromonovich Mirziyoyev, have paid great attention to mathematics also had an effect. Therefore, what happened, I perceived not as something very unexpected, but as a great trust of my fellow academicians.

A. Khakimov: It was unanimous decision, because not only mathematicians, physicists, the natural sciences block, but also representatives of the humanities also unequivocally supported your candidacy. You are a mathematician - the 12th president of the Academy of Sciences, all previous presidents were also representatives of either the exact or natural sciences. However, the Academy of Sciences includes a large block of social and humanitarian sciences. What is your attitude to the development of such disciplines as history, archeology, philology, philosophy, political science, art history, oriental studies, etc.?

Sh. Ayupov: Firstly, indeed, in the entire history of our Academy of Sciences there have been 12 presidents. Of them, 5 are mathematicians, the rest were also representatives of the exact and natural sciences, and I do not think that at some point the humanities felt deprived of anything. For example, even when I meet with schoolchildren, I tell them that all the subjects that you are taught at school are necessary. Even if you want to become a mathematician, this does not mean that you should only study mathematics. You also need physics, chemistry, history, art, and knowledge of foreign languages. Therefore, a person must be comprehensively developed in order to understand his or her separately chosen scientific discipline. Therefore, I believe that all sciences, especially history, literature, and art, everything should be harmoniously developed in society and I will do everything for the development of social and humanitarian disciplines in the system of the Academy of Sciences.

A. Khakimov: What do you consider to be a priority for yourself now, as the president of the Academy of Sciences? How do you imagine its development strategy for the future?

Sh. Ayupov: In general, I believe that the Academy of Sciences is responsible for all science in the country. Not only for academic science. Because university science should also be well represented. And, in fact, until now I was also not only interested in the state of science in the Academy, but as a member of the Presidium of the Higher Attestation Commission, I was interested in the purity of science in all fields. And I have repeatedly said, even in my speeches in the press, that we now have a danger that hack work and deliberate plagiarism are appearing. And the only place where this does not exist yet is the Academy of Sciences. Because I even imagined the facts that there are unscrupulous scientists who work only to defend a dissertation by hook or by crook. Therefore, firstly, in the development strategy of the Academy of Sciences, one of the priority areas of activity for all scientific fields will be the task of increasing the level of scientific fundamental and applied research, as well as improving the quality of dissertations. Secondly, the activities of the Academy of Sciences should be aimed at closer and more effective assistance in solving the country's economic problems. Thirdly, as the President of the country noted, it is necessary to pay special attention to the activities of our scientific youth and stimulate their creative resources.

A. Khakimov: At the general meeting of the Academy of Sciences in December 2024, along with positive assessments, critical comments were also made about the activities of the Academy of Sciences in past years. What areas of the Academy of Sciences' activities need to be strengthened?

Sh. Ayupov: Regarding critical remarks. It must be said that the activities of each organization have their advantages and, of course, disadvantages. You just need to help if you see that there are shortcomings somewhere. That is, criticism is necessary, but the criticism must be constructive. I believe, first of all, that society should know that there is an Academy of Sciences and what it does. And it is no secret that in recent years, namely since 2017, it began to recover precisely with the support of the President of the country. But 8 years have already passed, and the Academy must show itself. To do this, we need, firstly, to strengthen the promotion of the achievements of our scientists. We need, as they say, PR. Because representatives of many industries and departments constantly appear on television, on the radio, in the press. And academicians, our scientists, especial-

The president of the Academy of Sciences of the Republic of Uzbekistan, Hero of Uzbekistan Shavkat Abdullayevich Ayupov and the Director of the Center for the Promotion of Science of the Uzbekistan Academy of Sciences, Editor-in-Chief of the journal "Fan va Turmush", Academician Akbar Abdullayevich Hakimov

ly representatives of the exact and natural sciences, fruitfully working in the Academy system, are not public, little is known about them. It is necessary for society to know what they do and what contribution they make to the development of society and the national economy. Many of our scientific developments are successfully implemented in practice, provide an economic effect in the sphere of industry, agriculture, medicine, etc. But few people know about this. We know that physicists, chemists, and biologists have serious scientific discoveries that are successfully implemented. We need to talk about this, pay more attention to the implementation of scientific developments in the economy. Moreover, 2025 is designated as the year of environmental conservation and the «green economy» and the Academy should be at the forefront here, and not follow production.

A. Khakimov: In your speeches both at the general meeting and on television, you emphasized working with young people. What would you say about supporting young scientists?

Sh. Ayupov: I believe that science without youth has no prospects for development, so a constant influx of youth into science is necessary. The role of young scientists is especially important in the exact sciences, since the most original ideas come to the minds of the young. It is not for nothing that, for example, in mathematics the highest award - the Fields Medal is awarded to mathematicians under 40 years of age. Because it is the youth who are capable of original thoughts, original ideas. It is no secret now that the average age of academics is quite high. Most academics are over 80 years old. And an influx is needed. And for this, we must have good connections with higher educational institutions. In addition, there is a special layer that is not involved - this is our youth, who on their own efforts entered prestigious universities abroad - in America, Europe, Russia, China and so on. They entered on their own efforts on grants, or their parents support them. So, it was the President of the country who set the task for the Academy to somehow establish contacts with our talented guys who are studying abroad in order to, firstly, support them if necessary, and secondly, to then use their potential for their homeland.

A. Khakimov: What are your wishes for the scientific community, scientists and staff of the Academy of Sciences for the New Year 2025?

Sh. Ayupov: In the New Year's greetings of the President of the country Shavkat Miromonovich Mirziyoyev, a very optimistic thought was voiced that in 2025 science, culture, and art will receive even greater support and attention. I am sure that this will be so, and I wish all our scientists, academicians, and research staff new achievements, success, and prosperity in the New Year.

Current problems of superconductivity: world and domestic experience

Dilbar Gulamova,
Doctor of Chemical Sciences

All phenomena that begin with the prefix «super» arouse great interest in society, as they promise something extraordinary, beyond the limits of ordinary phenomena. In physics, all effects: superplasticity, superfluidity, superconductivity also attract great attention of scientists and the public, as they are evidence of certain unusual properties of matter and, in addition to purely scientific interest in the phenomenon, analysis and forecasts of the use of new effects for the progress of the world community are carried out. Superconducting materials are no exception, as they promise incredible results of application in almost all areas of science and technology. Since the discovery of the phenomenon of superconductivity, there are practically no areas left where superconducting materials have not been used, or their use has not been predicted. The phenomenon of superconductivity attracts the attention of scientific and engineering thought in power engineering due to the absence of losses during transmission of energy and signals along high-voltage and low-voltage lines.

The nature and mechanism of superconductivity in materials is that when the temperature is lowered to zero degrees Kelvin, the thermal vibrations of the atoms that make up the structure of solid materials, such as copper, aluminum, iron, and others, first decrease and then cease. As a result, the resistance of these materials in relation to the movement of valence electrons of the atoms that make up the structure of these materials decreases to almost zero or a minimum value. That is, an almost unhindered possibility appears in the transmission of electrical signals and electric current through wires, or the phenomenon of superconductivity is realized. But for their implementation, low temperatures were needed, and the use of the phenomenon of resistance losses by conventional materials in practice was complicated by the manifestation of this property only at low temperatures.

However, in recent years, significant discoveries of superconductivity have appeared in non-traditional, multicomponent materials, including magnesium diboride, iron compounds, pinktides, fullerenes, and warm superconductivity of cuprates, etc. has also been observed. Today, superconductors are most widely used in magnetic resonance diagnostics, and MRI machines have already been traditionally used in medical practice and diagnostics. It should be noted that only superconducting materials provide energy savings for generating a magnetic field that drives an MRI machine. Moreover, the intensity of the magnetic field created in MRI machines is from 2,500 to 10,000 times greater than the intensity of the Earth's magnetic field. The use of superconducting materials in particle accelerators is also known, for example, in the unique Large Hadron collider (LHC) at CERN (Switzerland) or in the proposed future cyclic collider. Today, the LHC Collider is an absolute giant of scientific and technological progress. It ensures the transportation of trillions of particles around 27-kilometer tunnels at speeds close to the speed of light, maintaining the stability of the particle beam and their movement along a precise path. This requires the creation of a magnetic field of enormous power, more than 100 thousand times greater than the Earth's magnetic field and, accordingly, requires a huge amount of energy, the transmission of which can only be ensured by superconductors.

The phenomenon of superconductivity was discovered in 1911 by Professor and Rector of Leiden University Heike Kamerlingh Onnes, the 1913 Nobel Prize in Physics. This was the time of practical production of liquefied gases. Kamerlingh Onnes persistently went to obtain liquid helium, necessary for creating low temperatures at which superconductivity manifests itself. Having extracted gaseous helium from monazite sand by calcining it, he then obtained a liquid substance of helium and measured the electrical conductivity of pure metals (mercury, and later tin and lead) at very low temperatures. He said, "In

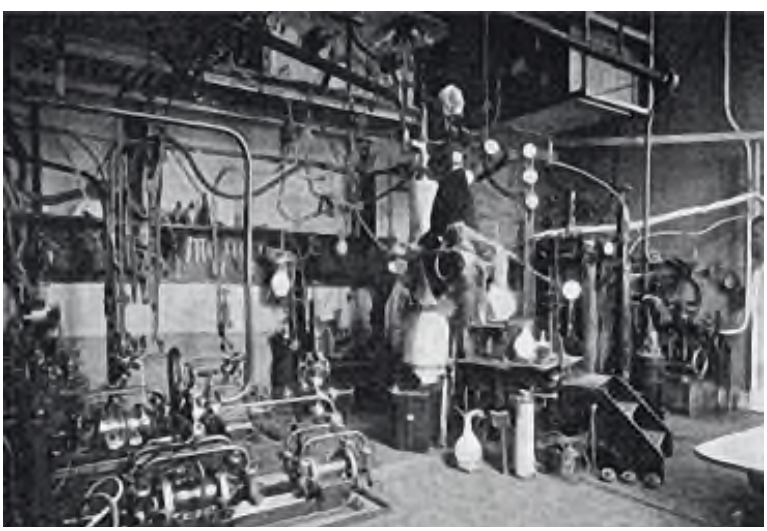
The discoverer of superconductivity Heike Kamerling-Onnes and his experimental laboratory, where liquid helium was first obtained

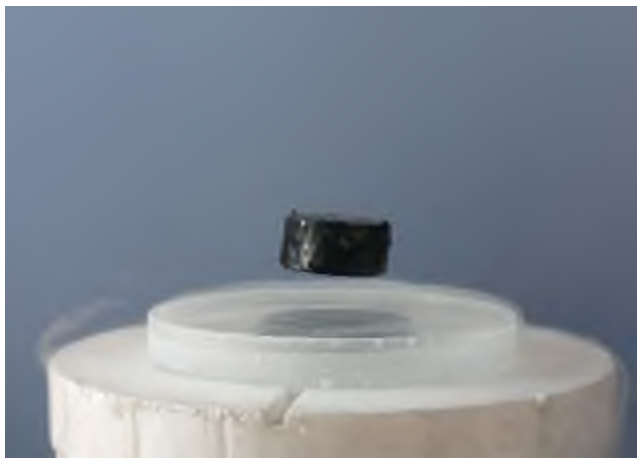
this successful experiment, both man and machine gave it their all."

The next significant breakthrough discovery, made by German scientists Walter Meissner and Robert Ochsenfeld, occurred in 1933. They were the first to establish the unusual, previously unknown fact of magnetic field repulsion by a superconducting material. The essence of this effect is that the magnetic flux penetrating the superconductor generates an electric current. The current created in the superconductor by the magnetic field reflects the external magnetic field that created this current, and as a result, the magnet is repelled from the superconductor. The magnet hangs in the air, and the discovered effect is known among superconductivity researchers as the Meissner effect. In practical application, the repulsion of the magnetic field determines the possibility of creating electric generators.

Such unusual phenomena attracted scientists to expand their research into the properties of superconducting materials, mainly in order to achieve superconductivity at higher temperatures, approaching room temperature.

The third major step in superconductivity was made by Alex Muller and Georg Bednorz of the IBM Research Laboratory in Rüschlikon, Switzerland. They created a ceramic that superconducted at 30 degrees Kelvin (-243 °C). This ushered in a new era of non-metallic superconductors – oxides, hydrides, etc. The surge in activity was attributed to scientists developing materials for completely different applications, since ceramics were not considered superconducting materials. Traditionally, ceramics were seen as insulators, and only special ceramics, such as those based on zirconium dioxide, were conductors. But, like conventional ceramics, they had significant resistance. Further research by scientists around the world led to a research team from the University of Alabama- Huntsville (USA) developing a ceramic that superconducted at 92 degrees Kelvin (-181 °C), i.e. "warmer" than the temperature for obtaining liquid nitrogen. American physicist R. Chu , who discovered this effect based on a compound containing the rare





Expulsion of a superconductor by a magnetic field

earth element lanthanum, having seen the results of the resistance drop at a temperature of 93K, said to his employees: "Too good to be true." However, the result he obtained was so significant that many scientists discussed it all night in the presence of US President D. Reagan. And as a result, a special scientific Laboratory of Superconductivity was organized in the USA, which to this day carries out research into the wonderful phenomenon of superconductivity and is one of the most authoritative in the world. It should be noted that liquid nitrogen is widely available today due to the cheapness of its production.

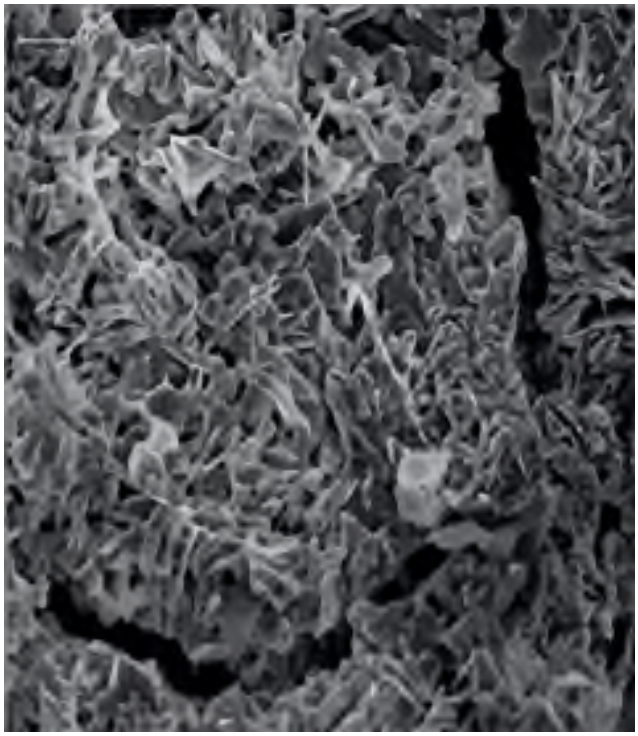
New scientific achievements in the direction of increasing the critical temperature of the superconducting transition in materials are currently carried out at ultra-high pressures, which is very difficult and unacceptable for multifaceted practical application. Pressures of the order of gigopascals require expensive special equipment and complex technology. Therefore, such experiments, although they give hope for advancing to room -temperature superconductors, are only feasible in laboratory conditions and are more likely a subject for identifying the capabilities of these materials, but they are still far from being used in everyday technology and in practice. It should be noted that such studies are being conducted by scientists in a number of economically advanced countries of the world.

Uzbekistan can also rightfully be considered a country with serious grounds for applying for priority research in the field of development of innovative technologies for synthesis of superconducting materials. The initial studies of superconductors based on yttrium and bismuth cuprates, carried out in laboratory conditions at the Physics-Sun Scientific and Production Association and the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences, were part of the all-Union state program. As part of these studies, laboratory superconducting samples with critical temperatures of the superconducting transition up to 100K (- 173 ° C) were obtained. Continuation and a new approach to the technology of synthesis of superconducting cuprates was carried out 17 years ago by scientists at the Institute of Materials

Fig. 3. Experimental unit of the Large Solar Furnace (LSF, Parkent, Uzbekistan)

Science of the Uzbekistan Academy of Sciences. The basis of these works and technology, in contrast to high-pressure technologies, was the use of concentrated solar energy as a source of high-temperature heating of these materials. This approach combined two main factors of energy saving. The first is the creation of energy-saving solar technology. And the second is the synthesis of the energy-saving superconducting material itself.

Cuprates with a critical temperature of T c = 110 K (- 163 °C) were obtained using concentrated solar energy at the Large Solar Furnace (LSF). These materials corresponded to the advanced and, at that time, the best results of superconducting yttrium cuprates with temperatures of Tc=110K (- 163°C) produced under industrial conditions. At the same time, scientists believed that the first task had been solved – to prove the viability of high-temperature solar technology and then, on its basis, to obtain such a superconducting material. That is, an answer was given to the question that had been asked since the creation of the Large Solar Furnace about the features and differences of materials obtained using concentrated solar energy. It took 17 years to justify the well-founded prediction and dream of the creators of this unique world-famous LSF installation – Academicians S.A. Azimov and T.T. Riskiev, namely, to show properties that are not reproducible by known technologies, i.e. the uniqueness of the technology developed in our country, which determines the world priority of Uzbekistan and domestic scientists who developed solar technology for the synthesis of long-term stable superconducting materials. The work of domestic scientists was then aimed at realizing the dream of scien-

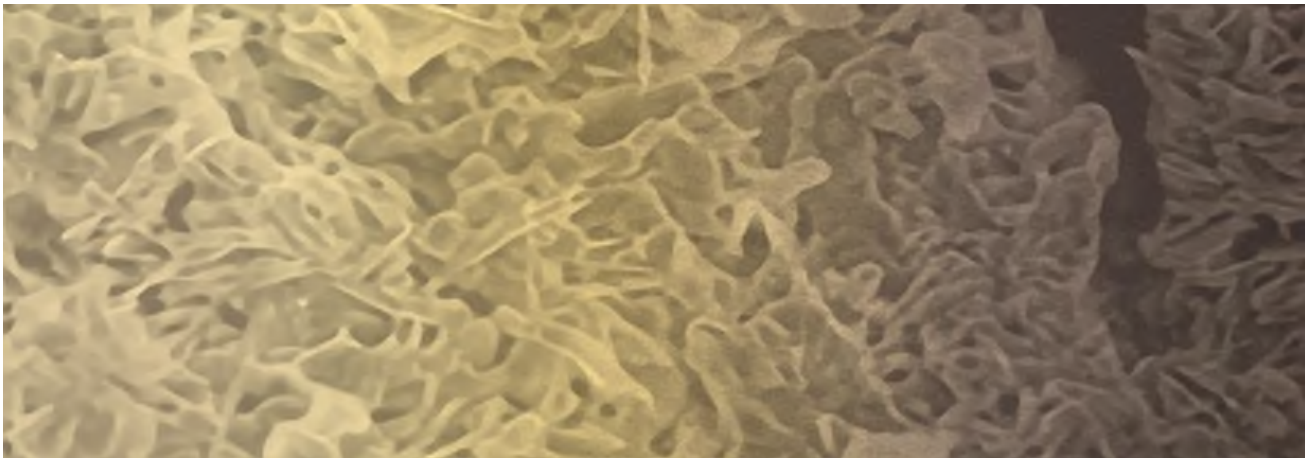


Massive superconducting bismuth cuprate synthesized in the Large Solar Furnace (Parkent) and its submicron layered structure

tists around the world – to obtain room temperature long-term stable superconducting materials and, as a result, to large-scale production of these materials at the Large Solar Furnace (Parkent).

Support for these works, despite all the difficulties, was constantly provided by the late President of the Uzbekistan Academy of Sciences, Academician B.S. Yuldashev. The results, repeatedly tested in France, the USA, and Georgia, determined the reliability of the fact of obtaining in Uzbekistan, still laboratory, long-term stable at normal atmospheric pressure, room temperature bismuth cuprates with a critical temperature of the superconducting transition Tc = 295-320 K (from + 22 to + 47 °C). The results obtained by domestic scientists, however, do not allow us to fall into euphoria. Such high parameters require multiple checks, since the responsibility for claiming such high results, which scientists from different countries of the world strive for, is too great. In this regard, both technological developments and thorough scientific research are currently continuing. In terms of the use of solar superconductors, their sensor properties are being studied for use in medical diagnostics and photoelectronic solar panels.

Scientists rightly say that “There is still much we do not know about superconducting materials, and every day we develop new applications for superconductors. The hope is to one day use superconductivity in energy transmission, which would dramatically reduce electricity costs worldwide. And experimental magnetic levitation trains, which use the phenomenon of superconductivity to make the car float above the rail, thereby eliminating the friction that slows the train, could be the future of transport. Who knows, maybe this will come true? And what is also possible is that one day we will have cutting-edge electronics that will use superconductors to give us smartphones that only need to be charged once a month, or something else very important, but still unknown!” These and other still unconquered scientific and technical peaks are hidden in this unique phenomenon of superconductivity.



The mysterious world of neutrinos

Khusniddin Olimov,
Professor,
Mikhail Kremkov,
Professor

Currently, the development of cosmology is inextricably linked with the registration and study of the properties of unusual particles, neutrinos. Today, we can rightfully say that the neutrino is a ghost particle, a tiny particle that has conquered the vast Universe. Once it was considered only a "particle without properties," a kind of wandering cosmic phantom. Now, many observatories around the world are throwing all their efforts into studying the characteristics and behavior of neutrinos as a possible component of "dark matter," a source of energy for the expansion of the Universe, the cause of gravitational instability of the Big Bang era, and a number of other phenomena in cosmology. Nobel Prizes are awarded for discoveries in the field of nature and interaction of neutrinos, and the field of knowledge about them is even planned to be allocated to a separate section of the science of celestial bodies, i.e. neutrino astrophysics.

The emergence of such a new mysterious object as a neutrino in the physics of elementary particles was inextricably linked with the phenomenon of beta decay of a neutron into two other particles: a proton and an electron. It was known that this decay has a characteristic feature, a wide continuous spectrum of electron energy, which would be impossible with a simple two-particle decay and a fixed electron energy, since the question of where the energy released during such a decay disappears was not resolved. The only way to eliminate this contradiction with the laws of conservation of energy was to introduce a new third particle into the decay scheme, which has a small mass and no charge.

This new particle was the neutrino, the most elusive of the elementary particles known in the world. The neutrino has no electric charge and was long thought to have no rest mass either. It was also found that the neutrino has virtually no interaction with matter. It can pass through 10,000 billion kilometers of heavy lead (one light year) without interacting with the particles of that matter. It was also predicted that the neutrino can interact with matter only through a newly established type of natural force, the so-called weak interaction.

For a more detailed description of this new particle, we should turn to a number of events in the world of science that led to the theoretical prediction and experimental proof of the existence of the neutrino, as well as to the methods of recording it and studying its diverse properties, which has been going on for over 90 years. These studies, carried out by many of the greatest physicists of the past and present centuries, were awarded four Nobel Prizes in Physics, which in itself was an extraordinary event of extraordinary significance. No other physical object has been so highly praised by the world scientific community.

It is known that the existence of the neutrino as a new, previously unknown particle was first predicted in 1930 by the famous Austrian physicist Wolfgang Pauli. At the end of December 1930, Pauli wrote his now famous letter to the German Scientific Society, in which he congratulated its members on Christmas and the New Year and simultaneously reported: "It seems that I have found the cause of the problem of energy loss in beta decay—this is another particle, but for some reason, we do not register this particle; it escapes our sight, and as a result, we get a classic three-body problem when you cannot say exactly how the energy distribution is related to each other and you get a continuous spectrum." He also immediately prophetically predicted that registering such a particle would be a very difficult task and suggested that this particle should have an extremely low mass or no mass and charge at all. This turned out to be true, and it took scientists many years to discover this elusive ghost particle.

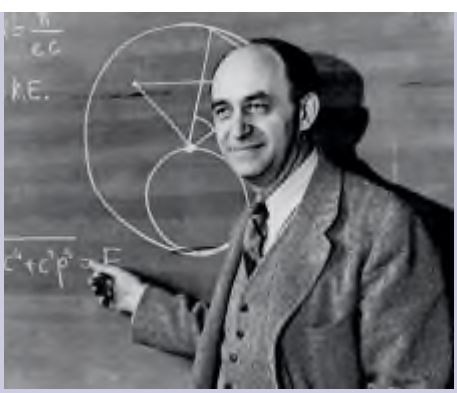
A little later, in 1934, the Italian physicist Enrico Fermi developed the theory of weak interaction. And it was Fermi who called this new particle, predicted by Wolfgang Pauli, a small neutral particle - neutrino, which in Italian means "little neutron", and described its behavior in the matter by the forces of weak interaction.

In 1938, Academician A. Alikhanov theoretically proposed a very elegant way to test the hypothesis of the existence of neutrinos, when the process of formation of one nucleus from another nucleus occurs and a certain particle that arises in this process carries away the released energy. In 1945, the future Academician of the USSR Academy of Sciences of Italian origin Bruno Pontecorvo proposed another original method of registering neutrinos, which was called chlorine-argon, when chlorine is converted into argon due to the reaction of a neutrino with one of its neutrons. But neutrinos were only registered in the mid-fifties, that is, almost 25 years after their prediction, and the study of neutrinos required the creation of special and previously unknown to science

The Ice Cube Neutrino Observatory, built at the Amundsen-Scott Antarctic Station

cumbersome and high-precision technical solutions. Thus, in 1953, American physicists Frederick Reines and Clyde Cowan conducted an experiment that could demonstrate the existence of neutrinos. This was the first, but unsuccessful, attempt to register neutrinos experimentally at an experimental setup based on the nuclear power plant in Hanford (USA). This set-up consisted of two polyethylene tanks with water, each 200 liters in volume. Cadmium salt was added to the water to increase the efficiency of neutrino capture, and 90 photomultipliers were located around the tanks to register gamma radiation that appeared during the possible interaction of neutrinos released during a nuclear reaction with a hydrogen-containing substance serving as a target. However, the volume of this substance turned out to be too small to ensure the registration of these single acts of interaction with it by neutrinos, due to the extremely small cross-section of its interaction. In addition, it became clear that the neutrino is not a truly neutral particle, and there is its antiparticle, the antineutrino, and there is a clear difference between the neutrino and the antineutrino. Moreover, during beta decays occurring in nuclear reactors, such as in Hanford, it is antineutrinos that are released. In 1955, a much larger installation was built in the Savannah River, up to 10 meters high and with a large volume of hydrogen-containing substance. This is what allowed F. Reines and K. Cowen to conduct a successful experiment on neutrino detection in the Savannah River (1956), and they obtained the first reactor new particles.

But, as it turned out later, these were antineutrinos, which allowed the official announcement of the registration of antineutrinos. And this discovery was marked by the Nobel Prize in Physics in 1995 “for pioneering experimental contributions to the physics of leptons”, which was awarded jointly to two scientists - Martin L. Perl “for the discovery of the tau lepton” and Frederick Reines “for the detection of neutrinos.” In 1962, the next important step in the development of ideas about neutrinos was made when Leon M. Lederman observed the decay of the pi-meson particle with the formation of another elementary particle—the muon and the emission of a different type of neutrino, called the muon neutrino. For these studies, the Nobel Prize in Physics in 1988 was awarded jointly to Leon M. Lederman, Melvin Schwartz and Jack Steinberger “for the neutrino beam method and the demonstration of the doublet structure of leptons through the discovery of the muon neutrino.” In 1963, the construction of a giant neutrino detector with a volume of 450 thousand litres began in the Homestake mine in Lead, South Dakota (USA). However, although the first measurements on this detector by the American chemist Raymond Davis did not give positive results, the scientist continued to improve the registration technique and already in 1967-1970 built an installation in the Barberton-Limestone mine near Akron in Ohio, where he placed a tank with perchloroethylene with a volume of 378 cubic meters at a depth of



Enrico Fermi (1901 – 1954)

Wolfgang Pauli (1900 – 1958)

Bruno Maximovich Pontecorvo (1913–1993)

1400 meters. On this large-scale detector, for the first time in the world, he experimentally proved that it is possible to register neutrinos formed due to thermonuclear reactions occurring on the Sun and travelling to the Earth from the Sun. For his achievements, Raymond Davis was awarded the Nobel Prize in Physics in 2002 together with the Japanese scientist Masatoshi Koshiba for the creation of neutrino astronomy. These registered particles were called solar neutrinos, but their flux turned out to be smaller than predicted theoretically. In the following decades, many scientists studied the nature of this discrepancy between the experiment and the theoretical prediction, which was called the "solar neutrino mystery," and only after the discovery of neutrino oscillations was this mystery finally solved. It should be noted that much earlier, back in the late 1950s, the hypothesis of the existence of neutrino oscillations was first put forward by Academician Bruno Pontecorvo. In the early 1970s, he proposed the existence of neutrino oscillations as a possible explanation for the deficit of solar neutrinos in the experiment due to the transition of particles of one type of neutrino to another kind. And this was also confirmed by experiments with solar neutrinos, of which there were indeed fewer than could reach the Earth from the Sun, and neutrino oscillations caused the detected effect. In 2015, Japanese scientist Takaaki Kajita and Canadian physicist Arthur McDonald became Nobel laureates in physics for the experimental discovery of neutrino oscillations, which also served as proof that the neutrino particle has mass.

Research related to neutrinos in the world of particles continued, and in 1975, Martin Perl discovered another new elementary particle, the taon, during the decay of which a new type of neutrino is generated and registered, called the taon neutrino. Thus, since the 1980s, the era of new neutrino physics has been actively continuing, and various types of neutrinos coming from various sources and in a variety of ways have been registered. Among them, astrophys-

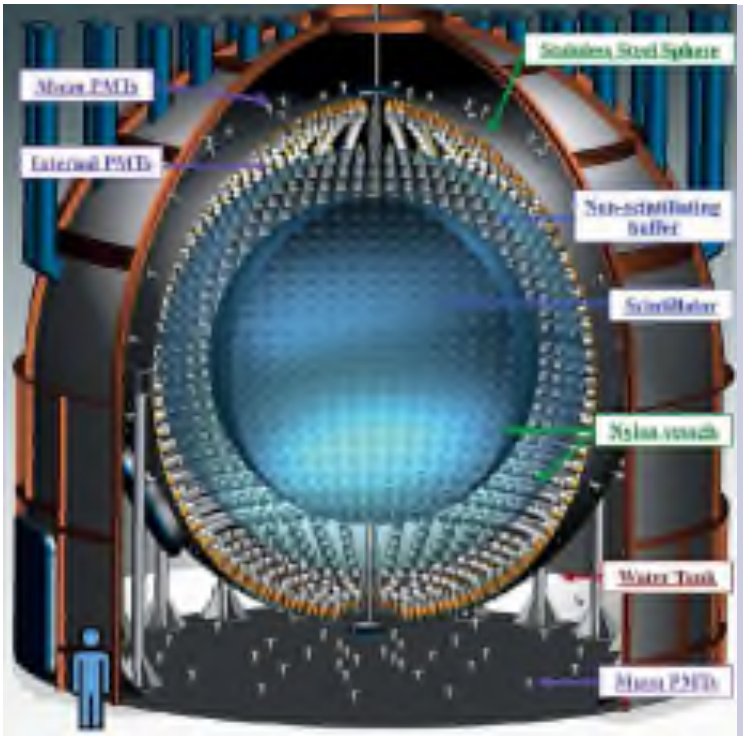
Inside the Super Kamiokande Neutrino Observatory, where neutrino oscillations were discovered. Observatory staff is checking the operation of the detectors. Japan

ical neutrinos were found, coming from supernovae, quasars, and active galactic nuclei, as well as those coming from the depths of the Earth—geoneutrinos. In addition, so-called model relic neutrinos were also predicted, with very low radiation energy in the range of several millielectron volts, which presents exceptional difficulties for their registration even by the most modern methods. As a result, a whole family of various types of such particles appeared: first, antineutrinos and several types of neutrinos—reactor, solar, muon, taon, astrophysical, geoneutrinos, and even relic neutrinos. Moreover, it was impossible to register different types of neutrinos directly but could only be detected indirectly by the resulting gamma radiation or Cherenkov radiation, which occurs as a result of the interaction of different types of neutrinos with the substance of a hydrogen-containing target of very large dimensions.

The main difficulty in neutrino research is its extremely weak interaction with matter. Even modern registration methods record a rather small percentage of incoming neutrinos, and this is a significant difficulty. One of the detectors that most accurately measured the acts of neutrino interaction with hydrogen-containing matter was the Super-Kamiokande detector in Japan, which collected the largest statistics on solar neutrinos to date. In addition, at the very beginning of neutrino research, a reasonable question arose: is it a massless particle? The fact is that the presence of a mass in neutrinos would entail several rather interesting consequences. As a result, even if only electron neutrinos leave the Sun, their mixed flow will reach the Earth. The presence of mass in neutrinos leads to another problem, and the neutrino can become identical to the antiparticle. Projects have also been proposed in which a beam of neutrino particles passes practically through the Earth, but they are associated with serious technical difficulties, both in setting up the experiment and in ensuring the appropriate registration of the radiation arising from their interaction in the Earth's interior.

Nevertheless, constant progress is being made in neutrino research. Today, one of the important goals of neutrino studies is a more accurate recording of the existence of their oscillations and a more accurate determination of their mass. At present, the following neutrino mass limits are known: m in electron volts: for an electron neutrino: $m < 3.8$ eV, in the case of a muon neutrino: $m < 0.19$ MeV, and for a taon neutrino: $m < 18.2$ MeV.

Neutrinos can occur, appear, and manifest themselves as high-speed particles that penetrate deeply into any substance as a result of various types of nuclear reactions that constantly occur in natural conditions on the Sun, in the Earth's interior, in stars, and also in artificial conditions in reactors and accelerators. Thus, to register cosmic neutrinos in the ice of Antarctica, scientists created a unique, world's largest neutrino detection facility, the Ice Cube, which is a cylinder 72 meters high and 68 meters in diameter where Cherenkov radiation arising from the interaction of cosmic neutrino flows with ice particles was



The Borexino detector is assembled based on the principle of a Matryoshka doll: an outer water reservoir; a stainless steel sphere equipped with 2200 photomultiplier tubes (PMTs); an external nylon sphere serves as a radon barrier; the inner nylon sphere contains 300 tons of liquid scintillator

recorded. The purpose of the experiment was to answer the question of what these smallest particles can say about space and map the Milky Way "through the eyes of neutrinos." Indeed, scientists at the Ice Cube detector in 2023 were able to confirm the presence of high-energy neutrinos emanating from the Milky Way, thereby opening a new era in neutrino astronomy. Today it has already become clear that neutrinos are the most common particle in the Universe. There are so many neutrino particles that all other "non-neutrino" matter accounts for only about 3-10% of the mass of the Universe! That is, as many astrophysicists say, we live in a neutrino Universe! Without undertaking to discuss in this article the truth of many bold ideas of scientists about the nature and reasons for the appearance of various new particles, we can only say that our knowledge will be constantly refined, expanded, and deepened and will make many things impossible and unpredictable today quite real in the near or distant future.

It is also possible to show a certain practical interest associated with the possible use of neutrinos. However, in practical terms, the use of neutrinos is still only at the very beginning of its development. At the same time, the presence of neutrino oscillations in matter may someday create conditions for studying the deep structure of the Earth and gravitational waves, but such applications are hindered by the imperfection and complexity of neutrino registration methods. The closest to practical application is a project for remote monitoring of nuclear reactors by mea-

Takaaki Kajita
(Born 09.03.1959, Japan)

Arthur McDonald
(Born 29.08.1943, Canada)

suring neutrino flows emitted by nuclear reactions, as well as for remote monitoring of illegal nuclear weapons production. In the future, it is also possible to create new types of wireless high-speed communication based on the use of neutrino flows. In any case, the study of neutrinos and related phenomena has undoubted scientific value, and any results using them are extremely important today. As theoretical physicist Academician M.A. Markov prophetically said at the end of the last century, "It is difficult for a contemporary to guess what true place the neutrino will occupy in the physics of the future. But the properties of this particle are so elementary and unique that it is natural to think that nature created the neutrino with some deep, not always clear to us, "goals." Thus, we can say that the neutrino is a tiny particle that has truly conquered the vast Universe. These particles freely pierce the Sun, our planet and us! In this "elusive" particle, its extremely small mass also helps, when, approaching massive bodies, its speed does not decrease, and it overcomes giant celestial objects easier than a beam of light passes through glass. Look around: everything that surrounds you now, including you at this moment, is passing through hundreds of trillions of neutrinos. But you can only find out about this by reading a similar article and future popular science publications since it is simply impossible to directly sense neutrino flows.

Schematic representation of the interaction of a neutrino flux (left) with matter (centre of the picture) and the resulting radiation (right).

A bottom view of the Kamiokande detector, located 1 kilometer underground in the Kamioka zinc mine in Japan.

The construction site of the Jiangmen Underground Neutrino Observatory. China

Dampening dust transportation from the Aral sea desert territories

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As is known, atmospheric pollution is a common global and climate problem. The passing part of pollutants is dust of both industrial and natural origin. The issue of atmospheric dustiness is especially relevant for Uzbekistan, the vast territories occupied by the Aralkum, Ustyurt, Kyzylkum and Karakum deserts.

Excessive atmospheric dustiness affects the growth of morbidity among the population. Diseases associated with atmospheric dustiness occur when dust particles are inhaled along with microbes, heavy metals, pesticides and other pollutants contained in the soil. Due to their micro- and nano-size, dust particles easily enter the lungs and penetrate the bloodstream. According to expert estimates, in 2014, exposure to dust particles caused about 400 thousand premature deaths from cardiovascular diseases among the population over 30 years of age. Salt-dust storms and emissions, spreading for many tens of kilometers, also have a significant impact on the ecology and health of the population in the regions adjacent to the Aral Sea. Atmospheric dustiness also affects the climate, changing biogeochemical cycles, the intensity of solar radiation, suppressing cyclone activity and affecting the microphysics of clouds and the hydrological cycle. Other negative consequences of dust storms are: - reduced visibility, affecting the control of aircraft and vehicles; - reduced sunlight reaching the Earth's surface; - the effect of a thermal "blanket" from excess dust particles in the atmosphere; - the "Voeikov effect" with an increase in air temperature by 6-7 ° K; - as well as the suppression of vegetation.

In view of the numerous negative impacts of atmospheric dustiness, the relevance of developing and implementing measures to reduce it is undoubtedly important. An integral part of these developments is the study of factors increasing atmospheric dustiness, as well as checking the environmental safety of planned protective measures against atmospheric dustiness.

Particularly dangerous is the removal of salt dust from the dried bottom of the Aral Sea, which contains a significant share of toxic sulfates. The deposition of salts over a huge area poses significant risks to the health of the population of Uzbekistan, as well as soil salinization and damage to vegetation. Depending on the wind speed, dust spreads in the leeward direction for 150-800 km.

The conditions for the occurrence of wind removal of dust aerosol are the presence of wind with a speed of more than 4 m/s, positive air temperature for more than 9 months a year, and a suitable condition of the underlying surface for the deposition of dust particles (weak vegetation cover, volumetric soil moisture of no more than 5%, fine-grained mechanical composition of the soil, etc.). All these conditions are almost permanently present in the deserts of Uzbekistan in the warm season. To reduce the wind removal of aerosol, it is enough to neutralize or reduce the effect of at least one of these conditions.

Since changing the wind and temperature regime, as well as the mechanical composition of the soil in the deserts are beyond people's control, it remains to

Map of the location of created reservoirs in the Aral zone

use a number of methods to increase soil moisture and total projective cover, as well as to create a protective vegetation cover. Of course, the most effective is the use of these measures in combination.

According to known technologies, measures to reduce wind removal of dust can be divided into 4 types:

1) Chemical protection of the underlying surface from weathering;

2) Creation of reservoirs;

3) Creation of artificial precipitation that moistens the underlying surface;

4) Phytomelioration (greening).

It is interesting to consider the features, efficiency and environmental safety of the above measures.

Chemical protection of the underlying surface from weathering

Fixation of the relief of moving sands during phytomelioration can be carried out using strip chemical coatings. Nerozinum and mixtures of SAS (sulfate-alcohol stillage) and PAE (polyvinyl acetate emulsion), as well as water-soluble polymers K-4 and K-6, have shown high efficiency in fixing sands. The width of the surface coating strips made of these materials is 0.7 m, the distance between them is 3-4 m.

Employees of the Institute of Polymer Chemistry and Physics of the Uzbekistan Academy of Sciences have developed methods for fixing mobile sands with compositions based on acetone-formaldehyde (AF) resin. A strong crust formed when fixing sands with AF resins does not interfere with seed germination. Polymer compositions based on AF resins meet the basic requirements for chemical ameliorants: - do not exhibit toxicity, - do not pollute the environment, and - do not deteriorate within 3 years.

Scientists from the Institute of General and Inorganic Chemistry of the Uzbekistan Academy of Sciences have developed 2 methods for fixing saline soils of the dried Aral Sea bed based on industrial waste. Firstly, this is a method of liming the soil with the addition of highly dispersed ash (ash is the carryover from the state district power station electrostatic precipitators) followed by treatment with a solution of a binder - a surface-active substance, which is lignosulphate (waste from the pulp and paper industry), waste from the oil and fat industry and gas purification - monoethanolamine. When treating slightly saline sands with these compositions, a crust is formed, the strength of which is 6.0 kg / cm2. With an increase in the salt content in the soil to 25-30%, the strength of the crust increases by 3-4 times. Another method of soil stabilization is based on the use of waste from the oil industry. Experimental field tests were carried out on the dried bottom of the Muynak, Rybatskoye Bays and on Kokdarya). After sowing the seeds and planting the saxaul, kandym and tamarisk seedlings, the surface of the moving sands was treated with a 3-6% solution of malonaft, a waste product of oil refining, or a 10-25% solution of apratan, a waste product of the Namangan non-woven factory, as well as waste from the oil and fat and pulp and paper industries, and oth-

Cloud "seeding"

Jiltirbos Reservoir

Muynak Reservoir

er reagents. When using these compositions, a strong (30-35 kg/cm2) and water-resistant crust is formed on the underlying surface, preventing the removal of dust and salt particles from the treated surface.

It should be noted, however, that a quantitative assessment of the reduction in the annual volume of salt and dust removal from underlying surfaces by the abovementioned methods of chemical protection has not yet been obtained.

Creation of reservoirs

By the beginning of the 1990s, for the partial revival of the Amu Darya delta and adjacent dried-up shallow bays of the Aral Sea, regulated or partially regulated lakes and reservoirs were created by flooding the most depressed areas of the above-water delta, i.e. former lake-swamp interchannel depressions, with the remains of the Amu Darya runoff and collector-drainage waters. As a result of this flooding, artificial lake-swamp or reed-lake lands were formed in the Amu Darya delta - Sudochie, Shagyrlykkol, Makpalkol, Shegekol (Mezhdurechinskoye), Mailiozek (Maipost), Dumalak, and reservoirs appeared on the dried-up bottom of the Aral Sea - Muynaksky, Rybatsky and the vast flowing lake Jyltyrbas.

The hydrological regime of the listed lakes and reservoirs is not constant and depends entirely on the volume of water entering them. Thus, by the end of summer, the water level of many of them drops by 1–2 m and a significant part of the area of reservoirs and lakes dries up.

Reservoirs on the dried-up bottom of the Aral Sea, together with lakes and regularly flooded interfluves of the Amu Darya delta, are of exceptional importance in improving the ecological situation in the Aral Sea region. Reservoirs and constantly flooded interfluves not only increase the number of commercial fish, but also contribute to an increase in relative air humidity in the summer, which has a beneficial effect on the vegetation of grassy, woody and shrubby tugai. Irrigation of ecosystems also has a beneficial effect on the reproduction and ecology of habitats of individual animal species (birds, muskrats, ungulates, fish, etc.).

When planning and implementing rehabilitation measures, it is important to know their effectiveness in digital terms. Until now, the effectiveness of, for example, positive anthropogenic intervention (Kokaral Dam, reservoirs, forest plantations, drainage water discharges) in reducing wind-induced salt removal was assessed only verbally and approximately.

In the laboratory of environmental modelling of the Karakalpak branch of the Uzbekistan Academy of Sciences, the authors developed a method for assessing the effectiveness of positive anthropogenic impacts (PAI) on the dried bed of the Aral Sea concerning reducing salt removal. The PAI include artificial reservoirs—Muynak, Rybatsky and Jyltyrbas, as well as the reservoirs of the Kokaral Dam and KS-4 collectors and the ongoing forest plantations. Since salts are not removed from the moistened soil, as well as from the water surface, the water outlets from the Kokaral Dam and collectors, feeding the Central Aral, partly Chebas and the eastern part of the Greater Aral, completely prevent the removal of salts from the territories irrigated by them. Using the remodelling method, scientists from the Karakalpak branch assessed how much the total removal of salts from the entire drying area was reduced. Thus, the average annual impact of these reservoirs and the Central Aral on the weakening of salt removal in 2019 was 4.56 (million tons/year), while the total removal of salts from the entire area of the dried bottom of the Aral Sea was 128.8 million tons/year.

Creation of artificial precipitation

With a volumetric soil moisture content greater than 5%, the probability of wind removal of salts and dust from the surface approaches zero. At present, technologies for artificial precipitation formation have been developed, the essence of which is to accelerate the formation and growth of droplets in clouds. The fact is that for the formation of droplets from cloud vapour, so-called condensation nuclei are needed, the smallest microparticles (aerosol) on which water vapour condenses. For droplets to fall from clouds,

it is necessary that by coagulation (fusion) they reach a certain size.

The traditional method of artificial precipitation is to "seed" clouds with silver iodide or other salts from airplanes, developed by General Electric scientists back in the 1940s. However, this method leads to mineralization of precipitation and, consequently, to additional soil salinization. To eliminate this negative effect, an innovative method was used in Dubai in 2021, using drones to disperse negative ions in the atmosphere, forcing water molecules to "merge" together into large droplets and fall as rain. The lack of scientific and technical developments to regulate the amount of artificially induced precipitation has led to the fact that too much of it can fall, which creates significant inconvenience for these regions and their populations.

Scientists from the South Kazakhstan University named after M.O. Auezov have created a rain-inducing technology that can send negatively charged ions into the atmosphere and collect rain clouds in a clear sky. If the new technology is successfully tested, 5 similar devices will be installed in the region. One device operates within a radius of 200 km and covers an area of 160 thousand square kilometres.

However, scientists and organizations dealing with this problem around the world are sceptical about the ionization method. Experimental studies conducted in Russia and the United States have proven that the capabilities of modern technologies increase the level of natural precipitation by only 10-15%. Scientists from the Karakalpak branch of the Uzbekistan Academy of Sciences assessed the weakening of the wind removal of salts from the dried bottom of the Aral Sea and showed that it is enough to cause artificial precipitation in the amount of 1 mm on the eve of a predicted strong wind (more than 10 m / s) to significantly reduce the wind removal of salts. Artificial precipitation is also an effective measure for: - combating drought; - increasing vegetation cover; - reducing atmospheric dustiness; and - reducing global warming. However, this method of artificial rain has not yet been developed in the Aral Sea region.

Phytomelioration

World experience shows that the only widely used measure against dust storms and soil weathering is

Kokaral Dam in the northern part of the Aral Sea

greening. Thus, in the 1930s, a series of dust storms called the "Dust Bowl" forced the US government to implement the "Great Plains Protective Belt" project, planting 200 million trees and significantly reducing the number of dust storms in Texas. The largest greening within the "Great Green Wall" project is being carried out in China to protect against dust storms in the Gobi Desert, which is expanding annually by 3,600 square kilometres. The planting of billions of trees has made it possible to stop the expansion of the Gobi and significantly reduce air dustiness in the country. A similar "green wall" is also being created in Africa to reduce the impact of dust storms in the Sahara.

In Uzbekistan, large-scale forest plantings have been undertaken only on the dried bed of the Aral Sea. Vast desert territories are almost not reclaimed, although it is clear that phytomelioration of the Kyzylkum and Ustyurt would help solve not only the problems of desertification and atmospheric dustiness, but also problems with the forage base for livestock.

Initially, the goal of phytomelioration of the dried bed of the Aral Sea was to prevent the negative environmental consequences of the Aral problem (in particular, the removal of salts) and the formation of desert artificial pastures. Calculations carried out in the dissertation of J.J. Kublanov showed that vegetation with a total projective cover of 0.3 reduces the speed of the surface wind by 20-30%, and with a total projective cover of 0.6 - by 40-50%. The power of dust emission from the underlying surface is also reduced. The importance of phytomelioration of the dried bed of the Aral Sea, as well as water bodies, can be determined using the method of assessing the effectiveness of positive anthropogenic impacts. The essence of the method lies in the study (remodelling) of the patterns of the natural evolution of the Aral geosystem and its dried bed, without anthropogenic intervention, so that when comparing model and actual data, we can obtain digital information on how the salinity of soils has decreased, the total projective cover has increased, and the removal of salts has decreased as a result of the applied impacts.

Despite the increase in the area of forest plantations, their effect on reducing the removal of salts tends to decrease, due to the prevalence of the rate of increase in salt removal and, in part, a decrease in the germination of new forest plantations on more saline drained areas observed in 2015-2021. Therefore, only chemical protection of the underlying surface from weathering and artificial precipitation remain applicable in these areas. Summarizing the effects of positive anthropogenic impacts (PAI) on the dried bottom of the Aral Sea, scientists from the Karakalpak branch of the Uzbekistan Academy of Sciences showed that, in total, they reduced, for example, salt removal by 20% in 2019. The overall efficiency of surfactants on the dried bottom of the Aral Sea can be much higher since the Small Aral is preserved, biodiversity grows, livestock feed is provided, the microclimate improves, etc.

As for natural deserts (Kyzylkum, Ustyurt, Karakum, etc.), which significantly increase the summer air temperature in the adjacent territories, only landscaping and artificial precipitation are suitable for their melioration. Landscaping, despite a wide range of positive effects, is less effective since vegetation is known to partially burn out in the summer, and the germination of plantings is not high enough. In addition, phytomelioration is practically possible only on a narrow strip of the periphery of the deserts, provided that the dust carried by the wind from the central part remains in the deserts themselves.

The advantage of artificial precipitation is that its creation is necessary over desert territories only on the eve of a predicted strong wind (more than 10 m / s). Secondly, precipitation would ensure the self-overgrowing of the areas of their impact, and the problem of phytomelioration would disappear. Of course, the problem of reducing dust flows from deserts, although it is being intensively dealt with in all countries bordering deserts, requires further in-depth research. But at the same time, the existing experience of combating wind-blown dust from desert areas indicates a real possibility of regulating the level of atmospheric dustiness and improving the environmental situation.

Diesel locomotives: history of creation and development

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Currently, diesel locomotives are one of three types of locomotives that transport passengers and freight on railways and provide efficient communication between different countries and regions. For almost a century, steam locomotives were the only type of locomotives on railways. Diesel locomotive construction began to develop later than steam locomotive construction, at the beginning of the 20th century, and compared favorably with it due to the advantages of diesel locomotives, which do not require water intakes and coal depots. Moreover, diesel locomotives require less maintenance than steam locomotives, which need a constant supply of water, coal and cleaning of steam boilers. Another advantage of diesel locomotives is flexibility, since they can operate on sections without electrification and electrical supply, which is necessary for another type of widely used locomotives - electric locomotives. In addition, diesel locomotives do not depend on a stable power supply, which is especially important in regions with frequent power outages. This allows diesel locomotives to be used on the most remote and less developed sections of railways, where there are no sources of fuel, electricity or other infrastructure necessary for steam and electric locomotives.

Yury Vladimirovich Lomonosov (1876 –1952) was a Russian railway engineer and a leading figure in the development of Russian Railways in the early 20th century

The conditions for the creation of diesel locomotives appeared at the end of the 19th century, when in 1892 Rudolf Diesel received a patent, and in 1897 he presented a version of the internal combustion engine, which was named after him. The first diesel had a power of 14.7 kW (20 hp), its efficiency exceeded the efficiency of steam engines and did not depend on the size of the engine. Very economical, compact, convenient and simple in design, the diesel quickly became widespread, including in transport. The appearance of diesel engines also gave impetus to the creation of new types of locomotives for railways–diesel locomotives.

The first diesel-powered locomotives appeared in the 1900s. However, they were inefficient and were not widely used. The first experimental diesel locomotive for mainline operation was designed under the direction of Rudolf Diesel in 1909 and built by September 1912, but due to problems during testing and the outbreak of World War I, its development was not completed.

Diesel locomotive construction began to develop in the USA, Germany, England, Switzerland and other countries of the world, including particularly successfully in Russia. Thus, in 1905 in Russia, engineer Nikolai Kuznetsov and Colonel Alexander Odintsov presented a report on the project of a diesel locomotive with electric transmission to a technical society. This was the world's first project of a modern diesel locomotive. The power unit of the locomotive consisted of an internal combustion engine, an alternating current generator and four electric motors. A similar locomotive design later became the most widespread. Then in 1909, engineer Yu.V. Lomonosov (1876-1952), who worked as the head of the locomotive service of the Tashkent Railway, designed his own design of a diesel locomotive with a group wheel drive.

In January 1922, the Government decided to build three diesel locomotives - two abroad and one in the Soviet Republic. One was built in Petrograd under the supervision of the mechanical scientist Ya. M. Gakkel , the other two - under the supervision of the engineer Yu. V. Lomonosov in Germany. At that time, there were no separate diesel locomotive building plants in the world. Of the two diesel locomotives ordered in Germany, the most successful was the diesel locomotive designed by Yu. V. Lomonosov under the name UE 001 and built at the Hohenzollern plant in Esslingen. Its construction began in August 1923 and Russian

and German specialists participated in its creation. The locomotive was equipped with a six-cylinder non-reversible engine from the German company MAN, which was widely used in submarines. And the traction electric motors together with the generator were ordered from the Swiss company "Brown- Boverly". On November 6, 1924, the diesel locomotive designed by Yu.V.Lomonosov made its first run.

The diesel locomotive of the Ya.M. Gakkel system was built in Leningrad by three plants. The traction electric motors were designed and constructed at the Elektrik plant. The main frame and body of the locomotive were created at the Krasny Putilovets plant. The locomotive was assembled and the power units were installed at the Baltic Shipyard. A ten-cylinder diesel engine from a Lebed-type submarine with a capacity of 1,000 hp was installed on the locomotive. The generators were used from the unfinished Yaz submarine. Due to the large length and weight of the locomotive, three four-axle bogies were installed on it. This Shch-EL-1 diesel locomotive became the first bogie-type locomotive in the world. Its length was 22 meters, its weight was 180 tons, the power of the diesel engine was 1,000 horsepower, and the maximum speed was up to 75 km/h. On August 5, 1924, the first official departure of a diesel locomotive from the workshop took place on the tracks of the Baltic Shipyard.

In November 1924, two mainline diesel locomotives were put to the test: Yue 001 (designed by Yu. V. Lomonosov) and Yue 002 (designed by Ya. M. Gakkel). The two-section diesel locomotive presented by Ya. M. Gakkel in 1924 used diesel engines, which provided greater efficiency and maneuverability. This model became the basis for the further development of diesel locomotive construction in the world. Diesel locomotive Yue No. 002 was given the name GE1 (Gakkel system, with electric transmission), then Shch-EL-1, and later Shchel 1; the letter Shch meant that this locomotive was equal in power to a steam locomotive of the Shch series, and the letters EL indicated the presence of an electric transmission. On January 16, 1925, the world's first diesel locomotive designed by Ya. M. Gakkel arrived in Moscow with great ceremony, pulling a thousand-ton train. And on December 30, 1925, the locomotive began working with freight trains on the Lyublino- Kursk section of the Moscow-Kursk Railway. Today, this locomotive is an exhibit at the Museum of Russian Railways in St. Petersburg .

"Da" series locomotives by the ALCO company (USA)

In 1936, Ya. M. Gakkel became the dean of the mechanical engineering department of the Leningrad Institute of Railway Engineers (now PGUPS) and went on to design mobile power trains for the front. The work of the designer of the world's first diesel locomotive, Yakov Modestovich Gakkel, was continued by his daughter, Ekaterina Yakovlevna Gakkel, head of the laboratory "Automation of Locomotives". Having become the first female professor in this field, E. Ya. Gakkel developed new design solutions in the field of

Professor Ekaterina Gakkel and colleagues discussing the new diesel locomotive model

The TGM1 maneuvering diesel locomotive. A photograph from the archive of the Novocherkassk Electric Locomotive Factory, 1958

TEP70BS diesel locomotive in the composition of a passenger train, Uzbekistan

diesel locomotive construction, trained a whole galaxy of engineering personnel, as well as 35 candidates and 5 doctors of science, and wrote a number of textbooks for students in the locomotive industry.

Before the Second World War, in addition to the Shchel 1 diesel locomotive, individual examples of diesel locomotives of various variants of the O ^{el} series and several dozen diesel locomotives of the E $^{el\ series}$ were built at factories in the former USSR.

Since the early 1930s, the widespread development of diesel locomotive construction and mass production of diesel locomotives began. At this time, more efficient and reliable designs were developed that could operate in various conditions. In 1931, most of the available diesel locomotives were sent to the Ashgabat station depot and the first diesel locomotive depot in the country was created. The Ashgabat railway, which was separated from the Central Asian railway on July 1, 1936, became the first diesel locomotive depot in the world. Diesel locomotives were delivered there from the Kolomna Machine-Building Plant, which built 37 E $^{-el}$ series diesel locomotives with a capacity of 1,200 hp and 3 Ol series shunting diesel locomotives with a capacity of 600 hp from 1931 to 1937. In 1938, special workshops for all types of repairs and the manufacture of spare parts for diesel locomotives were built in Ashgabat. In 1945, diesel locomotives of the "Da" series from the Alco company arrived from the USA (120 of them were assigned to the Ashgabat depot). The specific operating costs of these diesel locomotives were 33.7% lower than those of steam locomotives, and 25 times lower in terms of water supply. It should be especially noted that diesel locomotive traction was first introduced in the country on the former Ashgabat railway over a distance of more than 700 km.

One of the first Soviet diesel-electric locomotive YaG 1 with a capacity of 1000 hp and a maximum speed of up to 100 km/h was developed in the early 1950s and became widespread due to its reliability and high maneuverability. Another well-known representative of Soviet diesel locomotive construction was also developed in the 1950s – the ShChEL 1 with a capacity of 1200 hp, and a more modern design. Fundamental changes occurred in the mid-1950s, when the locomotive industry was reoriented to diesel and electric traction.

Thus, the Murom plant was one of the first to start building shunting and industrial diesel locomotives of the 9P series. In 1956, the plant built the first 2 three-axle shunting diesel locomotives TGM 1 (diesel locomotive with hydraulic transmission, shunting)

The 2TE10M diesel locomotive in the composition of the Moscow-Dushanbe train passing through the Navoi region

based on the captured German shunting diesel locomotive DG14-1. In total, from 1956 to 1972, the Murom plant produced 3,369 diesel locomotives of the TGM 1 series. Most of the locomotives of this series worked at industrial enterprises, but some locomotives were used for shunting work at railway stations.

The need for mainline diesel locomotives was also high at that time. One of the first large-scale diesel locomotives and the first serial two-section locomotive was the TE 2 diesel locomotive. These series of diesel locomotives were produced at the Kharkov Transport Engineering Plant from 1948 to 1955. A total of 528 locomotives were built. In 1953, the same plant began producing a series of two-section diesel locomotives of the TE3 series, which developed a speed of up to 100 km/h, and the power of one section was already 2000 hp, which was 2 times more than the power of the TE 2 locomotive. In addition to the Kharkov Transport Engineering Plant, TE3 series locomotives were also produced at Kolomna and Voroshilovgrad factories, a total of 6,808 TEZ diesel locomotives were produced. Thanks to this, already in 1955, 6.5 thousand km of railways were converted to diesel traction.

Due to the growth of transportation volumes and industry, there was a need for a more powerful and reliable shunting diesel locomotive. In 1958, the Bryansk Machine-Building Plant began production of a new six-axle locomotive TEM 1 with a capacity of 735 kW, and it was decided to place an order in Czechoslovakia, at the CKD Praha plant. The shunting diesel locomotive ChME3 with electric transmission created there was developed in 1963, its serial production began in 1965. In terms of general layout, the locomotive is similar to the Soviet TEM 1, but was more powerful (993 kW).

In 1973, the Lugansk Diesel Locomotive Plant joined the production of diesel locomotives of the ChME3 series. By 1987, about 9.6 thousand of these diesel locomotives had been produced, of which 7.5 thousand were delivered to the republics of the former Soviet Union. It should be noted that the ChME3 shunting locomotive became one of the most common diesel locomotives throughout the post-Soviet space.

In 1958, the Kharkov Transport Engineering Plant began production of a six-axle two-cabin single-section freight and passenger diesel locomotive TE10 with electric transmission, with a capacity of 2.2 thousand kW. In 1961-1964, the Leningrad plant created the TG102 diesel locomotive with a capacity

Gas-piston maneuvering locomotive TEMG1 in the Orenburg region

of 2000 hp and 200 sections of diesel locomotives of this series were produced. In total, 13,500 sections of mainline diesel locomotives and 5,840 mainline electric locomotives were built in 1956 to 1970. As a result of replacing steam locomotives with diesel and electric locomotives, transportation costs were reduced by 35-40% and labor productivity increased by 2.5 times, while the speed of locomotives increased by 2 times. From 1970 to 1990, diesel locomotives of various modifications of the 2TE10, 2TE10M and other series were also created.

For passenger transportation, the Kolomna Diesel Locomotive Plant produced TEP60 diesel locomotives in two versions from 1960 to 1987. A total of 1,241 single-section TEP60 and 116 two-section 2TEP60 were built. In the 1970s and 1980s, TEP60 diesel locomotives were the main passenger diesel locomotives on the railways of the former Soviet Union for long-distance trains. The same plant produced TEP70 passenger diesel locomotives from 1973 to 2006, and since 2006, it has been producing the TEP70BS diesel locomotive based on it, which is widely used today, including in passenger transportation in Uzbekistan.

The ever-increasing demands for increasing train weight and speeds determine the need to create increasingly powerful locomotives. Today, as part of JSC Transmashholding (Russia), the Bryansk Machine-Building Plant produces modern diesel locomotives of the TEM 18DM, 3TE28, 3TE25K2M series. JSC Kolomensky Zavod designs and produces new-generation passenger and freight diesel locomotives - TEP70BS, operating on the railways of Russia, the CIS and the Baltic States.

Modern diesel locomotives are equipped with high-tech control, automation and monitoring systems. Hybrid models are being developed that combine diesel and electric drives, which helps reduce carbon emissions and increase efficiency.

Taking into account global trends to reduce carbon emissions, diesel locomotive construction is also changing. Manufacturers strive to create environmentally friendly models of diesel locomotives, reducing their impact on the environment. In this regard, an important task is the transfer of autonomous locomotives to alternative types of fuel, including gas. It is proposed to solve these problems by using gas turbine engines in locomotive construction. Such a diesel locomotive has 2 gas piston engines with a total capacity of 824 kW, gas fuel consumption is less than 182 g / kW * h, which allows reducing fuel costs by 50% and CO^2 emissions by 40% compared to diesel. The speed of these diesel locomotives is 100 km / h, and the locomotive refueling time with gas is 40-50 minutes.

The history of diesel locomotives is a history of pioneering engineering solutions, innovations and their adaptation to the demands of the times. Diesel locomotives have played a key role in the development of rail transport and remain an important part of the transport system of many countries around the world. And, from the first models developed at the beginning of the 20th century to modern highly efficient locomotives, diesel locomotives continue to occupy an important place in the rail transport system.

Maneuvering diesel locomotive CHME3

The Sch-EL-1 diesel locomotive with M.Ya. Gakkel's electric transmission system, built in 1924, in the Central Museum of Railway Transport of Russia, St. Petersburg

Amazing secrets of the mirror

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Mirrors have been a subject of mystery and wonder for centuries. They were used to see one's own reflection, as well as for mystical and magical purposes, such as fortune telling. The history of mirrors is very extensive and complex, full of intrigue and mystery. From the time of ancient civilizations to the present day, mirrors have played an important role in the life of mankind. If you are interested in the history of mirrors, we will introduce you to several interesting opinions.

It is known that the earliest examples of mirrors were made of polished obsidian or copper. The ancient civilizations of Egypt and Mesopotamia used them for both practical and religious purposes. Mirrors were considered gateways to the spiritual world and were often used in fortune telling and other mystical practices. In the 2nd century BCE, a piece of polished bronze was used as a mirror. The first known modern mirror appeared 1,300 years later, in 1254 to be exact.

The first glass mirrors were created by the Romans in the 1st century CE and were made by coating polished glass with a layer of reflective metal such as silver or tin. These mirrors were very expensive and were used only by the rich and wealthy.

By the 14th century, Venetian glassblowers had developed a new technique for making mirrors by coating the back of the glass with mercury, creating a highly reflective coating. This mirror, being cheaper than the previous one, had very quickly become widespread.

Mirrors have historically played an important role in art. Many famous works of art, such as Jan van Eyck's "Arnolfini Portrait", feature a mirror as a central element. Mirrors have also been used in art to create optical illusions, such as the curved mirrors in amusement parks.

The mirror is also used in literature as a symbol of reflection of the inner world and introspection. Alice, the main character in Lewis Carroll's novel Through the Looking-Glass, enters a fantasy world through a mirror. The mirror represents an entrance to other wonders and represents the concept of the hero's self-expression in a world of wonders.

Reflection can be divided into two types: specular reflection and diffuse reflection. Specular reflection occurs when light reflects off a smooth surface and the reflection is clear and sharp, like looking into a mirror. Diffuse reflection occurs when light reflects off a rough surface and is scattered in different directions, like looking at a mirrored wall.

A mirror is an object that has many uses, including windows, telescopes, microscopes, and even solar panels. Mirrors are used to create a crisp, clear image of an object. Telescopes and microscopes use mirrors to magnify and view objects that are too far away or too small to see with the naked eye. Solar panels use mirrors to convert sunlight into electricity and concentrate it in solar cells. The most common use of reflection is in telescopes. By reflecting light off a series of mirrors, astronomers can observe the universe in incredible detail. For example, the Hubble Space

Mirror, silver and copper alloy.
Ancient Egypt, New Kingdom, Dynasty 18, 1479-1390 B.C.
Brooklyn Museum. Charles Edwin Wilbour Fund

Bronze mirror. 17th -16th centuries BCE. Sopollitepa

Telescope uses mirrors to produce images of distant galaxies and nebulae. Mirrors and other reflective surfaces are often used in architecture to create interesting visual effects and make a space feel larger than it actually is. For example, The Bean sculpture in Chicago's Millennium Park uses a polished surface to reflect the city's skyline (The Bean is the popular nickname for Anish Kapoor's Cloud Gate sculpture, which we discussed above).

Whether we use mirrors to get ready in the morning or use telescopes to study distant galaxies, the process of reflection in mirrors is an integral part of our lives.

Mirrors have always been shrouded in an air of mystery. They are often used in horror films to evoke a sense of uneasiness, and many cultures believe that mirrors have supernatural properties. The mysteries of mirrors continue to fascinate us, and understanding the science behind them only adds to their appeal. Their ability to reflect light and form images has led to many scientific and philosophical debates, and even some superstitions. One of the most interesting aspects of mirrors is their variety of appearances and peculiar properties. Studying these types of mirrors can tell us a lot about the nature of mirrors, optics, and even our perceptions.

There are three types of mirrors: flat, concave, and convex. Airplane mirrors are flat and reflect light evenly, creating a specular image. Concave mirrors curve inward and reflect light inward, creating a larger image. A convex mirror curves outward and reflects light outward, creating a smaller image. Car mirrors are the most common types of mirrors that we come across every day. They have a flat surface and create a virtual image of the same size as the object being reflected. They are used for a variety of purposes, from personal grooming to scientific experiments. The best example of a car mirror is the rearview mirror, which allows the driver to see what is behind them without turning around.

Concave mirrors: This mirror has a curved surface that is convex inward. They are used to focus light and create realistic images that are projected onto a screen or surface. An example of a concave mirror is a makeup mirror, which magnifies the size of the face's reflection.

Convex mirrors have a curved surface that bends outward. They are used to diffuse light and create virtual images that appear smaller than the reflected object. An example is the safety mirror used in stores and parking lots, which allows people to see around corners and other blind spots.

Two-way mirror: This mirror is partly reflective and partly transparent, allowing light to pass through on one side and reflecting it back on the other. They are used in investigation and entertainment areas such as interrogation rooms or magic shows.

Mirrors in funhouses have a distorted shape that creates funny and unusual reflections. They are used in entertainment venues such as carnival houses or amusement parks. The wavy mirror creates distorted images of people that are interesting to look at and take pictures of.

The mirror is an object that has been around for centuries and has amazing properties. But did you know that mirrors can read minds? This possibility was inspired by the idea of mirror neurons, a type of brain cell that responds in the same way when we take an action and when we watch someone else perform the same action. Mirror neurons were first discovered in monkeys: a certain neuron was found to activate when a monkey performs an action and watches another monkey perform the same action. This led to the idea that the neurons play a crucial role in understanding the actions of others and in learning through imitation.

One of the most interesting aspects of mirror neurons is their connection to empathy[1]. Mirror neurons play a crucial role in our ability to understand the emotions and intentions of others. When we see someone else perform an action, our mirror neurons fire in the same way as when we perform the same action ourselves. This allows us to "mirror" the feelings and intentions of the person we are observing, which in turn helps us better understand them.

The mirror neuron system is a network of neurons scattered throughout the brain. These neurons are located in areas involved in movement, vision, and grasping, indicating that they play a role in all of these areas. The mirror neuron system is thought to be involved in a wide range of processes, from imitative learning to social cognition.

When it comes to mirrors, there are countless myths and legends that have been passed down

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Jan Van Eyck. Portrait of Giovanni Arnolfini and His Wife, 1434

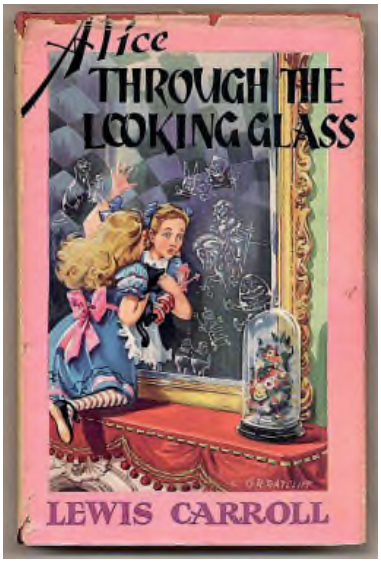
through the ages. Some believe that mirrors have supernatural powers and can be used to communicate with the dead or even summon evil spirits. Others believe that mirrors are simply reflections of ourselves and the rumors surrounding them are nothing more than legends and superstitions. No matter what you believe, there is no denying that mirrors have a mysterious and fascinating history. Breaking a Mirror Will Bring You Seven Years of Bad Luck: This is probably one of the most popular superstitions associated with mirrors. People believe that if you break a mirror, you will have seven years of bad luck. This superstition dates back to ancient Rome, where mirrors were believed to be able to reflect a person's soul. Therefore, breaking a mirror was considered a sign of great misfortune, as it meant that the person's soul was somehow damaged.

Mirrors have long been associated with self-reflection and introspection. Some people believe that mirrors can reveal hidden truths about ourselves and the world around us. For example, a mirror can reveal a hidden flaw in our appearance or a secret about our personality. The concept of mirroring is evolving with advances such as virtual reality and augmented reality, which reflect our physical world and expand the boundaries of our perception. A mirror not only reflects existing reality, but also creates new realities, expands the boundaries of what we accept as truth, and creates doubts about our understanding of the nature of reality.

Some believe that mirrors are portals to other dimensions. The Maya believed that there were several worlds beyond the human world. They believed that portals connected these worlds and that there was a connection between the portals and the worlds. Evidence suggests that the Maya believed that reflective surfaces, such as mirrors and bodies of water, were portals to spirit worlds. Combining archaeological, iconographic, and linguistic evidence, it can be said that the Maya believed that the mirror served as an important ritual gateway between humans and the gods and was a two-way portal between the earthly and spirit worlds. There is some truth to the fifty-one scenes of mirrors on Maya painted pottery, how they were used in court life, and what they may have meant to the people who used them, which is interpreted as objects functioning as portals between worlds.

The superstitions and legends surrounding mirrors are varied and interesting. In almost all cases, there is a belief that a mirror is a special window into the other world, through which the dead can pass in both directions. The symbolism and meaning of mirrors in art is vast, and different cultures and periods have used them in their own ways. Some use the mirror to reflect reality, while others use it to distort it.

Lewis Carroll. Cover of the book "Alice through the looking glass", published in Great Britain in 1955



Some use it to represent vanity, while others use it to reflect their inner selves.

One of the most common uses of mirrors in art is to reflect reality. This can be seen in the works of many artists, such as Jan van Eyck's "Arnolfini Portrait", where the mirror in the background reflects the scene in front of it and gives a second perspective of the room and its occupants. Another example is Diego Velázquez's Las Meninas, where the mirror in the background reflects an image of the king and queen that the viewer cannot directly see. In these works, mirrors are used to create a sense of depth and realism, giving the artist a wider view of the scene.

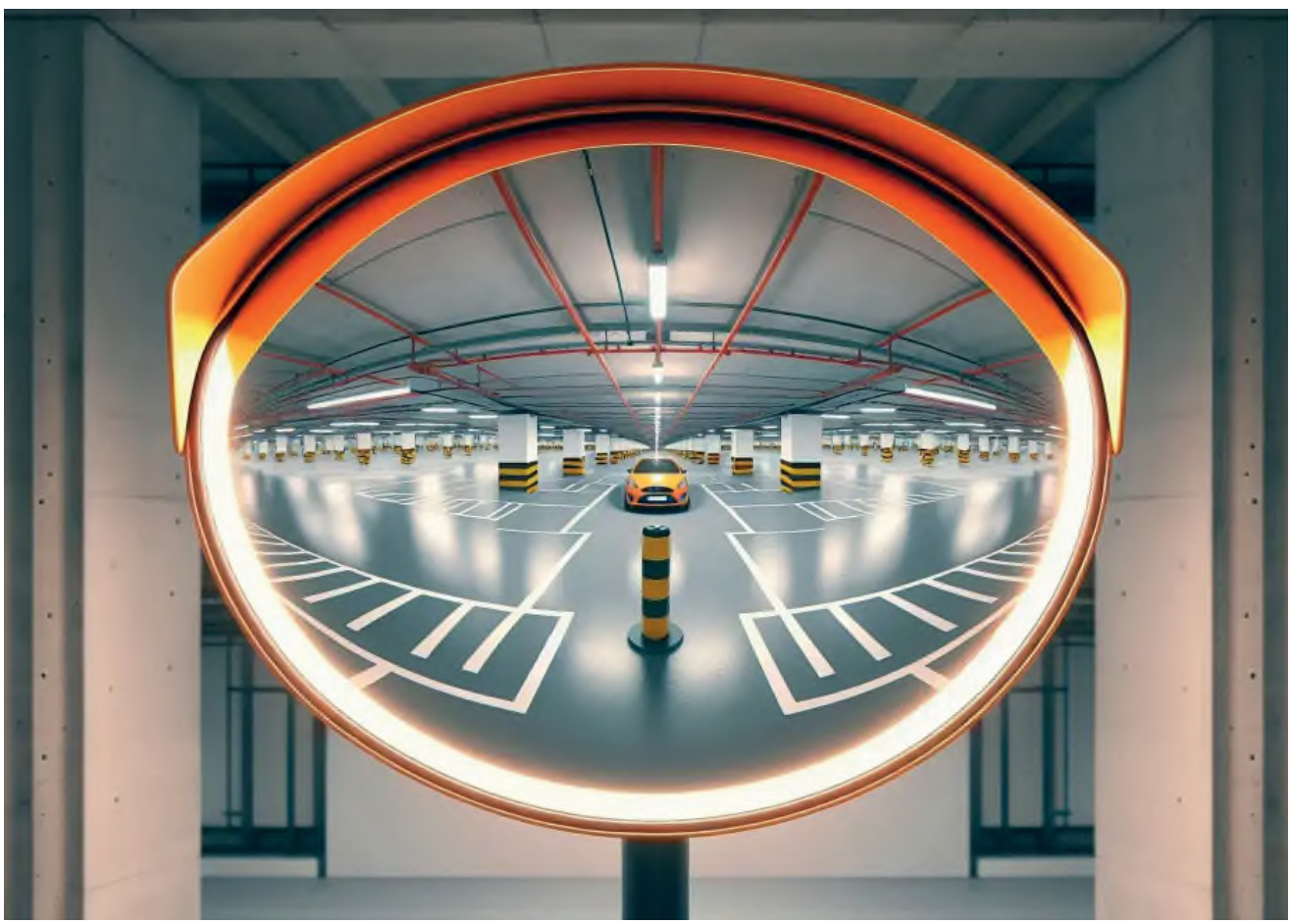
Some artists use mirrors to reflect reality, while others use them to distort it. This can be seen in the work of surrealist artists like Salvador Dali, who often used mirrors to create a sense of disorientation and uneasiness. In his work The Persistence of Memory, the distorted reflection of a melted watch in a mirror creates a sense of confusion and instability. Similarly, in Rene Magritte's The Human Condition, a mirror reflects an external scene, creating the illusion that the painting is a window into another world. By distorting reality, these artists challenge our perceptions and make us question our understanding of the world around us.

Finally, mirrors are used to represent the inner self, reflecting feelings, thoughts, and desires that lie beneath the surface. This can also be seen in the work of contemporary artists such as Anish Kapoor, whose Cloud Gate mirrors the surrounding cityscape while distorting the viewer's image. Similarly, in Yayoi Kusama's Infinity Mirrors, multiple mirrors create one infinity mirror, representing the infinite possibilities of the inner self. In these works, the mirror is used to express the complex and multifaceted nature of the human psyche, reflecting both the outer world and the inner self.

In art, mirrors continue to fascinate and inspire both artists and viewers, opening a window into the human experience and questioning our perception of reality. Whether used to reflect the world around us or to distort it, the mirror remains a powerful symbol in the artistic landscape, representing both the beauty and mystery of the human being.

In literature, the mirror is often used as a symbol of self-reflection, allowing characters to see themselves as they really are. This can be seen in works such as Oscar Wilde's The Picture of Dorian Gray, where the protagonist's portrait acts as a mirror that reflects the true self that he tries to hide from the world. Similarly, in Charlotte Perkins Gilman's The Yellow Wallpaper, the heroine's obsession with the pattern on the wallpaper is a metaphor for self-reflection as she becomes increasingly aware of her state of mind. The mirror is also used in literature to create a sense of mystery

Convex mirror



Cloud gate (The bean) – public sculpture. Anish Kapoor. 2004-2006. Chicago, USA

and intrigue. In Edgar Allan Poe's short story "The Fall of the House of Usher", the narrator describes a tarnished mirror that reflects the dilapidated state of the mansion and its inhabitants. The mirror creates anxiety in the narrator and enhances the overall effect of the story being told. Mirrors can also be used in literature to reflect the society in which the story is set. In the novel The Great Gatsby by F. Scott Fitzgerald, the characters are obsessed with their image and the image they present to society. The use of mirrors in the novel shows the superficiality of the characters themselves and the society they live in.

Mirrors can also be used to develop a character's personality and motivation in literature. In Lewis Carroll's Through the Looking-Glass, the main character Alice finds herself in a world where everything is upside down, including her own reflection. This reflects Alice's confusion and uncertainty about her identity and place in the world. The use of mirrors in literature is a powerful tool for exploring the human condition and can provide valuable insight into characters and the society they live in.

Reflection is also a key element in photography and is used to create interesting and dynamic compositions. Photographers often use mirrors and other reflective surfaces to create interesting images. Reflection is an ongoing area of research, with scientists and engineers continually developing new and innovative ways to harness its power. One area of particular interest is the development of reflective coatings that can help improve the energy efficiency of buildings and vehicles.

As we can see, reflection is a wonderful and extremely useful phenomenon, with many practical applications. From telescopes to fiber optic cables, mirrors and other reflective surfaces have proven to be invaluable tools in science and technology.

Traditions of storing tughs in the places of worship in Bukhara

Uktamali Ravshanov,
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The Bukhara State Museum-Reserve, created more than 100 years ago, preserves unique examples of material culture. Among them are thousands of religious, ritual, ethnographic, historical, archaeological, and numismatic and other finds. Among the historical objects stored today in the museums of Bukhara, *tughs* (35 examples in total) have a special historical significance and have not yet been covered from a scientific point of view.

"*Tugh*" in the Old Turkic language means "flag, object above the flag, flag of a military unit." The term "*tugh*" was preserved even when the Arab culture became widespread (the Arabs designated the flag by the word "*a'lam*"). This is explained by the large-scale military campaigns carried out by the Turkic tribes in later periods, and the obligatory raising of battle flags (*tughs*). The term *tugh* is also used in its meaning by the Mongolian, Chinese, Tibetan and Indian peoples.

The *tughs* are not only a symbolic sign of Islam, they were also used by the local population before the spread of Islam in Central Asia. States, tribes, and individual military formations considered the *tughs* to be the abode of their divine powers, and placed images of wolves, dragons, signs showing the four cardinal directions, birds of prey, and other figures and images on the top of the *tughs*. With the spread of Islam in Central Asia, the use of the *tughs* underwent a transformation. Now, in addition to their previous function, the *tughs* were also supposed to reflect elements of Islam. Although these *tughs* have survived to this day, their perception by the people is far from their original essence. This is why it became necessary to study their historical position.

Tughs were mostly installed on the tombs of famous saints. The main purpose of these *tughs* was to show pilgrims the way to the saint's grave or the adjacent cemetery from afar. The flags also reminded believers of the duties of a Muslim with their appearance - shape, components and various signs (or letters). In other words, *tughs* also had the ability to exert a religious influence on people. *Tughs* usually consisted of the following components: a pole made of a long trunk, tapering towards the top, the upper part - "*taji tughs*", a belt fastening the pole and *taji tughs* together, an image of an open palm of the right hand - "*panja*" (in Farsi), "*hamsa*" (in Arabic), a triangular white (sometimes black and brown) fabric, a pomegranate, bells, horse hair or a yak's tail, a crescent, a five-pointed star and other symbolic elements. In addition, attributes of ancient ideas have been preserved on *tughs* in various regions of Central Asia. For example, a ball of fabric of seven different colors tied to the top of the flag represents the seven heavens or the ladder leading to them (in shamanism, if a white cloth is tied over a rope, the rope itself also serves as a flag). Horse hair or a tail (sometimes a yak tail) was used on the flags of the ancient Turks as a symbol of valor and bravery. The banner of Genghis Khan was called the "nine-legged *tugh*" ("*esun kaltu chakhaan*" in Mongolian, "*tughi* nuhpoya" in Farsi). After the death of Genghis Khan, a belief arose that his soul made this banner its abode. This is why subsequent khans used this "*tughi nuhpoya*" as their banner.

Horsehair from the forehead of a horse was especially valued. In shamanic rituals, before starting any business, water is sprinkled on the four cardinal directions. If a person was on horseback, water from his palms was poured out of the horse's head. That is why attributes that do not repeat each other acquired different meanings. Crescent and five-pointed star - in Islam, the crescent moon marks the beginning of time. That is why we find its image in different places. The star has five (eight) rays and is always placed inside the crescent (in the new moon phase) or circle. These symbols are mainly reflected on flags. For example, it has long been used as a state symbol in Bukhara, Kokand, Khiva, Turkey and a number of other Muslim countries. In ancient fetishistic ideas and shamanism, a branch of *jigda* or a thorny tree was used to summon and drive out spirits. Among the Turkic peoples, square and triangular panels are attached to the top

Tughi nukhpoya. Mongolia. Bayan Ovoo valley. Photo: Ali Bahranmpour. 2024.

of the flag, on which the symbols of the tribe are displayed in different colors and images.

The height of flags in pilgrimage sites also indicates the authority of the person buried there. Large *tughs* made of precious metals are erected on the graves of famous sheikhs and saints. According to some researchers, *tughs* began to be used more often to designate a pilgrimage site since the 14th century. The installation of *tugh* on the graves of warriors for the faith (*ghazi*) shows their religious and military functions. White or red cloth on top of the *tugh* indicated the grave of a ghazi. Among nomads, the white cloth on top of the *tughs* was called "*yakhlik*", and the woven ribbons were called "*helem*". The Arabs call the military flag "*sayfi a'lam*", and the religious flag "*bandi a'lam*". The vertical installation of the flag signifies the connection between "heaven and earth", the world of "people and spirits". If we approach the customs of installing *tughs* in the Bukhara oasis, which is the main object of the study, then "*panja*", name of Hasan on the ring finger, and the name of Hussein on the little finger. Some *panjas* have "Allah, Muhammad, Ali" written on them. Some others have "la ilaha illallah Muhammadar-rasul Allah" written on them, besides the names of Allah, Muhammad, Fatima, Ali, Hasan, Hussein. There is another type of *tughs* in the form of a forked branch, on which is written "La fata illa Ali la sayfi illa zulfiqar" , that is, "Ali, the owner of the sword Zulfiqar, was the first to accept Islam", "Muhammad rasulullah Ali waliyullah", which means "Muhammad is the Messenger of Allah, Ali is the friend of Allah", in the center of the back side are written the words "Nasrun minallahi wa fathun qarib" - "Victory from Allah, victory is near". We can find these verses on other *tughs* as well. Also, the *panja* is a symbol of Abul Fazl Abbas. It is a symbol of his being a standard bearer during the incident in Karbala, and of the fact that Abul Fazl Abbas' hands were cut off on the Karbala desert.

Types of tugh tops - in the form of a) a star and a crescent moon, b) a figure resembling a pomegranate fruit and c) a panji - an open palm

"pomegranate", "horsehair", "bell", "crescent and star" have symbolic meaning. They can be classified as follows:

"Pomegranate" is a metal copy installed on the graves of those who know "*quddus as-sirruhu*", i.e. the secrets of Allah, learned these secrets from the holy Khidhr. It also signifies the inability of a person to know what is inside the pomegranate, i.e. one should not judge by its appearance. From the Sufi point of view, an attempt was made to explain using the example of the pomegranate that with penetration into the essence of Islam, one learns the diversity of its secrets. To summarize, it can be said that the pomegranate acquired a Sufi significance, and "*tajitugh*" - "pomegranate" was installed on top of the *tughs* on the graves of all seven *pirs* (saints) of Bukhara.

"Horsehair" - in addition to the above magical processes, horsehair has acquired the meaning that after a person's death, his path passes through the "orphans" - a bridge that is very thin and sharp, like horsehair.

"*Panja*" is an ancient attribute that has acquired special symbolism in various religions and beliefs. In Zoroastrianism, *panja* means "water-fire, earth-air, faith" (water, fire, earth, air and faith); it is an open palm of the right hand. The name of Muhammad is written on the thumb, the name of Fatima on the index finger, the name of Ali on the middle finger, the

In 1985, during excavations in the Bukhara region in the Kizbibi shrine, a large *tugh* dating back to the end of the 19th century was found. The *tugh* is surrounded by an ornament. In the center is a *panja*. The prayer written on the front side of this *panja* is as follows: "Yadullahi favqi aybihim rabbana la tazhalna fitnatan bilqawmi zalimin" , that is, "The hand of Allah is over your hands (*everything is in the power of Allah*), Lord, do not sacrifice us to hostile tribes", on the back it is written: "Rabbana istan baynana wa baynaqawmina bil haqqi wa anta khairul fatihin" , i.e. "Lord, reveal to us and our people the true path, you are undoubtedly the best of the winners (those who pass judgment)", the lower part is in the form of a leaf, above is the date: 1287 AH - 1870-1871 CE. It was in this sanctuary that the "*tughbardori*" ceremony was held every year on the eve of the Navruz holiday. During the ceremony, people from the surrounding areas and distant lands gathered and replaced the *thugs* of the shrine. On this day, pilaf was prepared for the people. Abdumumin Hakim, who witnessed this event, recalls: four tall poplars were processed by a carpenter and connected to each other with iron rings and nails, removing the old *thug* (although it could have stood for several more decades), many people erected a new one. Three to four thousand people gathered at this ceremony and many sheep, goats and money were donated. In Judaism, Islam and Christianity, the top of the *tugh* was often used to protect against the devil, enemies

and envious people. In the Middle East and North Africa, where Islam is widespread, the names "*Hamsa*" and "Palm of Fatima" are widely used.

The *tugh* with the inventory No. 5306/11, kept in the collection of metal objects of the museum, consists of three parts – "pomegranate", "*tajitugh*" and "*panja*". The front part of the "pomegranate" depicts the mosque of "Mawlana Abbas", on the sides "Allah, Muhammad, Ali, Fatima, Hasan and Hussein" are inscribed, on the back part - "Bil fazlil Abbos", that is, "Grant enjoyment of the virtues of Abbas", in the circle located in the center – "Nasrun minalloh wa fatkhun qarib" and words about the virtues of Ali, on the front and back side of the upper part of the "*tajitugh*" it is written the 256th verse "Ayat al-Kursi" of the Sura of "Baqara". The tughs brought from the tomb of Bahauddin Naqshbandi are very large and confirm the opinion stated above. And now in the sanctuary a similar tomb has been raised over the graves where the saint's mothers and aunts were buried and which are objects of pilgrimage.

The height of the tughs, their number, and the material from which the "*tajitugh*" was made also indicated the level and authority of the saint. For example, the museum's collection of metal objects also includes tughs made of silver. For example, the tugh brought from the tomb of Bahauddin Naqshbandi is very large, and the words "O Allah, amali usta Abdulhakim (the name of the master who made it), 1300 AH (1882-1883 CE)" are written on it. The tughs also served as markers. As a result of the burials of local residents around the saint's grave, this area turned into a large cemetery. And the tugh showed pilgrims the location of the saint's grave.

In medieval miniatures we can also see the use of thugs in various situations. For example, in the miniature of Masud ibn Usman Kuhistani from 1540 for the work "The History of Abulkhair Khan" the funeral ceremony of Shiruye, the son of the Shahanshah of Iran Khosrow Parviz from the Sassanid dynasty is depicted. In the miniature with thugs placed on top of the military flags of the state, in the image of the crossing of the Khorezmshah Jalaliddin across the Indus River, military thugs are shown raised by the Mongol warriors who remained on the other bank of the river. In the image of the battle of Sultan Masud of Ghaznavi with the Seljuks, we see that the Seljuks raised exactly the same flags. These thugs were not raised just like that, but only in special, "royal" cases (i.e., in the place where the thug was raised, there were representatives of the ruling family).

From the above, we can conclude that tughhs in the form of *tajitugh* were raised during mourning ceremonies and installed on graves. Also, tughhs of this form are widespread among the Mongols. In the Bukhara oasis, a "panja" element is attached to such tughhs. Today, tughhs of this type in this form are installed on the graves of saints and in the *husayniyhan* (the place where Shiites hold Ashura ceremonies).

Shiites (a sect of Islam) still place the "panja" on top of flags. In Najaf (Iraq), a renewed "panja-oftob" (the Sun) was installed above the Hazrat Ali Mosque. That is, after Nadirshah made a pilgrimage to Najaf, he ordered the construction of a large dome over the Hazrat Ali Mosque and ordered the verse "The Hand of Allah is above their hands" to be written on its top in Arabic, and in later times this became a custom. Elements of the tughs were used as decoration in embroidery and coppersmithing and were called "tughbarg", "tughgul". The decoration in the form of "panja" used in jewelry was called "Fatima". These decorations are mainly made in the form of necklaces.

Tugh is one of the attributes that demonstrates ancient ideas and their adaptation to Islam. Tugh can now be found only on religious objects. Historically, they were used for military, ceremonial, religious and pilgrimage purposes. Just as any object from the past conveys information, so too do tugh help to understand the ethnographic, religious and pilgrimage traditions of people of the past and present.

Sheikham. "Fight scene". "Gulistan". Saadi. 975/1567-1568, l. 14b. Calligrapher – Mir Ali Khusaini. British Library

What affects the preservation of monuments?

Makset Karlybayev,
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Veneration of holy places is a centuries-old tradition of the peoples of Uzbekistan in general and Karakalpakstan in particular. The tradition continues to be preserved, despite ongoing discussions regarding its correctness or the necessity of this cult from the point of view of the religion itself. The so-called "rites and customs" ('urf va 'adat) have found legitimacy in their actions, including the rituals practised during pilgrimages to the graves of "saints".

In works on fiqh, the most common reference is to the hadith: "At first I forbade you ziyarat of graves. Now perform it, for it will remind you of the Day of Judgement." Other authors refer to the so-called "weak" (i.e. with an unreliable chain of narrators—isnad) hadith: "When you despair in affairs, seek help from the inhabitants of the graves." However, as often happens, the interpretation of the "limits of the permissible" from the point of view of the prescriptions of fiqh was interpreted by theologians in different ways: from the permissibility of the "ziyarat" rite to its complete rejection. It should be taken into account that the ritual performers (in our case, pilgrims) perceive their actions as part of Muslim rituals. Based on these considerations, we will not undertake to discuss or, moreover, condemn the actions of pilgrims. The question, or more precisely, the problem, lies in another plane—the influence of these traditions on the quality of preservation of pilgrimage sites, on the one hand, and tourist sites, as well as cultural heritage monuments, on the other. I. Pankov correctly points out that scholars often limit themselves to a simple description of pilgrimage sites: "study the hagiography of the saint, legends and myths, less often—the ritual practised in the sanctuary," while the actors themselves, performing the pilgrimage ritual, remain outside the scope of scientific interests.

The preservation and transfer of cultural and natural heritage to future generations is a pressing issue not only at the level of one individual country, but also at the global level. That is why UNESCO included problems related to cultural and natural heritage monuments (CHM and NHM) in one of its priority tasks and adopted the most important documents that are mandatory for implementation subject to their ratification. In Uzbekistan, serious attention is paid to CHM issues; not only domestic specialists but also foreign ones are involved in the conservation and restoration of CHM.

Extensive research work has been carried out within the framework of research and development of the country's research institutes specialized in the humanitarian sphere. The issues of preserving the cultural heritage monuments are the prerogative of the Cultural Heritage Agency. Unfortunately, research institutes specialized in the field of conservation or restoration of architectural, historical, and archaeological monuments have not been created. In the meantime, the issues of forming and strengthening the attitude of society to cultural heritage require scientific study, development of approaches and methods, especially with the use of advanced technologies. The solution of such problems requires both compliance with the laws on cultural and archaeological heritage, and the development of relevant regulations and decrees at the government level.

The words of Winston Churchill "first we create houses, and then they create us" have a profound meaning. The house is the result of centuries of human labor, and we, as its successors, use this heritage. With the development of mankind, not only the appearance of the material and immaterial, natural and cultural world changes, but also their content. Let us pay attention to two key factors, although there are many others. The choice of these two factors is determined by our right of choice, the right of the user and owner of the heritage of our ancestors. Other factors, at least many of them, are beyond our control—natural disasters, political, ideological and others, affect not only the quality of preservation, but also the very

Growing stones of wishes on the Mount of Shaykh Jalil Bobo

Mizdakkhan. Khojeyli district. 7 stones

existence of a cultural heritage site. It should be noted that examples of the destruction of cultural heritage sites can be found in various regions of the world, for example, in Syria and Afghanistan. These cases are small but significant examples accompanied by large losses. It is also worth mentioning the destruction that occurred during the years of Soviet power when many ancient monuments were demolished. It should be emphasized that the Soviet power did not completely destroy ancient monuments; thousands of them were preserved during those years, but the ideological situation often deprived them of the opportunity for further preservation. This illustrates the ideological aspect of the destruction of heritage. But other examples depend on you and me. Each reader can give dozens of examples of the manifestation of personal qualities in the preservation of natural or cultural heritage sites. This is our right to choose and express our civic position. Based on these considerations, we would like to focus on two factors that significantly affect the preservation of cultural heritage. The first is the measures taken by the state. Despite the word "state," it is necessary to note the presence of the human factor when a person takes responsibility for actions aimed at preserving cultural heritage objects.

Uzbekistan, which includes the Republic of Karakalpakstan, has a rich historical, archaeological and architectural heritage. The state allocates large funds for conservation and restoration work on monuments. Thousands of monuments across the country are under state protection, which implies a certain guarantee of their preservation in the form in which we received this heritage. However, a number of questions arise here that turn the problem into an acute one. Questions often arise: Who is engaged in the conservation and restoration of architectural monuments? What is the training of these specialists? What are their qualifications? What scientifically based methods and approaches do they use?

A very important point in this matter is the lack of study of the bulk of monuments, which means that when research work begins, all the restoration work carried out before will be useless. Usually, the preservation of immovable cultural heritage is understood as both the measures prescribed by law and those undertaken by society: "measures aimed at ensuring the physical preservation and preservation of the historical and cultural value of a cultural heritage site, providing for conservation, repair, restoration, adaptation of a cultural heritage site for modern use, and including scientific research, survey, design, and production work...". There are different ways to solve the problem of protecting and preserving immovable cultural heritage. A public-private partnership against the background of the rapid development of a profitable economy is one of the positive solutions to this problem. Today, there is a world practice of such business management, and it is necessary to study the positive (success factors) and negative (risk factors) experiences.

Each state solves this problem differently. For example, in Tunisia, we have witnessed a public-private partnership. Several monuments remain on the balance sheet of the state; others are transferred

by mutual agreement on a contractual basis to private structures: for a hotel, a retail outlet, a food outlet (cafe, restaurant) or other purposes. The most interesting thing is that a private person who undertakes to use this monument not only preserves the authenticity of the monument and does not violate the integrity of the monument, but also undertakes to maintain it in the condition in which it was received. Any activity aimed at maintaining the monument is coordinated by the state. We saw how they restored a medieval fortress dwelling (ksar Hadada), which is under state protection but is used by a private person in the form of a hotel. This person finances at his own expense the restoration process, which is carried out by restorers and archaeologists. Not a single third-party worker or mercenary. Student interns are also involved in the process. An experience worth studying and learning.

A very illustrative example could be the medieval and, at the same time, modern city of Celle in Germany. The population lives and works in the houses of this city of the 16th-17th centuries, and each owner undertakes to preserve the building in its original form. Local authorities (that is, one can say the state) monitor and control the relevant structures.

Uzbekistan also has its own experience in this area—the experience of using CHM by the local population as private houses or other institutions (for example, Ichan-Kala in Khiva, Khorezm region). It should be understood that by giving CHM to private use, the state does not care about additional income but relieves itself of some costly obligations, placing this on private shoulders.

That is, each country pursues its policy of preserving historical and cultural heritage and has its sources of funding—budgetary or private sponsorship. The creation of museums is considered "unprofitable" and economically ineffective somewhere, and somewhere an important measure to ensure preservation. There are various models of attitude towards monuments in the world: a scientific and educational complex (when monuments serve as a kind of scientific testing ground; useful for scientific purposes, for organizing expeditions, joint research, grants, etc.), a model of a historical and cultural reserve (dozens of jobs for service personnel appear, i.e., a structure is created), a model of a tourist complex (various branches of tourism are developed, primarily domestic tourism; infrastructure will appear around the monuments, and, accordingly, also jobs). The second factor influencing the quality of preservation of the CHM is our traditions and customs. As an example, we can consider the custom of putting 7 columns of stones. We have conventionally designated this tradition as "7 stones". In fact, in different places of the country, traditions associated with stones have their characteristics. For example, at the "Narinjan Baba" monument in the Ellikkala district of Karakalpakstan, visitors (pilgrims) leave individual (piece) stones on the surface of the holy place: on the tombstone, on the fences, etc. (Fig. 1). On Sultan Uvays Baba in the Beruni district or Shaikh-Jalil Baba in the Karauzyak district (Fig. 2) there is a tradition of piling up pebbles. Over time, a huge hill grows out of such piles. Our observations have shown that these are "wish stones" left by pilgrims. In Mizdakhkan (Khojeyli District), stones are collected in the form of a column in a strictly defined quantity of 7 pebbles. Bricks and fragments of walls of preserved architectural monuments are mainly used as pebbles (Fig. 3). These and a number of other similar places are the most visited sites in Karakalpakstan. The number seven is associated by some researchers with its sacredness in connection with the holy places in Mizdakhkan: the Shamun Nabi mausoleum with seven domes, the Jeti Sahaba (Seven Companions) *saghana* next to the Khalifa Erejep mausoleum.

Soviet ethnographer Yu. Knorozov wrote back in the 1940s that on the Jumart Kassab hill on Mizdahkan there was a tradition of piling stones into columns, while the mausoleum with 7 domes of Shamun-nabi did not have them. The custom of "putting up columns (or miniature dolmens) of stones is connected with the idea that after the death of the person who put up such a column, his *arvakh* (spirit) will settle in this column. Thus, the columns represent a magical imitation of a tomb—a dwelling place for the spirit, regardless of the fate of the body." Field observations on Mizdahkan or other places where there is a tradition of piling up stones at holy places show that the main motive is the desire of the pilgrim who leaves or collects these stones into a column/pile. Over time, due to various phenomena, these desires, according to the beliefs of pilgrims, come true. Returning to the "functional purposes" of the stones, it would be interesting to recall the information of the ethnographer G.P. Snesarev, who, while studying the rituals and beliefs in Khorezm, noted a magico-animistic technique in the pilgrimage ritual, typical for the region: "From two or three bricks, the pilgrim builds the so-called *arvakh* ui, i.e., the house of the ancestors, a kind of burial structure (the bricks are

The Stone of Wishes. The Complex of Sultan Uvais Bobo. 17th-19th Centuries

placed on edge)," where the spirit of the deceased supposedly settles. The tradition of stones on graves is also found in other cultures. For example, in the Jewish tradition, stones on graves are associated with various legends—with Cain, who covered the body of his brother Abel with stones, or with fragments of the destroyed temple in Jerusalem, with a monument to all the Jews from 12 boulders—the 12 tribes of Israel, or a simple explanation—the eternity of stones instead of flowers that quickly fade. According to another version, through the stone on the grave, they show "the connection with the deceased, respect, and eternal memory of him."

Stones (mostly more or less large in size) are also found in Russian traditions: "a stone (small - the size of a cobblestone or a small boulder) is placed on the grave, usually after the fortieth day." The tradition of leaving stones on the grave did not disappear even when the local population changed. According to D.V. Gromov, these stones seem to serve as a home for the soul of the deceased or a "window" for contact with a living person. Another version of the existence of a tradition associated with laying a stone on a grave is interesting - "Our grandmother always told us that the guardian angel of the deceased sits on a stone when he flies to visit him. He is not allowed to come down to earth, so he sits on a stone," that is, here there is an appeal to the Gospel image, as the author of the article believes.

This tradition, as we can see, has much in common with somewhat "formed" (from the word form, type) differences. In many cases, the stone is associated as a stopping place / "home" of the soul of the deceased or angels. It seems to us that in most cases the main meaning of this tradition has been lost, acquiring new ones against the background of current spiritual needs.

The paradox of this situation is that, "pushing back" the end of the world and preventing the fall of the last brick from the monument, pilgrims use the bricks of this particular architectural monument, often tearing them out of relatively intact parts of the structure. Today, we see how many tombstones, the bricks of which are used for the tradition of 7 stones, disappear over time.

I would like to note that we are far from condemning this tradition. We only emphasize the incorrectness, and perhaps even the absurdity of actions aimed at destroying the whole for the sake of maintaining the ritual.

Both the issues of restoration and conservation of monuments, especially those in a ruined state, are complex in themselves, difficult and responsible. Despite the ruined state and poor preservation, each of the monuments carries historical information about our past. It is in their state of preservation, as paradoxical as it may sound, that the uniqueness of the monuments of Karakalpakstan lies – the absence of the last cultural layers. Touching them, you really touch history. This is their authenticity. Until human activity, his interest did not turn his gaze to these monuments, they existed on their own for hundreds, if not thousands of years. But it is precisely human attention, unfortunately, that becomes the cause of their rapid destruction.

Thus, the veneration of holy places and the traditions associated with them appear to be an integral part of the cultural heritage of the peoples of Uzbekistan. Despite the ongoing debates about their legitimacy, as well as the need for these rituals within the framework of religion, they retain their significance among the local population.

Such traditions, as we can see from the material we have presented, can have both positive and negative consequences for the preservation of cultural heritage. The problem of preserving cultural heritage sites requires a comprehensive approach that includes both government measures and active participation of society. Government attention to conservation and restoration issues, government funding of such work are necessary, but insufficient without high-quality training of specialists and scientific substantiation of work methods.

Taking into account foreign experience and experience at the national level, it is necessary, in our opinion, to review and improve the legislative framework in this area, develop and refine issues on the concession agreement, adopting more acceptable forms.

In addition, each member of society should realize that our attitude to the heritage of our ancestors shapes the future, and strive to ensure that this heritage is not only preserved, but also passed on to future generations in its entirety.

Stones on the Mount of Shaykh Jalil Bobo

Interpretation of social-psychological drama in contemporary Uzbek theatre

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PhD (Art History)

During the period of independence, the Uzbek theatre has paid much attention to the stage interpretation of social and psychological dramas in order to highlight the most painful moments of public life. In the plays of this trend, the thesis that a person should be conscientious and honest is not a slogan or a call, but the main emphasis is on reflecting the image of a spiritually lonely person who has lost his state of peace of mind due to indifference and heartlessness, who has not found his place in a rapidly developing era, who is needed by someone solely for the purpose of profit, otherwise becoming something like a useless object.

Among the original dramas on a contemporary theme written during the years of independence, Usman Azim's play "One step journey" (Bir qadam yo'l) and its stage interpretation occupies a special place. The work is distinguished by a sharp collision, raising current issues of the last quarter of the 20th century and the new millennium. The drama promotes the idea that a person's life consists of one step, and on this short path he must live with a sense of pure love, honesty, kindness and mutual respect.

In 2002, director V. Umarov staged this work on the stage of the National Theater in the genre of social and psychological drama, the conflicts of the play are built with the help of such contrasting concepts as morality, decency, faith and in opposition to them - bad manners, moral depravity, hypocrisy, cynicism. These contrasting phenomena collide with each other throughout the play and ultimately destroy the family. When the curtain opens, the viewer sees a cozy courtyard (artist F. Gazizova) of the Old Man. In the courtyard, surrounded by a clay wall, there is no sense of luxury. Within the four walls of this, at first glance, such a simple Uzbek house, events occur that shake the human heart.

The play "One step journey" (Bir qadam yo'l) by the Uzbek National Academic Drama Theater (author U. Azim, director V. Umarov)

The director introduced a prologue and an epilogue into the play. In them, the characters of the play appear in different corners of the yard thoughtful and sad, reflecting on the events that have taken place, admitting their mistakes and regretting what they have done. In the prologue, the Father brings a seedling to the stage and asks the children to plant it, and when they do not respond, he carefully places the seedling on the proscenium. In this scene of huts, facial expressions and gestures, using the example of one family, it is said about the broken spiritual ties between humanity, forgotten moral views and values, the preoccupation of the younger generation with themselves and their affairs, and the oblivion of the concepts of kindness. In the finale of the play, the Father, with the help of his grandson Shukurjan, plants a seedling in the ground. In this way, the director embodied the hope and desire of the father for a new generation to be born that will be harmonious and united, respecting and honoring each other.

From the first scenes of the play, one can feel both external pride and an internal atmosphere of danger. This oppressive atmosphere is reflected in the tension of the music by composer Anvar Ergashev and in the mystery of the characters. The leitmotif of the music he created conveys the unevenly beating heart and

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tears of the main character, the cause of which are the events taking place in the family.

The main tension is reflected in the secrets hidden in the hearts of the characters in the play, especially the brothers: Jura , the old man's eldest son, has chosen an honest path, but is trying to hide the fact that he is very tired of his life in poverty, the middle son Shakir is rich and well-off, but he has lost his peace of mind because he was involved in drug trafficking and sent his only son with a drug caravan, and the youngest son Kasim is tormented by the complications of the Afghan war – infertility, and the pain of feeling unable to be with his beloved.

Through mise-en-scène, the director managed to show the contrast between the events of the play and the thoughts of the characters.

In the courtyard are represented: contentment - in the form of the middle son of the Old Man, Shakir (E. Kamilov), and his accomplices Baltabaev (P. Nasyrov) and Eshmamatov (R. Avazov); employment in important work – in the form of the eldest son Jura (T. Muminov) and his wife (S. Rametova), peace and happiness – in the form of Shakir 's wife Begam (G. Zakirova). When they leave the courtyard, the experiences gnawing at them flare up with a bright flame. For the house is filled with lies in the form of fun and jokes, and outside it, the truth emerges from the relationships and monologues of the characters. The Father's House is a reference to his heart. His children, with their ostentatious fun and false happiness, bring discord into the soul of the father, which, like a slanted adobe fence in the courtyard, is eaten away by pain. That is why Father (T. Karimov) strives to get away from the yard, where he feels calm.

During the performance, a gun hangs in the yard. Shakir picks it up once, remembering his youth. However, in one of the last scenes, this gun becomes the main means of resolving conflicts. The culmination of the performance is the scene of Baltabaev's murder by his youngest son Kasim. This single shot puts an end to the conflicts between the characters, the gradually revealed painful truths, the internal contradictions in the characters. After this, the main character of the play dies, tired of deception, worries and unfulfilled expectations. The death of the Father leads to catharsis in the performance. His soul is freed from the insensitivity, malice and lies that reign in his house.

The play is interpreted in a simple, serious, bright realistic style, with attention to everyday life, concrete, psychologically correct decisions of characters. The theme touched upon in it, the problems raised are relevant and important. Director V. Umarov, relying on the traditions of the Uzbek theater, staged the play on the basis of the "art of experiences" put forward by Stanislavsky.

The creative search observed in the interpretation of venerable directors of Uzbekistan has also found its expression in the socio-psychological performances of young directors. One of such performances is the play "Grandfather Aral" (Orol bobo), staged in 2014 by director Farkhad Jumaev at the musical and drama theater of the Kashkadarya region. It was staged based on the play "Lonely Boat" (Tanho qayiq) by playwright Erkin Azam. "Lonely Boat" tells the story of an old man suffering from loneliness. The author describes the events of the work as taking place in Karakalpakstan, not far from the Aral Sea. Of course, the old man lives here and waits for the return of the Aral Sea. In the play in the form of a philosophical story, as interpreted by F. Jumaev, the main focus is on the balance between human history, interpersonal relations, social life and man. The playwright and director sound the alarm about the fact that this balance has been disturbed recently. The atmosphere created by Erkin Azam in the play, is fully expressed in the performance in the interpretation of the director F. Jumaev. Through the fate of the old man, the director draws the attention of the viewer to the fact that the ideas of mutual understanding and harmony between people today are gradually disappearing. The philosophical generalization and psychological tension is that the old man cannot find his place and feels increasingly

"Grandfather Aral" (Orol bobo) play by the Kashkadarya Regional Musical Drama Theater (author E. Azam, director F. Jumaev)

The play"Grandfather Aral" (Orol bobo) by the Kashkadarya Regional Musical Drama Theater (author E. Azam, director F. Jumaev)

useless in an era when no one cares about others, and even the relationship between parents and children, which since ancient times were based on high values, have disappeared, the material has become preferable to the spiritual.

The old man, who forgot his name and got used to everyone calling him Grandfather Aral, did not taste the love of his stupid children, was deprived of the joy of babysitting his grandchildren; happy moments of the past, his blooming youth left him like the Aral Sea. It is not without reason that the fate of the hero of the play is compared to the fate of the Aral Sea. Over the years, the Aral Sea was treated mercilessly, and as a result, the sea, which for centuries generously gave life to the environment, became of no use to anyone. The fate of the old man is similar: having raised his children, he was left alone in his old age. How can one bear the heavy burden of loneliness in such a situation? There is only one way – the old man always lives with hope and faith. Of course, he understands well that the Aral Sea will not return, that he, like the sea, cannot turn back time. However, for a lonely person, living with hope is like looking for a cure for a serious illness. The old man sees this medicine in boat building, and hopes that one day the boats he builds will be needed by people. He diligently teaches his students the craft of boat building. In this way, he tries to convey sparks of hope to the hearts of the younger generation, and believes that they will value the concepts of harmony and goodness, and hopes that this will cause the return of primordial values in the form of the Aral Sea.

To make the play more meaningful and spectacular, the director enriched it with various expressive means. He tried to make it more polished, while preserving the philosophy of the play. The plasticity of the actors, the music and the songs expressing the emptiness in the heart of the main character, gave shine to the philosophical spirit of the play.

G. Khusainov, the actor who embodied the image of the old man, expressed the inner experiences of his character simply and sincerely, with a tremor in his voice. The viewer understands that this tremor is caused not by old age, but by heartache and worries. In the scene where his son and daughter, who is a candidate for deputy, having failed to obtain his consent to leave voluntarily, take their father away by force, the characters are shown with exaggerated realism and stand in vivid contrast. The viewers see, on the one hand, the callousness of children who are afraid for their careers and are wary of human gossip, and on the other hand, the father who does not want to betray the native land on which he was born and raised, his faith and conscience.

The performance, unlike the play, ends with the death of the main character. By this, director F. Jumaev sought to say that people like Grandfather Aral, who possess true virtue, pure faith and pure human feelings, do not fit into this world. The departure of the soul, freed from its mortal shell, into eternity was reflected in the actor's dance, filled with philosophical actions.

With the performance "Grandfather Aral" on stage F. Jumaev expressed thoughts about humanitarian ideas and called on the audience to be more attentive to the surroundings, not to lose kindness and mutual understanding and to live with a clear conscience.

In the socio-psychological dramas staged in the modern Uzbek theatre, it is emphasized that ill will, insensitivity, and shamelessness prevail in human relationships, and emphasis is placed on combating such vices. In the director's searches, there is a tendency to use the realistic style of psychological theatre on stage or to combine it with figurative and conventional styles.

Emir of Bukhara, buried far from his homeland

Shavkat Babajanov,
PhD (History)

It is known that not all the khans and emirs who ruled our country died a natural death. They died as a result of conspiracies, at the hands of hired killers, from poisoning, mercury poured into the ear, plague, pestilence, accidents, during travel, pilgrimage to Mecca. In particular, not all Bukhara emirs were destined to find rest in the land of Holy Bukhara.

The last emir of Bukhara, Seyyid Alim Khan, was forced to flee to Afghanistan after the fall of the emirate. He lived in exile for 23 years. In the last years of his life, Emir Alim Khan fell seriously ill and died in his bed in Afghanistan on April 28 (in some sources - April 29, 30) 1944 at the age of 63, surrounded by his children and was buried in the cemetery of Shahidoni Islom (martyrs of Islam) in Kabul (this cemetery is also known as "Shuhado" and "Shuadoyi Salihin").

Seyid Alim Khan - Youthful years of the last Emir of Bukhara. Photo late 19th-early 20th century

Before his death, Alim Khan said: "O Bukhara, I was born for You, I live for You and I leave this life remembering You. Greetings to You, Bukhara."

The Emir of Bukhara, Seyyid Alim Khan, wrote a work entitled called "Tarihi huzn al-milali Bukhoro" ("The History of the Sorrow of the People (Nation) of Bukhara"). Through the efforts of General Haji Yusuf Mukimbay, this book was published in Farsi by the Mozon Navdar publishing house in Paris. The third part of the book briefly outlines the biographies of Emir Abdulahad Khan and Alim Khan. The memoirs of "Tarihi huzn al-milali Bukhoro" end with verses that express themes of guilt for leaving the Motherland to foreigners. The garden of Kalai Fatu, located 11 km from Kabul, was the Emir's last residence, where he spent 23 years of his exile. Before moving to the fortress, Fatukh Alim Khan lived in his first residence in Kabul, the Hussein Kaft Garden, soon after which he moved to the Hashim Khan Garden and then to the Muradbek Fortress [1]. The Emir married several times in exile, and had 37 children abroad, including 16 sons and 21 daughters.

No matter how Emir Alim Khan ended his life, the funeral ceremonies were held according to the traditions of burial of rulers.

Abdulkabir Azimi, one of the sons of Alim Khan, living in the city of Gaziantep (Turkey), told the following about the funeral of the emir, who died in Afghanistan: "My parent passed away in Kabul in 1944. I was 13-14 years old then. I was given the task: "Look after the children so that they do not leave the inner chambers and do not make noise during the funeral." There was a large courtyard outside the harem. The clergy gathered there and read the Koran. After washing my father's body, they wrapped it in shrouds and laid it in one of the rooms. After my father's wives left, we children lined up and entered one after another, kissing my father's hands and feet. My father's grand vizier Hashim Khan and several other officials lined up there. When my father's body was carried out, one thing struck me. There was not a single person who did not cry. Even Bukharan Jews came to the funeral. They were crying so much that I couldn't believe my eyes. When someone asked them, "Why are you crying?" they replied, "After all, he was our ruler." That day, flags were lowered in Afghanistan, even some embassies lowered their flags[2]." They say that even the Russian embassy lowered its flag and lit up the red lights.

The death of Alim Khan attracted the attention of the print media in Afghanistan and caused shock and sadness. The newspapers of that time published reports of the death of the former Emir of Bukhara. The main headlines and columns of the newspapers "Anis" and "Islah" were devoted to this news. The following message was published: "*The former ruler of Bukhara, His Highness Alim Khan, lived in Afghanistan for 23 years and died at the age of 63 due to high blood*

[1] Khayitov Sh., Rahmonov K., Ahmadov O. Bukhoro va Bukhoriylarning zhagony shuhrati. – Tashkent: Navruz, 2020. – B.72.

[2] Amir Said Olimkhon shakhsiyati //bukhari.uz.2024 yil, April 15.

Seyid Alim Khan's tomb in Kabul's Shahidoni Islom cemetery in 2014

pressure and cerebral hemorrhage. In connection with this tragic event, we express our condolences to the relatives of the deceased. The government of Afghanistan also expresses its grief in its letter. The funeral will be held as an official ceremony. The funeral prayer will be read in the Iydgoh mosque, and he will be buried in the Shukhadoyi Solihin cemetery. "[3]

Although many government officials attended the funeral, the next day, the Emir of Afghanistan, Zahir Shah, personally came to Qalai Fatuh to express his condolences to the Emir's family. The ruler of Afghanistan provided all the necessary things for the funeral and the family of the deceased.

The children of the former emir held a funeral ceremony for their father-ruler with great pomp. Almost all members of the Afghan government took part in his funeral. Ministers from England, Iran, Turkey, and France came to the funeral. The Shah of Afghanistan ordered the Koran to be read at his grave for forty days and held a wake. Alim Khan was buried with the honors reserved for emirs. The four sons of the deceased, who were born in Afghanistan, expressed gratitude to the Afghan government through the newspaper Islam published in Kabul for the respect shown to the memory of their father.

[3] Nurettin Hatunhog`lu. Buhâra emirliği'nin son hükümdari Âlim han'in Afganistan'da ölümü ve sonrasinda yaşanan gelişmeler // 3. Uluslararası Sosyal Bilimler Kongresi. Asya Araştırmaları Dergisi | Sayı: 2 / Cilt: 2. – Buhara, 2018. – S.134.

Before his death, Sayyid Alim Khan wanted to get out of the situation and enjoy the beauty of life. In the last years of his life, the former ruler, already seriously ill, demanded that his sons, born to his wives in Afghanistan, take him for a drive around Kabul. Alim Khan, who was not allowed to leave his residence, was literally suffocating. His children turned to the Prime Minister of Afghanistan Sadr Azam and asked for permission for such a trip. The government of Afghanistan, which had promised the Soviet government to keep the emir under house arrest, did not fulfill this

Seyid Alim Khan - the Last Emir of Bukhara

Seyid Alim Khan - the Last Emir of Bukhara. Colour photograph by Russian photographer Sergei Mikhailovich Prokudin-Gorsky. 1911 y.

request. In addition, Emir Alim Khan was very homesick in exile. Years later, he wrote several official appeals to the leaders of the Soviet government, asking for permission to visit his homeland, Bukhara, and also asked the Afghan government for permission to perform the hajj, a pilgrimage to Mecca. But he did not receive a positive response on this matter either. Alim Khan and his family were not even given identification documents as citizens of Afghanistan. The reason for this was the desire to prevent them from leaving for other countries. The conditions that arose affected Emir Alim Khan both materially and morally.

Said Abdul Kabir Azimi Alimi, the eighth son of Seyid Alim Khan, born in Afghanistan, recalls the last days of the emir: "In the last years of his life, my father's eyesight deteriorated greatly. My elder brothers read newspaper articles to him. Eventually, his mental faculties also began to weaken, and he asked his children to take him to Bukhara. Then two servants picked him up, carried him to one of the corners of the large courtyard and said: "You are in Bukhara." Then my father, it turns out, asked: "Are the peacocks still here?" When his condition worsened, he said: "Death is right. But let me remind you of one thing. When the time comes, the Motherland will be free. Bukhara will be free." My father asked to be buried temporarily in the Shukhadoi Solihin cemetery and, after Bukhara gained freedom, to rebury his ashes in his homeland. This was his main will. My father also bequeathed to us to value the Bukharans who followed him."

The *marsiya* (a poem devoted to the deceased), carved by the stone carver Mullah Abduraim Ghazgani above the beautiful gate leading to the shrine where the emir was buried, is still well preserved (it is possible that the author of the *marsiya* was the court poet of the emir Abdulahad Khan, Mirza Hayit Sabkho).

Shahniyaz Musa, a senior research fellow at the Institute of Oriental Studies of the Uzbekistan Academy of Sciences, spent several years in Afghanistan. During a trip in late June 1973, he visited the grave

Emir Said Alim Khan. The cover of the book "History of the longing of the Bukharan people"

Emir Alim Khan in Afghanistan. 1925

of Emir Alim Khan. On the tombstone in the emir's mausoleum at the Shahidoni Islom (Martyrs of Islam) cemetery in the suburbs of Kabul, he read these words: *"The owner of this grave is a memory of the suffering emir and royal ruler, this man was the last blessed ruler of Holy Bukhara from the Mangyt dynasty. That is, this gentleman is the emir forgiven by Allah, Seyid Alim Khan ibn Emir Seyid Abdulahad Khan ibn Emir Muzaffar Khan ibn Emir Seyid Nasrullah Khan ibn Emir Haidar Khan ibn Shahmurad, who, known by the nickname Gazi, ascends to the famous emir Daniyal Khan. After the deceased's tenth year of rule in Holy Bukhara was captured by Russian infidels, he found refuge in neighboring Afghanistan. After 23 years, at the age of 64, on the fifth Saturday of the month of Thawr (April – author) 1323 Hijri Shamsi and on the 5th of the month of Jumadul Awwal 1363 Hijri Qamari (April 28, 1944), he left this mortal world [4]."*

Many *marsiyas*, dedications to the deceased and mourning *beyts* were written on the death of the Bukharan emirs. During the days of mourning ceremonies, the children of the emirs remembered their father as deceased and forgiven[5]. *Marsiyas* were even processed by mourners and performed at ceremonies. Poems about the deceased filled everyone's heart with pain.

As a conclusion, we can say that the fate of the Bukhara khans and emirs was different. Some of them died in honor and dignity, some ingloriously, some died an easy death, and some in agony. Since no one could resist fate, the rulers died in their homeland, but some of them died far from it. Of course, this is written in everyone's destiny. The following words of Emir Alim Khan, spoken by him in exile, testify to the fact that there is no holier place than the homeland:

"Amiri be Vatan zoru haqir ast.
Gado gar dar Vatan mirad – amir ast!"

[4] Sayyid Olimkhon. Bukhoro halqining khasrati tarihi. – Tashkent: Fan, 1991. – B.31.
[5] Ibid.

Meaning:

"An emir without a homeland is pitiful and insignificant.

A beggar who died in his homeland is truly an emir!

The era of the Emirs of Bukhara from the Mangyt dynasty, who ruled from 1783 to 1920, came to an end during the reign of Emir Alim Khan. Alim Khan not only lost his country, crown and throne, but also lost the opportunity to rest in the land of Sacred Bukhara, the land of his Homeland. With this unfulfilled dream he went to the eternal world. Only his children were lucky enough to see the Homeland.

Traditions associated with the burial of khans and emirs are of great importance in the study of religious, educational and even military processes of the historical period. In-depth study of the final resting places and mausoleums of our ancestors who ruled the country in the distant past has allowed us to obtain more information about individual aspects of the political history of our state.

Yura Useinov. "The Emir of Bukhara Before Eid al-Adha". Knitted panel picture. 2018

Portrait Saga of Akmal Ikramjanov: Generation of New Uzbekistan

Akbar Khakimov,
Academician

In the era of nanotechnology, robotics and artificial intelligence, imitating images of people and creating computer versions of portraits, paintings created by the hand of a true artist retain the indescribable warmth of human feelings. About a cycle of such portraits our contemporaries – scientists and creative figures, are discussed in this article.

The portrait genre occupies a special place in the works of Akmal Ikramjanov, the People's Artist of Uzbekistan, Academician of the Academy of Arts. Over more than 40 years of his creative career, the artist, along with remarkable genre, historical paintings, landscapes, still lives, created a huge number of portraits: cultural and art figures, simple farmers and workers, engineers and ordinary citizens, his colleagues and friends, girls, family members, etc. Many of them are a true asset of the treasury of national painting of the late 20th - early 21st centuries. However, these portraits were created at different times and were not united into a single thematic project.

In 2023, Akmal Ikramjanov began working on a cycle of 10 portraits of his contemporaries - prominent figures in science, culture and art. To date, the artist has prepared 7 portraits and is working on the 8th painting. There are two more paintings to complete the cycle. The artist said the following about the sequence of painting the portraits: "In 2023, I decided to start creating a series of portraits of scientists and cultural figures who made an important contribution to the development of independent Uzbekistan. This idea came to me after painting the portrait of People's Artist of Uzbekistan Erkin Kamilov, which became the first in the conceived series. After painting it, I turned to the image of Academician Akbar Khakimov, who helped me meet the academicians - the President of the Academy of Sciences, physicist Bekhzod Yuldashev, who passed away in 2024, and mathematician, then director of the Institute of Mathematics Shavkat Ayupov, now the President of the Uzbekistan Academy of Sciences. Their portraits were ready in August-September 2024. Unfortunately, Bekhzod Yuldashev did not get to see his portrait. The next stage was portraits of the sculptor, academician of the Academy of Arts Ilkhom Jabbarov, then the wonderful actors Boyir Kholmirzaev and Farkhod Abdullaev. Now I am working on the portrait of Munojat Yulchieva."

Portrait of E. Kamilov differs from subsequent paintings in this series in that it depicts the actor standing and looking intently straight at the viewer. Beginning with this work, the artist pays special attention to the background, which either emphasizes the character of the hero or symbolically conveys the sitter's sphere of activity. Conventionally speaking, the painting consists of three planes. Erkin Kamilov stands, leaning his hands on the edge of a chair with figured brown edges and dark green upholstery. This chair defines the foreground of the painting, its color scheme seems to balance the contrasting colors of the light beige jacket and bright blue shirt of E. Kamilov, whose figure represents the background of the painting. An even more intense, contrasting interpretation is provided by the background of the painting – this is the third plane. Vertical red stripes are emphasized against the thick black background, creating a sense of a deeply dramatic atmosphere. This emphasizes the role of the actor, who has brilliant tragic images behind him, created both in the theater and in cinema. The dramatic tone of the black and red background is softened by horizontal light stripes, which also symbolically express the actor's repertoire of roles, but of a less tragic tone. Despite the hero's modern costume, the expression on his tense face indicates that the actor is in the state of one of his dramatic characters. This is probably the reason why the portrait somewhat idealizes the image of the actor, giving him aristocratic features, while the audience perceives him as a talented natural, a kind of native of the people.

Working on the image of E. Kamilov was not easy. At first, the artist created a square-shaped painting, then abandoned this option and decided to paint a painting elongated vertically. The artist retained this format of the painting, and all subsequent portraits were painted in this canvas format. The principle of working on the creation of portraits is that the artist, having chosen a model, conducts a photo shoot, in which the future model appears in various angles and poses. And only then in the workshop is the version of the image determined that best matches the character, type of activity and, finally, the inner world of the character.

But a photo is not an object for copying - it only gives an impetus to choosing the most accurate and expressive compositional solution. The author of these lines was convinced of this - in 2012, Akmal Ikramdzhanov asked me to turn in profile and took a photo.

As it turned out, he used this photo when creating my ironic portrait in the style of the portrait of Duke

Portrait of People's Artist of Uzbekistan
Erkin Komilov. 2024

Portrait of Academician, Art Historian
Akbar Hakimov. 2024 .

A portrait of Battista Sforza, Duchess of Urbino. Piero della Francesca. 1470. Uffizi, Florence

Urbino gersogi Federiko da Montefeltro portreti. Pyero della Francheska. 1470. Uffitsi galereyasi, Florensiya

Battista Sforza by the 15th century Italian artist Piero della Francesca.

Despite the ironic nature of the portrait, the calm color scheme, subtle play of light and shadow, and exquisite drawing give the image psychological depth and a certain ahistorical quality. The subject is free from all that is vain and accidental, from worries and cares. The historical attributes make the image of the contemporary sublime, but not arrogant. The image of a butterfly on the forearm is another sign of the author's ironic approach to the portrait: according to the artist, the butterfly is a symbol of the fact that the subject knows the value of a fleeting moment.

And so, 12 years later, A. Ikramjanov began a more serious, psychological depiction of A. Khakimov, which is fundamentally different from the 2012 portrait. The subject is sitting in the artist's studio in profile, his right leg crossed over his left, and his head turned towards the viewer.

As the artist notes: "... in this painting I tried to convey the human qualities of the character with the help of a number of attributes - his democratic nature, simplicity, and at the same time express the high professional qualities and intelligence of the person being portrayed." In fact, the slippers on the feet of the character, the inexpensive plastic red chair, the wooden floor are intended to represent a person connected with everyday life, well acquainted with the problems and atmosphere of the life of ordinary people. The intellectual nature of the model's activity is manifested in the expression of a concentrated look, in the pose, the color characteristics of the clothes and, of course, in the nature of the background of the painting in the form of a colorful, patterned embroidered *suzani*. The *suzani* symbolically expresses the connection of the person being portrayed with the subject of his research - the history of art and traditional craft.

In early 2024, the artist approached the author of these lines with a request to introduce him to Academician Bekhzod Yuldashev in order to paint his portrait. This meeting took place in the building of the Academy of Sciences, on the 3rd floor in the foyer. A. Ikramjanov conducted a photo session and photographed B. Yuldashev sitting in a wide armchair. The portrait was completed in September 2024, when Bekhzod Sadykovich had already passed away, and he was not able to see this painting. The portrait was published in the previous issue of our journal in the section dedicated to the memory of Bekhzod Sadykovich. Academician Yuldashev is depicted sitting in a wide light-brown armchair in a blue shirt with a tie and grey trousers. The back of the armchair in the form of brown wooden slats contrasts with the light coffee color of the background. Nevertheless, the entire color scheme of the painting is restrained, pacifying, aimed at a meditative perception of the image. In the portrait, the professional characterization of the image gives way to the transmission of human experiences and psychological qualities of the character. In the pose of Academician B. Yuldashev, who has slumped his shoulders wearily and is looking at the viewer with slight sadness, the complex mental state of the hero can be read.

While working on the portrait of Bekhzod Yuldashev, A. Ikramjanov demonstrated the ability to notice the movements of the human soul in the seemingly motionless state of the character. A. Ikramjanov seems to follow the well-known saying - to evoke spiritual empathy, in the words of V. Kandinsky, "spiritual vibration", to feel a resonating response from the exciting intonations, moods and pictorial combinations created by him. Probably, the artist's intuition suggested such a dramatic reading of the image of Bekhzod Sadykovich, who at that time already knew about his incurable disease.

A completely different dynamic and emphatically optimistic character of the character appears in the portrait of the Academician, Hero of Uzbekistan Shavkat Ayupov. The famous mathematician and mathematician from Kazan Foat Sultanbekov, in his sonnet dedicated to Shavkat Ayupov, gave him a rather precise characterization:

> Smart, kind, fast. And moderately strict.
> To the disciples, instructing them: "Work without fear
> And persistently - there are no beaten paths in science!
> "

This is how Academician Sh. Ayupov appears in A. Ikramjanov's portrait. He sits cross-legged in a soft armchair with maroon and blue patterned upholstery, with his hands folded on his knees. His gaze is directed at the viewer, his strict blue suit and tie emphasize his commitment to the rules and public etiquette, since the scientist is also a statesman - as a senator, he takes an active part in legislative work. The artist consciously chooses the color and plastic solution of the background in a geometrically verified style, emphasizing the professional interests of the portrait. The portrait is painted on a light beige background with chaotic intersecting straight lines, and blue curtains with vertical narrow black stripes hang on the

Portrait of Academician (Physics)
Bekhzod Yuldashev. 2024

Portrait of Academician, Mathematician, President of
the Uzbekistan Academy of Sciences
Shavkat Ayupov. 2024

sides. Despite the somewhat pathos and constructivist solution to the image, the artist managed to convey the inner nobility, kindness and humanity of the hero through the seemingly impenetrable external texture.

If the aesthetics of the portrait of Academician Sh. Ayupov are dominated by straight lines and geometric rhythms, then in the portrait of the famous sculptor, the author of the most significant monuments to Amir Temur and other outstanding historical figures, Ilkhom Jabbarov, we feel an atmosphere of easy creative disorder. The freedom and relaxedness of the creative personality is very accurately conveyed in the pose of the sculptor, sitting on a chair and leaning on a vertical podium, and in his clothes - a light sweater and dark trousers, a black scarf casually thrown around his neck. The chaotically constructed background is also noteworthy - in the form of plaster copies of sculptural heads, blue with wide black stripes of fabric, red and white chess patterns, a table with a white tablecloth with mugs on it. The sculptor's head is slightly turned to the side and an attentive, studying look is directed there. In this portrait, Ikramjanov appears in several qualities: a) as an excellent colorist - the combinations of cold bluish and red-flaming colors are magnificent; b) as a virtuoso master of compositional solutions - the deliberate disorder in the background gives the picture dynamics and special tension; c) a subtle psychologist - he managed to show the inner essence of I. Jabbarov - soft intelligence and firmness of decisions, poetic nature and analytical rationalism, sentimentality and tenacity of character.

An important feature of the interpretation of the image of the famous dramatic actor, Honored Artist of Uzbekistan Farhad Abdullaev is that A. Ikramjanov departs from psychological clichés - to present him as some kind of ideal, romantic personality. Such an approach dries up, deprives the image of a person and an actor of vital flesh. Therefore, A. Ikramjanov again, as in the portrait of the Academician A. Khakimov, uses the technique of introducing attributes into the space of the picture that emphasize the democratic nature and human simplicity of the character. An ordinary striped shirt with rolled-up sleeves in the style of the 1970s-80s, sports shoes with a white border on the sole, a blue plastic chair, a floor in the form of tiles with a simple pattern - all this subconsciously serves to create the image of an extraordinary personality and at the same time a person close to the people's worldview. The background of the painting in the form of bright, blue, red-yellow and green patterned stripes, interrupted by a wide strip of beige wall, also serves the same task of "democratizing" the image of a talented actor, bringing it closer to the elements of folk culture. The open, bright face and direct gaze of the actor are aimed at the viewer, in it the artist was able to very subtly capture the creative ideas and plans flickering in the soul of the master. This portrait is an example of the synthesis of painting skills, mastery and an instinctive sense of figurative expression and trepidation of the soul of the depicted hero, immeasurable by art criticism categories.

The artist also used an unusual composition and plastic solution in the portrait of a young but well-known actor, Honored Artist of Uzbekistan Boyir Kholmirzaev. This is the only portrait in this series of paintings with a profile image of the hero. Unlike the actor F. Abdullaev, B. Kholmirzaev represents the next generation of actors. A. Ikramjanov conveys this difference with the help of external attributes - a fashionable, modern haircut, clothes in the form of a white elegant jacket and a dark shirt, black ironed trousers and shiny patent leather shoes of the same color. The emphasized artistry and refined taste of the character are evidenced by the graceful wooden rocking chair and elegant colored patterned stripes of the background of the painting, between which, as in the previous portraits of this series, a wide light beige strip of a wall fragment is depicted. The state of dramatic tension and creative introspection that comes from the interpretation of the image does not prevent us from seeing in the hero the features of deep sincerity, spiritual and inner purity.

* * *

The figures of science and art who were captured by the brush of A. Ikramjanov are only a small part of the huge number of talented scientists, writers, poets, artists, actors, musicians of the New Uzbekistan. To capture these images, as well as images of representatives of other professions, is a difficult but noble task. The portraits created by the brush of the People's Artist of Uzbekistan, Academician of the Academy of Arts of Uzbekistan Akmal Ikramjanov will certainly become an artistic revelation of modern national painting. They demonstrated the deep professionalism of the artist, subtle psychological development of images and filigree technique. His paintings reflect universal philosophical and moral problems and a broad panorama of the life of the nation, its history and spiritual aspirations. Nature endowed the artist with human talent - it lies in the ability to perceive life acutely, accurately capture the vicissitudes of feelings and experiences, the ability to capture the pulse of time and the coordinates of historical space.

Akmal Ikramjanov's paintings are far from trying to attract the viewer with shocking techniques or extreme subjects; his paintings retain the noble bearing of high academic art and continue the traditions of outstanding masters of world and national art.

Portrait of Honored Artist of Uzbekistan, Sculptor
Ilhom Jabborov. 2024

Portrait of Honored Artist of Uzbekistan
Farhod Abdullayev. 2024

Portrait of Honored Artist of Uzbekistan
Boir Kholmirzaev. 2024

Wine poems on vessels of the 12th century from the Shodmalik Ota settlement

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Saida Ilyasova,
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The glorification of wine (*khamr*, *bada, may*; Sogdian: mδw; Turkic: čaγur), as one of the most popular genre trends in Arabic, Persian and Turkic poetry, has its roots in the pre-Islamic era. In the Islamic era, despite the prohibitions, wine poetry in Persian and Turkic widely used the tradition of glorifying wine and wine feasts, inherited from the musical and song traditions of previous eras. It is enough to recall the pompous descriptions of feasts in the palaces of the caliphs and stories about wine feasts in medieval Arabic and Persian authors, as is often found, for example, in the epic Shahnameh of Firdausi. The same lofty praise of wine as a "healer of soul and body" occupies a significant place in the works of Rudaki (860-941), especially in his poem "Mother of Wine / *Modari Mai*". Both poets described the properties of wine not just as a metaphor, but as a drink that was actually consumed. Moreover, the style and "table ethic" of their works was borrowed by many court historians of Central Asia, who often describe the wine feasts of the nobility, but do not mention religious restrictions. At the same time, wine consumption was played up in an edifying key, that is, with calls for moderation.

Inscriptions on khum. Photo by Ilyasov J.Y.

However, literature and especially poetry most often circulated in the circles of the palace and social elite. But how can one look into the quarters and houses of ordinary citizens (artisans, small traders) or ordinary farmers? It is no secret that poetry with wine verses reached them too. Then how did they understand these verses? Meanwhile, the production of wine and, in fact, *hums* (clay vessels), as the main «technological vessels», was done by artisans from the outskirts of the city. This is evidenced by the finds of workshops for squeezing grape juice with entire «warehouses» of large *hums* for fermentation and storage of wine. These finds were created in a certain social and cultural environment, and therefore become «accumulators» of the most diverse information about the society that creates them.

In this article we will try to answer these and similar questions by turning to the wine verses that were recently read on the rims of *hums* from the second half of the 12th century found at the Shodmalik Ota settlement (Tashkent region). Two of them are kept in the Museum of the History of Uzbekistan (Collection 7/81, Inv. No. A-34-50, A-34-51) and one in the National Center of Archaeology of the Uzbekistan Academy of Sciences. All the verses are in Persian (the dominant language of poetry of that era) and are written on the (upper) surface of the rims.

Rim of *Hum* No. 1 (Fig. 1)

Translation of the poem : " *The places for the cup and goblets of wine, / The pagans trampled. // In the place where the chang, flute and pipe sounded, / The voices of crows and kites are heard .*"

The poems are written in a calligraphic type of handwriting called "divani". It has been established that the author of the poems is Amir Abu 'Abd Allah Muhammad ibn 'Abdul-Malik Mu'izzi Nishapuri (d. 1125 or 1127). The qasida from which this bayt is borrowed is of mystical content (bayt no. 319). The poet alludes to the events when the palace and the gatherings of poets began to be dominated by ignoramuses and religious hypocrites.

Rim of *Hum* No. 2 (Fig. 2)

Translation of the poem : " *This is ... rise up and knock down the mountain // This is my love [for God] ... knocked down the mountain! // At all times we are commanded: // "Fill the cup with wine and knock down the mountain*".

The handwriting is professional, but extremely decorated with «*divani*». Some words could not be

read due to losses. The author of the poems is also not established. The context of the poems refers us to the perception of wine as an inspiring and instilling strength «potion».

Rim of *Hum* No. 3 (Fig. 3)

Translation : " *This seal of the New Moon must appear on a hot day , // In the rotation of the epochs for the sake of the cup of Jamshid someone will come // The holiday has come* [D] *from heaven cleaning the Earth // It's a holiday, and therefore this is good news for wine merchants* [E] ».

Jamshid (the fourth king of the Pishdad dynasty) mentioned in the poems is a model of justice and reasonable governance. According to legend, his cup was always full of wine. In Sufi poetry in Persian and later in Turkic, wine and the famous cup of Jamshid acquired a metaphorical meaning as «wine and cup of attainment of Truth (God).»

The author of the poems has been identified as Afzal ad-din Ibrahim al-Khakani (1120-1199) [*qasida* 200, first two *beyts*]. In the text on the *hum*, the first and fourth *misrs* (stanzas) are mixed up (compared to the book versions). There are some discrepancies with the published text. It is clear that the *rubai* was written from memory. In addition, the handwriting of the text is rough, obviously written by the master himself. Therefore, the poems of the wine genre circulated among ordinary townspeople. Secondly, by writing these *rubai* of the famous poet al-Khakani (who was revered among the Sufis) on an ordinary *hum*, the master recorded not only his knowledge of some examples of the great poet's work, but certainly counted on a potential buyer and / or user of this *hum*, who, obviously, were familiar and close to both the theme of the poems and their context.

True, it is necessary to keep in mind the allegorical (Sufi) understanding of this poetry. With the emergence and evolution of Sufism in the Muslim world and its active dissemination, poetry becomes the most powerful, accessible and therefore effective tool for popularizing this mystical-philosophical movement. In this poetry, its own language of symbols, allegories and other "lexical units" is developed, which are called "bird language" (Arabic. "*lisanu-t-tayr*", Persian "*zabon-i murgon*", Turkic "*qushlar tili*").

In this poetry, the glorification of wine and all the sensations associated with it acquire a new sound, and the semantics of the «image» of wine began to be filled with more and more metaphorical and allegorical meanings. They marked the emergence of other variations of the «wine» topos, with its new allegories in understanding this genre. In other words, Sufi ideology assigned new symbols to wine. It became a metaphor for «intoxication from the comprehension of the True Allah», and intoxication was interpreted as a manifestation of «opening the path to the Almighty», etc. Thus, the genre of «*Saqi-name*» («Book of the Cupbearer») appeared, the founder of which was considered the great Azerbaijani poet Nizami Ganjavi (1141-1209).

The new ideology, like mystical poetry itself, arose outside the palace and court poetry, becoming popular in the lower strata of the cities, especially among artisans. At the same time, the "wine theme" of palace poetry acquired new sounds and meanings. This meant not only an expansion of the social base of Sufism, but also led to an expansion of the number of "creators and consumers" of mystical poetry, which fully met the needs of city dwellers. According to M.L. Reisner, "*The trade and craft strata of the population of*

Inscriptions on khum. Photo by Babajanov B.M.

the medieval Muslim city became, at first, if not the authors, then the interested listeners and sincere followers of those [*Sufi*] *preachers of the new type who used poetry to propagate religious teachings. The guild organization of artisans became the social structure into which the Sufi traditions that developed during the 8th –11th centuries were easily incorporated. Sufi brotherhoods, often led by the very heads of craft corporations*».

From the point of view of this observation, it is obvious that the verses given on the *hums* can and should be considered as a direct consequence of the spread of the ideology of Sufism in the «settlement» of the pre-Mongol city, together with its poetry, which in one way or another influenced the norms of morality, ethics and, ultimately, ideology in different classes of the city. There are almost no reports about this phenomenon (as part of the ideology of different social classes of medieval townspeople) in written sources. Therefore, the texts on archaeological artifacts are important as another (albeit small) «window» into the subtleties of the urban culture of the Middle Ages in the broadest sense of this concept, for example, from the point of view of the spiritual preferences of ordinary townspeople and artisans. Moreover, *hums* are not included in the category of ceremonial dishes that were purchased by the upper classes of society. Large-sized dishes for everyday use (*hums*, cauldrons, etc.) hardly ever caught the eye of the aristocracy. Being produced in the environment of artisans, these dishes were later used by the same artisans, depending on the functions of these *hums*.

However, can we assume that the verses cited were understood by the masters or calligraphers (as well as by the buyers and consumers of the *hums*) exclusively in a metaphorical (Sufi) sense, which should completely exclude the use of these *hums* specifically as wine vessels? If the *hums* were not intended for wine (keeping in mind the theological restrictions), then why were wine verses written on them? Or did one not exclude the other? Let us recall that the overwhelming majority of poets and historians of the Muslim Renaissance quite calmly described the feasts of the nobility, wrote «wine verses» that were understood and interpreted «directly», that is, in the style of «wine poetry» of the early Islamic era. Of course, Sufi ideology «reshaped» the meanings of wine poetry, as shown above. But the extensive socialization of Sufi ideology could not mean a complete rejection of the old traditions of drinking alcoholic beverages (especially among the political aristocracy), which, as has been proven by research, continued even during the era of the khanates in the Central Asian states.

Of course, research in this direction still needs to be continued. However, before conducting more extensive research (possibly discussions), we should abandon the unacceptable constructivism in relation to the past. That is, we should not assume that the inhabitants of Islamic cities of the Middle Ages were always limited by rigorous (religious) prescriptions, which they could understand differently than it is interpreted in today's realities, enriched by extensive religious-intellectual communications and the availability of information from the field of the so-called «theoretical Islam». In other words, the presented poems are unique not only by the very fact of the exclusivity of the «wine genre» in the texts on *hums*, but also by the fact that this material is capable of provoking more extensive discussions, including those concerning the forms of urban culture of the pre-Mongol period, the prevailing ethical norms among ordinary citizens, their understanding of morality, etc. It is here that archeology, we are sure, will become one of the most reliable sources for performing anthropological tasks in more detailed studies of societies of the past.

The author's beginning in lyrics of Usman Azim on themes of ancient legends

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In modern poetry, authors often turn to images of folk legends, themes of epic and folklore works. This feature is also characteristic of the work of the famous Uzbek poet Usman Azim. However, the poet does not limit himself to a virtuoso interpretation of these images, but enriches them with his own emotional experiences and life hardships.

In the poem «Daedalus and Icarus» the poet uses historical and mythological images, creatively transforming them through his personal life experience. The lyrical heroes of the poem are the skilled craftsman and inventor Daedalus and his son Icarus– characters from an ancient Greek myth, according to which Daedalus, famous for his knowledge and inventions, lives in the palace of King Minos on Crete. When Daedalus and his son decided to leave the island, Minos did not let them go and ordered to block all sea routes. Then Daedalus plans to escape by air. He makes wings from bird feathers, gluing them with wax for strength, and teaches Icarus to fly. Finally, when the day of escape comes, Daedalus strictly forbids his son to approach the Sun, since its rays will melt the wax. However, Icarus forgets his father's words. The pleasure of flight intoxicates him, he rises higher and higher and the wax melts under the scorching sun. Icarus falls into the sea and dies. Usman Azim uses the technique of a monologue on behalf of Daedalus, and in these lines one can feel the intonations of the author's own experience:

My heart was telling me to fly,
I was aiming for the sky, but this life
She plunged into the dust and could not get enough...
I still made wings, wings!..

From the above verses spoken by Daedalus, it is clear that no matter how much he strives for freedom, no matter how high he strives, life does not spare him. Trials and difficulties weigh him down and pull him down to earth. However, despite this, he strives to realize his dream. His son Icarus reaches out to his father, he also wants to fly. In the poem, his image personifies the spirit seeking freedom and will. The poet's personal «I» merges with the experiences of the heroes. However, Daedalus, feeling that this path is not without difficulties, tries many times to dissuade him from this path:

My child, why do you cause such pain?
Life's torment, do you feel the same?
Flying, a torture you can't construe,
To soar and chase fate, a path so true.

Instead of choosing such a difficult path, the father advises his son to have a feast in a tavern and organize dog fights. However, seeing Icarus's firm intention, he still gives him a pair of wings and tells him not to fly too close to the sun. Here we see some people who have no purpose in life and whose lives are filled with such trifles as feasts and dog fights. Such people are contrasted with Icarus's steadfastness in his decision, his determination not to turn away from his path. But there is a limit to everything. Excessive desire turns into an irrepressible desire. And this is the ruin of a person. Icarus, who did not pay attention to his father's pleas, is also destined for a similar fate:

Bird painting featuring the Simurgh, from a manuscript (c.1400s) of the mystical Persian poem Mantiq al-Tayr (Language of the Birds) by Farid al-Din 'Attar

Usmon Azim, Tashkent 2022. Fotograf Dirk-Skiba

Vain greatness is tiring!
Fly low, flying over the sea is also beautiful...
Stop! Don't get close to the sun, it will burn you!
Stop! Your wings will burn, my child!..
- Father! The fire burned to the bones,
How painful it is when the flesh absorbs the sun...
But having reached such beauty - the sky
Turn into ashes and fall to the ground.
- Fate spares no one!
Did she spare us? What can I say:
Falling, burning, your flesh, my child,
And the damned flight that was interrupted in the sky![1]

Awareness of proportion is the highest happiness of mankind. Even in matters of pride. On the path to freedom, Icarus wanted more than just freedom. And this became the cause of his death. The poem reflects cruel but realistic images of life. Each line makes the reader think. Indeed, the spirit always strives upward. Perhaps Icarus wanted to cross the boundaries of freedom in this world. That is why he does not regret the death of his flesh. He falls to the ground, but his flight metaphorically continues. The ancient myth and its images seem to come to life before our eyes, thanks to the author's masterful interpretation of the ancient text, its actualization through modern ideas and feelings.

Another poem by Usman Azima – "Simurgh" – is a unique example of lyric poetry. Its pathos, special spirit, and method of depiction attract attention. The image of the bird Simurgh, chosen as the object of the poem, personifies thirty birds. This image first appears in classical literature in the work of Fariduddin Attar's «Mantiq- ut - tayr», written in Persian, and then in Alisher Navoi's «Lison-ut-tayr», written in Turkic. The summary of the work is as follows: one day, birds want to get together and hold a meeting. They cannot organize themselves and begin to disunite. Seeing this, the Hoopoe bird says that they need a leader, and its name is Simurgh. Then the birds set out to find the bird Simurgh. Along the way, they cross the valleys of Demand, Love, Enlightenment, Abundance, Unity, Surprise, Poverty and Decay with various difficulties. During the journey, many birds turn back or die. In the end, the thirty birds that reach their destination realize that they are the Simurgh and achieve immortality. Usman Azim, introducing this plot into his poem, reworks it and makes subtle philosophical changes. The poem describes the Simurgh, consisting of thirty birds. Twenty-nine of them want to separate from the Simurgh and fly separately, thinking that they will be stronger alone:

Why be one body and one soul!
The Simurgh was again divided into thirty parts.
Twenty-nine birds flew out of it -
Twenty-nine birds who are tired of being Simurgh!
But they forgot about the thirtieth bird.

The Simurgh falls apart and twenty-nine birds set off on their desired journey. Dreaming of becoming great alone, they fly off in different directions. But the journey is not what they expected, flying alone puts

[1] Usmon Azim. Sog'inch . –T.: " O'zbekiston milliy ensiklopediyasi ", 2007. 131-b.

them in front of many shocks and hardships. They are shot, their feathers are ruffled by the wind, and they get into trouble. Then they remember what it means to be a Simurgh. In the end, they understand that they have no other way and salvation than to become a Simurgh! Their strength is in unity. Having understood this, the birds return to unite in the Simurgh. Twenty-nine birds gather. However... the thirtieth bird is missing, no one has seen it and no one knows where it is:

However, the thirtieth bird is missing.
The thirtieth bird...
Chirp-chirp

The birds were full of anxiety and worry because they could not unite, did not understand each other and could not become Simurgh. They lament that they cannot return to Simurgh because of one ignorant bird. Here begins the climax of the poem:

Stands sadly to the side
The soul of the thirtieth bird.
Her pose translates into words as follows:
Everyone flew away...
Everyone flew away...
My heart was broken and I died,
When Simurg fell apart!..

The thirtieth bird understood the essence of the Simurgh, it clearly realized that its power, strength and immortality lie in unity. Therefore, it could not bear the fact that the birds put their "I" first and became the cause of the disintegration of the Simurgh, and its heart broke from great torment. Now there is no thirtieth bird, no unity, immortality, strength, there is no more Simurgh! No matter how much the deceived birds scream, nothing can be changed. The poem conveys the experiences of the thirtieth bird so masterfully that the reader, immersed in the spirit of the poem, feels this experience as his own. The disintegration of the spirit is a difficult process, once disintegrated, it will never return to its previous state. The Simurgh was also a whole soul, egoism and egocentrism doomed him to non-existence. Unity has always had power.

To reach this conclusion, the poet skillfully uses the classical image of Simurgh. However, he changes the form of the plot given in the sources. From "Lison ut -Tair" by Alisher Navoi we know that birds unite, go through difficulties without retreating, look for Simurgh, and eventually realize that they are Simurgh, and find happiness and immortality. And according to Usman Azim birds, already Simurgh, but not yet aware that they are Simurgh, separate and seek the power of Simurgh one by one. And when they realize that they have made a mistake and return, they cannot unite due to the absence of the thirtieth bird. Critic I. Khakkulov writes that in the poetry of Usman Azim the lyrical hero rises to the level of understanding the truth. The true understanding of a person begins with the awareness of oneself. As a striking example of the philosophical search for self-awareness, one can cite the work «Simurgh» by Usman Azim.

In the poem «I am Majnun « to reveal the experiences of the lyrical hero, the poet also turns to an image from classical literature. Majnun is a character of many romantic legends. This is confirmed by the works of Nizami Ganjavi, Khusrav Dehlavi, Abdurrahman Jami, Alisher Navoi, Abul Bekr al-Walibi. First of all, from Navoi's poem «Layli and Majnun» we know that Majnun, whose real name is Qais, has been ob-

Mosaic of scenes of Daedalus, Icarus and Pasiphae. 2nd century CE.
Archaeological Museum of Gaziantep, Turkey

Akmal Ikromjonov. Meeting (Leyli and Majnun). 2020

sessed with divine love since childhood. After meeting his beloved Layli, he becomes a real madman. They cannot bring him back from this path. As a madman, he wanders through the mountains and deserts and perishes on the path of love. The love depicted in the poem actually reflects the love of Allah. The lyrical hero of Usman Azim also compares himself to Majnun and his essence also burns in the fire of love:

I am Majnun .
The healthy ones froze in amazement.
But in my soul a volcano of love boils:
Time calls me to life -
I will break into a new legend

For a person obsessed with love, both heaven and hell are the same. For him, "And heaven is Layli, and hell is Layli". His mind is detached from life, occupied only with it, obsessed with love, capable of even making him forget his own name: "I will forget my name Qais". After Majnun became insane, those around him began to call him Majnun instead of his real name Qais. He himself forgets his name. Like Qais, the lyrical hero realizes that he is ready to forget his name. If Majnun's love for Allah in the classical poem is reflected through Leyli, a person, then Layli of Usman Azim is not a human, but the Truth itself. He calls Allah «Layli». In an effort to unite with his beloved, he complains that people are busy with worldly concerns. He tries not to be distracted by such concerns, realizing that they will lead him astray:

I am Majnun.
In melancholy I write a letter.
The fire of separation burns in the soul.
Although the world is busy with other concerns -
He reads the letter over my shoulder.
I am Majnun.
Time is merciless.
Concerns about the daily routine are as dispassionate as stone.
World, show me if this is tomorrow's letter!
This is my letter, my letter![2]

When the poet faces life's problems, he considers it his noble task to endure them. The letter he writes is actually a life's journey. Depicting the fleetingness of time, he says: «Time walks on me without wiping its feet.» We know that only a person in a hurry can cross the threshold without wiping its feet. Here we can understand how quickly time flies. Following this time, the lyrical hero finally stands at the end of his path. Now he is one step away from reaching his beloved, the image of Layli. There is only one thing left – to give up his soul. In order to reach this stage, standing between life and death, the hero of Usman Azim yearned like Majnun, passed many difficult roads. And now he is on the threshold of his goal. It can be seen that the anxiety at the beginning of the poem turns into calm and satisfaction in its final stage. Through the lyrical hero, the poet describes a person who stoically endures difficulties and stubbornly follows the chosen path.

There are many more examples of references to similar images from legends and epics found in the works of Usman Azim. Oral folklore – folklore and epic legends – play an important role in the poet's work. This is especially noticeable in the collection «Bakhshiyona». Alpamish, Ak-Batir and Kara-Batir, Yadgar and similar images are skillfully used by the poet to reveal the inner world of the lyrical hero. Expression of experiences in a poem through images familiar to the people multiplies the power of its impact. A poet who understands this well includes such images in his creative world and enriches his creative heritage with them.

[2] Usmon Azim . Fonus . –T.: " Sharq " nashriyot-matbaa , 2010. 52-b.

Words of gratitude to my native Uzbekistan

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When in 2008, at the insistence of the editor of my latest book, information about the author was placed at the end of it, taken from the authoritative tome MARQUIS "Who is Who in the World"—25th Silver Jubilee Edition of 2008, I was most pleased with the fact that from now on the name of the city of Kokand, dear to my heart, would become somewhat better known to the whole world. 16 years later, I was kindly offered a brief essay about aviation to write for the Uzbek popular science journal "Fan va Turmush." "Not to seem, but to be a great aviation power" was the headline of an essay I had previously written about urgent issues in aircraft manufacture for the Russian journal "Science and Life" No. 8, 2006. I did not want to repeat myself because it is also available online. However, I became intrigued by this surprising offer after perusing an intriguing issue of a hitherto undiscovered Uzbek journal of 2024 that was sent to me. I thought when I woke up in the middle of the night, "But I have something positive to say to my Uzbekistan...

When I received a kind offer to write a short article about aviation for the science journal "Fan va turmush", I became interested in this unexpected offer. I woke up at night with the thought: "But I have something good to say to my small Motherland - my Uzbekistan...". And here is what a mosaic, subjective picture arose in my awakened memory grateful to Uzbekistan...

Perhaps first I need to say a little about myself. I was born in Kokand on June 4, 1937, in an Armenian family of immigrants from Karabakh. I spent my childhood and youth in Kokand. I also graduated from high school there. Then I received higher education at the Moscow Aviation Institute (1960), and also completed postgraduate studies at the Moscow Institute of Physics and Technology (1968).

My hometown of Kokand has a glorious history; it is one of the ancient cities of Central Asia. It has been known under different names since the 10th century. The city was the capital of the Kokand Khanate (1709 – 1876). Kokand has preserved its ancient urban structure; it consists of a new and an old city parts. In the new city, already at the end of the 19th and beginning of the 20th centuries, there were trading and craft enterprises, banks, a telegraph, educational institutions, and modern buildings of original, solid architecture. In the old part of the city, the Khan's palace "Urda", monuments of folk residential architecture, mosques, madrassas, and memorial buildings have been preserved... It turned out that my wife's grandfather, Artashes Vachyanets, lived in Kokand before the revolution and was a well-known merchant in Central Asia, heading the "Trading House of Tarona". Arriving home on another vacation in Kokand, I learned that the former large stone house of this merchant now housed a music school, and the former Trading House housed a two-story hotel; these stone buildings continue to serve people to this day.

We were taught Uzbek in a Russian school by wonderful teachers, whom I still remember with gratitude. Once, in the 1980s, we, engineers from TsAGI, were flying on a business trip to central China from Moscow along an unusual route—via Alma-Ata, Urumqi—to the city of Chengdu. Due to bad weather, the flight was delayed, and we arrived in Urumqi when the plane to Chengdu had already departed. The next flight was in a few days. Our team of specialists, very much needed at the then-young aviation design bureau in Chengdu, was placed in the best hotel in Urumqi, and the administration was instructed to "feed us first class." But none of the locals knew English, and none of us knew Chinese. What a joy it was for us when I suddenly discovered that we were among the Uyghurs. Their speech is very close to Uzbek, we were able to talk to them. My father, Ashot Avetisovich, a fine mechanic and a well-known hunter in the Kokand region, knew Uzbek much better than I did. My younger brother, Yuri, who headed the construction and assembly train No. 370 in Kokand for many years, spoke Uzbek perfectly, like his native language. This was, in fact, a construction trust

Developer of aviation technology Dr. G.A.Amiryants at work in the cabin of the airplane

Proton rocket

that built railways, bridges and structures, schools, hospitals, and housing along the entire Central Asian Railway. My Kokand friends remember the Uzbek language and good Uzbek traditions: test pilot Slava Petrosyants, who now lives in Moscow, and director of the Zhukovsky refrigeration plant Anna Yancharek...

Like many other cities in Uzbekistan, Kokand gave shelter to people of various nationalities evacuated from the center of the country during the war—Russians, Ukrainians, Jews, and special settlers - Greeks, and Crimean Tatars.

Colonel I.S. Koshevoy worked closely with the head of the 4th GUMO G.F. Baidukov for 15 years. Ivan Koshevoy experienced the hardships of war in full. After graduating from high school in 1941, with the outbreak of war, the military registration and enlistment office of his native Ukrainian city of Uman formed a detachment of about a hundred young guys who could not yet be drafted into the army, but who could not be left in the territory that would be captured by the Germans. They had to be sent to the east along with the enterprises. "The guys, from July 7, 1941, set off on foot from Uman to Kharkov, and then from Kramatorsk to Stalingrad," recalled Ivan Savvatyevich. "There we were loaded onto trains and taken to Orenburg..." From there, their plant, the largest enterprise, was forced to be divided: part of it was sent to the Southern Urals, and the other part to Central Asia. The plant's employees, including I.S. Koshevoy and his two young friends arrived in Tashkent, and in the fall of 1941, machine tools and equipment began to arrive at the plant in Uzbekistan. These guys had a work reservation, but when in the spring of 1942, Koshevoy saw an announcement in the military registration and enlistment office about recruitment to a military aviation school, he became enthusiastic about it. He, who dreamed of aviation, successfully passed the entrance exams, but when the cadets were brought from Tashkent to the place of deployment, it turned out that this was a military aviation school... of communications. He was sent to a battalion that trained navigators - the heads of squadron communications: in bomber aviation, the navigator was also a radio operator.

- Where was your school located? - I asked Ivan Savvatyevich.

- In the small Uzbek town of Kokand.

- What are you saying! I'm from Kokand! - Well, you know, the world is small, - Ivan Savvatyevich smiled and continued: "... In Kokand, the school was located in two buildings. Our battalion was located in the state bank building. I studied there for a year. And at that time, radar technology was developing at a rapid pace. And it was clear that without such technology, it was, of course, impossible to gain air supremacy. So they quickly formed a group of us, future

graduates, and sent us to the Moscow Aviation School of Communications…" Since then, I have repeatedly heard I.S. Koshevoy's colorful stories about his service in my native Kokand: about the state bank, where the cadets not only studied, but also lived, about how compassionate local Uzbeks fed their patrols on duty with pilaf. He finished his service, participating in the work on creating the now famous S-300 anti-aircraft missile system. It became the foundation for all other subsequent systems: S-400, S-500… It is difficult to overestimate the importance of these "deterrent" systems in maintaining a large, strategic peace after WWII, and even in our days. Kokand can therefore be proud of its contribution to the training of specialists who subsequently created the latest anti-aircraft missile systems in the interests of the global defense of the CIS.

In 1954, having entered the Moscow Aviation Institute, I met my fellow countryman (though he was born in another, similar Uzbek city – Kagan) Yuri Juraevich Khojaev. Yura and I have been the closest friends for seven decades now. After graduating from MAI, we were both assigned to the leading centre of Soviet aviation science—the Central Aerohydrodynamic Institute—TSAGI. Here we work side by side, but in different directions. Yuri Juraevich is one of the leading specialists in the field of thermal strength of supersonic and hypersonic aircraft. His contribution, in particular, to providing thermal protection for the Buran aerospace aircraft is invaluable… Here is another memorable recollection "on a given topic". At TsAGI, I worked for many years next to Alexander Georgievich Popovyan. We met in a more than strange way. In 1964, we both entered graduate school at MIPT. One day, we, graduate students from different faculties, from different cities, were gathered for a general meeting for some reason. After the meeting, all of its participants were strictly invited to a clean-up day in Dolgoprudny. We did not know each other before, but while working side by side with shovels, we got to talking… He said that he had been living in Russia for a long time, and was not born in Armenia. I nodded. "I have been in Moscow for ten years now… And I was born in the Uzbek hinterland." He was very surprised: "That can't be, I am from Uzbekistan too!" I said that I was from a little-known town in the Fergana Valley—Kokand. He was dumbfounded: "And I am from Kokand!"

In 1943, after graduating from high school with a gold medal, he entered the aviation department of the Industrial Institute in Tashkent. In October 1944, his entire class voluntarily went to the front, and only three returned from the front. In 1950, he entered the power engineering department of the Moscow Power Engineering Institute - MEI in Moscow… Much can be said about the specific scientific and design achievements of A.G. Popovyan at TsAGI and the Central Institute of Aviation Motors - CIAM. As a specialist in the field of creating stands for researching jet engines, he had no equal in the industry. And all this was laid down by the Kokand, as well as Tashkent upbringing and education… My older comrade in

The building of the Russian-Asian Bank on Rosenbakhovsky Avenue. Kokand, 1910-1912. Photo by E. Wilde

Moscow was our Kokand relative Mikhail Mishetyan - the uncle of the wife of my younger brother Volodya, who had been fruitfully working for many years at the famous Flight Research Institute in Zhukovsky. Misha and I were connected not only by close kinship, but also by common work in aviation. After graduating from the Moscow Aviation Institute, he was the leading designer in the newly created, subsequently outstanding Experimental Design Bureau (OKB) of V.M. Myasishchev, so his contribution to the creation of transonic and supersonic strategic aviation was also significant. And after this aviation design bureau was re-profiled into a rocket design bureau, he took the most active part in the creation of the now famous, unique launch vehicle "Proton" for launching spacecraft…

This is only a small part of my chaotic, grateful night memories… My teacher, Academician A.A. Dorodnitsyn, said, "There is nothing simpler, more accessible, or more natural than gratitude. And there is nothing more unnatural, disgusting, and vile than ingratitude.".

These memories of mine are natural words of gratitude to my native Uzbekistan and the Uzbek people.

Avezov R.R., Niyazov Sh.K., Kasimov F.Sh., Vokhidov A.U., Rakhimov E.Yu.

Solar water heaters with capacity

Publishing house " Ziyo", Gulistan. 2022, 112 p.

The monograph presents information concerning capacitive solar water heating collectors with bottom absorption of solar radiation for obtaining hot water for the needs of consumers located far from centralized hot water supply systems. The operating principle, design and application features of these collectors are explained. Methods for increasing the efficiency and reliability of capacitive water heating collectors in seasonal solar hot water supply systems are described.

The monograph is intended for scientific and engineering workers, doctoral students, as well as undergraduate and graduate students in the specialties "Fundamentals of Solar Energy Use" and "Renewable Energy Sources".

The monograph is published in Russian with brief annotations in Uzbek and English.

Makhsudov A.U., Umaraliev N.
Study of primary cosmic rays

Publishing house "SP Nihol Print". 2021, 144 p.

The monograph presents the results of work on the creation of experimental setups for studying particles of primary cosmic rays. A review of studies carried out in space using artificial Earth satellites, on balloon aerostats, in highlands and at sea level, as well as on the ground-based Cherenkov gamma-telescope NCHT-10 in the Tashkent region (Parkent) is given. The setups and results of studying the energy spectrum of primary cosmic rays at energies of 10 12 - 10 14 eV are described.

Data is provided on the information and measuring complex, created on the basis of modern technical and software tools, intended for the automation of scientific research into the characteristics of cosmic rays.

The monograph is intended for researchers, doctoral students, as well as undergraduate and graduate students.

The monograph was published in Russian.

Tursunov M.N., Sobirov H., Yuldoshev I.A., Shoguchkorov S. K.

Development of solar cogeneration devices based on photovoltaic thermal batteries

Publishing house «Bookmany print», Tashkent. 2022, 146 p.

The monograph provides information about substantiation of the use of renewable energy sources by combining them with solar cogeneration devices based on photovoltaic thermal batteries. The monograph describes the results of mathematical modeling of the process of obtaining electrical and thermal energy in one technological installation from photovoltaic thermal batteries, as well as the results of testing technologies for the manufacture of photovoltaic thermal batteries, devices that ensure their functioning, and determining the technical indicators and energy characteristics and parameters of these combined photothermal converters.

The monograph is intended for scientific and engineering workers, doctoral students, as well as undergraduate and graduate students.

The monograph was published in Uzbek.

Musaeva Feruza

Uzbek folk dictionary

Publishing house «Innovatsion rivojlanish». 2022

This dictionary contains and explains words and expressions that have flourished and are currently present in Uzbek dialects, vividly reflect the way of life, thinking of the Uzbek people, reflect their linguistic perception; the footnotes provide illustrative examples from artistic, scientific, journalistic works and oral folklore.

The introductory article analyzes the principles of naming aggregated words based on modern linguistic approaches, as well as the principles of naming words specific to dialects. The book is intended for students of philological faculties, specialists in the field of linguistics, as well as representatives of the public engaged in the promotion of the Uzbek language.

The book is published in Uzbek.

MODERN GENERATION OF SCOOTERS

A scooter is a two-wheeled vehicle designed for driving while standing. In the traditional sense, a scooter is a vehicle driven by muscle power - pushing the foot off the ground. However, electric scooters have recently become widespread, their main method of use is movement with the help of an electric motor. Scooters are used not only as personal transport, but also for recreation, sports and physical education. Although there are several types of scooters with different parameters, they all have the same principle of movement.

If we turn to the history of the scooter, it was invented in 1761 in Germany by Michael Kassler, a manufacturer of carriages. According to another version, the scooter was created in 1817 by the German inventor Karl von Dres and improved in 1820 by adding a front wheel steering system. Such scooters became quite popular in France and England. In 1819, English inventor Denis Johnson managed to patent an improved version of the scooter invented two years earlier by Baron Karl Dres. In this version, the frame and wheels were made of wood, the tires were replaced with a hard metal covering, and the seat and front fork were also made of iron. The wheel diameter was 76.2 cm (30 inches), and the approximate weight of such a scooter was 30 kilograms. The principle of movement of this scooter was similar to the now popular children's balance bike. Balance and speed could be achieved by alternately pushing off the ground with your feet. A real breakthrough in terms of scooters can be considered the early 1890s, when the former Swiss banker Wim Oboter put forward the idea of creating a scooter with a folding design. The idea was that after use, it could be folded with a few hand movements and put in a box. Today, a scooter can easily compete with a bicycle due to its modular design, maneuverability and mobility, and this is certainly a good thing. Thus, scooters have won the glory of an ideal means of transport for fast travel around the city.

Kickbikes. Amish kick scooters

Lady Florence Norman, on her motor-scooter in 1916

Children's scooter. Children's scooters are designed for children to use in games and for walks. They are designed for children of small weight, have small-diameter wheels, often with solid airless tires. Designed for small children who do not yet know how to maintain balance when riding scooters, scooters have two wheels on the front axle and can stand still when stationary. And today, such scooters are a favorite transport of small children. Children's scooters are usually painted in bright colors and decorated with various patterns. They can also have a signal bell or horn and decorative lighting, and colorful lighting devices can be used inside the transparent tires of the wheels.

City scooters. Today, the number of scooters in the city has increased significantly. This type of transport has attracted the attention of not only hundreds of thousands of children, but also adults in recent decades. The fact is that scooters are truly multifunctional. Electric scooters have recently become widespread, the main (and only practical) use for them is movement with an electric motor. The first electric scooter was created on September 19, 1895. Its creator was Ogden Bolton. This scooter had a centrally located electric motor and a 10-volt battery. Howev-

er, it is still unknown whether Bolton's scooter was released for general use. At the beginning of the 20th century, the Ajax Motor company presented its electric scooter to the world. However, consumers did not appreciate the invention at all and did not use it. The reason for this is that in those years, electricity was not yet as widespread as it is now, and was in short supply. Over time, people began to actively use electric scooters. Evidence of this is the growing number of people around the world who are interested in this type of transport. People widely use these scooters to save time, reduce distances and lead a healthy lifestyle. The main purpose of a city scooter is to move around the city. Especially in the hot season, it has become natural to meet young and old people confidently driving scooters on city streets, and even office workers rushing to work.

The diameter of the wheels of city scooters ranges from 150 to 250 millimeters, which allows them to develop very high speed and easily overcome small unevenness in the road: asphalt cracks, tiles and curbs. The presence of shock absorbers, flexible or inflatable wheels in such scooters reduces vibration when moving on different road surfaces. The lightness and disassemblability of the scooter make it easy to move around in public places and transport it in public transport.

Short-term rental of electric scooters using mobile applications is very convenient and saves time. To use and rent scooters, simply download the application and scan the QR code on the scooter's steering wheel. At the end of the trip, the scooter is left in a specially designated place, after which the rental is considered complete.

Since April 2022, an online scooter rental service has been launched in Tashkent. The kick-sharing market has quickly gained popularity. This, of course, is pleasing. However, it is also worth noting that the sudden appearance of electric scooters without the introduction of appropriate parking and use rules has caused some inconvenience for pedestrians, cyclists and cars.

Modern scooters

How is scooter driving regulated in different countries?

It is often not easy to introduce electric scooters into traffic rules. They cannot be included in the list of motor vehicles, and scooter drivers pose a danger to pedestrians. However, it is also difficult to force scooter owners to move only on bike paths: few cities can boast of a developed road infrastructure.

In particular, in Singapore, electric scooters are practically prohibited. They are offered to ride only on bike paths, of which there are very few in the country. In the UK, personal electric scooters can only be used on private property: to ride on the roads, you need to rent models at special stations, but they are very difficult to find. In some countries, a driver's license or a special exam is required to drive. In others, people over 18 are allowed to ride a scooter. In Denmark, Spain and Norway, wearing helmets and meeting minimum safety standards is mandatory.

Electric scooter rental in other countries

Mandatory age category

From 10 years old – after passing a special exam, you can freely drive a scooter in Poland.

From 12 years old – in France.

From 14-15 years old – in Sweden, Germany, Denmark.

From 18 years old – scooters are available for rent in Finland and Belgium.

Maximum speed

6-8 km/h – in some pedestrian zones in France and Italy.

20 km/h – in Germany, Sweden, France

25 km/h – in Austria, Switzerland, Spain, Belgium, Russia, Great Britain.

48 km/h – in Florida

There may be restrictions

In the cities of Singapore, Jakarta, Shanghai – you can only move on bicycle paths.

In Brazil, you cannot ride on paths intended for pedestrians, but you can move on sections of the road with a speed limit of 40 km/h (where the maximum speed for a scooter is 20 km/h).

This may come in handy

In Japan, even scooters require a driver's license and registration with the country's police.

In Israel, you must provide a driver's license and a certificate of training on a special two-day course for better study of traffic rules.

In Italy, in the evening and at night, you must use lighting devices and special vests that reflect light.

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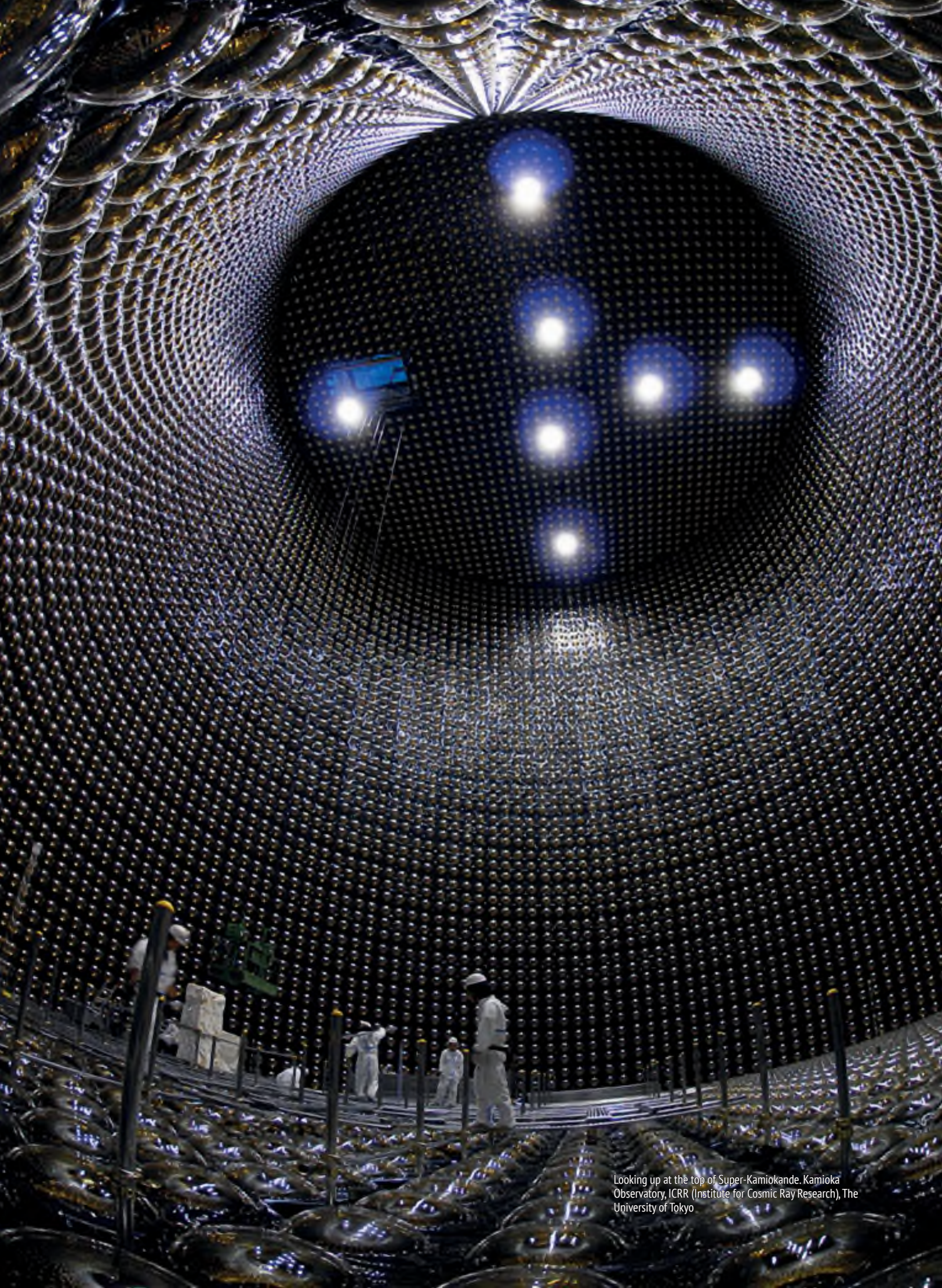
On the cover: A sea bream that's part of a permanent exhibition of endangered species displayed at the History Museum of Aralsk, Kazakhstan, a former Soviet fishing port on the Aral Sea.
Carolyn Drake/MAGNUM PHOTOS, 2009



Looking up at the top of Super-Kamiokande. Kamioka Observatory, ICRR (Institute for Cosmic Ray Research), The University of Tokyo

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Bronze mirror. 17th-16th centuries BCE. Sopollitepa