SCIENCE FOR THE BENEFIT OF MANKIND

FAN VA TURMUSH

«Science and Life» popular science journal
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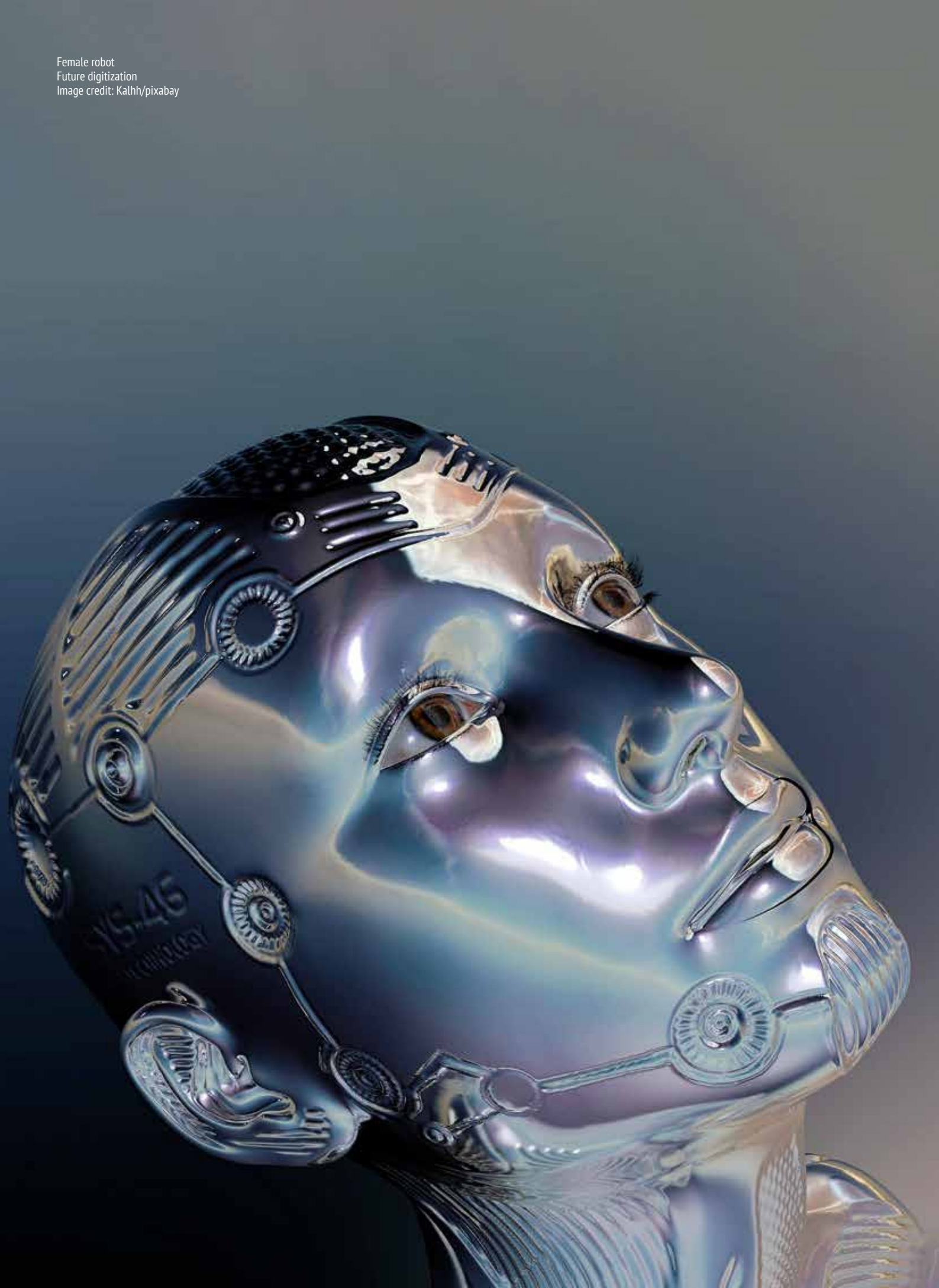
SHEADWORKS UZBEKISTAN RETURNING TO THE HOMELAND

- Titans of the Muslim Renaissance;
- Saxaul – a unique desert guardia;
- War sign embossed on the coin of Khorezmshah;
- About the history of the creation of New Urda of Tashkent in the 19th century;

Female robot
Future digitization
Image credit: Kalhh/pixabay



EDITORIAL

Dear readers!

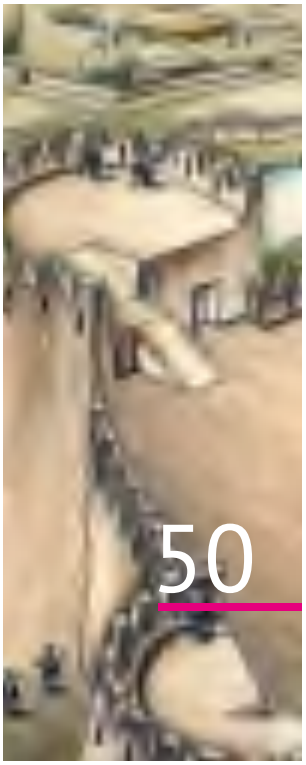
As you know, science is the basis of development and one of the most important areas of activity of the state and society. We owe everything that surrounds us and makes people's lives comprehensively secure and interesting to science. It is science that moves society forward, creates new theories and innovations, develops technologies, improves production and opens up new paths for the socio-economic development of the state and society.

The popularization of science and the widespread dissemination of scientific knowledge are a priority for the active involvement of citizens of Uzbekistan in professional activities and public life. Therefore, special significance and responsibility in this most important matter – the promotion of scientific knowledge among the population – traditionally belong to our journal, the oldest periodical publication in Uzbekistan.

Since 2023, when the concept and design of our journal were updated, we have been publishing popular science articles in four main sections. These are: 1. "Numbers rule the world" (mathematics, astronomy, physics); 2. "Nature and Man" (chemistry, biology, ecology, medicine, earth sciences); 3. "The World of Technology and IT Technologies" (mechanics, engineering, transport, information technology, artificial intelligence); 4. "Society, History, Culture" (history, archeology, oriental studies, art criticism, literary criticism, linguistics, political science, jurisprudence, etc.). The final sections of the journal provide information about the discoveries of scientists, new scientific books and textbooks, interesting scientific facts, memories and memorable dates of scientists and scholars of Uzbekistan.

The articles presented in this 3rd issue (2025) of our journal are traditionally distributed across all sections and reflect the latest achievements in a number of relevant areas of world and domestic science. We sincerely hope that these articles will interest you and help you learn about new scientific horizons and achievements. Since 1999, every year on November 10, the entire world scientific community celebrates the international holiday "World Science Day for Peace and Development", established by UNESCO. The editorial board of the journal "Fan va turmush" heartily congratulates its readers, scientists and workers of science on this wonderful holiday! We sincerely wish that all the thorny paths in your life lead to new knowledge and the development of new professional heights. And may luck always accompany you in this noble aspiration!

CONTENT



Academician Anatoliy Sagdullaev: The Third Renaissance should be understood as a completely new policy

Editor-in-Chief, Academician A. Khakimov, and Executive Secretary A. Isakova interviewed by Academician A. Sagdullayev

The Editor: Anatoly Sagdullaevich, how do you understand the term "Third Renaissance"?

A. Sagdullayev: The changes taking place today in culture, art, and historical and cultural heritage can be described as an approach that defines the present and future development in all areas that involve people living in our society. The concept of the Third Renaissance is a well-thought-out idea, combining both theoretical and practical elements. It is a new policy – a new perspective on shared history and culture, based on the promotion of national concepts and the integration of the achievements of the peoples living in the Central Asian region. In our President's speech at the 72nd session of the UN General Assembly, the main focus was on issues such as regional unity and creating broad opportunities for the younger generation in various areas, including education, social protection, sports, art, culture, and science. The Uzbekistan Academy of Sciences occupies a special place in this nationwide process – it promotes the implementation of scientific discoveries in various sectors of the national economy and improves the quality of scientific research. At the same time, it pays special attention to motivating the interests of young people, organising meetings between scientists and young people living in remote areas and master classes for students to stimulate their interest in science.

The Editor: Why did Uzbekistan serve as a centre for intercivilisational dialogue?

A. Sagdullayev: Researchers of antiquity believe that historical and cultural heritage knows no boundaries; it is both a national and universal value. If we rely on this approach, there will be no disputes or objections. Uzbekistan has been a centre of intercivilisational dialogue since ancient times. Scientific research on this very issue began in the 1980s. In my opinion, everything created through the lives of the populations of neighbouring territories belongs to a common civilisation and cannot be divided. For example, in Turkmenistan, the Bronze Age site of Gonur; in Afghanistan, Dashly; and in southern Uzbekistan, Jarkutan are part of a common civilisation.

The Editor: Tell us about your research as an archaeologist, and how did your interest in this profession arise?

A. Sagdullayev: As a young man, I studied at secondary school No. 2. Around seventh grade, students from M. Masson's Kesh Archaeological and Topographic Expedition in the Kashkadarya Region appeared on our school's sports field. They came to do an internship at the ruins of the city of Kitab and played volleyball and basketball with us. We became very interested in their work because they began finding fragments of pottery and coins in excavation sites resembling wells. In subsequent years, similar expeditions came, and we first observed their work and then began assisting. It was then that my interest in archaeology was piqued, and I decided to become an archaeologist. Unfortunately, none of my seven classmates went into the field. At that time, there was little interest among applicants to become archaeologists; there were even courses where only one student studied archaeology. But among the senior students were such outstanding representatives of Uzbek archaeology as Sh. Pidaev, U. Rakhmanov, and Nekrasova, who continue to work tirelessly in this field today. In 1971, as a third-year student, I was sent to intern with the Uzbek Art History Expedition, where we worked alongside such prominent representatives of the archaeological school as G. Pugachenkova, E. Rtveladze, B. Turgunov, and Z. Khakimov. During one of these internships, we worked with Z.A. Khakimov at the Kyzyltepa site in Surkhandarya until 1985, then compiled archaeological maps in the mountainous regions at the Daratepa site in Kashkadarya and the Uzunkir site in Shakhrisabz.

The Editor: What is your opinion on the concept of Turanian civilisation?

A. Sagdullayev: When approaching the question of the Turanian civilization, it is necessary not to jump to conclusions but to thoroughly analyze its historical sources, scientific foundations, and stages of development in historiography. This is important not only from a scientific perspective but also for understanding our national identity and cultural heritage. The problems of the formation of historical and cultural regions and the ethnic geography of Central Asia are a very pressing issue. I think the first thing we need to emphasize is the following: Uzbekistan is our state, our homeland. The Republic of Uzbekistan. The State of Uzbekistan. It will forever enter world history under this official name. Therefore, first and foremost, we must think not only about the present but also about the future, about centuries to come. Above all, we must study the Uzbek people, history, culture, statehood, and civilization of Uzbekistan. People talk about the civilizations of India and Egypt. The concept of the civilization of Uzbekistan has also become established. This is recognized by the international community. The issue of the Turanian civilization mentioned in your question should also be considered in this context. From a scientific perspective, any idea or concept must be based on scientific foundations. In particular, ideas about the Turanian civilization must be grounded in scientific facts, sources, and historical data. It is well known that the territory of Central Asia has been a crossroads of various civilizations since ancient times. Both sedentary cultures and the cultures of nomadic pastoral tribes coexisted here, and their interactions resulted in the formation of a rich, diverse cultural environment. Therefore, we need to thoroughly analyze the diversity of civilizations in this region, their mutual influences, and connections.

The Avesta, as one of the first written sources to have reached us, mentions territories inhabited primarily by sedentary peoples. However, it also mentions nomadic tribes inhabiting the steppes (for example, the Dahae, Sain, and others). In later historical sources, the term "Turan" is associated specifically with these tribes and the territories they inhabited. However, it is important to note that the Avesta, Achaemenid inscriptions, or Greek sources do not mention the name "Turan" as a country, political entity, or specific geographic region. Tribes such as the Sakas and Massagetae are primarily mentioned. Thus, the term "Turan" emerged later in history, and its scholarly study spans 120 years. Scholarly research on this topic has primarily been conducted in Western countries and is widely covered in literature published in various languages.

By the sixth century, the powerful Turkic Khaganate emerged on the historical stage. During this time, the Turks themselves became the main rivals of the Sassanids. During this period, Zoroastrian priests were busy editing and codifying the Avesta. Through the prism of their religious views, they began to portray the Turkic tribes and pastoral peoples as their opposite. The term "Turan," associated with the roots of the nomadic tribes inhabiting these vast steppes, dates back to these times.

Subsequently, the ancient Iranian epic poetry arose from this foundation, based on historical legends formed in the Avesta. We see this clearly in Ferdowsi's Shahnameh. There, the struggle between Iran and Turan is described through the legends of Afrasiyab, Siyavush, Isfandiyar, and Rustam. Thus, the term "Turan" took shape and began appearing in historical sources from the early Middle Ages. Consequently, the contradictions between Turan and Iran are, in fact, largely mythological in nature.

In the later Middle Ages, especially in the works of Arab and Persian geographers, the term "Turan" gradually became associated with the concepts of "steppe," "Turkestan," and "Transoxiana." For this reason, this name began to be used in a geographical and cultural context. I am stating facts here; this is not my personal opinion, but the historical truth itself. If anyone disagrees, they can refute it scientifically and prove it with facts. The study of history—whether in the natural sciences or the humanities—begins in school. The process of creating new-generation textbooks began in 1998. The textbooks of that time, of course, were not as sophisticated as they are today, but they served as a foundation. In recent years, textbooks have been revised and enriched with new scientific information. However, approaches are ambiguous: some textbooks include the term "Turan," while others do not. Some perceive Turan as the territory of ancient Uzbekistan, while others see it as a historical legend. This difference is natural.

The Editor: As you noted, the issue of reading culture and museum visits is currently relevant in the school and higher education systems. We would like to hear your opinion on this.

A. Sagdullayev: Yes, this is a very important issue. Unfortunately, there are serious problems in this area today. For example, museum attendance, exhibition attendance, and social engagement in this regard are very low in our country. In other countries, no matter where the exhibition is coming from, people line up to get in. But here, unfortunately, museums are empty. In his speech on December 22 last year, the President specifically addressed this issue and spoke about organising museum activities on a new basis and strengthening their material and technical infrastructure. We will undoubtedly achieve success in this area.

Previously, when we were studying, if we needed to write a coursework, we had to go to the library. For example, finding a seat at the Alisher Navoi National Library was difficult – we had to stand in line to find a chair and table. Now, when I say this, my grandchildren laugh: "You must have been primitive people!" But in fact, that library environment taught us to read and research. Now, students are losing the habit of consulting sources beyond the textbook. The textbook is the primary learning tool, but it shouldn't be the only source. Without supplementing the textbook with additional literature, sources, and research, knowledge becomes superficial.

These additional sources play an invaluable role in art, literature, history, and so on. For example, if history is studied in close connection with other fields of study, the results will be completely different. Unfortunately, this approach has not yet been fully implemented in our education system.

The Editor: How the ideas of the Third Renaissance are reflected in the preservation and promotion of Uzbekistan's cultural heritage and the development of contemporary art?

A. Sagdullayev: Today, work in the field of humanitarian policy in our country, carried out under the leadership of the head of state, has reached a new level. Exhibitions, scientific and cultural events of such a scale have never been held before. This is undoubtedly inextricably linked to the Third Renaissance processes taking place in our country and signifies a new level of approach to the restoration, preservation, and scientific study of historical and cultural heritage. International exhibitions, festivals, and competitions are being held within the country and abroad—all in the spirit of a new Renaissance. Note that at the end of 2022 and in 2023, thanks to the efforts and initiatives of the head of state, major exhibitions were organised at the Louvre, and then at the Berlin Museum and Gallery, which were visited by thousands of people. Visitors discovered Uzbekistan. This was demonstrated by exhibitions presenting Uzbekistan as a civilisation, which is of enormous international significance.

Therefore, I want to say that society cannot fully develop without the humanities, culture, and art. These areas are closely interconnected and largely determine the level of civilisational development of a nation.

New amazing material graphene

Farid Umarov,
professor,
Ishmumin Yadgarov,
doctor of Physical and Mathematical Sciences

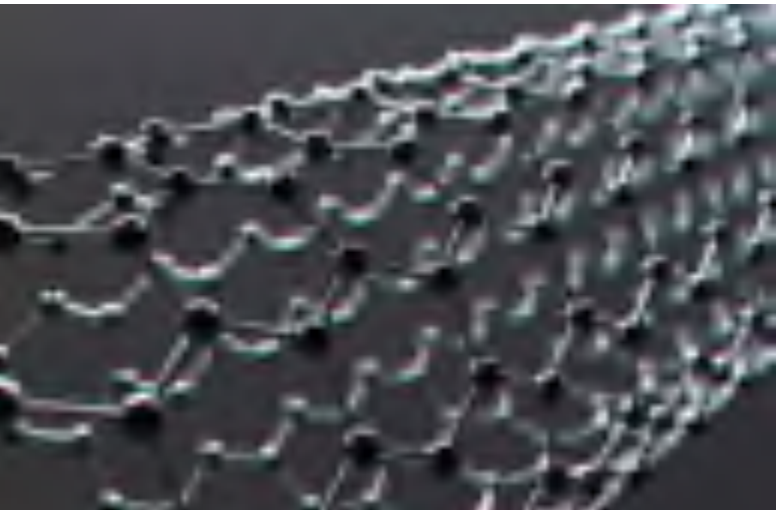
Graphene is a material that was discovered in the early 2000s and rightfully belongs to a series of unique materials and innovative technologies called "the amazing is near!" Graphene is a flat two-dimensional crystalline modification of carbon, one of the most common elements in the Universe, or more precisely, one of its carbon structures. The features of graphene are the form of its unusual organizational structure, temperature stability and existence as a unique thin-film material. In other words, graphene is a monolayer of carbon atoms connected in a two-dimensional crystal lattice with 2D geometry. The thickness of the layer of such a monolayer "film" is the size of exactly one atom (the minimum possible atomic size). In fact, graphene is a monoatomic in thickness and localized in one plane polyatomic cluster consisting of carbon atoms that are firmly linked by electronic chemical bonds and orderly located in a flat two-dimensional honeycomb structure.

Simple graphite pencil. Source: Shutterstock

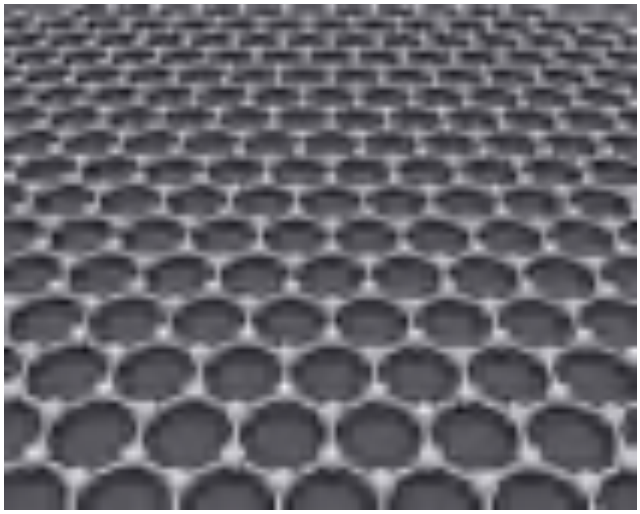
Graphene is a truly amazing material that was obtained on the basis of another carbon-containing material – graphite. More than five and a half centuries have passed since the beginning of the use of graphite carbon rods for writing and for the production of pencils based on them. Thus, in 1564 in England, in the Borrowdale valley, a graphite deposit was discovered. The first thing that pleased people with this find was that graphite left a darker mark when writing on paper compared to lead, which was previously used for writing and designations. At first, graphite rods were simply wrapped with thread and rope so as not to stain their hands when used for writing, and a little later they decided to insert them into special hollow sticks. This is how the prototype of the graphite pencil appeared. It is not known who exactly invented the first such pencil, but it was first described in 1565, a year after the discovery of graphite, by the Swiss scientist Conrad Gesner. That is, just a year after the discovery of the properties of graphite, European artisans mastered the production of pencils. At first, they were made by hand, and the first serial production was established only two centuries later - in 1761. And in 1795, the Swiss Conte patented a new method of making pencils.

However, until now scientists, design engineers, draftsmen, as well as students, schoolchildren and other representatives of the general public have been practically uninterested in the question of how, when drawing or writing, clear solid black lines are obtained on paper from the hard graphite lead of a pencil, and on their basis – letters, words, phrases, as well as drawings, diagrams and other symbols, signs, figures, diagrams and objects depicted in pencil .

And only 20 years ago, physicists were able to answer these pressing questions. An interesting coincidence is that graphene, like graphite, was also first obtained in England by British scientists of Russian origin. So, in 2004, young physicists working in Great Britain, Andre Geim and Konstantin Novoselov, made a discovery that resembled a magic trick. Experimenting with graphite, they glued a piece of ordinary adhesive material – Scotch tape – to it. Then tearing this sticky tape off the graphite, they took the thinnest layers of graphite with it. Repeating this process over and over again, the researchers were able to isolate a single material just one atom thick, or a monatomic material, with a specific crystalline structure for the first time in history. What is so special about this monatomic carbon-containing flake? But the discovery of these scientists turned out to be incredible in its scientific and practical significance. Thus, the structure of the resulting substance, reminiscent of a wire mesh of honeycomb hexagons, combines paradoxical properties: it is stronger than diamond, more transparent than glass, flexible like plastic, and also conducts electricity better than silver. Before this, sci-



Single-walled tubular graphene structure. Source: Shutterstock



Ideal flat crystalline structure of graphene. Source: Shutterstock

entists believed that such materials could not really exist at all.

It is interesting to note that the layered structure of graphite was known back in the mid-20th century, but for decades no one could separate one layer from it. Many of A. Geim and K. Novoselov's colleagues doubted their method, calling it simply "childish". However, it was the simplicity of their creative approach that became the key to success, and their discovery became a breakthrough in materials science. In 2010, A. Geim and K. Novoselov received the Nobel Prize in Physics, and the graphene they discovered was called the "material of the future", capable of revolutionizing the applied spheres of our lives. In 2013, the Soviet, Russian and Dutch theoretical physicist Mikhail Katsnelson was awarded the prestigious Spinoza Prize for developing the basic concept and concepts that science uses today in relation to graphene.

So, about the discovery of this material and assignment the name graphene, as consonant with the name of its progenitor – graphite, originates in 2004. Graphene was the first elementary two-dimensional crystal obtained, but subsequently scientists from different countries of the world also obtained other two-dimensional materials - silicene, phosphorene, germanene.

Over the past two decades, scientists have established a number of properties of graphene that are not typical for traditional solid state physics and materials with three-dimensional 3D geometry, which is why in English-language literature it is called a "wonder" or "miracle" material (wonder material).

This article will show why this new unique material is interesting to scientists and manufacturers. It should be especially noted that the number of publications and patents of scientific institutions, universities and companies dedicated to graphene is growing every year, reaching today several tens of thousands per year. The main holders of patents related to the properties and technologies of obtaining graphene are companies and universities in China (40%), the USA (23%), South Korea (21%), and the EU countries (9%). Among large companies and universities, the leader in the number of patents obtained on the basis of the material graphene is famous south Korean Samsung company.

As many studies have shown, the main "miracle" of graphene is that, despite its absolute "thinness", it is stable and very resistant, and its atomic bonds do not disintegrate, as, according to theory, should happen in two-dimensional materials. It has been established that the carbon atoms in the crystalline honeycomb structure of this material are held together due to their special vibrations in this film structure, and they are also not subject to the effects of aggressive and chemical environments.

One of the main unusual features of graphene is that its addition to almost any material gives this material absolutely fantastic properties, including strength, durability and resistance to external influences. Thus, graphene, as a strengthening additive, introduced in an amount of only a few percent, is capable of radically changing the most important properties of many known traditional materials, including metals, ceramics, polymers, glass, coatings, cement, paints and others.

Firstly, it was established that graphene is the strongest material on Earth. It is 200-300 times stronger than various types of steel, and a graphene sheet with an area of 1 square meter and a thickness of only one atomic layer can hold an object weighing 4 kilograms. Graphene can be bent, rolled, and stretched and twisted like rubber, just like paper. For example, it can be stretched by 20 percent without damage, which is simply unachievable for most materials. And it stably withstands all these mechanical effects without breaking down. In addition, graphene retains its other properties under these effects.

Due to its two-dimensional structure, graphene is a very flexible material, which allows it to be used,

for example, to create nanotubes, weave threads and other structures. At the same time, a thin and light graphene "rope" will be similar in strength to a thick and heavy steel cable.

Secondly, graphene has an abnormally high electrical conductivity. It has virtually no resistance. The speed of electrons in graphene is 10,000 km/s, although in a regular conductor (copper, silver, aluminum) the speed of electrons is only about 100 m/s. At the same time, graphene is almost transparent and absorbs only 2.3% of incident light, without reducing its high conductivity. For comparison, note that ordinary glass absorbs about 10% of light. For this reason, manufacturers of displays and solar batteries are interested in graphene, for whom it is important to obtain a protective layer of maximum transparency. When adding graphene, for example, to a metal wire, its electrical resistance is noticeably reduced, and its conductivity is increased.

Thirdly, graphene conducts and removes heat better and faster than any metal when heated. Graphene has high thermal conductivity, which is 10 times higher than the thermal conductivity of copper. This feature can protect existing gadgets from thermal overload. For example, you can imagine a laptop that will never "slow down" with entering and transmitting information due to high temperatures when it may overheat. Graphene also has a higher boiling point than tungsten (3700 °C).

Fourthly, and this is perhaps the most important today, graphene is increasingly used in energy. This is due to the fact that the electrons that carry electric current in a graphene film are practically not dissipated by thermal vibrations of its constituent atoms, as is the case in a conventional conductor with a three-dimensional 3D structure. The use of graphene improves the properties of lithium-ion batteries: these batteries become more capacious, and their charging time is significantly reduced. Graphene has a high energy capacity, its specific energy capacity is approaching 65 kWh/kg. This figure is 47 times higher than the corresponding energy capacity of lithium-ion batteries, which are so common today.

In this regard, the use of graphene in energy storage devices is expected to have the fastest growth rate, with the average annual growth forecast being up to 90%. Currently, work on graphene-polymer batteries is being carried out by researchers in many countries around the world. Graphene electrodes are widely used in energy storage devices such as electromagnetic supercapacitors and batteries (Li-ion, Li-air, lead-acid and fuel cells), due to their high energy density and fast charging. These batteries are used, among other things, to equip electric cars. It is known that Spanish scientists have achieved significant success in this matter, and the battery they created using graphene has an energy capacity that is hundreds of times higher than that of other existing batteries. Moreover, a car in which such a graphene battery is installed can travel several thousand kilometers without stopping. It will take no more than 8 minutes to recharge an electric car until its battery is fully charged. Engineers from the Karlsruhe Institute of Technology (Germany) and the Estonian company Sketenton Tech has created graphene-based batteries that can charge tens of times faster – in just 15 seconds. Australian company Graphene Manufacturing Group (GMG) has created industrial batteries based on aluminum and graphene. These batteries charge 60 times faster than lithium-ion analogues.

High mobility of current carriers, flexibility and low density allow using graphene in another promising area – for the production of electrodes in supercapacitors. Experimental samples of supercapacitors

Desktop illustration of graphene

Batteries produced by Graphene Manufacturing Group. Source: Shutterstock

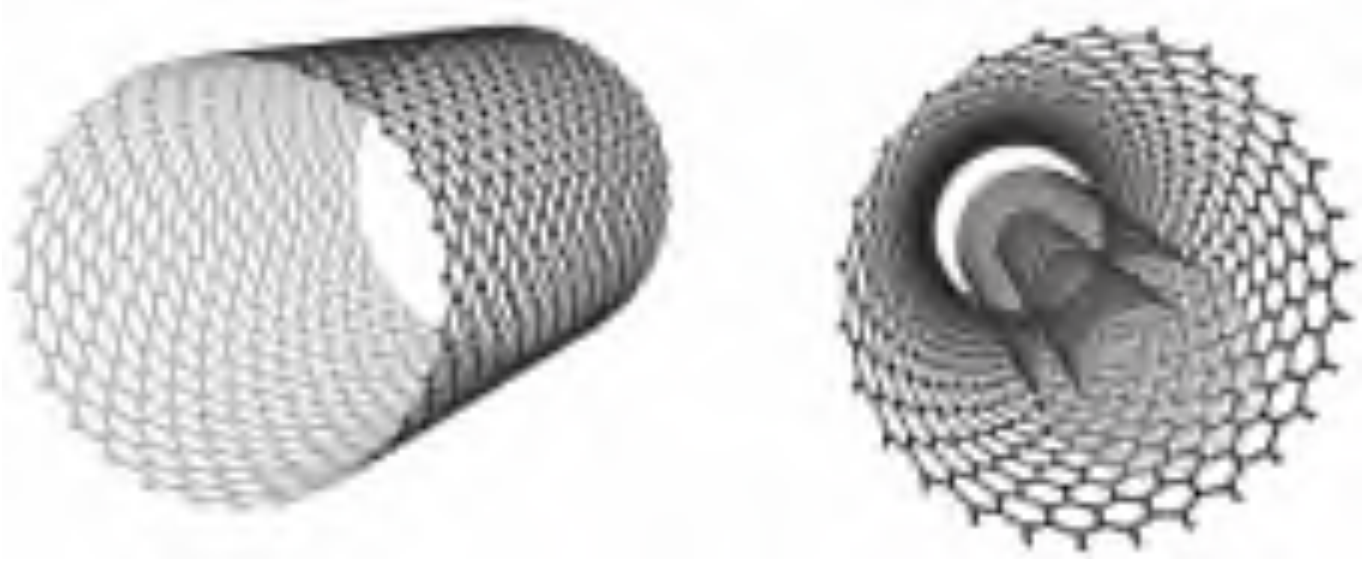
on graphene have a specific energy capacity of 32 Wh/kg, comparable to the capacity of lead-acid batteries (30-40 Wh/kg), and in the future it will be possible to achieve an energy capacity of up to 250 Wh/kg.

Moreover, it has been established that when salt water flows over a graphene sheet, this sheet material is capable of generating electrical energy by converting the kinetic energy of the salt water flow into electrical energy (electrokinetic effect).

Graphene will also give a new impetus to the development of alternative energy. Thus, solar cells and batteries with graphene produce energy in the most minimal light, even in cloudy weather and during rain. In addition, thin graphene coatings on the surface of solar batteries increase the transmission of solar energy in photocells and improve their performance.

It is also worth noting other important properties of graphene. For example, the possibility of using graphene as an ultra-sensitive sensor for detecting small amounts (traces and even individual molecules) of chemicals NH3, CO, H2O, NO2 falling on the surface of the graphene film was demonstrated. It was found that the graphene film allows water molecules to pass through, but retains molecules of other substances, which allows using this film as a filter for obtaining environmentally friendly drinking water. Graphene is the lightest material, approximately 100 times lighter than ordinary water. It is inert to the environment, and multilayer graphene can absorb radioactive waste. Graphene is also the basis for obtaining various independent two-dimensional materials, as well as multilayer two-dimensional heterostructures.

Along with graphene, graphene nanotubes are very interesting and promising material. What is the difference between graphene and nanotubes? Graphene is extremely strong and flexible. Graphene nanotubes are also very strong, with a high strength-to-weight ratio, and can be more flexible than graphene due to their tubular structure.



Single-walled and multi-walled graphene nanotubes

Graphene Nanotubes, also known as single-wall carbon nanotubes, are extremely thin sheets of graphene rolled into tubes longer than 5 microns and 1.6 nanometers in diameter. They have a number of exceptional properties, such as excellent electrical conductivity and strength, high heat resistance, and flexibility. By imparting these properties to polymers, graphene nanotubes improve their qualities at extremely low working concentrations.

There are many products with graphene nanotubes have already been successfully launched on the market. Among them are semiconductor compounds for medium and high voltage power cables with a volume resistance below 20 Ohm-cm at 23 °C and below 100 Ohm-cm at 90 °C, graphene chips, products for microelectronics, medicine, automotive production and others.

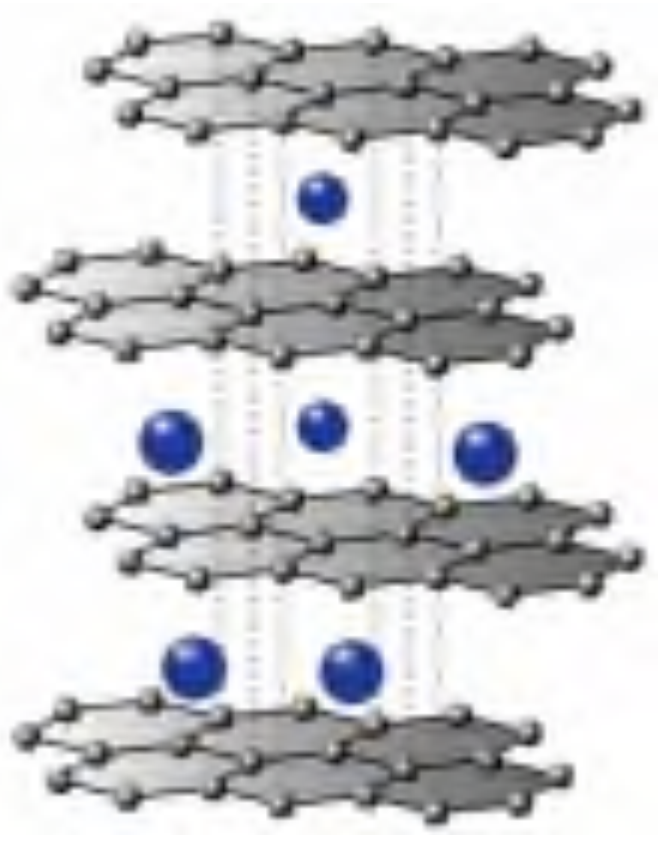
All of the above properties of graphene have given a powerful impetus to extensive research into various methods and technologies for its production, as well as the possibility of using it in various fields of science, technology and innovative production. At the same time, graphene production is very complex and requires a balance between quality, cost and scale. Several basic methods and technologies for producing graphene are known, and we will give here only the most common ones as an example.

Mechanical exfoliation is the original method, the so-called "scotch tape method" used by A. Geim and K. Novoselov, which remains the standard for obtaining the highest quality graphene. In this method, graphite is treated with adhesive tape, gradually separating layers from the graphite base until a layer of 1-atom thickness is obtained. After peeling, the tape with thin films of graphite is pressed onto a substrate of oxidized silicon and single-atom films of graphene are obtained. However, despite its simplicity, this method turned out to be impractical for mass production due to the low yield of graphene and the impossibility of obtaining graphene films of a certain shape and size.

Chemical vapor deposition is the most promising industrial method, in which carbon-containing gases (methane, etc.) are fed onto a copper or nickel substrate, where at high temperatures the gas molecules decompose and graphene is formed. This method can produce large sheets of material suitable for electronics.

Chemical oxidation and reduction of graphite, which is first oxidized and then thermally or chemically reduced. The resulting material is cheap, but contains defects that impair its properties, and the method itself is not environmentally friendly.

Electrochemical exfoliation of graphite, which is placed in an electrolyte and under the influence of electric current, its exfoliation occurs with the formation of film graphene. This method is more environmentally friendly than the chemical oxidation method and allows you to control the quality of the resulting graphene.



Layers of intercalated graphite – the structural basis of graphene

Problems and prospects associated with graphene. Despite the existing potential, mass production of graphene is still expensive: the cost of 1 gram of high-quality material reaches several thousand US$. In addition, industrial methods for producing graphene require complex equipment, and cheap analogues of the resulting graphene films have inhomogeneities in their structure.

At the same time, graphene production technologies are constantly being improved and more modern ones are emerging, which allows us to expect graphene to enter the wide market and be used in various fields of science, technology and production. And this man-made unique two-dimensional material – graphene – will take one of the worthiest places in the world of materials, and its use will serve for many years to come innovative development and progress for the benefit of all mankind.

Saxaul – a unique desert guardian

Zinoviy Novitsky,
doctor of Agricultural Sciences

Among the lifeless sands of the desert, where even the wind seems hot, lives a green warrior - saxaul. It does not catch the eye with bright flowers or lush foliage. Its beauty is in its resilience. For centuries, saxaul protected nomads from sandstorms, served as fuel and food, and now saves millions of hectares of parched land, including in the Aral Sea region. In the era of climate crises and the degradation of many natural regions, saxaul has become a symbol of hope. Saxaul is a tree that thrives in the desert, resisting wind-blown sand and salt.

Saxaul (Haloxylon) is a genus of shrubs or small trees of the amaranth family. It includes two main species: black saxaul (Haloxylon aphyllum) and white saxaul (Haloxylon persicum). Outside the Republic of Uzbekistan and Central Asia, in Mongolia and Northwest China, there is Zaisan saxaul (Haloxylon ammodendron). The most common is black saxaul, which tolerates harsher desert conditions than white saxaul and can grow in more difficult and suitable conditions. White saxaul is also called sand saxaul, since it most often grows on unstable dune sands. White saxaul does not tolerate soil salinization, unlike black saxaul, which also grows on saline lands, including the dried bottom of the Aral Sea.

Black saxaul growing on the dried seabed of the Aral Sea

Black saxaul is also known as saline or leafless saxaul. It grows in places with root-accessible groundwater and on richer soils. Black saxaul tolerates soil and groundwater salinization satisfactorily and reaches fairly large sizes: 8-10 meters in height and 50-60 centimeters in the butt section of the trunk. The fruits of this saxaul are light, carried by gusts of wind, samaras - a flower 4 to 12 centimeters in size, in the center of which there is a small (2 mm) saxaul seed embryo. The weight of 1000 well-developed winged seeds is 5.1-5.2 grams, and of descarred seeds - 3 grams. The sowing rate of black saxaul seeds is 5 kilograms per 1 hectare. When creating plantations, you can use aerial aeroseeding or mechanized seed sowing. Saxaul seeds do not have a pre-sowing dormancy period and do not require any additional preparation before sowing. Saxaul shoots grow quickly and by autumn they reach a height of 50-60 centimeters, and their roots grow especially intensively. Already at the age of one month, the saxaul root goes 20-25 centimeters deep, and by the end of the year it reaches a depth of 1.5-2.0 meters, and also continues to grow with the age of the plant. For example, in three-year-old plants, the saxaul root reaches a depth of 5 meters, and at 7 years - up to 10 meters or more. This allows black saxaul to use even deep groundwater to feed the plant. Saxaul tolerates soil and groundwater salinization quite well. In an adult state, it can withstand groundwater mineralization up to 40 g/liter of dry residue.

Black saxaul plantations are considered mature at 20-25 years: the growth of their trees stops, and they begin to dry out. The best shoot renewal (up to 92%) occurs at the age of plants up to 18-20 years, and trees older than 50 years do not form stump shoots. In recent years, interest in black saxaul has increased, especially in Uzbekistan, due to the widespread use of this species in forest reclamation of desert pastures and in forest reclamation work on the dried bottom of the Aral Sea. Vegetative shoots of saxaul are also good feed for sheep and camels, especially in winter, during the period of fodder shortage. In autumn, absolutely dry black saxaul hay contains such substances as protein - 11.2%, fat - 2.4%, fiber - 9.9%, nitrogen-free extractive substances - 43.55 and ash - 33%.

The wood of black saxaul is of great value. It has a high specific heat of combustion and is not inferior to brown coal. In favourable conditions, the gross timber reserve can reach 20-25 tons/ha.

Unlike most plants, saxaul does not have the usual leaves, and their function is performed by green stems capable of photosynthesis. The bark of the trunk and branches of saxaul is dark. This natural feature helps to minimize moisture evaporation—an invaluable feature for ensuring the life of the plant in conditions of extreme drought in desert areas. As already noted, the root system of saxaul can penetrate to a depth of 10 meters, extracting water from deep layers of soil. As is known, saxaul can live for more than 100 years.

Currently, it is impossible to imagine carrying out forest reclamation work on the dried bottom of

Saxaule flower

Seeds of the black saxaul

the Aral Sea without the use of black saxaul, which is the ecological savior of this region. For this purpose, within the framework of the State Program for the Environmental Improvement of the Aral Sea Zone, which was developed on the initiative of the President of the Republic of Uzbekistan Sh.M. Mirziyoyev, its widespread implementation began on December 16, 2018. Moreover, in this State Forest Reclamation Program, black saxaul was the main forest-forming species. To date, about 2 million hectares of protective forest plantations have already been created on the dried bottom of the Aral Sea based on saxaul plantings. Moreover, in some places, saxaul reaches a height of more than 3 meters, and the survival rate of its seedlings is 50-75% depending on the forest suitability of the types of bottom sediments. The practical implementation of all forest reclamation works on the dried bed of the Aral Sea would be simply unthinkable without scientifically developed recommendations in the laboratory of protective afforestation and forest reclamation of the Research Institute of Forestry (NIILH (RIF), Novitsky Z.B., 1985-2024).

In his book "The Path of "Green" Development of the New Uzbekistan", the President of the Republic of Uzbekistan Sh.M. Mirziyoyev clearly formulated the most important task facing foresters of our country - to create a Regional Center for Growing Seedlings of Desert and Forage Plants. I could not help but respond to the call of our President and developed the main provisions for the creation of such a Center, which were published in 2025 in the journal "Agriculture of Uzbekistan", No. 6, pp. 29-30. The Center will grow seedlings of various desert plants and, first of all, black saxaul seedlings, using an innovative technology developed by us over the past decades of work in the laboratory of protective afforestation of forest melioration of the Research Institute of Forestry. The ecological role of saxaul plantations is incomparable with other species of desert plants. This is especially evident in the Aral Sea zone, where the ecological situation is deteriorating every year, and the removal of salts and other harmful substances from the dried bottom significantly pollutes the air, saturating it with carbon dioxide. And it is the forest plantations of black saxaul that are simply irreplaceable in terms of purifying the atmospheric air. Therefore, the role of saxaul is very great. A study of the absorption of carbon dioxide and the release of oxygen by plants depending on age showed that black saxaul sown on 1 hectare, which has reached the age of 4 years, absorbs 1158.2 kilograms of carbon dioxide per year and releases 835.4 kilograms of oxygen. Undoubtedly, saxaul is the most important element in desert ecosystems. It protects soils from erosion and falling into shifting

Three-branched black saxaul bush

Five-year-old black saxaul plantations on the dried Aral Sea bed

Ten-year-old black saxaul plantations in a desert area

Ten-year-old saxaul plantations on the dried seabed of the Aral Sea

sands, stabilizes the climate near the earth's surface, promotes soil formation by retaining moisture and organic matter, and absorbs carbon dioxide, releasing oxygen, which is so necessary for the life support of the population living in desert zones.

Our studies have shown that saxaul is especially important on the border of deserts and pastures, where it acts as a buffer zone between productive and degrading ecosystems.

As is known, saxaul has been an important part of the life support of the peoples of Central Asia for thousands of years; its wood has been used for centuries as a high-calorie fuel, its branches were used in the construction of houses, it served as a source of shade and protection from the scorching sun, and was even used as fodder for cattle in desert areas.

However, in the 20th century, excessive logging of saxaul led to a catastrophic reduction in its population. Moreover, areas with saxaul felling are then restored slowly, and its mass extermination requires decades for subsequent compensation for lost forest plantations.

Today, saxaul is protected in many countries around the world, including being included in the Red Books of the flora of Uzbekistan and Kazakhstan. Its felling is prohibited or strictly limited. Currently, the area of saxaul forests in Uzbekistan is about 3.2 million hectares. This is approximately 85% of all desert forests in the country. The main part of the saxaul forests is concentrated in the southern regions of Uzbekistan: the Republic of Karakalpakstan, Navoi, Bukhara, Jizzakh and Kashkadarya regions.

After the drying up of the Aral Sea, a poisonous desert remained in its place—a salt marsh, from where the winds raise a toxic dust-salt air mass. To save the region from its harmful impact on the health of the population, Uzbekistan, Kazakhstan and international organizations are implementing large-scale afforestation programs on the dried seabed.

Saxaul has become a key species in these projects: it withstands salinity, is tolerant to heat, and requires virtually no care after rooting. Thanks to these qualities, new desert saxaul forests are already forming on tens of thousands of hectares of the Aral Sea region.

As we have shown, saxaul is not just a tree. This is the great guardian of the desert, an ally of man in the struggle for survival in extreme natural conditions. The example of saxaul shows that even in the harshest conditions, life is possible if nature is treated with respect and knowledge.

Forest plantations of black saxaul on the dried bottom of the Aral Sea are an effective biological factor capable of providing the population of the Aral Sea region with a healthy lifestyle, solving the problem of plant feed for animals, and also minimizing the occurrence and territorial spread of deflation and salt-dust processes in the Aral Sea region.

Two-year-old row plantations of black saxaul on the dried seabed of the Aral Sea

Potato variety "Bisyor": increasing yield and ensuring food security with Using RNA Interference technology

Feruza Babajanova,
PhD (Biological Sciences)

The potato (*Solanum tuberosum*) is one of the most important food crops in the world, playing a vital role in providing the population with food, along with rice, wheat, and corn. It is widely used not only as a food crop but also as a raw material in the production of various food products. Potatoes were first introduced to Uzbekistan after the country became part of the Russian Empire, that is, in the late 19th century, and were initially grown in the Fergana Valley (Margilan, Kokand) and around Tashkent. Special seed potato varieties were imported from Russia, and these were used in breeding work adapted to local climatic conditions. Numerous studies are being conducted worldwide in the fields of biotechnology, molecular biology, and potato plant genomics with the goal of creating varieties that are resistant to pests and diseases and have high yields. In particular, since the determination of the complete nucleotide sequence of the potato genome in 2011, a number of positive results have been achieved using genetic engineering. In this regard, our centre places special emphasis on creating varieties with improved growth and development indicators based on phytochrome genes, which are involved in plant responses to red and infrared light.

Decree No. PP-4704 of the President of the Republic of Uzbekistan dated May 6, 2020, set a number of objectives for creating a collection of new high-yielding varieties of consumer and seed potatoes and implementing scientific developments into practice. The biotechnological potato variety “Bisyor,” developed by scientists at the Centre for Genomics and Bioinformatics of the Uzbekistan Academy of Sciences using RNA interference technology, was selected as the most optimal, given its agrobiological properties, high yield, and adaptability to local climatic conditions. It was therefore deemed appropriate to cultivate this variety among promising varieties and contribute to the implementation of the objectives outlined in state programs.

What is RNA interference technology and how does it work?

RNA interference (RNAi) is a universal molecular mechanism that controls gene expression in a site-specific manner through the mediation of double-stranded RNA (dsRNA), which is widespread in eukaryotic organisms. This process plays an important role in controlling the expression of specific genes in an organism, protecting against pathogenic viruses, and suppressing mobile elements in the genome. During RNA interference, a double-stranded RNA molecule is cleaved into small fragments (e.g., siRNA - small interfering RNA) by specialized enzymes. These fragments bind to the target mRNA (messenger RNA), leading to its degradation or cessation of translation. The concept of RNA interference is also known to the scientific community by such names as “cosuppression,” “downregulation,” or “post-transcriptional gene silencing (PTGS).” This process is widely used not only as a natural molecular defense

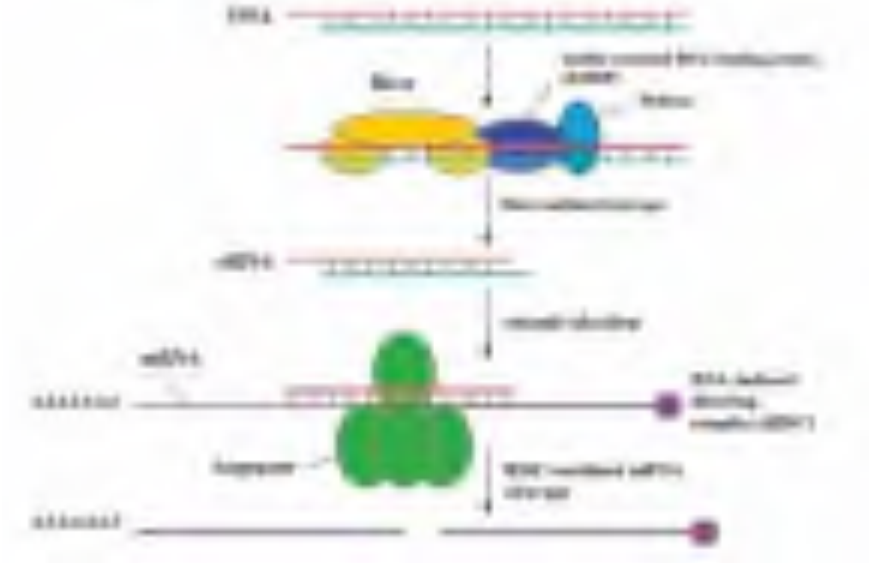


Figure 1. Main stages of the RNA interference (RNAi) mechanism leading to mRNA degradation via double-stranded RNA (dsRNA)

mechanism, but also in modern biotechnology and genome editing to study gene functions, model pathologies, and for therapeutic purposes.

dsRNA molecules in the cell are recognized by specialized enzymes belonging to the Dicer family, and these long double-stranded RNAs are cleaved into small interfering RNAs (siRNAs), consisting of 21–25 base pairs. These siRNAs then form the RNA-induced suppression complex (RISC), which identifies target mRNAs and prevents their degradation or translation. Thus, RNA interference precisely and efficiently controls gene activity within the cell and acts as a natural defense mechanism against viruses [Hannon, GJ (2002) RNA interference. *Nature* . 418, 244–251].

When small interfering RNA (siRNA) begins functioning in a cell, it consists of two strands, called the "passenger" strand and the "guide" strand. After some time, these two strands separate from each other. Following this separation, the "guide" strand binds to the RISC (RNA-induced silencing complex), which is composed of specialized proteins. The function of this complex is to use the "guide" strand to reach and recognize a specific RNA molecule complementary to the target strand. Once the complex recognizes this target RNA, it cleaves it, thereby preventing gene expression—that is, and the synthesis of a protein from it. This process is called "gene silencing." At this point, the "passenger" strand, whose function has been fulfilled, is recognized by the cell and undergoes degradation, that is, destruction, up to and including complete destruction (Figure 1).

RISC (RNA - induced) silencing complex) is a key molecular complex involved in the regulation of gene expression using nucleotides such as small interfering RNA (siRNA) and microRNA (miRNA), and consists of several key components. Among these components, the most important elements are the Argonaute (AGO) and P-element Induced Wimpy Testis (PIWI) proteins. These proteins not only participate in RNA recognition and binding but also possess endonuclease activity—an enzyme capable of cleaving, that is, destroying, RNA. In particular, the AGO and PIWI proteins provide enzymatic activity in RISC, identifying the target RNA and performing cleavage and degradation according to its sequence. [Sen, G., and Blau, H. (2005). Argonaute 2/RISC resides in sites of mammalian mRNA decay known as cytoplasmic bodies. Nat Cell Biol. 7, 633–636.].

The PHYB gene: a key mechanism for plant adaptation to the environment

Photomorphogenesis is a set of processes associated with plant growth and development under the influence of light. Phytochromes are among the main photoreceptors controlling this process. They perceive light in plant cells and alter gene expression depending on the external environment. Phytochromes were first discovered in 1959 by American scientists [Smith, H. (2000). Phytochromes and light signal perception by plants – an emerging synthesis. *Nature*, 407(6804), 585–591]. They identified phytochromes as pigments in plants that are responsible for the response to light. Thus, phytochromes became known to the scientific community as important photoreceptors that perceive light. Plant growth and development depend not only on internal signals but also on environmental factors. Light is essential for the life of all plants not only because it is the main source of energy, but also because light signals provide plants with information about the environment [K.A.Franklin Phytochromes and shade-avoidance responses in plants. / KA Franklin and Whitelam G.C. // Ann. Bot. - 2005. - Vol. 96. – P. 169-175.].

Plants have evolved a number of structures responsible for light. One of them is the PHYB gene. PHYB is one of the genes that controls the processes of light perception and growth in plants. It "senses" where, under what conditions, and when the plant should grow. Phytochromes are a family of light-sensitive proteins involved in the plant response to red and infrared light [Reed J.W. Phytochrome A and Phytochrome B Have Overlapping but Distinct Functions in *Arabidopsis*. Plant Physiol. (1994) 1139-1149.]. Phytochrome genes are involved in molecular and cellular processes in plant life. They regulate physiological and molecular aspects of plants through red and infrared dependent mechanisms rays. Short pulses of red light activate phytochromes in plants. Under their influence and through the influence of essential biochemical processes, important molecular changes occur to produce photopigments. Since the discovery of phytochrome genes, their activity has played a key role in controlling genetic processes. They influence the germination of the resulting seeds and help them adapt (Figure 2).

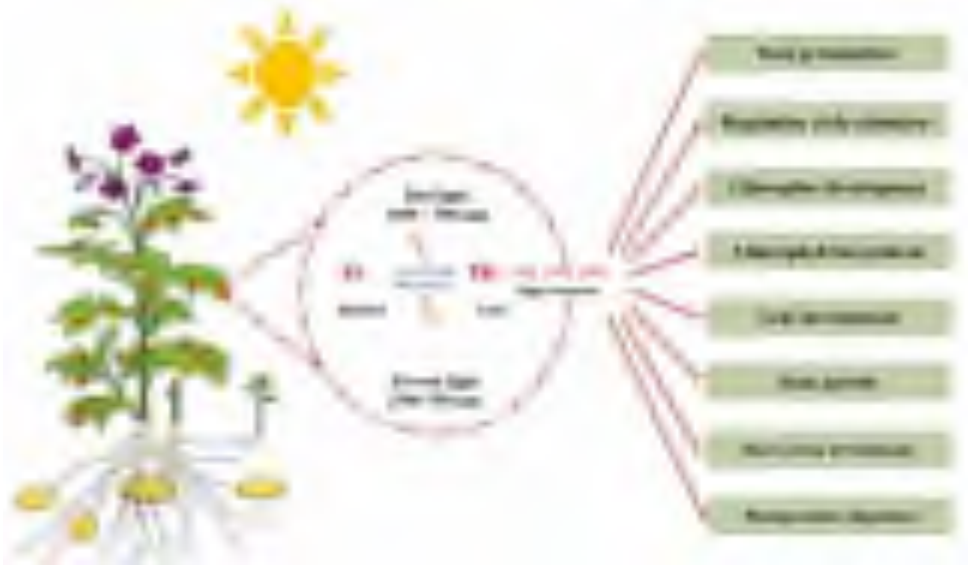


Figure 2. Functions of phytochromes in the process of photomorphogenesis

Five different phytochrome genes have been identified in potato (*S. tuberosum*) —PHYA,

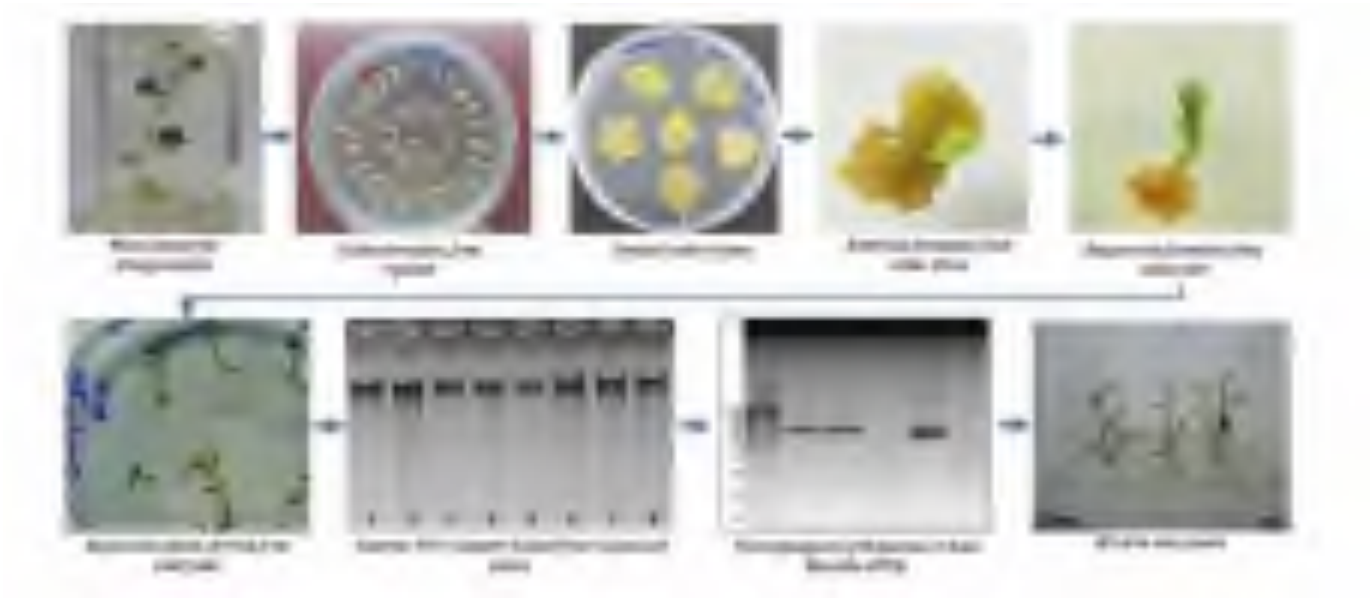


Figure 3. Stages of plant transformation using Agrobacterium tumefaciens and regeneration of plants through somatic embryogenesis

PHYB, PHYB-like, PHYE, and PHYF—located on chromosomes 10, 1, 5, 2, and 7, respectively. These phytochrome genes play an important role in the reception and transduction of light signals in plants and are also involved in the regulation of biological processes such as photomorphogenesis, flowering, growth, and light-seeking.

Stages of creation of the "Bisyor" variety

The study utilized basic molecular biology techniques, modern genomics methods (genomic DNA isolation, total RNA isolation, PCR analysis), biotechnological methods (genetic transformation using *A. tumefaciens, somatic embryogenesis, in vitro* micropropagation), and bioinformatics methods. Initially, the potato-specific pHellsgate8_PHYB RNAi genetic construct was created and transferred into the potato genome using *Agrobacterium tumifaciens-mediated transformation*. Regenerated PHYB RNAi plants were obtained from single-cell callus tissues and somatic embryogenesis from transformed explants, after which PCR analyses were performed. Potato RNAi lines that yielded positive results were microcloned *in vitro* (Figure 3).

The main goal of *in vitro* micropropagation of HYB RNAi plants is to obtain micro-tubers *in vitro*. During our research, we succeeded in obtaining microtubers and adapting them to *in vivo conditions* in a phytotron. In subsequent stages, these microtubers were planted in greenhouse soil and grown into minitubers. The resulting minitubers were then planted in open ground, their morphobiological properties were assessed, and they were tested for varietal evaluation.

Advantages of the Bisyor variety

Creating a new potato variety using traditional breeding methods is a long and complex process. This variety was created in a short period of time using RNA interference technology. Also The PHYB gene was deliberately suppressed, allowing only the desired qualities to be enhanced. In traditional breeding, genetic changes occur randomly, and the results are not always as expected. The process of creating this potato variety was carried out mainly in laboratory conditions. That is, the initial formation of the variety, work on genetic modification, the use of RNA interference technology to reduce the activity of certain genes and the formation of specific traits were carried out using modern laboratory equipment.

After obtaining a plant with the desired characteristics in laboratory conditions, extensive field tests were conducted. The results showed that the lab-created plant also demonstrated high productivity in the field, confirming the variety's reliability and suitability for practical use. In particular, the potato variety "Bisyor" showed a well-developed root system, flowering 10-15 days earlier, productivity 26.6% higher, and yield 28.0% higher than the control variety (Figure 4). For the first time in Uzbekistan, scientific research was conducted to create a new generation of biotechnological potato varieties based on RNA interference (RNAi) technology. In this regard, highly accurate, optimized and consistent

Figure 4. Morphological and biological characteristics of the potato variety "Bisyor"

Flowering characteristics of the biotechnological potato variety "Bisyor"

molecular genetic methods were developed that allow for the effective control of gene expression. This achievement is an important step towards developing potato varieties adapted to local conditions, high-yielding, and resistant to diseases and pests, and will serve to enhance the country's scientific potential in the field of agrobiotechnology.

- Productivity: 40-41 tons/ha
- Mid-early variety, vegetation period: 80-85 days
- Plant height: 50-55 cm
- Plant shape: upright, spreading bush
- Flower colour: white
- Tuber colour: yellowish
- Weight of one tuber: 115-120 grams

Environmental sustainability and food security

Due to the growth of the Earth's population, the demand for agricultural products is increasing. In particular, the efficient cultivation of staple foods such as potatoes is becoming increasingly important. To meet this demand, it's crucial to develop new varieties that are high-yielding, disease-resistant, and safe for human health. Food security and healthy eating are also important not only for scientists but also for ordinary people. The "Bisyor" potato variety was created using a modern yet natural process called RNA interference. The most interesting thing is that not a single foreign gene was introduced into this potato variety. That is, no animal, bacterial, or other plant genes were added. All modifications were made using the potato's own natural genes. This new method reduced the activity of a gene called PHYB. This gene is involved in potato adaptation to the environment, growth, and several biological processes.

By "disabling" the PHYB gene, it was possible to improve some of the potato's properties: for example, it generated a well-developed root system, early flowering, high yields, and increased resistance to external influences. In this case, only the activity of the potato's own genes was controlled. Not any alien materials were added. Therefore, many may think that these are GMOs, but in fact, such products are close to varieties created through traditional breeding.

RNA interference is a method of temporarily "suppressing" certain genes using the natural "memory" of the plant itself. Similar processes occur in nature. By studying this process and learning to harness it, science has been able to control harmful or unnecessary functions in plants. The new potato variety should not be considered dangerous or containing alien genes. It was created using a modern, yet natural and environmentally friendly method. The "Bisyor" potato variety is an environmentally and economically advantageous variety, developed through scientific research. Using RNA interference technology, we controlled plant development at the gene level. This method will enable us to find innovative solutions to many problems in the future.

Yield of the biotechnological potato variety "Bisyor"

Artificial Intelligence in the Creative Industries

Nataliya Yusupova,
PhD (Art History)

With the development of generative neural networks, creative professionals are becoming increasingly concerned about their futures. Among those worried about their future careers are voice actors and dubbing actors, artists, set designers, graphic designers, screenwriters, directors, musicians, and stage designers. Let's explore the upcoming changes and how neural networks could harm or, conversely, help these professionals. Is there a potential economic impact from their use and will artificial intelligence be able to completely replace humans?

"I believe the creation of true AI could spell the end of humanity. Once humans develop artificial intelligence, it will take over and improve itself at an ever-increasing rate. Humans, whose capabilities are limited, will be unable to compete due to the slow pace of biological evolution and will be displaced." These words belong to Stephen Hawking, spoken shortly before his death. The absurdity of the situation lies in the fact that he, a brilliant scientist, a highly qualified specialist in physics, astronomy, and astrophysics, could not help but foresee the true consequences of the active introduction of AI into human life. However, as an individual who was immobilized due to a rare and complex disease, but continued to lead a relatively active lifestyle thanks to an advanced wheelchair connected to a computer for movement and speech recognition, he could not help but recognize all the advantages and benefits of "computer thinking." Why is the concern of not only Stephen Hawking but many other scientists about the rapid development of artificial intelligence only growing? Is there reason to believe that in the near future, the world of real professions, including creative ones, will truly disappear?

To begin, let's define the concepts we are exploring in this article. What exactly are we talking about when we hypothetically forecast the future of creative industries? In recent years, creative industries have become "...increasingly attractive to governments outside the developed world." In 2005, the United Nations Conference on Trade and Development (UNCTAD) 11th High-Level Panel on Creative Industries and Development commissioned several studies to identify the challenges and opportunities facing the growth and development of creative industries in emerging industries. As stated, "...harnessing creative potential offers opportunities for creating new wealth, developing local talent and creative capital, opening up new export markets, generating significant multiplier effects across the economy, leveraging information and communications technologies, and enhancing competitiveness in an increasingly

Body Tracking Installation. 2019. Stereo sound

Creative Industries Model
UNCTAD (Source: UNCTAD, 2004)

globalized economy." A key factor driving interest in the creative industries and their development is the recognition that the value of creative production lies in ideas and individual creativity. Today, many heads of state understand that developing countries have rich cultural traditions and creative talents that lay the foundation for creative enterprises, serving as the basis for the development of creativity. And the creative industries account for a significant share of jobs, which in turn contributes to the economy. Renowned sociologists John Urry and Scott Lash, famous for their research and landmark publications in the field of economics and sociology, put forward the following definitions in their joint work "The Economy of Signs and Space", to understand what we mean by the creative industry: ".. those industries that arose thanks to individual creativity, skills, and talents and that have the potential to create wealth and jobs through the generation and use of intellectual property." According to this definition, 10 years ago, namely in 2015, nine main areas were identified: 1) advertising and marketing; 2) architecture; 3) crafts; 4) design: product, graphic and fashion design; 5) Film, television productions, TV, video, radio and photography; 6) IT, software and computer services; 7) Publishing; 8) Museums, galleries and libraries; 9) Music and fine arts.

It should be noted that this classification was put forward by the UK Department for Culture, Media and Sport (DCMS). This list proved influential, and many other countries officially adopted it for their own use. However, the list has not escaped criticism. It has been argued that the sectoral division obscures the distinctions between lifestyle businesses, non-profit organizations, and large enterprises, as well as between those receiving government subsidies (such as the film industry) and those not (such as computer game developers). The inclusion of the antiques trade is often questioned, as this activity typically does not involve direct production (with the exception of reproductions).

So, what has changed in the creative industries over time? Which sectors are holding their ground, and which are not? And the most pressing question in this study is: will artificial intelligence dominate this economic sector?

First, it should be noted that many countries have developed a legislative framework for the creative economy, with clear definitions of sectors. The creative economy plays a significant role in

The Use of Human Nature's Power in the Age of Automation by C.
Source: Placidplace/Pixabay

the global economy. According to UNESCO, its contribution to global GDP is 3.1%, and its share of global employment reaches 6.2%. In countries with developed social policies, this figure is significantly higher. The creation of a solid legal framework for the creative sector in Uzbekistan is consistent with the country's status as a welfare state, enshrined in the Constitution. In this regard, the Law "On the Creative Economy" entered into force in Uzbekistan in 2024 (effective date: October 4, 2024) which defines key concepts including "creative industry", "creative industry park", "creative entrepreneurship" and "creative product".

The creative industry sphere in this document is divided as follows: 1) literary creativity; 2) applied arts and crafts; 3) architecture, design and urban planning; 4) audiovisual arts; 5) performing arts; 6) organization of concert and entertainment activities and cultural events; 7) fashion and design art; 8) activities of museums, art galleries (exhibitions) and information and library activities; 9) creative activities in publishing and printing; 10) creative activities in the field of mass media and creative activities carried out by transmission via the World Wide Web; 11) production activities; 12) creative activities in the field of digital technologies; 13) creative activities in the field of advertising; 14) activities for the preservation of art objects and cultural heritage sites; 15) fine arts.

Here we see fairly clear definitions and an expanding list of creative fields, which today are also called creative. Turning to the question of the implementation of artificial intelligence in these professions, I would like to note that this process is irreversible. In some sectors, AI is used quite actively, while in others it is unnecessary, but it is no longer possible to claim that all professions in the modern world remain unchanged. Professionals in the fields of filmmaking, directing, and acting say that artificial intelligence programs partially assist in structuring scripts, developing staging, and providing creative suggestions for lighting and set design. However, replacing such professions is not expected in the near future. Since generative networks do not yet possess feelings and emotions, it is unlikely that the text of a play, for example, will be brought to life on stage without the participation of a director. Technologically, this is conceivable, but the fine-tuning of emotional experiences, empathy, antipathy, and the creation of hidden subtexts are all the preserve of a living person. And whether a viewer would buy a ticket to a completely generated performance remains a big question.

Computer games, animation, television programs, and online programs are a different matter. They create a kind of information field where the recipient's primary task is to immerse themselves in the audiovisual environment for a short time, without further reflection on what they see. For example, watching the weather with an artificially generated TV presenter against a backdrop of beautiful landscapes, also generated by a neural network, is an interesting experience. Production, which involves creating clear algorithms for the actions of a person who determines the creative fate of a film or television project, also actively uses neuroprogramming. However, in this field, the producer is essential as a manager, communicating with all members of the filming process, representatives of channels, festivals, and other agencies. Therefore, it is impossible to completely replace the producer at this stage. In architecture and design, artificial intelligence helps generate templates, create drawings, and suggest options for project implementation, which significantly saves creators time, but does not replace them.

So, to summarize, I'd like to note that artificial intelligence currently doesn't pose a clear threat to creative professionals in Uzbekistan, but in some areas it does pose significant competition. This is due to the strength of traditional values and national schools of art. In the future, when creative generation programs learn to utilize the inherent qualities of each individual and the national characteristics of the region in which and for which the request is being made, then perhaps we'll be able to discuss competition between living creative individuals and AI programs.

Artificial intelligence and global bifurcation

Abdurashid Yafasov,
doctor of Technical Sciences

Nowadays, artificial intelligence (AI) is located in the centre of global attention and the stage of accelerating changes with unapproachable risks. Breakthrough innovations in the field of cryptocurrencies, nanoelectronics, sensory, computer technology (CT), communications and AI funds radically change approaches to the organisation of the work of enterprises, on the scale of the economy of individual countries and unions of states. AI allows you to create fundamentally new forms of education and production, new technologies for generating intellectual property, and contributes to the inclusiveness of not only the educational but also the production environment. The reverse process also takes place – the degree of education, culture, ethics of man and society, and production capacities of CT affect the development of AI. These two processes ensure new results in technics and technology, contribute to new intellectual achievements, and accelerate the development process. Thus, **the development of AI becomes a self-supporting process, the course of which so far depends on a person and his engineering and technical capabilities** determined by the state of nanoelectronics, sensory, CT, communications, and energy means, depending, in turn, on the achievements of fundamental physics, mathematics, biology, and chemistry. However, since the development of AI has become a self-supporting process, the risks of losing the development of AI with non -aggressive consequences are growing.

Two approaches to the development and management of artificial intelligence

In July 2025, two leading countries in the field of AI – the USA and China – released their vision of the development paths of AI. The American development plan is opened by the quote from US President Donald J. Trump: "He who will have the largest ecosystem will establish global AI standards and will receive broad economic and military benefits. Just as we won the space race, the United States and their allies must win this race. " The analysis of this plan shows its political, economic and military orientation in all 3 components allocated in the document.

Component I: Acceleration of innovation in the field of AI: Elimination of burdensome regulation and bureaucratic red tape; encouraging and ensuring the introduction of AI with open source; expanding the capabilities of American workers in the AI era; stimulating the implementation of AI in the Ministry of Defence; protecting commercial and government innovations in the field of AI; and the fight against synthetic media in the legal system.

Component II: Creation of American Infrastructure of AI: Development of networks corresponding to the dynamics of the development of innovation in the field of AI with the construction of highly protected data centres (data centres) for use by military and intelligence communities; restoration of American production of semiconductors; the introduction of simplified permits for the data centre; preparation of qualified labour for the infrastructure of AI; and strengthening of cybersecurity of critical infrastructure.

Component III: Leadership in international and security: Exports of American AI allies and partners, counteracting the influence of China in international governing bodies, strengthening control over the export of calculations using AI, consistent protection measures at the global level and new risks of powerful AI systems in the near future for national security: cyber attacks and the development of chemical, bio-, radiological, and nuclear weapons and explosives, and understanding of the nature of these risks as they arise for the defence of the country and internal security.

China's approach to the development of AI was outlined in the report by Prime Minister Lee Jiang

Gradual Replacement of Human Labor by AI

of the State Council of the PRC at the opening of the International Information Security Forum (Japan) - WAIC 2025. The Global Plan of the PRC on AI management includes 13 points. China calls on all interested parties, including governments of countries, international organisations, universities, science institutions, enterprises, public organisations, and individual citizens, to cooperate for the following purposes:

1. The joint development of AI, digital infrastructure, and the introduction and use of AI capabilities to solve the global problems of mankind in the concept of sustainable development.

2. The formation of a political environment favourable for the innovative development of AI, the elimination of technological barriers, coordination of work, and the creation of international platforms for scientific and technical cooperation;

3. Creation and joint use of intellectual infrastructure, exchange of achievements and advanced experience to expand the capabilities of AI in all sectors of the real economy;

4. Construction of digital infrastructure, including joint sources of pure energy, CT, data centre, a unified system of CT standards, and support of the countries of the Global South;

5. Creation of an open, innovative, inclusive ecosystem, using the capabilities of various interested parties, including governments, industry and academic circles:

6. The development of high-quality data (HQD), stimulation of AI, using HQD, elimination of discrimination, promotion, protection and preservation of the variety of human civilisation;

7. Solving energy and environmental problems in the concept of sustainable development, resource-saving and safe AI development models, and the expansion of AI technologies in related areas.

8. Promoting the general understanding of standards and norms: increasing inclusiveness and functional compatibility of the system of standards, increasing the role of international organisations of ITU, ISO and IEC;

9. The leadership of state sectors in the AI management: exchange and international cooperation, respect for intellectual property rights (IP), and regular assessment of the security of AI systems;

10. Creation of open-hearted AI platforms in the world; testing and risk assessment systems for AI; risk assessment; data protection; development of emergency response measures to risks and threats to AI;

11. The creation of the inclusive and fair global system of digital management, based on the observance of international law and respect for national sovereignty and differences in development;

12. The priority of international cooperation to build the potential in the field of AI, the infrastructure of AI, the creation of joint laboratories, and the organisation of educational curricula.

The Digital Twin of a Human

13. Creation of inclusive management platforms based on public interests and joint participation, dialogue, and exchange of knowledge and experience with enterprises and organisations in the field of AI from different countries.

Forsyth on the development of artificial intelligence

A comparison of the approaches of the United States and China, which can have a significant impact on the path of world development, reveals a shared concern among countries regarding the risks associated with AI development and the need for continuous control. However, they differ fundamentally on a different issue. From the Chinese document, high concern is followed by the fragmentation of AI on a global scale and significant differences in the concept of regulation and institutional rules in various countries and transnational companies, which can lead to the development of AI beyond human control. The US Directive Plan in the field of AI can be characterised as a set of measures aimed at ensuring the country's sole leadership in the world in the political, economic and military areas.

In the AI roadmap, China proposes to immediately begin coordination of AI works between countries, universities, research institutes, enterprises and companies and, as soon as possible, to form a global system of management of AI based on a wide consensus. That is, to make all achievements in the field of AI the property of all mankind without any discriminatory restrictions.

The purpose of the US plan is to create its infrastructure of AI, leadership in international AI diplomacy and the safety of networks; highly accumulated data centres for export to allies and partners; counteract the influence of China in international governing bodies; and strengthen control over high-quality data using military and intelligence communities.

Differences for the purpose of the United States and China, which determine the future of mankind and possible risks today, are one of the signs of a state of bifurcation in world development, since it is currently determined by the development of AI. Obviously, such a situation can lead to counter-productive interaction of the main players in the space of innovation – the USA and China, their partners and satellites, an increase in tension in the field of high technologies, and the desire to ensure self-sufficiency in solving key problems. These include the provision of materials of semiconductor technology and electronics, precision products of mechanotronics, technologies and equipment for the production of nanoelectronics and CT, and robots with AI, and the attraction of the best professionals from around the world.

At the same time, the documents of both countries give the same assessment:

Artificial Intelligence is Becoming Better at Hearing, Speaking, Understanding, and Translating Speech

• new global risks for humanity as the quantity and power of the created AI systems grow, which can have a significant impact on the uncontrolled development of chemical, biological, radiological, and nuclear weapons, and explosives;

• the need for systemic training of qualified labour for the infrastructure of AI, implying a combination of fundamental and professional knowledge, skills in a certain field of production, with the possession of tools.

It can be argued that AI is already in the midst of transformations from the revolution in the digital world to the physical world, and here, China is ahead of the United States in the applied use of AI. According to the World Intellectual Property Organisation (WIPO), for the past 8 years, China annually issues patents for inventions in the field of generative AI more than all other countries of the world together. Visually, characterising the successes of China in the field of AI, sensorics and precision mechanotronics, it can be noted that a robot was shown at the WAIC-2025 stand that cleansed raw quail eggs from the shells without damaging their internal membrane, thereby showing its exceptional possibilities for processing biological materials with an accuracy of 0.1 μm.

It should be mentioned that 2 more fundamental points are in a state of bifurcation in world development and are associated with cryptocurrency and the emotional intelligence of a person in innovatics. So, in 2025, several acts aimed at changing financial markets were adopted in the United States, including:

- on the establishment of US leadership in the field of digital financial technologies (23.01.2025);

- on the creation of a strategic Bitcoin reserve and US digital assets (06.03.2025);

- on the creation of the federal system of regulation of stablecoins (18.07.2025);

- recommendations for strengthening America's leadership in the field of digital financial technologies (07.30.2025);

- The "Crypto Project" has begun for the full transfer of US financial markets to blockchain and has published a crypto strategy. All these actions are directly related to the world financial market and enhance the state of bifurcation in world development.

On the other hand, AI cannot compete with a person in the field of emotional intelligence. Emotions are a complex psychological state of a person, including neurological, physiological and cognitive processes that arise as a result of the interaction of the limbic system of the brain, neurotransmitters and bodily reactions, which are genetically laid in a person, in living nature.

By collecting and forming high-quality data, it is possible to program AI to recognise and interpret human emotions, but they will differ from reality since AI does not have a genetic history of a particular person and a complete picture of bioprocesses in their body; it works based on algorithms and data and not personalised biological processes. Research in this direction requires incomparably higher VT speeds and capacities and new research and software products, but the result can become unpredictable.

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The world community realised that the AI industry is becoming the driving force of economic growth in developed countries, ensuring the production of high-quality new products with various functionality, a sharp increase in labour productivity, resource conservation, non-waste production, and a closed cycle economy. As AI develops, small creative IT companies with incommensurably smaller expenses become competitors in the creativity of their models with technological giants (OpenAI, Huawei, Google, Amazon, Microsoft, etc.). New forms of professional training and improving the requirements for the working and entrepreneurial class, to management systems at all levels, were also updated. Today, the time has come to "sit at the desks" for all humanity, since the development of AI has reached the point of global bifurcation, in which the world system is economics, finance, public consciousness, and the habitat becomes dependent on the further development of AI.

The centuries-old experience of world development shows that innovations begin to be applied primarily in the military-industrial complex. In the context of AI in management systems, he can play a poor role. A separate deep consideration requires innovation in finance—cryptocurrencies. The organisation of continuous education based on the new achievements of science and technology and the accelerated transition to AI achievement, with the inclusion of AI achievements, depends on the correctness of the person, the selection and adoption of a person, the state, and the world community, and the organisation of continuing education; its future depends on its future. Therefore, it is reasonable to ask a question: will the further development of mankind go to a new, differentiated, and high level of orderliness or become unpredictable? In the meantime, the process of development of AI is going on without consistent monitoring by the world community with unified risks on a global scale.

The exit from bifurcation into a state of sustainable development can only be active international cooperation and the new principles of the AI strategy agreed and adopted by the world community with special attention to the issues of risk assessment, the study of nature and the creation of guarantees for the prevention of risk based on the knowledge economy and continuous total inclusive monitoring of the development of AI.

AI is Rapidly Developing: It More Accurately Recognizes Faces and Objects

War sign embossed on the coin of Khorezmshah

Shahrukhmirza Ismailov,
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The history of the monetary policy of the Khorezmshahs in the 12th – 13th centuries is one of the unexplored pages in the history of Uzbek statehood. After the Anushteginids, considered the last dynasty of the Khorezmshahs, established their power in Khorezm, they captured vast territories as a result of continuous successful wars. Such major victories must have been based on a solid economic base. The Anushteginids did not make any fundamental changes to the monetary system in the territories they captured – they introduced some changes to the previously existing monetary policy in accordance with their traditions. It is quite natural that in the territory of the vast empire, stretching from the Persian Gulf to the steppes of Dashti Qipchak and from the Tien Shan Mountains to Azerbaijan and Asia Minor, there were many types of coins in circulation. For, all the countries that were part of the vast empire, of course, had a monetary system that corresponded to their traditions. The only thing that united these diverse monetary systems was the power of the Khorezmshahs.

At the beginning of the 13th century, the empire reached the peak of its development, and the state of the Khorezmshahs became the most powerful and influential state in the entire Muslim world. At the same time, another large and powerful state began to form in the East, and the conflict between these two forces became a historical reality of that time. Having conquered Northern China and Eastern Turkestan, the ruler of the Mongol Empire, Genghis Khan, turned his attention to Central Asia, looking for a pretext to start a war with the Khorezmshah Muhammad. Ultimately, the pretext for the war was the "Otrar tragedy" of 1218 [1, 85]. It should be especially noted that contacts at the embassy level between these countries began in 1216, and the content of the letters sent by the rulers to each other was varied. The political situation and dual power that developed in Khorezm during this period undoubtedly influenced the outcome of the war. In particular, the mistake of distributing a huge army among the cities on the eve of the war, assuming that each city would independently conduct its defense, cost the Anushteginid dynasty dearly [2, 92]. This peculiar process of distributing troops among the cities was described in detail by Shihabiddin an-Nasafi in his work "Siyrat as-Sultan Jalaluddin Menkburni"; and at this time, Termez, one of the largest cities of the state, was transferred to Fakhriddin Habash, known as "Ayyar an-Nasawi" [3, 76].

It is interesting that the Termez coin with the image of a bow and arrow, which is the main topic of this article, was minted as a dirham of Khorezmshah Muhammad on the eve of the attack of the Mongol army on this city. According to E. Davidovich, a hoard of coins of this type was found in the middle of the 20th century on the territory of Old Termez, and the average weight of coins of this type was 4.6 grams, and their diameter was 33 millimeters [4, 44].

The obverse of the coin features a bow and arrow in the center. Around the image is the inscription"السلطان العظم ع الدنيا و الدين», which means «The Great Sultan of Peace and Faith». At the top of the coin is the word"قرارى» , i.e. ***«Qaroriy»***, as an epithet.

Figure 1. Coin of Sultan Alauddin Muhammad, minted in Termez.

Sons of Oguz collecting taxes in Egypt per Oguz's order.
Jami al-Tawarikh (1317-1425) H.1654

Inside the rectangular plate in the center of the reverse of the coin is the sentence "نب دمحم حتفلاوبا الس‌لطان» that is, «***Muhammad, son of the Sultan, father of victories*** .» On both sides of the coin, the date and place of minting are engraved around the circumference: "برض» which means «This dirham was minted in Termez in 617. The power belongs to Allah.» Another type of this coin is described in the research of A.E. Garachev. According to the research, in the center of the reverse of the coin, instead of the name of the sultan, is stamped "لوسر دمحم هللا الا هلا ال هللا" - ***"There is no god but Allah, and Muhammad is his prophet"*** [5, 37].

The Mystery of the Termez Coin with a Bow and Arrow

The unique feature of the two coins we have mentioned is that the image of a bow and arrow on them is not found on the coins of other representatives of the Anushteginid dynasty. From this we can conclude that this image is not a dynastic sign (*tamga*). So, these images carry a different meaning. In addition, the fact that coins of this type were minted in Termez and in the last year of Sultan Muhammad's reign further increases the attention to this coin.

It is known that the city of Termez in the Middle Ages, especially during the reign of the Khorezmshahs, had a very important geostrategic significance. Trade routes to Khorasan, then to India and Iran passed through this city, that is, the city was a bridge connecting Maverannahr (a.k.a. Transoxiana) with Herat, Bamiyan, Seistan, southern Khorasan and India. In addition, from Termez along the Amu Darya one could reach the capital – Gurganj (Urgench) in a relatively short time. For this reason, the city served as a very important customs point for the state of the Khorezmshahs [6, 177-180].

Historical sources, especially Atamalik Juvayni's Tarihi Jahonkushoy and the works of Rashid ad-Din, contain extensive information about the Mongol attack on the city. In particular, according to Rashid ad-Din, the army led by Genghis Khan approached the city in the autumn of 1220. The historian describes the beginning of the battle for Termez as follows: "*After taking Samarkand, he decided to leave the city together with Tuli. He headed towards Nakhsheb and Kesh. From there he selected one man from every ten of his army to form an army to capture Khorasan, and appointed Tuli as its leader. He himself headed for Termez* " [7, 217-218]. The campaign against Termez is also mentioned in Juvayni's "Tarihi Jahonkushoy", where it is said that the inhabitants of the city, built on the banks of the Amu Darya and surrounded by strong walls, under the leadership of Fakhriddin Habash, put up fierce resistance to the Mongols, but the city was taken on the eleventh day of the siege.

It is no coincidence that we are talking here about the location of Termez and its siege by the Mongols. Because it was this event that may have been the reason for minting coins with the image of a bow and arrow in Termez in the last year of the reign of Khorezmshah Alauddin Muhammad. For the ruler of the city may have used these coins to raise the fighting spirit of the city's residents on the eve of these events and call for the defense of the city. In addition, a bow and arrow are also depicted on the seal of Oghuz Khan, who has long been considered the ancestor of all Turkic peoples [8, 168-169]. According to a legend given in the Shajara-i Tarokima by Abulghazi Bahodir Khan, Oghuz Khan once had a dream. In the dream, he sends his six sons to different parts of the world. His three eldest sons (the Sun, the Moon, and the Star) returned from the East with a golden bow. His three younger

sons (Sky, Mountain, Sea) brought three silver arrows from the west. Oghuz Khan divides the golden bow into three parts and gives it to his three elder sons, ordering them: “My sons, shoot from this bow into the sky, and be like this bow.” He gives three silver arrows to his three younger sons and says: “Oh, my younger sons, take these three arrows and shoot them from your bows.” “Be like these arrows,” he orders. After this, the golden bow became a symbol of the ruler’s power, and the three silver arrows – a symbol of the clan, tribe and community. At one time, the bow and arrows were also depicted on the flag of the Seljuk state.

Thus, it can be concluded that by minting this coin, the city’s ruler not only tried to make the population understand that the city was in good hands, but also to remind residents of its historical identity, to increase their fighting spirit and patriotism.

As we have already mentioned above, the bow and arrow depicted on this coin cannot be considered a dynastic sign or seal. However, one can ask whether similar coins were minted by representatives of other dynasties or rulers of other states. A.I. Garachev in his research examined this particular coin and cited information about a similar coin minted by another dynasty. According to him, in 670 AH, a coin worth one dirham was minted in Merv in the name of Abagha Khan, the grandson of Ilkhan Hulagu, on which an image of a bow was stamped [5, 38]. In this regard, it is interesting that around the 1270s a dynastic struggle broke out between Abagha Khan, a representative of the Hulagu dynasty, and Barak Khan, a representative of the Chagatai state. Although Merv lost its former economic and political status after it was destroyed by the Mongol army in February 1221, it served as one of the important border points between the Chagatai state and the Ilkhanate of the Hulaguids at that time.

In conclusion, it can be said that during this period, symbols of religious and national significance played a very important role in the spiritual life of the population. In particular, such symbols served to raise the spiritual mood of the entire nation, strengthen the ideas of patriotism and national pride. And coins were used to cover all social strata of the population. When the fate of the country was under threat, the use of such a measure in the most important and largest cities proved its effectiveness. In addition, our thoughts about the above-mentioned seal of Oguz Khan are not accidental. For the population of the state of the Khorezmshahs Anushteginids considered themselves Turks. From this we can conclude that Turkic elements and traditions were preserved in its social and spiritual life. The fact that this type of coin was minted by the Mongol rulers can be explained by the fact that such a tradition was characteristic not only of a separate state, but also of an entire region, and we can even draw some conclusions about the main ethnic composition of the population of Central Asia at that time. It goes without saying that the rulers of the Mongolian states, whose population was mainly Turkic, must have had an idea of the tradition and culture of the Turkic peoples. In general, the history of this period has not been sufficiently studied based on numismatic sources, and a unified opinion regarding such symbols has not yet been reached. This, in turn, will require greater efforts and responsibility from researchers in the future.

Coronation of Il-Arslan. This painting is from the book Jami' al-Tawarikh (literally "Compendium of Chronicles" but often referred to as The Universal History or History of the World), by Rashid al-Din, published in Tabriz, Persia, 1307 A.D.

Titans of the Muslim Renaissance - on Man, Economics, and Society

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It is well known that in the history of Muslim countries, including Central Asia, the 9th to 15th centuries are considered the "Golden Age" of Islam. Scholars of the Baghdad "Academy of al-Ma'mun" stood at the origins of this "Golden Age" and shaped it. It is undeniable that the syncretic Muslim culture, which absorbed the intellectual values of many peoples, achieved worldwide fame in a very short historical period. This was a kind of Eastern-Central Asian Renaissance, giving birth to true titans of thought, great polymaths. Among the thinkers and polymaths who enriched Muslim Eastern culture were dozens of our ancestors, who made significant contributions to economic knowledge.

Statue of Abu Nasr al-Farabi on the campus of Al-Farabi University, Almaty, Kazakhstan

A key cultural feature of that time was the extensive study and restoration of the rich scientific traditions of ancient Greece and Rome, the legacy of their outstanding representatives – Plato, Socrates, Aristotle, Galen, Hippocrates, Archimedes, Ptolemy, and others. Ancient philosophy and other sciences (including economic views) found fertile ground in Muslim culture, exerting a profound influence on its development.

In the 9th to 12th centuries, Central Asia emerged as one of the major centres of advanced social thought in the East. During this period, world-renowned scholars such as Farabi, Ibn Sina, Beruni, Yusuf Khos Khwajib, and many others emerged. Their works also reflected economic ideas. Although they had not yet become distinct from philosophical and social knowledge, they nevertheless remain of considerable interest.

The doctrine of human needs occupied a central place in the views of Farabi and Ibn Sina. According to Farabi (873–950), a polymath and follower of Aristotle, human needs are the primary cause of the formation of society. Emphasising the role of labour and tools in the production of material goods and the existence of various types of crafts, he sharply opposed slavery and advocated for free labour. Furthermore, noting the role of money and trade, he noted that every society lacks at least some essential resources, and thus an optimal society can only be achieved through domestic, regional, and international trade, and that such trade can be beneficial to all parties involved.

One of the outstanding thinkers of Central Asia, the greatest scholar, encyclopedist and humanist Abu Ali ibn Sina (980-1037), along with works on philosophy, logic, psychology, ethics, etc., was also interested in economic issues. His economic views, along with such works as "Treatise on Housekeeping" and "Psychology", are also set out in many philosophical works. Interesting are the discussions on human needs, the importance of labour and its decisive role in material production. Ibn Sina was interested in many issues of the economy of feudal society. The subject of his special attention was craft, which he considered the basis of the existence of society. In "Treatise on Housekeeping", Ibn Sina gives the following classification of types of craft: 1) rational crafts (politicians and rulers); 2) crafts of high art (writers, astronomers, doctors, etc.); 3) artistic crafts (painters, sculptors, etc.). Of particular interest are his discussions on the balance of income and expenses not only within the family but also within the city and even the state. In his opinion, it is necessary to achieve a balance of income and expenses, taking into account the allocation of funds to form reserves in case of natural disasters, war, epidemics, etc.

Of particular interest are his discussions on the balance of income and expenses not only within the family, but also within the city, and even the state. In his opinion, it is necessary to achieve a balance of income and expenses, taking into account the allocation of funds to form reserves in case of natural di-

sasters or war. Ibn Sina's views on the ideal state are characterized by the following features: 1) everyone is obliged to work for their own benefit; 2) all material goods in given state should be distributed equally, so that there is no fabulous wealth and abject poverty; 3) since all people will engage in honest labour and trade fairly, there will be no one and no reason to fight, wars will disappear, and political disputes between states will be resolved peacefully; 4) in an ideal state, people will be well-off and therefore will stop opposing one another, will love cheerful songs and melodies, and will not age for a long time.

A contemporary of Ibn Sina, the leading Central Asian scholar and encyclopedist Abu Rayhan al-Beruni (973-1048), in his works, based on the objective fact of human interaction with the world around him, demonstrated the crucial importance of labour for humanity. Therefore, "the value of every person is that he does his job excellently." Beruni developed the teachings of Farabi and Ibn Sina on the factors that shape society. He explained the need for people to unite by saying that only by working together can they resist the forces of nature. His merit in the development of economic thought among the peoples of the region lies in the fact that he was the first to study the origin, functions and significance of money, believing that its origin is connected with the increase and non-simultaneous emergence of needs for products and the work of producers for each other. According to Beruni, the role of money is to express the relationship between expended labour and the product produced. This understanding of the role of money (more labour, more money) significantly surpasses Aristotle's views, who saw it as a measure of value and a medium of exchange, but overlooked the connection between labour and value. In interpreting the functions of money, Beruni placed particular emphasis on its transformation into treasure when people stop using it and it returns to "its original position in the bowels of the earth," which is equivalent to the return of a fetus to its mother's womb. At the same time, Beruni recognised the necessity of accumulating funds in the state treasury and using its resources to fulfil state functions. Beruni believed that any goal could be achieved with gold, but he condemned its "unnatural" use and its deification.

A portrait of Ibn Sina (Avicenna) (from, Krueger, H.C.: Avicenna's poem on medicine. Springfield, Illinois; Charles C Thomas, 1963; p 52a).

Yusuf Khas Khwajib (Yusuf Balasaguni), a prominent poet and thinker of the 11th century, played a significant role in the development of economic thought among the peoples of Central Asia. He outlined his economic views in his work "Kutadgu-Bilig" ("Knowledge That Brings Happiness"). His views largely coincided with those of Beruni, although he was not familiar with his works. Emphasising the role of labour in the development of society, Khwajib stated that "a person who does not benefit another is dead" and "one does not regret the years lived, but rather the labour wasted." Khwajib emphasised the functions of money as a measure of value, a medium of exchange, and a treasure trove. In his view, the strength of a state lies not only in the size of its army but also in the resources of its treasury. However, rulers should not become infatuated with hoarding treasures; they should spend public funds in the interests of the people.

Furthermore, Khwajib emphasised the importance of the division of labour, noting the characteristics and nature of the material goods created by farmers, herders, and artisans. It was emphasised

Bust of Ibn Khaldun at the entrance to the Kasbah in Bejaia, Algeria

A statue of the 11th century astronomer Abu Rayhan al-Biruni in Park-e Laleh, Tehran, Iran.

that it is the peasant's labour that feeds and clothes all living creatures capable of movement and that herders, although they do not own real estate, breed herds of horses, camels, and other animals used for food, clothing, and transportation. At the same time, artisans create essential items. The work of scientists deserves high praise.

His assessment of the merchant class is noteworthy. Unlike farmers, herders, and artisans, merchants think only of profit; their primary goal is to increase their personal wealth. Travelling through various countries, they care only for their own gain. For merchants, gold and silver are the most precious commodities. True, gold can transform an ill-mannered person into a polite one, and a stubborn one into a conscientious one.

Finally, a list of Central Asian encyclopedic scholars who made significant contributions not only to economic thought but also to a wide range of exact and natural sciences would be quite limited without al-Khwarizmi. Today, every educated person knows the name of Muhammad al-Khwarizmi, immortalised in the term "algorithm," and the science he founded, algebra – an essential element of any existing economic theory. Before him, mathematics meant primarily geometry with a dash of number theory. The scholar's work, "Kitab Mukhtasar al-Jabr wa-l-Muqabala" (A Short Book of Completion and Contrast), became, along with Euclid's "Elements," the foundation upon which not only modern mathematics but also economics rests.

For a long time, the practical use of mathematics was limited primarily to physics, including astronomy. Most of the representatives of this science who lived until the turn of the 20th century were also physicists, and many physicists also made significant contributions to mathematics. Of course, today the scope of application of mathematics, especially in economics, is vastly broader. Most importantly, in his book "On Indian Calculation," Al-Khwarizmi developed and introduced the decimal system of notation, which subsequently contributed to its popularisation throughout the world. It can be argued that the system of notation he developed and implemented, among other things, underlies modern economics.

In summary, it should be noted that the issues of economic development raised by medieval Central Asian thinkers made a significant contribution to the development of economic thought globally. Due to specific historical processes, their invaluable contribution has not received due recognition. Consequently, when discussing the development of economic thought in the Muslim East, conventional classical economic literature places the name of the Arab thinker Ibn Khaldun (1332–1406), who lived much later than his Central Asian predecessors, at the forefront. It is worth noting that many of Khaldun's ideas were based, in part, on the research of Central Asian scholars and encyclopedists (the role of the market, money, labour, etc.), who anticipated many propositions in modern economics. This, in turn, suggests that the time has come to reconsider the established postulates associated with the contributions to economic thought of the most prominent representatives of the Central Asian Renaissance.

Ethnographic information in the works of Biruni

Gularam Masharipova,
professor

Abu Rayhan Biruni is a scholar who mastered astronomy, mathematics, geography, geology, history, philosophy, philology and ethnography.

Biruni's works "Monuments of Past Generations" and "India" can rightfully be classified as ethnographic works. A significant portion of ethnographic material is also contained in his works "Mineralogy" and "Geodesy." In presenting ethnographic information, Beruni made extensive use of oral traditions, folk tales describing the traditions of the peoples of the East, and, finally, his own personal observations. The scholar's works contain unique materials on the economic life of peoples, national figures, agricultural seasons, folk customs, and beliefs. In his works, he mentions the names of more than 100 peoples and tribes. All this testifies to the fact that Beruni's works are a rich source of ethnographic information.

Biruni's information on the peoples of Central Asia, particularly the peoples and tribes living in the territory of present-day Uzbekistan – the Khorezmians, Sogdians, and Turkic-speaking peoples – is of great importance in the study of the Uzbek people's past. In his works, Beruni mentions several groups of Turkic peoples: the Turks of Transoxiana (Karakhanids), the Northern Turks (Oghuz, Kimaks, Kyrgyz, and others), the Eastern Turks, as well as the Turks living in the Chu River valley, Khotan, Tibet, and Afghanistan. His works contain unique information about the lives of the Karluks, Cumans, and other tribes. According to K. Shaniyazov, Abu Rayhan Biruni did not write a dedicated ethnographic work, but the materials he cited are a sufficient source for shedding light on the settlement and life of the peoples of Central Asia in the Middle Ages.

Biruni's made extensive use of folk tales as a source of ethnographic information. These include accounts of the folk festivals of the Khorezmians and Sogdians. Biruni repeatedly notes the similarities between Sogdian and Khorezmian traditions and beliefs. This attests to the shared culture of the two ancient peoples who inhabited the territory of modern-day Uzbekistan.

Biruni's clearly distinguishes between the origins of secular and religious holidays and their purpose in the lives of the people. He states, "Some of these (holidays) are reserved for worldly affairs, while others are for religious ones." Religious holidays, according to the scholar, "were initiated by Sharia scholars – imams, jurists, and the deeply religious. The purpose of observing such holidays is similar to the one we mentioned, but for the afterlife."

Folk festivals have a long history and are closely linked to the creativity and living conditions of the people. According to Biruni, "These festivals became one of the reasons why the grief of the poor was transformed into relief, their dreams became reality, and those close to death were spared danger and disaster." Biruni openly asserts that the content and emphasis of festive rituals sometimes served the interests of the ruling class: "Festivals were great days; rulers held ceremonies on these days, and with their help they could satisfy their desires... The common people, participating in the ceremonies, shared in the joy of the kings and emirs, expressing their sincere submission and readiness to serve."

Biruni's reflections on the holiday of Navruz are also noteworthy. This holiday is celebrated on the first day of the first month of the new year, which falls on March 21st according to our calendar. Navruz coincided with the month of spring – the beginning of agricultural work. The Navruz celebration lasted several days, but the first and sixth days were especially

Birth of Roman Emperor Augustus

solemnly celebrated. According to Biruni's findings, Navruz originated in ancient times among the Iranian peoples and then spread to the countries of Central Asia and the Middle East. Navruz was celebrated with great pomp and ceremony in ancient times, the early Middle Ages, and the Middle Ages in Khorezm, Tokharistan, and Fergana. Later, these festive rituals, through sedentary farmers, penetrated the traditions of the semi-nomadic and nomadic Turkic peoples.

Biruni's mentions that the Sogdians and Khorezmians also celebrate several other holidays throughout the year. Traditions and rituals associated with these holidays among the Uzbek and other peoples have survived to this day. For example, in ancient times, during the holiday of Navruz, people gave each other sugar. From the facts cited by Beruni, it becomes clear that the origin of this custom was connected with the planting and continuous cultivation of sugarcane. The beginning of sugarcane cultivation is associated with the legendary Iranian king Jamshid. Beruni writes about this: "On the day of Navruz, sugarcane, previously unknown, appeared in Jamshid's land. Jamshid saw moisture dripping from one juicy cane. Having tasted it and tasting its delicious sweetness, he ordered the juice to be squeezed out and made into sugar. On the fifth day, sugar was obtained, and it was given to each other as a sign of congratulations."

Although this story is legendary, the information provided testifies to the beginning of the cultivation of a new agricultural crop, sugarcane and the production of sugar from it. For ancient peoples attached great significance to every new beginning in their

Manuscript of Abu Rayhan al-Biruni "The Chronology of Ancient Nations"

lives and the cultural achievements created through labor. Inspired by this event, they celebrated it with great pomp. Sugar is white (goodness). White and sweets, as is well known, were considered symbols of life and happiness by the Uzbeks and other peoples of Central Asia. To this day, the Uzbek people have a tradition according to which, on Eid al-Adha and Eid al-Fitr (as well as Navruz), the groom's parents send various sweets to the matchmakers. Traditionally, these sweets include white sugar, *halva*, *parvarda*, and confectionery. This is a wish for a bright and happy future for the newlyweds. Today, in Khorezm, when people come to propose, they bring sweets even before the bride's side has given their consent. If the bride's side agrees, the sweets brought are kept. If the bride refuses, the sweets are returned.

The Sogdians celebrated the first day of the seventh month as "nim sarda," meaning "half of the year," and the second day as a holiday. According to Biruni, on this day, the Sogdians "gathered in the temples of fire worshipers and ate food made from millet flour, butter, and sugar." Biruni described this dish as reminiscent of "*halvaytar*," which is used in Uzbek and Tajik rites. Today, this dish is made from regular wheat flour, not millet, and is primarily prepared during mourning rituals. The Khorezmians call this day "azdokandkhvor," meaning "the day of baking bread with butter (*patyr nan*)." Patyr and flatbreads (*kulcha*) made with butter are traditionally prepared for special occasions, such as weddings and holidays, as well as for the visit of a distinguished guest. Patyr and kulcha have now become a highlight of a hearty family table.

According to Biruni, the inhabitants of Khorezm prepared appropriate food on the fifteenth day of the tenth month to ward off harm from *jinn* and evil spirits. During this ceremony, called "is chikarish," usually on the eve of holidays, wedding celebrations, before spring and autumn plowing (before harnessing the ox

Sogdian Funerary Bed. White Marble. China, late 6th century. Miho Museum, Japan

to the plow), and during mourning ceremonies, baked "*bogursoq*," "*yupga*," and "*qatlama*" were distributed among neighbours and relatives. The smell of hot butter was believed to have purifying and protective properties. The smell of hot butter supposedly warded off human-induced dangers from the home and summoned the spirits of ancestors, who were the guardians of future generations.

According to Biruni, peasants resorted to various methods of witchcraft. Among them were "beating off hail with a stone and burying a turtle upside down in the trash." Peasants believed that turtles could not only ward off hail but also bring rain. K. Shaniyazov wrote that such a custom existed in Kashkadarya. According to this custom, during a drought, farmers would leave a turtle upside down or hang it by its feet from a tree. All these actions are undoubtedly magical techniques employed by humans, an attempt to influence nature with certain objects and thereby achieve desired results. Remnants of this ritual have survived to this day among a number of peoples in the region.

Biruni understood well that natural forces cannot be changed by magical means, and that all such actions are aimed at deceiving people and benefiting magicians and sorcerers. Speaking of Indians who tried to protect themselves from hail with magical rites, Biruni writes: "...Since the peoples of India finally believed in the possibility of protection from hail, they fell under the rule of the Brahmins, who live off the produce of the village population." Biruni himself explains natural phenomena scientifically, explaining the causes of hail and rain.

Biruni also describes some magical rites used by nomadic and semi-nomadic Turkic peoples. He exposes misconceptions and methods of witchcraft, thereby helping to separate truth from falsehood. Speaking of the "rainstone," the scholar writes: "One Turk brought me such a thing, expecting me to rejoice or accept it without any hesitation. I told him: 'Use this stone to call for rain at various times, whether during the rainy season or when there is no rain, then I will take your stone and give you what you hoped for, and even more.'" He began to do what I had heard about before: throwing a stone into the water, splashing water into the sky, while whispering or shouting something, but he could not bring forth a single drop of rain... The most amazing thing is that the legend about this object is so widespread and so ingrained in people's minds that, unable to be satisfied with the truth, they even quarrel over it."

Among the Turkic peoples, the "stones of rain," "hail," "snow," and "thunderstorm" were called "yada" (jade) or "jada." Besides Al-Biruni, other medieval authors wrote about this, including the 10th-century geographer Ibn al-Faqih. Belief in the power of this stone was widespread among Turkic-speaking tribes and tribal associations (Karluks, Oghuz, and others) in the 10th-13th centuries.

Information about some peoples and tribes mentioned in the works of Abu Rayhan Biruni, their traditions and customs, magical ideas have not lost their significance even today.

In 1030, his greatest work, known as "India", i.e. "Tahqiq mo li-l-Hind min ma'qula maqbula fi-l-aql aw marzula" ("India, or the Book Containing an Explanation of the Teachings of the Indians, Acceptable or Rejected by Reason"), was completed. In the year of completing "India", Mahmud of Ghazni died. He appointed his youngest son, Muhammad, as his successor. However, a few months later, his eldest son, Mas'ud (1030-1041), overthrew his brother and seized power in the state. Under Mas'ud, Beruni's position improved significantly. According to Yaqut Hamawi, Mas'ud was interested in astronomy and paid special attention to scientific observations. Biruni helped Mas'ud improve his command of Arabic. Mas'ud took the scholar under his protection and rewarded him with various gifts.

It is known that Central Asia has had cultural, economic, and political ties with India since ancient times. Abu Rayhan Biruni, in his work "India," cites several Indian legends in various contexts. Some of these Indian legends are also common among the peoples of Central Asia. We will cite a few of them.

One legend, related by Biruni, goes like this: One day, a king announced to his people that after his death he should be cremated in a place where no body had ever been cremated (the Hindu tradition of cremation has existed since ancient times). After the king's death, the people searched for such a place for a long time and became very tired. Finally, when they found a rock rising above sea level and were about to cremate the body, a voice came from within: "This king has been cremated several times on this rock. Now do what you wish, for this is what the king wanted to tell you."

Illustration Depicting Khosrow Celebrating Navruz, from Shahnameh by Firdavsi. From Shiraz, Iran, 1560; held at the British Library

This story, in a different form, is also common in Central Asia, where it is attributed to Iskandar Zulqarnayn (Alexander the Great). Legend has it that Iskandar wished to be buried where no one had been before. People searched for such a place for a long time and finally found a stone beneath a waterfall flowing down a mountain. As they were about to bury Iskandar beneath this stone, a voice emerged from it and said, "This very Iskandar has been buried under this stone seven times, and this is the eighth."

This, on the one hand, testifies to the prevalence of this narrative, and on the other hand, to the fact that the concept of the eternity of matter is expressed in narrative form.

Muslim peoples, including the Uzbeks, have a myth associated with Laylat al-Qadr. It is said that on the night of the twenty-seventh day of Ramadan, a woman was breastfeeding her child when suddenly, on the night of Laylat al-Qadr (the Night of Destiny), a bright light illuminated everything around her. The woman became frightened and hugged the baby tightly, but both the baby and its cradle turned into gold. The baby remained in this state for a whole year. The woman, needing money, cut a piece from the "golden child's" little finger and sold it to earn money. The following year, on the same night, the same woman was sitting as before, and the same light reappeared. The woman became frightened and touched her child, who returned to his former state. This legend has been circulated in various versions.

A similar legend was told by Biruni in his work "India." It says that a man asked a shepherd to find a herb called "*tokhar*." The shepherd complied, and the man saw the herb, lit a fire, and threw the shepherd's dog into it. Seeing this, the shepherd became enraged, threw the man into the fire, waited for the fire to burn out, and then saw that both his dog and the man had turned into gold. The shepherd took his dog and left the man there. One of the villagers, learning of this, cut off the finger of the man who had turned into gold and took it to a poor merchant. Since the merchant was not doing well, he took the finger. When the man returned to the same spot, he saw that the severed finger had grown back and everything was as before. He cut off the finger again and brought it to the merchant. When the merchant asked where he got it, the simpleton took him back to the place. The merchant immediately took the gold home, became rich and took over the city, and, in the end, for this reason, a war broke out between the kings.

Biruni also mentions Kanika (in Sahau's translation, this name is likely Kanishka) in the forty-ninth chapter of "India," entitled "A Brief History." This story of King Kanishka (probably the ruler of the Kushan Empire, who reigned from 78 to 123 CE) and the vizier of the Rajah of Kannauj is perhaps reminiscent of the legend of Shirak.

In conclusion, it can be said that Central Asian myths and Indian legends played an important role in the work of Abu Rayhan Biruni, and they have not lost their significance today, but are a key source that must be studied.

Sogdians on a Persian relief of the Achaemenid period from the Apadana of Persepolis, Iran, bringing tribute to the Persian king Darius I, 5th century BCE. Source: A. Davey, CC BY 2.0

Problems and prospects of physical anthropology in Uzbekistan

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"Uzbek Madonna." 1935. Max Penson

Anthropology in a broad sense is a science about man, helping to answer many questions about his place in the past and present, about the diversity of human individuality and about the changes that have occurred over time during the lives of many generations of humanity. Modern anthropology studies the process of human formation, genetics, antiquity, place and causes of changes. The specialty of an anthropologist is one of the interesting and rare professions. This profession is not competitive in the labor market. Anthropologists are considered to be the champions of science, developing such disciplines as medicine, history and archeology.

An anthropologist is a highly qualified specialist who studies humans as a biological species: their origin, development, place in the natural and cultural environment, as well as the influence of natural and socio-cultural factors on the evolution of humanity. At the end of the 19th century, the concept of anthropology united the history of art, psychology and theology, but later, with the active development of archeology, geology, geography, biology, criminology and other humanities, natural and social sciences, the concept of anthropology took on a more expanded character.

What personal qualities should an anthropologist have? The requirements for the profession of an anthropologist vary depending on the range of professional knowledge. As a rule, employers have a set of standard requirements. These are: work experience, higher education, communication skills, high intellectual and organizational abilities, etc. In addition, personal qualities: interest in the object of study, curiosity; observation and attention to even the smallest details. These also include: analytical thinking, logical thinking, passion for science, attention, perseverance, patience, intellectual level and others.

The work of an anthropologist is not limited to scientific research activities at a university, institute, department, research center or laboratory. Because in order to get acquainted with the habitat of the object being studied, it is necessary to visit the research area for scientific purposes and be prepared to live in various unfavorable conditions. That is why the profession of an anthropologist is more suitable for men.

At the same time, the profession of an anthropologist has a number of advantages, and we will try to provide brief information about them. The profession of an anthropologist is one of the most popular, but at the same time rare professions. At the same time, this profession has its drawbacks. Scientific observations have shown that the mental work of anthropologists does not stop even at the end of the working day. Mental stress also negatively affects the work of the nervous and cardiovascular systems. Ultimately, this can lead to mental and nervous fatigue, vascular diseases and heart attacks, diseases of the musculoskeletal system. Therefore, to prevent such negative situations, it is always necessary to coordinate mental work with physical activity.

Anthropology, as a field of knowledge, is a system of sciences, the only object of study of which is man. It studies aspects of human existence, his attitude to nature and place in the socio-cultural environment. Comparison of the object and subject of research –

Uzbek. Max Penson

the microworld of man – with the complexity of the macrocosm, the diversity of their manifestations inevitably gives rise to many methodological problems.

As in the world anthropological science, anthropological research conducted in Uzbekistan in the 20th century was extremely fruitful. Clarity was brought to many issues, such as the origin of mankind and its evolution. Scientific research in the field of biology, physiology and psychology of man led to the emergence of new ideas about the structure of the human body and mind. However, as researchers emphasize, it is also necessary to note the onset of an anthropological crisis by the end of the 20th century, expressed in a change in anthropological paradigms. Because the development of psychology, ethnography, anthropology and history has collected a surprisingly rich factual material.

Another important methodological problem of modern anthropology is the classification of anthropological disciplines, the number of which is growing rapidly. The correlation of anthropology with natural sciences, social, historical, structural, psychological, philosophical, religious, pedagogical and legal disciplines is growing. One of the most important aspects is the relationship "man – nature", in which man is a natural entity with his own biological structure, properties and "biological" history. These qualities of man are studied by physical anthropology, traditionally called simply anthropology. Thus, anthropology is the science of the origin and evolution of man, the formation of human races and normal changes in the physical structure of man.

Another promising direction in the field of anthropology in Uzbekistan is the study of psychological and philosophical anthropology of man along with physical anthropology. Psychological anthropology studies the psychological state of man, his physical and mental (psychophysical and psychophysiological) problems, features that fundamentally distinguish his subjective world from the natural world. All this requires serious attention to the sphere of relations "man-nature", since the comparison of these phenomena, the identification of their common features and differences allows us to determine the unique characteristics of man. At present, the problem of the relationship between nature and man is reaching a global level. Philosophical analysis of the problem of the relationship between nature and man is an important part of research in the field of philosophical anthropology. The study of human nature sets anthropologists the task of studying the relationship between man and nature.

The development of historical anthropology is becoming increasingly important in order to study the process of change in important human characteristics, the relationship between socio-cultural phenomena (language, customs, rituals) depending on the cultural and historical changes occurring in society.

The issue of development of anthropology in Uzbekistan in the future is one of the most important tasks of science.

If today in Uzbekistan more than 100 state higher education institutions train young people in various professions, only two universities, namely the National University of Uzbekistan and the Tashkent State University of Oriental Studies – provide training for a bachelor's degree in "Anthropology and Ethnology" and a master's degree in the specialty 5A12140 "Ethnography, Ethnology and Anthropology". That is why, in our opinion, it is necessary to stimulate interest in anthropology and increase its authority in Uzbekistan. Scientific research conducted by anthropologists gives us a wealth of information about our people, country, who lives here, what languages they speak, what religion they profess and much more.

At the same time, further development of international cooperation is necessary in order to present to the world community the research and results achieved in the field of anthropology and ethnography in Uzbekistan.

The scope of modern anthropological research gradually includes such issues as determining the patterns of growth and development in accordance with the formation of the constitutional type, character and temperament of a person, clarifying the mechanisms of inheritance of many physical and mental characteristics depending on gender and age. Based on this, the main task of anthropologists and ethnologists of Uzbekistan should be to study the population, biological and physiological characteristics of groups living in extreme conditions, as well as the study of various ethnic, age and social groups in regions with similar biological conditions.

Reflecting on the problems of modern physical anthropology in Uzbekistan, it should be noted, first of all, that some studies are still descriptive. In fact,

any research conducted in the field of anthropology should have a certain practical value, and its results should be used in today's and tomorrow's practice.

An effective solution to the current and socially significant problems of anthropology determines its future prospects.

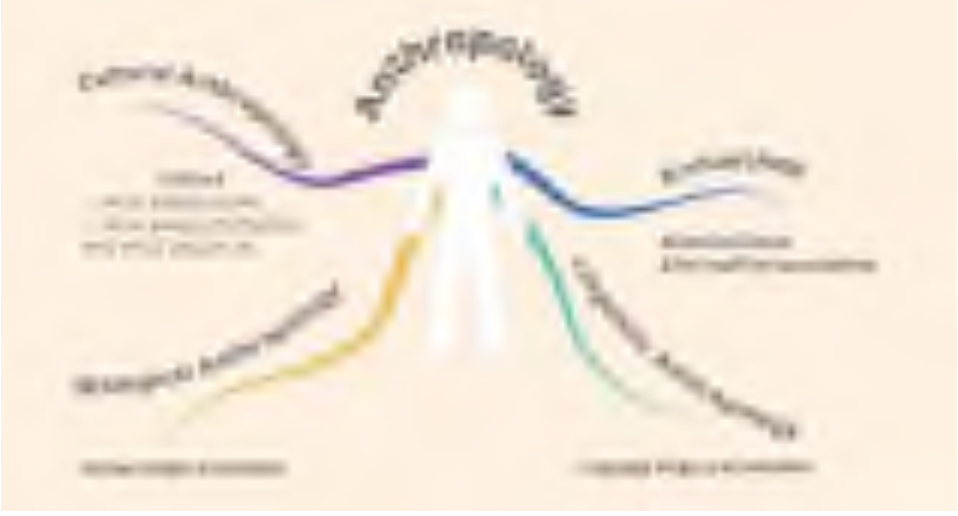
Researchers and specialists conducting research in the field of anthropology in Uzbekistan need to join efforts to determine promising areas for the development of this discipline. Uzbek anthropology should develop together with anthropological science in developed countries and, in turn, have its own schools and concepts. It is necessary to organize a qualitatively new approach to methodological problems, using non-traditional methods along with traditional ones. If you do not pay serious attention to theoretical and methodological research, any research and expeditions will have no practical significance and will remain descriptive works that have no scientific value. It is also necessary to study modern problems of anthropology from the point of view of anthropologists, archaeologists, ethnologists and historians and ensure that each study will bring practical results for a specific sector of society in which we live. Only in this case will the interest of society in anthropological research and its practical value increase.

In his work on the development of historical and anthropological knowledge about the regions of Central Asia in Western countries, researcher M.M. Askarov conducted an analysis showing that the growth of ethnographic and anthropological research compared to the 1990s is distributed unevenly across the countries of Central Asia. If we were to rank the five post-Soviet countries of Central Asia by the degree to which they have been studied by foreign scientists, Kyrgyzstan would be in first place, as it is more open to anthropological research by foreign scientists, Kazakhstan would be in second place, as it has a faculty of anthropology and whose students have studied in the United States, Uzbekistan would be in third place, as it has a unique development of ethnological and anthropological sciences, Tajikistan would be in fourth place, as research was not conducted there because of the civil war, and Turkmenistan would be in fifth place, as there are no conditions for ethnographic research at all.

Excellent Students. 1937. Author Unknown

Therefore, in Uzbekistan it is necessary to increase the volume of research based on high-quality findings of specialists conducting scientific research in the field of physical anthropology and other fields of science, such as historical, social, cultural, medical and philosophical disciplines.

The changes that have occurred in the socio-political life over the past century have led to the mixing of various ethnic groups and ethnicities, as well as different cultures. As a result of the strengthening of ties between people, serious changes have occurred in the material and spiritual way of life of the population living in the territory of Uzbekistan and the peoples who arrived here at different periods of history. Therefore, today interethnic, anthropo-political, anthropo-social, anthropo-cultural relations require serious research. It is necessary to qualitatively improve the teaching of anthropology in higher educational



Subfields of Anthropology

Svante Pääbo – Nobel Prize Laureate in Physiology or Medicine.
Photo: Frank Vinken / Max Planck Institute for Evolutionary Anthropology

institutions of Uzbekistan, cooperate with researchers and specialists conducting research in this field, publish new textbooks, brochures, teaching aids and articles. In this regard, it is advisable to widely use textbooks and teaching aids of leading foreign countries on cultural or social anthropology.

Another important task is to increase the number of hours of teaching anthropology in the curricula of higher education institutions located in large oases and regions of Uzbekistan, such as Tashkent State University of Oriental Studies, National University of Uzbekistan, Termez State University, Bukhara State University, Fergana State University, as well as the creation of departments of "Anthropology" or research centers specializing in social and natural sciences, organizing courses in such educational areas as physical, social, cultural, philosophical, economic, pedagogical, psychological anthropology.

In this regard, the importance of practice in strengthening theoretical knowledge and preparing mature personnel should not be overlooked. Because practice is an integral part of the training of anthropologists. The organization of archaeological and ethnographic internships for future anthropologists will yield positive results. Bachelor's and Master's students will actively participate in archaeological expeditions and field excavations conducted in Uzbekistan.

It should also be noted that one of the promising objects of research in modern anthropology is urbanism – the study of how people live in cities and villages. It seems appropriate to focus on the interaction of man with the urban environment.

Completing these tasks will help us master courses in urban planning, urban design, architecture and urban anthropology, sociology and psychology. Thus, as a result of implementing these tasks, students will acquire basic knowledge in areas related to almost all aspects of human socio-cultural life, as well as master research, analytical and other similar professional skills. They will also become specialists who understand the complexity of the urban environment and can independently work on solving specific urban problems.

As a result of training in the above-mentioned areas of anthropology, depending on the chosen specialization, anthropologists can work in a wide range of companies, institutions and organizations, including city government bodies, urban planning and architectural organizations, as well as international and local development institutions. In addition, in Uzbekistan, there are many opportunities for young people to continue their education in master's and doctoral programs in various academic and professional institutions.

The main task of modern anthropologists is to explain how complex the world is, how local populations interact with the environment, that this is part of the local economy and worldview, and on this basis to explain that problems cannot be solved by simple methods, and to contribute to the search for solutions to problems.

Infrastructure development without taking into account local specifics can cause irreparable damage. As a result, this can lead to the disappearance of not only the tangible but also the intangible heritage characteristic of a particular region.

Finally, it should also be noted that one of the most recent Nobel Prizes was awarded in 2022 to Swedish anthropologist Svante Pabo. He was awarded for creating a photo album of hominid genomes (a family of highly developed primates that includes modern humans and their ancient ancestors) and for developing methods for studying human evolution based on the reconstruction of modern human populations.

The organization of training of anthropologist specialists in Uzbekistan in accordance with international standards will significantly increase the level of attractiveness of anthropologists from higher education institutions, research institutes, scientific centers, as well as government agencies and private companies.

About the history of the creation of New Urda of Tashkent in the 19th century

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As part of the Kokand Khanate, Tashkent, as one of the main strongholds, was refortified and its outer city wall rebuilt. The old walls dating back to Yunuskhoja's time were increased in height and thickness, and water-filled moats were constructed in the most strategically dangerous sections. The walls were increased in height in places to nine meters, and their thickness to four to five meters, making them difficult for artillery to penetrate. A distinctive feature of Tashkent's defensive walls during this period was the inclusion of wide banquettes (upper platforms), sometimes reaching 3 to 3.5 meters, allowing laden clay carts to pass over them.

The construction of the new Urda on the left bank of the Ankhor Canal dates back to 1810, the beginning of Kokand rule (now the area of the northern part of Mustaqillik Square and the area around the Turkiston Theater). The former Urda, in the Karatash area, was destroyed by the conquerors, and for a long time this area was called "Yalankir," meaning desolate highland. The traveller Filipp Nazarov, who visited this area in 1813, describes the remaining ruins: "The castle of the former ruler of Tashkent (Yunuskhoja and his sons) was completely demolished by the Kokandians, and now only the remains of walls and buildings remain in its place."

The new Urda in the eastern part of the city was built in the style of existing fortresses of the Kokand Khanate (for example, Ak-Mechet, Tokmak, Pishpek, and others). Philipp Nazarov notes: "One quarter of a *verst* from Tashkent stands a fortification that could accommodate up to ten thousand troops." He adds: "...it is surrounded by a single wall on the city side, and by two rows of fortifications on the other three sides. Between the city and Urda, the deep canyon of the Ankhor Canal served as an additional barrier." "In the center of Urda, on an elevated site, a second fortification was erected—a castle surrounded by high walls and moats. This was the residence of the viceroy of the Kokand Khan, who governed the city."

In the southwestern part of Urda, near the main bastion, stood the Beklarbek palace complex. Surrounded by high walls with loopholes and enclosed by water barriers, this structure stood out significantly from all other buildings in Urda in its substantiality and more refined architecture.

Urda at the Initial Stage of Formation. 1815

Plan of Tashkent's Urda (survey of 1865)

Reconstructed Urda and the New Part of Tashkent

The last reconstruction of Tashkent's defensive walls took place from 1840 to 1865. These works were linked to two events: the first was the confrontation between the Kokand Khanate and the Emirate of Bukhara, and the second was the beginning of Tsarist Russia's large-scale offensive into Central Asia (in 1853, the Ak-Mechet fortress in Kokand, located on the right bank of the Syr Darya, was captured, and Fort Perovsk was built in its place). Tashkent, like other cities of the khanate – Turkestan, Chimkent, and Pishpek – rapidly strengthened its fortifications. By the 1840s, the lands of the eastern suburbs had been fully reclaimed for the new urban area. Here, beneath the walls of Urda, a *sarbaz* (military) contingent was stationed.

In the eastern part of Tashkent, near the new Urda, two gates were rebuilt – the Kashgar and Kokand gates. Through them, the Urda garrison communicated with the outside world.

By the mid-19th century, the rebuilt Urda abutted the cliff of the Ankhor River Terrace with its western façade. The perimeter of its defensive walls was 1,900 meters, with a total area of approximately 20 hectares. The citadel had a slightly irregular rectangular plan and occupied an area bordered by Kh. Suleymanov Street to the south and Ata Turk Street to the east. The northern boundary ran along the rear façade of the Turkestan Concert Hall. Urda was designed to accommodate a military garrison of approximately 2,000 men, an ammunition depot, and the residence of the viceroy of the Kokand Khan, Beklyarbek, along with his entourage and retinue.

General View of Urda by the Mid-19th Century (Reconstruction Variant)

General View of the Beklyarbek Palace on the Territory of Urda (Reconstruction Variant)

Urda itself was built unevenly in density and of varying quality and decoration. A deep canyon with running water, crossing the citadel from west to east, conventionally divided the fortress into two distinct zones – northern and southern. The northern, smaller zone (approximately 7 hectares) was designated for the garrison of *sarbaz* (warriors), where daily military exercises were likely conducted. The buildings here consisted of a loose array of *pakhsa* (adobe) buildings clustered in places. In the northeastern part of this zone, along the inner façade of the defensive wall, ran outbuildings in the form of adobe stables and barns. The size of the structures in Urda's southern zone varied depending on the social status of the owner. The castle of the city's ruler was located in the southwestern section, near the fortress's main bastion. This residence of Beklyarbek, rebuilt by the middle of the 19th century, consisted of three courtyard complexes.

The first courtyard, measuring 40 by 40 meters, was intended to house Beklyarbek's personal guard. Its perimeter was lined with barracks-type buildings, and in the center of the courtyard stood a large pond (*hauz*), lined with trees along its edges. The second courtyard complex, measuring 55 by 30 meters and adjoining the first on the south side, housed a large audience hall, servants' quarters, and the ruler's entourage. The third courtyard complex, compositionally an extension of the second courtyard from the west, served as the residence of Beklyarbek's female entourage. This complex included a *harem*, servants' quarters, and outbuildings.

The ruler's palace complex utilized a traditional layout – the "*ichkari*" and "*tashqari*" (inner and outer courtyards). The "*tashkari khovli*" housed the administrative offices, while the "*ichkari khovli*" was for women and children, and outsiders were prohibited from entering. The citadel also contained residences for Beklarbek's retinue, confidants, and personal guard. Around fifty of these residences were scattered throughout the vast Urda area, surrounded by verdant gardens and vineyards.

The citadel's architecture was somewhat chaotic. The lack of a clear street system is due to the haphazard arrangement of buildings, which are widely

Tashkent in the Early Years of Its Annexation to the Kokand Khanate. 1810–1815

Main Bastion of Urda in the Southwestern Part of the Fortress
(Reconstruction Variant)

spaced. The southwestern part of the fortress housed the most densely populated section, housing the mayor's residence. Near Beklarbek's palace stood an arsenal housing gunpowder and ammunition. Urda was connected to the old city through the western gate. Near this gate, within the fortress, a small bazaar operated, where trade took place on certain days of the week.

Urda's defensive walls were more powerful than those of the city. The southwestern section was the most fortified, being the highest in the city and suburbs (today the Mustaqillik monument stands here). This section of the citadel consisted of a bastion with three towers, designed for observation of the city and, if necessary, for shelling residential areas.

The full-flowing Gadragang Canal, originating in Bossu, flowed through Urda from north to south. In the central part of the citadel, another, smaller canal

Plan of the Beklyarbek Palace. Measured Drawing, 1865

branched off perpendicularly to the east. Numerous irrigation ditches branched off from it, abundantly watering the entire fortress. Along the ditches and in the open, watered areas, distinctive groves of fruit trees grew green.

The 1869 plan of the Urda quarter of Tashkent lists approximately thirty large and small *hauzes* (ponds) that served as a water source in case of a siege of the fortress. All of these *hauzes* varied in size and shape: rectangular, curvilinear, or oval in plan, they were created on the sites of pits from which soil was taken to build the fortress walls and other structures in Urda.

Construction of the defensive wall required a significant amount of wet clay (*pakhsa*). It was prepared in special quarries on lands poorly suited for irrigation. The technology for building defensive walls was as follows. First, the clay was repeatedly mixed and compacted in the quarries. Then, it was transported to its destination. For this purpose, carts were used, a huge number of which were made for this purpose by artisans from Kokand. These carts, with their enormous wheels, became widely used in urban life in the following decades and were popularly known as "Kokand arava," or Kokand carts.

Greening and Irrigation System of Urda. Survey, 1869

The next stage of the work involved laying the *pakhsa* into the wall. For this, wooden ramps were constructed along certain sections of the wall, along which carts would ascend the ramps and deliver the *pakhsa* to the desired section of the wall. Here, the clay was laid on top of the previous, already dried layer, which was no more than half a meter thick.

Strengthening the city's fortifications was a labor-intensive process. Most likely, the workforce was hired, and, working year-round, they steadily increased the height of new battlements and towers on the fortress wall. However, by the time Tashkent was captured by Tsarist Russia (June 1865), much of the fortification work was still unfinished. In particular, ramps and stairs for soldiers and especially artillery pieces to ascend to the battlements were not always installed. The battlements themselves were not raised to the required height, and the distance between the embrasures and the battlements reached three to four meters. This made firing between the battlements impossible without special scaffolding. Consequently, makeshift loopholes in the form of small openings were installed in many places on the upper walls.

The height of Urda's outer walls was increased to 14 meters, with a base width of 6 meters, and a banquette width of 4 meters. Three gates, flanked by towers, were built into Urda's defensive walls – on the western, southern, and eastern facades. The western gate led into the old city; the eastern gate led to the *sarbaz* courtyard, where the main contingent of the rank and file troops and their families resided; and the southern gate led to the surrounding lands.

Cinema as a tool for recovery historical memory

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Over the past four to five years, due to the increased focus on restoring historical memory [1]and the intensive ongoing [2]research into our history during World War II, the theme of the war has once again become one of the most pressing in national cinema. While between 1991 and 2018, only the film "Vatan" ("Homeland", 2006) brought the theme of war to the forefront, in recent years, four films—"Berlin - Akkurgan," "Ilhaq," "101," and "Uzbek Girl"—have focused on depicting war scenes from various perspectives. Naturally, this has its own socio-cultural reasons.

During the first period of our country's independence, the goal of art and culture was to restore our national values and glorify the names of our great ancestors, so the topic of war was not addressed for a while. In recent years, when the study of the role and significance of the people of Uzbekistan in World War II was elevated to the level of state policy, in order to perpetuate the courage shown by our people during the war, Victory Park was built, the Museum of Glory was opened, and, by personal order of the Head of State, a book-album entitled "The Contribution of the People of Uzbekistan to the Victory over Fascism" was prepared. These changes naturally demanded new perspectives and approaches to the topic of World War II, and this began to be reflected, primarily in cinema.

While war-themed films produced during the Soviet era were dominated by "adherence to a single ideology, demonstrating its educational function, the exceptional importance of the Communist Party in defeating the enemy, the unity of the Soviet people and the Party, the leading role of the patriotic spirit, heroism, and humanism, manifested in the image of the Soviet citizen," [3]today the main content of films is showing a realistic picture of the life of the people during the war years, revealing the true goals of the ideology of that period, and revealing the place of our people in the life of the front and the rear.

The film "101," created during the years of independence on the theme of World War II, aims to restore historical memory and depict the spiritual and moral victory of 101 Uzbek youths destined to become experimental weapons in a special concentration camp. In national cinema, the fate of captured soldiers has previously been depicted in the films "Sons of the Fatherland" (directed by L. Fayziev, 1968), "Motherland" (directed by Z. Musokov, 2005), and partially in the films "Unforgettable Song" (directed by R. Batyrov, 1974), and "A Tale of Two Soldiers" (directed by Z. Sobitov, 1976). Accordingly, although "101" does not open a new direction in examining military themes, the problem it examines offers a unique approach. In particular, while previous films focused on life in concentration camps, primarily on the torture of soldiers, and thus on exposing the evil emanating from the Nazis, the film "101" focused on interpreting the events that happened to Uzbek prisoners as people of great courage.

The film is based on the novel "101" by Anvar Irgashev and Yulia Medvedovskaya. The plot revolves around the events of Uzbek soldiers who participated in the Battle of Smolensk, were captured by the enemy after a brutal battle, and were subjected to various tortures by the Nazis in the Amersfoort concentration camp. Despite this, they, while maintaining their human qualities, selflessly sacrificed themselves on foreign soil. The director and director of photography, Khamidulla Khasanov, previously worked as a cameraman on the war film "Memory Grove" (directed by Uchkun Nazarov, screenwriters Boris Saakov and Ulmas Umarbekov), filmed in 1982. While Khasanov had learned to explore the theme of war solely as a cameraman at that time, he now tried his hand at directing with "101." Khasanov is known to have directed such films as "The Horseman" (2007) and "The Flying Horse" (2011). "The Horseman," in particular, demonstrates Khasanov's profound sense of national character, his ability to subtly interpret distinctive characters, and his creative power to convey the film's artistic and ideological content at the highest compositional level. The director's failure to capture these aspects in "101" seriously impacted the film's overall quality.

Firstly, due to the film's lack of a developed dramatic narrative, i.e., the absence of artistically expressive episodes emphasising the true courage of Uzbek soldiers in captivity, soldiers who demon-

[1] Decree of the President of the Republic of Uzbekistan PQ-3176 of August 7, 2017, PQ-3880 of July 24, 2018i, Decree PF-6202 of April 7, 2021, Decree PQ-5060 of April 7, 2021 - son qarori.

[2] Speech by the President of the Republic of Uzbekistan Shavkat Mirziyoyev at the ceremonial meeting dedicated to the 75th anniversary of the Great Victory and the Day of Remembrance and Honor // https://president.uz/uz/lists/view/3564

[3] Makarov D., Dronov V. Dynamics of the enemy image in modern films about the Great Patriotic War // "Vlast", 2013. No. 2. P. 160.

"O'zbek qizi". Film by Akbar Bekturdiev. 2023

strated unbending will in the face of enemy trials, real Uzbeks capable of maintaining their humanity under any circumstances, spectacular conflicts, and the absence of logically connected compositional solutions, the film failed to achieve its ideological goals, and the enormous work of the film crew was lost against the backdrop of overly pretentious and unrealistic episodes.

Secondly, the film lacks cinematic style and interpretation. Specifically, the film's artistic value is significantly undermined by the lack of need to complement the visuals with content, an excessive focus on narrative in most places where the image itself could fully convey the necessary meaning, and an abundance of unnecessary explanations and commentary read after each shot. Although the film's events are narrated through the recollections of a contemporary of the war years, the lack of effective use of narration means that the artistic visual impact of the film is replaced by documentary footage consisting of the author's commentary. For example, the episode showing Uzbek fighters fighting in Smolensk lasts almost six minutes, four of which are devoted exclusively to combat scenes. Despite the footage showing the soldiers fighting, the bodies of the dead, and other elements of the battle, the following words are read in parallel: "The Battle of Smolensk, where Uzbek youth put up resistance, is considered one of the most brutal chapters of World War II." The battlefields and trenches were strewn with the bodies of soldiers, and there was no time to bury them." In another episode, instead of showing the conflict between the characters and the antagonist's intentions through separate scenes, the filmmakers simply resolved it with the author's narration. These scenes show Uzbek prisoners being brought to the concentration camp and placed in a paddock, and only one shot stands out from the general background: the smile of Hashimjan, who has assumed command, at the son of the concentration camp commandant, Heinrich, and the eleven-year-old boy's return smile. In the next scene, the commandant, reviewing the profiles of the Uzbek prisoners, takes a long look at Hashim's information, and against the background of this gaze, the author's commentary is again heard: "Heinrich began to carefully read the information about the Uzbeks. As he read Hashimjan's documents, he realized that he had become nervous. "He understood that this simple teacher would become an obstacle to the fulfillment of an important task." There are two important aspects to this episode. First, instead of showing the factors that led to the conflict between Hashim and Henry (although this was absolutely necessary, as this conflict dominates the entire narrative, the lack of any basis for it in the early episodes weakens its significance and hinders empathy for the characters), the film simply uses voiceover narration. Although this "saved" a few

Excerpt from the National Film "O'zbek qizi". 2023


Jamila, an 18-year-old sniper, graduate of a military shooting school (actress Aysenem Yusupova). Excerpt from the national film "O'zbek qizi". 2023

frames, it ultimately negatively impacted the film's artistic quality. Second, there is no sequence that logically substantiates the author's explanation. The voiceover says, "He understood that this ordinary teacher would be an obstacle to the completion of an important task," but not a single sequence is provided that would show or substantiate how the commandant realized that Hashim would be an obstacle, what prompted or caused this. The fact that one of the soldiers who had just been brought to the concentration camp, that is, Hashim, gave a friendly wink and smile to the commandant's son was clearly not enough to cause anxiety and concern in Henry. The introduction of these two types of voiceover commentary throughout the film—one explaining the reality the viewer observes, the other narrating events for the sake of abbreviating the image—resulted in the film losing its cinematic appeal. "In the absence of sufficient knowledge and imagination to create a war film, they resort to the traditional method of presenting historical cliches about the war that have persisted in the public consciousness [4]." That "101" chose this path is evident in almost every scene.

Thirdly, the film's weak use of thematic material resulted in an artificial setting and unconvincing character behavior. In particular, the computer effects used to create the battle scenes are extremely unrealistic, the unnatural movements of the soldiers engaged in mortal combat, and especially the scene where an officer stands tall in a trench, calmly pacing back and forth, telling his soldiers, "Soldiers, even if we die, we must not let the Nazis pass. Behind us is Smolensk, and beyond that, Moscow!" Before he can finish his speech, a bomb falls on him, killing him without completing a single task. Khashim's obvious inability to handle a machine gun, along with other scenes, disillusion the viewer from the very first episodes and discourage them from following the events. However, the episodes related to the Battle of Smolensk were an important plot point, providing momentum and drama to the heroes' capture.

The overly vibrant colours in the shots also negatively impacted the film's artistic value. For example, the depiction of a concentration camp in very bright colors, a decorative style, and a very primitive form didn't produce the expected effect against the backdrop of the overall setting. On the contrary, the very appearance of the concentration camp was intended to reflect the frightening and horrific image of those years. If you look at the exteriors of concentration camps in Russian films like "Sons of the Fatherland," "Unforgettable Song," or "Motherland," filmed during the independence period, you'll notice that they lack the bright and vibrant colors of "101," but instead a cold, oppressive, and hopeless atmosphere.

Fourth, the film's use of language barriers also makes the events seem far removed from reality. Another illogical and inappropriate stylistic choice is that all the characters—whether Uzbeks, Germans, or Jews—speak the same language and understand each other without translators. True, if the Nazis in the film spoke Uzbek, but used a translator when communicating with real Uzbeks, this approach could be accepted as a way to make the speech understandable to the viewer. However, the assumption that all the characters speak the same language is unfounded. The conclusion from the review of "101" is that to create a film on a historical topic, including World War II, it is necessary, first and foremost, to thoroughly study the situation of the period and all relevant materials, consult with historians and military personnel, and, most importantly, strive to convey all the events in a cinematic interpretation. After all, the purpose of creating such historical films is not only to provide information about that era or the people of that time, but also to influence the viewer's psyche through artistic images and thereby warn society against repeating the tragedies of the past.

In recent years, a tradition has developed in Uzbek feature cinema of making films aimed at restor-

[4] Ilchenko S. Paradoxes of interpretation of history in the space of screen communications (based on films and TV series about the Great Patriotic War) // Humanitarian Vector, 2017. No. 4.

ing historical memory. In particular, films created on this topic, such as “Berlin - Akkurgan” (2018), “Ilhaq” (2020), and “101” (2020), explored various political, ideological, and social aspects of the war years. Although these films explore war scenes from different perspectives, a unifying theme is the depiction of the Uzbek character, life, and heroism of the Uzbek people during the war. It is worth noting that it is precisely this aspect, namely the coverage of the theme of war in Uzbek films through the fate of the nation or its representative, the emphasis on the role and contribution of the Uzbek people in the war, which is considered the main feature that distinguishes national cinema from films of other countries. It is by these criteria that it is appropriate to evaluate the feature film «Uzbek Girl,» released this year. This meaning is also reflected in the film’s ending: «Dedicated to the thousands of Uzbek women who participated in World War II and demonstrated courage, such as Zebo Ganieva, Muqaddam Ashrapova, Roza Ibragimova, Sharofat Ishanturaeva, and Rakhima Alimova.” Director Akbar Bekturdiev’s interest in war themes was evident in his film “On the Other Side of the World” (2019). It could be said that this film served as a touchstone for the director before working on “Uzbek Girl.” Furthermore, collaborating with Belarusian filmmakers, who have extensive experience making war films, also provided a valuable opportunity to explore this topic.

While the first films made during the years of independence on the theme of World War II, “Motherland” (2006) and “Berlin - Akkurgan” (2018), were based on original scripts, films made in later years, such as “Ilhaq” and “101,” are based on the works “Mother of Five Warriors” (by Alinazar Egamnazarov) and “101” (by Anvar Irgashev and Yulia Medvedovskaya). It is well known from the experience of both world and domestic cinema that the main idea, plot structure, and character interpretation are the key factors in the successful adaptation of a work of fiction. “Uzbek Girl” is based on Bakhtiyor Abdugafur’s novel of the same name. However, unlike the film, the ideological content of the work is much more significant, and the scale of events is correspondingly broader. The work, set against the backdrop of war, presents a generalized image of thousands of Uzbek women who courageously fought at the front and laboured in the home front, only to fall victim to Stalin’s repressions. The heroine, a simple Uzbek girl, reveals the true face of the regime during the war. For the film, however, the “frontline” portion of the work was primarily chosen. This approach not only prevented the film from fully conveying the content of the work but also led to a deviation from the ambitious goals of revealing the political, ideological, and social realities of the war period in a work of fiction, depicting the trials and tribulations of Uzbek women under such conditions. The film, first and foremost, focuses on depicting heroic deeds at the front.

The main part of the storyline, therefore, covers events at the front. At the beginning of the film, the heroine, Jamila, is forced to leave her village and, through a fortuitous set of circumstances, gains experience at a sniper school for girls. She then begins eliminating fascists one after another, and at the film’s end, successfully completes a combat mission and dies. Indeed, the image of the Uzbek female fighter in the context of World War II is a new theme for interpretation in national cinema. Until now, Uzbek feature films about the war have primarily portrayed women as caring mothers, faithful wives, and weaklings who endured the hardships of war. However, world cinema, especially Russian cinema, boasts many films about female snipers who demonstrated heroism during World War II. «Attention, Moscow Calling» (2005), «Sniper 2: Tunguska» (2012), «Snipers: Love in the Crosshairs» (2012), «I See the Target» (2013), «Battle for Sevastopol» (2015), and other similar films portray female snipers during the war years, experiencing different fates. The bold use of the creative experience of such films in «Uzbek Girl» is reflected throughout the compositional structure. In particular, the use of certain clichés is clearly visible in Jamila’s training at the school for female snipers, in the dialogues between the girls, in episodes illustrating the heroine’s state of mind, and in shots of the heroine at the front. Although

Excerpt from the Feature Film “Bir yuz bir (101).” 2020

the film demonstrates great effort to illuminate frontline events on an epic scale and to enliven battle scenes with special effects, it is difficult to give the film high marks for its original approach to the theme of war. And yet, it is appropriate to dwell on the features that illuminate the theme of war in the film "Uzbek Girl".

Firstly, the film pays special attention to depicting the wartime atmosphere: from small details to the characters' costumes and large sets. The film's opening shots begin with images of a red Soviet flag, loudspeakers broadcasting war news, the resonant voice of Yuri Levitan, an announcer for All-Union Radio and People's Artist of the USSR who became a frontline correspondent during the war, and a red poster with the slogan «Everything for the Front, Everything for Victory.» These details, long-standing symbols of war, convey the atmosphere of those ominous years from the very first shots. As events unfold, the content of each episode is enriched with similar details, reflecting the atmosphere of war.

Secondly, the film contains several scenes that effectively utilize cinematic language. For example, the scenes of Jamila leaving home and arriving at the front are shown against the backdrop of a letter she left for her aunt; the shots of Jamila eliminating Nazis one by one are conveyed through a monologue that expresses her hatred for the enemy; and the shots of Jamila joining the partisans, courageously fighting the enemy, with a bloodied face, carrying several enemy rifles over her shoulder, laying them out on a table, and handing over four cans of food seized from the Nazis to his comrades—all vividly convey the essence of the events.

Thirdly, the emphasis on depicting the tragedies of war broadened the scope of the film's content. This is evident in the characters' words (the captain in the ditch says, «Oh, this damned war, it turned everything upside down,» Rahima points to the battlefield, saying, «This is real hell,» etc.), the horrific scenes seen through the characters' eyes, the atrocities committed by the Nazis, and the episodes that happen to the characters. The fact that the hardships of the front, associated with the war, fell on the shoulders of defenseless women and children is reflected in the footage of the potato harvest in the opening shots. Note that in the footage of the home front, not a single man except the chairman is present, clearly demonstrating that war is a tragedy that separates women from their husbands and children from their fathers. When the female snipers reach the front, they see people abandoning their homes without looking back, their burned-out dwellings reflecting the scale of the destruction wrought by the war. A woman sitting amidst the smoldering ruins, holding a child in her arms, and a girl next to her, crying and helpless, appear even more powerful against the backdrop of slow-motion footage. Footage of fierce battles, the deaths of heroes, and such scenes as the hanging of an old man who helped Soviet soldiers in front of his grandson also reveal the mercilessness of war.

Fourth, the use of flashbacks in the film [5]helped to reveal the hero's feelings, transforming her into an emotional character. Vivid memories of her fiancé, shown during Jamila's difficult and challenging times, create a contrast between the brutality of war and her happier days.

Along with these striking features of "Uzbek Girl," it's worth noting aspects that significantly influenced the film's artistic and ideological quality. As already noted, world cinema has many films dedicated to the fate of female snipers during the war, so how should "Uzbek Girl" stand out among them? Despite the similarities in plot episodes and shots, and given the film's heroic military nature, one of the primary goals throughout the film was to reflect the Uzbek people's contribution to victory through the heroic deed of the Uzbek female sniper. Howev-

[5] Footage from past events

Hoshim – (main role) a Red Army soldier, concentration camp prisoner (actor Boris Gafurov). Feature Film "Bir yuz bir (101)." 2020

er, the character of Jamila Qadirova, interpreted as a generalized image of an Uzbek woman, lacks the characteristics that distinguish her from others on the front. Certainly, attempts were made to instill certain character traits in the heroine, but there are almost no episodes or shots that would distinguish her as a specifically Uzbek woman. Throughout the film, only one scene—a dialogue between the sniper school's commander and Jamila—highlights the courage of Uzbek women. To the question, "Are there many determined women in Uzbekistan ready to fight the enemy?" Jamila replies, "Exactly. But if everyone goes to war, who will send cotton, fruit, bread, and clothing to the front? It's not easy there either. There's a front there too, Comrade Colonel." This response presents the image of an Uzbek woman. The film's artistic and ideological value would have been greater if it had more fully explored the contribution of Uzbek women to the war, even through similar dialogue or other minor details. Therefore, it can be said that Jamila became more of an international figure than a representative of her people. This approach to interpreting the protagonist ultimately failed to reveal the role and significance of Uzbek women in the war.

Furthermore, the film contains scenes that lack logical and realistic resolutions. For example, while Jamila's heroic act of shooting down a Nazi plane with her Mosin-Nagant KO-44 rifle during an enemy air attack on a military convoy is spectacular, how Jamila acquired such skill is not confirmed in the preceding footage, thus raising questions. True, at the 69-minute mark, a few seconds of footage are shown of Jamila hunting with her uncle, but the late inclusion of these shots involving her uncle, after the events have unfolded and Jamila has already become a sniper, does not enrich the film's content or reveal the heroine's biography. Had these shots been shown before the plane was shot down, the film would have answered the questions posed at the beginning and justified her actions. Another similarly implausible episode can be seen in footage of the division's artillery chief, calmly emerging from a trench in the midst of battle, stepping into the open, and coming under fire from an enemy sniper. It's incredible that this character, who had gained combat experience and risen to the rank of colonel, would behave in such a manner while under fire from all sides. Furthermore, there's no apparent purpose to Gromov's survival of the shelling and his reintroduction into the story. Although Gromov, harboring a grudge against Jamila, the person responsible for his beloved's death, reappears on screen after the shelling and sets off with Jamila on a very important mission, which creates a certain intrigue, the fact that Gromov is simply captured and dies under torture in subsequent episodes doesn't justify his survival and reintroduction into the storyline.

An analysis of films reveals that, although feature films of the independence period strive for historical objectivity in their depiction of World War II and attempt to expose Soviet ideology, they prioritize imitating foreign films over depicting original events and characters. However, archives still hold untold stories of many Uzbek heroes who demonstrated genuine heroism during the war, and whose stories could form the basis of dozens of high-quality films.

Development and prospects of the oil and gas sector in Uzbekistan

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The oil and gas sector plays an important role in Uzbekistan's economy. It is one of the main sources of growth of the national economy and is of great importance for the growth of energy supply, industrial production and export potential. Oil and gas production in Uzbekistan began at the beginning of the XX century.

Later, such large deposits as Shurtan, Gazli, Uchkuduk, and Kungrat were put into operation, which formed the country's oil and gas base. During the years of independence, major reforms were carried out in the industry, modern technologies were introduced, and international cooperation was expanded.

Today, Uzbekistan operates more than 200 oil and gas fields. Most of the gas produced is used to supply the domestic market, but it is also exported to neighboring countries-Kazakhstan, Russia and China. The republic has long been among the top fifty countries in terms of “black gold " reserves. About 60 percent of oil and gas is produced in the Bukhara-Khiva region.

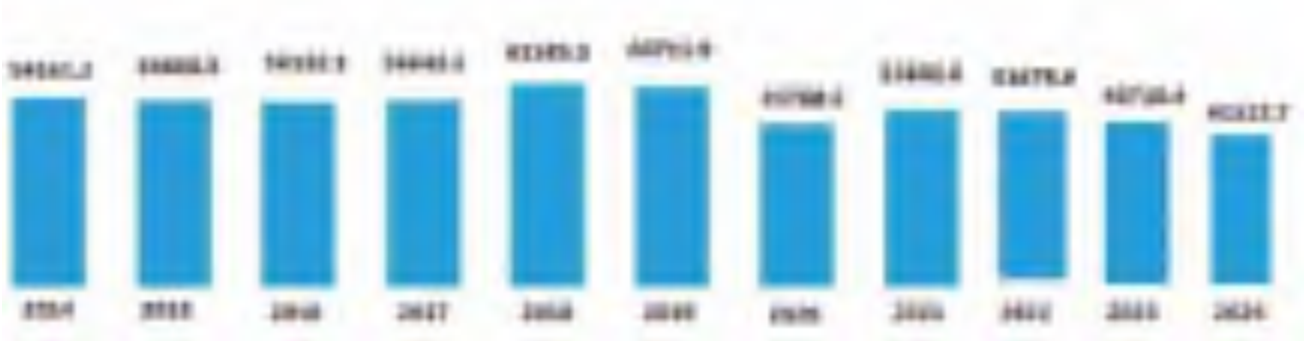
In 2024, oil production amounted to about 713.1 thousand tons, gas condensate production amounted to 1188.5 thousand tons, gasoline production-amounted to 1311.5 thousand tons, diesel production amounted to 1484.9 thousand tons.In July 2022, a field of high-viscosity bituminous oil was discovered in the Zarafshan basin. According to the conducted estimates, the reserves of bituminous oil amount to 100 million tons.

Thus, as of 2024, 41523.7 million m3of natural gas was produced in the country, and taking into account foreign participation, there is a high probability that natural gas production in the country will increase in the coming years and will have a stimulating effect on the entire gas production and production sector.

In 2021, Uzbekistan exported about $ 14 billion. export of natural gas to China, Russia, Kazakhstan and a number of other countries. It is expected that the developmentof existing deposits will lead to an increase in production, increase in exports and increase the country's income.

In 2021, Uzbekistan produced 53.6 billion cubic meters of gas. cubic meters of natural gas. The government plans to increase production to 66.1 billion rubles. By 2030, about 30 new oil and gas projects are planned to be implemented in 2025. In 2019-2030, it is planned to invest $ 3.5 billion in geological exploration and $ 6.3 billion in increasing natural gas production, which can contribute to the further development of the country's oil and gas market in the coming years.

In recent years, Uzbekistan has entered a phase of fundamental changes in the energy sector. The country is reaching a new level not only in natural gas production, but also in oil production and refining. These changes are related to the diversification of the national economy, increasing export potential and ensuring energy independence. Important work is being done in the industry to attract investment, digitalize and develop technologies for deep mining and processing of minerals. In cooperation with Uzbekneftegaz and foreign companies, such major projects as the GTL plant – production of liquid fuel from gas and the Shurtan Gas Chemical Complex have been implemented. The national company Uzbekneftegaz ranks 11th in the world in terms of natural gas production (60-70 billion cubic meters of natural gas are produced annually).m3 of gas). 194 hydrocarbon deposits have been explored in Uzbekistan, including 98 gas and condensate, 96 oil and gas, oil and gas



Uzbekistan's Oil and Gas Market: Natural Gas Production (in billion cubic meters), Uzbekistan, 2014–2024

condensate. The following hydrocarbon reserves have been explored and registered in the Republic:

- Geological oil reserves – 5 billion tons.
- Geological reserves of natural gas – more than 5 trillion. m3.
- Confirmed natural gas reserves are 3.4 trillionm3.
- Oil production is 3.5 million tons per year.

The New Uzbekistan strategy for 2022-2026 provides for additional measures to develop the oil and gas industry, including liberalizing energy and natural gas markets, attracting private investment, and introducing social consumption standards to protect vulnerable segments of the population. It is planned to further develop the chemical and gas chemical industries, increase the degree of processing of natural gas from 8% to 20%, and increase the volume of chemical production to 2 billion US dollars.

At the same time, the development of the country's oil and gas sector also requires environmental responsibility. Reducing methane emissions, using energy-efficient technologies and introducing renewable energy sources are urgent tasks today.

In the future, Uzbekistan will pay great attention not only to oil and gas production, but also to their processing and production of products with high added value. This will strengthen the country's economic independence, create new jobs and further increase its export potential. In the near future, Uzbekistan will undoubtedly become a model of sustainable development not only in the oil and gas sector, but also in the field of renewable energy.

Gold and Silver Masterpieces of Central Asia and Iran

Akbar Khakimov,
academician

Do not drink from vessels of gold and silver…
Al-Ghazali, 11th -12th centuries

In the previous issue of the magazine, we published material on the spring 2025 auctions held by Sotheby's and Christie's, which included managers and experts from Uzbekistan for the first time. From July 1 to July 8, 2025, a new stage of the acquisition of artefacts for the exhibition of the Centre of Islamic Civilisation in Uzbekistan took place in London. The selection committee selected artefacts for purchase—manuscripts, miniatures, and works of applied art—from the collections of SOTHEBY'S, CHRISTIE'S, and BONHAMS auction houses, as well as from leading oriental art galleries such as Sam Fogg, Davud Shah, Mansour Gallery, Aaron Gallery, Amir Mohtashemi, Momtaz Art, Kent Antiques, Jacob's Gallery, and Orpheus Gallery. Following the two purchases, the most numerous acquisitions were metalwork, with gold and silver pieces possessing particular material, historical, and artistic value. These include rarities made from precious metals from Central Asia dating back to the pre-Islamic period, as well as examples of Islamic toreutics—primarily pieces from the 9th to 18th centuries. This article is devoted to an overview of these artefacts.

Gold and Silver – the Privilege of the Elite

In ancient and medieval times, gold and silver items in the East were symbols of wealth, luxury, and power for rulers and court nobility. Gold and silver tableware was intended for feasts and gifts. Weapons (pieces of armour, sword scabbards, etc.) and gold jewellery for men (belts, torcs, and pectorals) served both utilitarian purposes and were symbolic expressions of the rulers' divinely chosen status. Items made of less expensive silver—bowls, round dishes, jugs, and vases—have survived to this day in greater numbers than gold items. However, the lustre of gold retains its magical power of grandeur, and so artisans gilded silver objects to add a visual sheen. Thanks to the skill of ancient and medieval artisans and jewellers, gold and silver items acquired artistic significance and the quality of masterpieces of high art. They also represent an important source for the history of their time, as they contain depictions of various scenes and motifs, and in Islamic times, inscriptions with the names of rulers or other historical figures.

Is the dilemma of Central Asia or Iran, Northern or Southern Bactria, Sogdiana or Iran, Transoxiana or Khorasan particularly relevant in relation to the question of the place of production of artistic handicrafts? Over the course of many centuries, the historical lands of Central Asia, especially its southern regions, entered into political and cultural interaction with the adjacent regions of present-day India, Afghanistan, and Iran. This interaction and interconnection changed over the course of historical development. In ancient times, individual regions of Central Asia were part of the Achaemenid Empire. In classical antiquity, the territory of the southern regions of Uzbekistan was part of the empire of Alexander the Great, then Greco-Bactria, and later the Kushan Empire, which also included the territories of northern India and northern Afghanistan. However, by the 14th and 15th centuries, the region had become part of the Achaemenid Empire. Iran was under the rule of the Timurid dynasty, and from the 16th to 18th centuries, Northern India became part of the Baburid Empire, the descendants of Sahibqiran (another title of Amir Timur).

When attributing toreutics of Central Asia and Iran, it is crucial to consider the shared historical fates of these regions, which largely determined the similarities in their forms and decoration. These historical transformations and cultural transactions also affected the destinies of the arts and crafts of the regions of Central Asia and Iran, which shared stylistic similarities and thematic features.

This had a particularly significant impact on precious metal items, which, due to their high export potential, were highly mobile and were traded, with the most valuable being presented as gifts from rulers of one state to those of another. Therefore, it is challenging to determine whether certain gold or silver items belong to Central Asia or Iran. For example, regarding so-called "Oriental silver" from antiquity and the early Middle Ages, as well as bronze objects from the Islamic period, scholarly discussions and debates have raged over the past century regarding the localisation of their origins. Difficulties arose due to the shared cultural and craft traditions of these regions. With the emergence of new rarities and artefacts, these debates continue to this day… Bearing this dilemma in mind, when annotating the toreutics cited in our article, in controversial situations, we have used the designation "Central Asia or Iran" for the pre-Islamic period, and "Central Asia or Iran"

for the 9th-15th centuries. In these cases, the term "Transoxiana or Khorasan" was used. It should also be noted that in scientific literature, the term "Eastern Iran" was used to refer to the territory of present-day Afghanistan.

In ancient Central Asia, the level of development of arts and crafts, including the craftsmanship of precious metals, was also quite high. The emergence of gold and silver items in the historical territory of Central Asia, particularly Uzbekistan, was largely facilitated by the presence of rich deposits of these precious metals. Silver was mined in mines in the Chach and Fergana regions, and gold was mined in the floodplain of the Zarafshan River, as evidenced by the name itself – literally "shaking gold." Unfortunately, there are not many gold and silver artefacts in Uzbekistan's museums. A hoard of gold jewellery and ingots weighing 36 kg, discovered by archaeologists from the Institute of Art History in 1972 at the Dalverzintepe site in southern Uzbekistan, is perhaps the only such large assemblage of gold objects in our region. However, only a few items from this hoard possess the qualities of artistic artefacts: a pectoral with a carnelian inlay depicting Hercules, a necklace with precious stone inlays, and a small buckle in the Saka-Scythian "animal style."

In the early Middle Ages, silverware production was developed in the territories of Sogdiana and Khorezm, as evidenced by the collections of foreign museums, most notably the enormous number of silver jugs, vases, and dishes of Sogdian and Khorezmian origin held in the State Hermitage Museum in Russia. Unfortunately, museums in Uzbekistan have virtually no silverware, except for a hoard of 5th-6th century silverware from Chilek, of which only one piece can be attributed to Sogdiana—an undecorated spoon bowl. The two remaining items—a Hephthalite bowl with dancing naked women—come from northern India, and a Sassanid dish depicting a royal hunt—come from Iran.

Between the 9th and early 13th centuries, due to the "silver" crisis, when precious items were melted down for coins, and the call of Sufi Muslim theologians to limit themselves to material goods, gold and silver production in Transoxiana and Khorasan declined significantly. Museums in Uzbekistan do not contain gold and silver items from the 9th to 18th centuries. Existing toreutics from this period are primarily copper and bronze objects.

From the Achaemenids to the Samanids

In the pre-Islamic period in Central Asia and Iran, gold and silver objects were often decorated with scenes from palace life and religious, mythological, or epic subjects. On gold and silver objects, alongside depictions of palace life and the surrounding natural environment, and naturalistic images of birds and animals, often of cultic and magical significance, we can see a host of fantastical images – a winged camel and Pegasus – winged horses, leo-gryphons – lions with a bird's head and wings, senmurvs – dogs with a bird's body, and birds with a female face – peri or sirens, etc. This diversity of themes and motifs allows us to see and understand the ideas and concepts of the people of those distant eras, what excited and captivated their minds and feelings.

Of exceptional value from a scientific, artistic and material point of view are a Central Asian gold scabbard from the Achaemenid period with an image of a gryphon's head (4th century BC), a pair of gold bracelets with tops in the form of ram's heads (6th century BC), a Greco-Bactrian gold pectoral (torc) with tips in the form of a bull's head (2nd-1st centuries BC), as well as a series of silver and gilded dishes, judging by the iconography, most likely of Sogdian origin (6th-8th centuries) with individual images of deer with branched antlers, horses and birds.

Golden sheath tip with a griffin. Central Asia or Iran. 4th century BCE. Mansour Gallery

This fragment of a gold scabbard finial depicting a gryphon reflects the artistic traditions of the Achaemenid period, characteristic of both Iranian art and the territories that were once part of the Achaemenid Empire. According to the owners of the Mansour Gallery, who presented this item, it was made in the southern regions of Central Asia. In fact, the image of the gryphon was quite popular in the ancient and medieval art of ancient Iran, Mesopotamia, and the Central Asian regions. A parallel to the decorative style of the scabbard can be found in the iconography of two opposing winged gryphons on a gold bracelet from the Amu Darya treasure, discovered in Central Asia, in the floodplains of the Amu Darya River.

These elegant bracelets, featuring paired ram's heads, reflect the artistic traditions of the Achaemenid period, characteristic both of Iranian soil art and of the territories that were once part of the Achaemenid Empire. For example, analogies to the decorative style of these bracelets can be found in examples of gold jewellery from the Amu Darya hoard, discovered in Central Asia, in the floodplains of the Amu Darya River. Executed to an exceptionally high standard, the bracelets are striking evidence

Pair of early Achaemenid gold bracelets with ram's head finials. Central Asia. Circa 500 BCE. Mansour Gallery

Gold torque with bull-head terminals. Central Asia. 2nd–1st centuries BCE. Aaron Gallery

of the advanced level of local civilisation. They also provide insight into the religious beliefs and aesthetic preferences of their owners. All these material points to a significant expansion of cultural ties between southern Uzbekistan and the Middle East.

The director of the Aaron Gallery has offered for sale a unique gold torc from the 2nd to 1st centuries, which experts believe was manufactured in the southern regions of Central Asia. Such neck rings with animal heads at the ends were widespread in the Ancient East—Mesopotamia, Achaemenid Iran, Central Asia, and the Eurasian continent among Scythian and Celtic tribes—beginning around 1200 BC. This gold torc, in the form of an unfinished circle with cast bull heads, is a unique and outstanding work of Bactrian art. A torc was a sign of privilege and high social status and was therefore made of the noble metal gold. The style of the torc is similar to that of the gold jewellery found in the Amu Darya hoard. For example, neck torcs can be seen on the necks of two gold figurines on a chariot from the Amu Darya hoard. A Sotheby's auction yielded truly unique examples of silver and gilded toreutics. Among them was a round dish from the 7th -8th centuries with a full-surface depiction of a royal pheasant. Characteristic of this iconography are the distinctive curls of the tail, the round halo against which the bird's head is depicted, and the sacred *ashkharavand*—a ribbon symbolising royal power.

As noted in the dish's description, along with Sassanid iconography, similar bird images have been found in other centres along the Silk Road. A very similar image of the same bird is found on a fragment of Sogdian samith textile purchased at Christie's, featuring the same birds in round medallions. The halo is clearly visible, as is the similar treatment of the tail curls and the similar profile view. This suggests that this dish could have been made in Sogdiana. The dish's description notes that the dating of the dish to post-Sassanid times in 2024 was challenged by D. Rabi and may date it to the Umayyad period. The Sogdian-Sasanian toreutics group also includes three round silver and gilded dishes from the collections of the Mansour Gallery, Orpheus Gallery, and Jacob's Gallery. Two of them depict horses with Ashkharavand ribbons around their necks, and a small footed saucer with a small bird depicted on the bottom—a pheasant with its characteristic curled tail.

This miniature and masterfully executed horse figurine on a silver platter from the Orpheus Gallery reflects the traditions of Sogdian and Sassanid toreutics and is similar in many features to a large horse image on another gilded silver platter from the

Silver pedestal dish with a bird image. Sogd or Iran. 6th–7th centuries. Mansour Gallery

Jacob's Gallery. Despite the difference in size, both images share obvious iconographic similarities—the horses' equipment, symbols of royal power (*ashkharavand* bows), the raised left leg of both horses, and more.

The image of a deer, popular in these regions, with magnificent, branching antlers and a raised right leg, is associated with the art of the Eastern steppe and the traditions of Far Eastern toreutics. The attribution

Gilded silver dish with a bird motif. Sogd. 6th–8th centuries. Sotheby's Auction House

Silver pedestal dish with a small depiction of a horse. Sogd or Iran. 6th–7th centuries.

Gilded silver Sogdian dish depicting a deer. Sogd. 7th century. Yacob's Gallery

of this dish to Sogdian toreutics (the school of B.I. Marshak) is also confirmed by a comparison of the deer iconography on the dish with a bronze deer figurine from the 2nd-1st centuries BC in the Aaron Gallery.

This is an undisputed masterpiece, acquired from the Aaron Gallery. This small figurine of a proudly standing deer is made of bronze, but the artist clearly attempted to imitate gold objects, as evidenced by the bronze's distinctly golden colour.

The image of the deer was widespread in Central Asian art. Iconographically and as an artistic motif, this image is associated with the art of the nomadic peoples of Siberia, Altai, and Central Asia. Based on an analysis of the metal composition, experts concluded that this sculpture could have been made in the Samarkand and Nurata regions. The image of the deer on the silver platter and the bronze deer sculpture reflect a unified complex of religious and cult beliefs of the Central Asian peoples. These artefacts testify to the high level of development of arts and crafts in ancient and early medieval Uzbekistan. The image of a deer with branched antlers on the Sogdian platter is iconographically similar to the statuette and may serve as an argument in favour of the Central Asian origin of the bronze deer figurine. All acquired pre-Islamic artefacts are unique rarities, with virtually no analogues in domestic museums. They will undoubtedly enrich the exhibition of the "Pre-Islamic Civilisation of Central Asia" hall at the Centre of Islamic Civilisation in Tashkent and will become recognised masterpieces of the Centre.

From the Samanids to the Timurids

In addition to these unique examples of pre-Islamic toreutics, during our two trips to London, we recorded a large number of metalwork artefacts from the 9th to 13th centuries, primarily from Transoxiana or Khorasan. Some of these were purchased for the halls of the Centre of Islamic Civilisation, while others were photographed for research purposes.

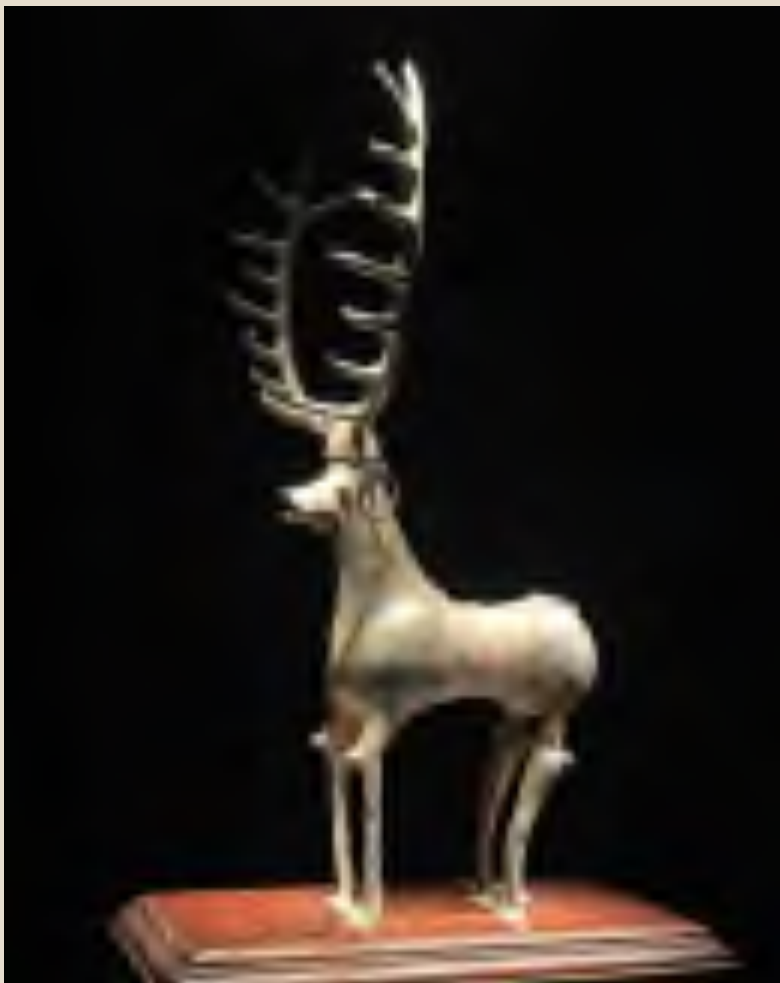
An elegant silver bowl on a low base was recorded in the Momtaz Art Gallery. On the outer surface of the bowl, a band of goodwill inscriptions in naskh script runs across the top, arranged in cartouches. It differs from the hemispherical bronze bowls that were quite common during this period in that it has a base and modest ornamentation.

A rare silver vessel for the period was acquired at Sotheby's auction. It features peacocks, a figure on horseback, and a fox against a background of swirls. The vessel's decoration is masterfully executed. Of note is the Kufic inscription, a wish to the customer—a maker of pillows and beds: "Glory, prosperity, wealth, and happiness to Abu Bakr Muhammad…Isa al-Najad (the maker of pillows and beds)."

A special portion of the selected artefacts includes silver items from the early Islamic period, including trays and bracelets inscribed with the names of rulers – the Samanids and Ghaznavids – and gold objects and jewellery dating back to the Seljuk and Golden Horde eras.

This rectangular silver tray bearing the name of one of the last rulers of the Samanid dynasty, Amir Abu Mansur bin Sabutin, is significant as both a remarkable work of craftsmanship and a valuable historical document. Silver trays are extremely rare for this period. For example, no similar silver piece from this period exists in any museum in Uzbekistan, and the only gilded silver tray bearing the name of Khorezmshah Ibrahim, which is related to our cultural heritage, is held in the Hermitage. There are fewer than a hundred exquisite silver items from this period in the world, which undoubtedly lends these silver trays a special museum significance.

A bracelet bearing the name of the last ruler of the Ghaznavid dynasty, Khusraw Malik ibn Khusraw Shah (963-1187 AD), is important both historically and artistically. The gallery presents a bracelet bearing



Bronze figurine of a deer. 2nd–1st centuries BCE. Central Asia. Aaron Gallery

Bronze figurine of a deer. 2nd–1st centuries BCE. Central Asia. Aaron Gallery

Gilded silver tray inscribed with the name of the Samanid Amir Abu Mansur ibn Sabutin. Central Asia. 10th–11th centuries. Transferred by Davud Shah Gallery to Christie's Auction House

the name of Khusraw Shah (963-1187 AD), the last ruler of the Ghaznavid dynasty.

This unique artefact is a thin gold plate depicting a fantastical winged goat against a background of scattered floral patterns. The plate, crafted using the hammered technique, was likely decorated with precious stones (usually turquoise), the placement of which remains as holes, and was used as an overlay on the warrior's chest armor.

This gold hoard from the Seljuk era, dating from the 11th-12th centuries, was acquired at Sotheby's as a single lot. However, the hoard contains over 130 different gold jewellery items—various earrings, chains, bracelets, clasps, and rings with turquoise and pearl stones, all crafted with masterful craftsmanship. Given that Khorezm was part of the Seljuk Empire, the inclusion of this hoard in the exhibition at the Centre of Islamic Civilisation was considered a legitimate acquisition.

Filigree jewellery work characterises a gold bracelet and pectoral ornament from the Golden Horde period, which were also purchased at Sotheby's.

The bracelet is crafted using various techniques—casting, filigree, and granulation—which lends its texture a contrast of movement and stillness. The inset near the clasp is decorated with two *makaras*—an aquatic creature with the body and tail of a fish and the wings and head of a dragon. Similar *makara* designs can be found on an openwork buckle from the Golden Horde, as well as in the carved *ganch* (stucco)

Silver vessel. Mawarannahr or Khorasan. Khwarazmshah period. 12th–13th centuries

Gilded silver tray inscribed with the name of Khwarazmshah Abu Ibrahim. 11th century. Khorazm. Hermitage Museum

Golden bracelet inscribed with the name of Khusraw Malik ibn Khusraw Shah. Khorasan. 12th century. Transferred by Davud Shah Gallery to Christie's Auction House

Gold bracelet. Central Asia or Golden Horde. 13th–14th centuries. Sotheby's Auction

of early medieval Varakhsha and the wall paintings of Afrasiab.

This pectoral is an exquisite example of the Golden Horde jewellery, a zone of cultural interaction that also included the territory of Khorezm.

During the Islamic period, gold and silver were replaced by bronze and copper items. The imitation of the richness of Sogdian and Sassanid precious metal objects is articulated here through the imitation of their forms and the introduction of a new technology: inlaying motifs with silver threads and plates. In their decoration, pre-Islamic motifs and images lose their sacred meaning and are transformed into patterned compositions, dominated by inscriptions of good wishes and intricate floral and geometric patterns.

Gold plaque depicting a winged deer or mountain goat. Central Asia. 11th–12th centuries. Yacob's Gallery

Among the artefacts related to weapons and armour, daggers and sabres dating back to the Timurid, Baburid, and Uzbek Khanate eras are noteworthy. The handles of swords and daggers, as well as their scabbards, were typically decorated with precious stones, inlays, or gold and silver inlays.

The mastery of Central Asian swordsmiths and jewellers is most strikingly and expressively demonstrated in the design of the scabbard and hilt

Gold pectoral medallion. Central Asia or Golden Horde. 13th–14th centuries. Sotheby's Auction House

Bronze casket-box with silver inlay. Mawarannahr or Khorasan. 12th–13th centuries. Sotheby's Auction House

of the sword intended for the Kokand Khan. The sabre was kept in the Amir Mohtashemi Gallery, the director of which donated it to Sotheby's for auction.

* * *

The world's largest museums rightfully boast collections of gold and silver objects as undisputed rarities. The virtuoso craftsmanship and value of gold and silver objects and jewellery characterise the level of development of the civilisation they represent. Gold and silver objects from the ancient and medieval periods, acquired during two trips to London and related to the cultural and artistic heritage of Uzbekistan, are true masterpieces of global significance.

Fragment of a bronze basin with silver inlay. Mawarannahr or Khorasan. 12th–13th centuries. Sotheby's Auction House

Sabre of the Kokand Khan. Kokand or Bukhara. 19th century. Amir Mohtashemi Gallery

The Book of Phytoecdysteroids: An Essential Practical Guide for Science and Practice

Ogiloy Yusupova,
PhD (Chemical Sciences)

Introduction

For centuries, humanity has used natural resources as a source of healing and health. Among these resources, a special place is occupied by a group of substances that has recently attracted considerable interest in scientific circles: **phytoecdysteroids**. These are special natural steroids found in plants and were first identified in the 1960s. Phytoecdysteroids are unique in that they act as a "molting hormone" in insects. In plants, these substances play an important role in self-defense – fighting insects, pests, and various types of external stress.

Contents of the book

This book, published in 2022, is dedicated to phytoecdysteroids and covers a wide range of scientific knowledge in this field. It covers the following aspects in detail:

- *History of discovery* – interesting information is presented about the first extraction of phytoecdysteroids from the *Podocarpus plant nakaii* by Japanese scientists in the 1960s.

- *Chemical diversity* – to date, more than 500 different phytoecdysteroids have been identified, their structural differences, as well as similarities and differences with other plant steroids (brassinosteroids, steroid glycosides) have been analyzed.

- *Role in the plant world* – scientific data is presented showing the ecological significance of phytoecdysteroids, that is, how they protect plants from insects and other phytophages.

- *Biosynthesis process* – data on the information collected in recent years on the pathways of phytoecdysteroid formation in plants, the participation of enzymes and mechanisms of genetic control are summarized.

- *Pharmacological properties* – a detailed analysis of the beneficial effects of these substances on the human body is provided, for example, increased protein synthesis, activation of the nervous system, support of adaptation processes.

The book pays special attention to extensive research conducted in Uzbekistan, Russia, and Kazakhstan. For example, as a result of years of research conducted by scientists at the Uzbekistan Academy of Sciences in Tashkent, the drug **Ecdysten** was developed and introduced into clinical practice.

Practical significance

The range of practical applications of phytoecdysteroids is very wide:

Pharmaceuticals: important in the development of drugs to strengthen the immune system, improve the functioning of the cardiovascular system and create anti-inflammatory agents.

Biotechnology and agriculture: there is a possibility of producing environmentally friendly plant protection products based on phytoecdysteroids.

Cosmetics: The prospects for their use in creams, serums and other care products are highlighted due to their rejuvenating and restorative effects.

Sports medicine and nutraceuticals: Phytoecdysteroids can be used as a natural supplement to increase muscle mass, fight fatigue, and improve overall performance.

This book serves as a valuable source of information for the following audiences:

For researchers and scientists – especially those conducting research in the fields of phytochemistry, pharmacognosy and pharmacology.

For pharmaceutical professionals, it provides an important scientific basis for those involved in the development of new drugs.

For biotechnologists and agronomists, it provides valuable information on the prospects for using phytoecdysteroids to protect plants and increase crop yields.

For cosmetologists and pharmacists, it has practical significance for specialists interested in the use of natural substances.

For students and young researchers, it serves as a source of knowledge for a new generation interested in the chemistry of natural compounds. It also contains interesting and understandable information for a wide range of readers interested in traditional medicine and natural remedies.

The authors of the book dedicate this work with deep respect and gratitude to the scientists who founded the school of phytoecdysteroid studies in Uzbekistan – Academician N.K. Abubakirov, Professors Z. Saatov, A.G. Kurmukov, T.T. Shakirov, N.J. Abdullaev, A.U. Mamatkhanov and other mentors.

Conclusion

Overall, the book summarizes current knowledge about phytoecdysteroids and comprehensively explores the potential for their future scientific and practical applications. It is a valuable resource for scientists, pharmaceutical and biotechnology professionals, and the general public interested in natural medicines.

What would happen if clouds disappeared?

Clouds seem light and fluffy to us, like cotton wool, and we often think they simply decorate the sky. But in fact, clouds play a huge role in the life of our planet. Imagine that one day they disappeared. At first, it would seem unusual: the sky would become clear and bright blue during the day and pitch black at night. But soon we would notice that the world was changing for the worse.

Without clouds, there would be no rain or snow, because they collect tiny droplets of water and then spill onto the ground. Rivers and lakes would dry up, plants would be unable to grow, and animals and people would be left without water. The Earth would gradually turn into a vast desert, where life would be almost impossible.

Clouds not only provide us with water but also protect the planet. During the day, they shade the Earth from the scorching sun, and at night, they retain heat. Without them, daytime temperatures would rise above sixty degrees, and at night, temperatures would plummet to below minus fifty. Life on such an Earth would become unbearable—one minute too hot, the next too cold.

Besides, beauty would disappear. There would be no white caps in the blue sky, no golden and pink sunsets, no rainbows or mists. The sky would become monotonous and boring, and the world would lose its magic.

Clouds help people predict the weather. Since ancient times, shepherds and sailors have looked at them and known: if the clouds are light and white, the day will be clear; if they are dark and heavy, rain will soon fall. Without clouds, we would lose this ancient “language of nature.”

Scientists say that even the smallest cloud consists of millions of water droplets, and a large one can weigh a million tons! But it still floats in the air because each droplet is too light. And if you climb to the top of a mountain or fly on an aeroplane, you can feel the clouds around you—they’re like a cool mist.

Now it’s clear that clouds aren’t just beautiful decorations in the sky. They’re the guardians of water, warmth, and the beauty of the Earth. If they disappeared, our planet would lose the ability to be a vibrant and wonderful home.

Why do stones tell stories?

We see stones every day—on the street, in our yards, on the banks of rivers. They seem simple and silent, but in fact, each stone holds a whole story, longer than the life of any human being. Geologists say that many stones are millions and even billions of years old. Imagine: the oldest minerals appeared before humans, animals, or even plants lived on Earth.

If you look closely at a stone, you'll notice that it's not monochromatic and boring. Inside, there are lines, sparkles, cracks, or flecks of colour. All of these are clues to its past. Some stones formed on the bottom of ancient seas and retain wavy patterns, while others formed near volcanoes and acquired a reddish hue. There are even stones with a fragment of the past frozen within them—for example, amber. You can find an insect trapped in the resin millions of years ago and preserved to this day.

Stones can hold not only the secrets of the Earth but also the memories of living things. Sometimes, imprints of leaves, shells, or even traces of ancient fish can be found within them. These are true photographs of the past, captured by nature itself.

It turns out that stones are also found in our everyday lives. Beautiful buildings are constructed of marble and granite, windows are made of quartz, and the sand on the beach is made of crushed stone crumbs. It turns out we are constantly surrounded by them without even realising it.

To see that stones can tell stories, just pick up an ordinary pebble from the street and examine it through a magnifying glass. You'll see sparkles, colourful dots, and patterns inside. This small piece of land has already lived a long life and is ready to share its story with anyone who can look closely.

Stones are the book of the Earth. It has no letters, but each page holds secrets from the distant past. And one only needs to learn to read this book to discover the history of our planet.

Prepared by Sayyora Asatullayeva based on internet materials.

Stone forest in the Dzharakuduk tract

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On the cover: Gold torque with bull-head terminals. Central Asia. 2nd–1st centuries BCE. Aaron Gallery

The native saxaul bush. Karakalpakstan

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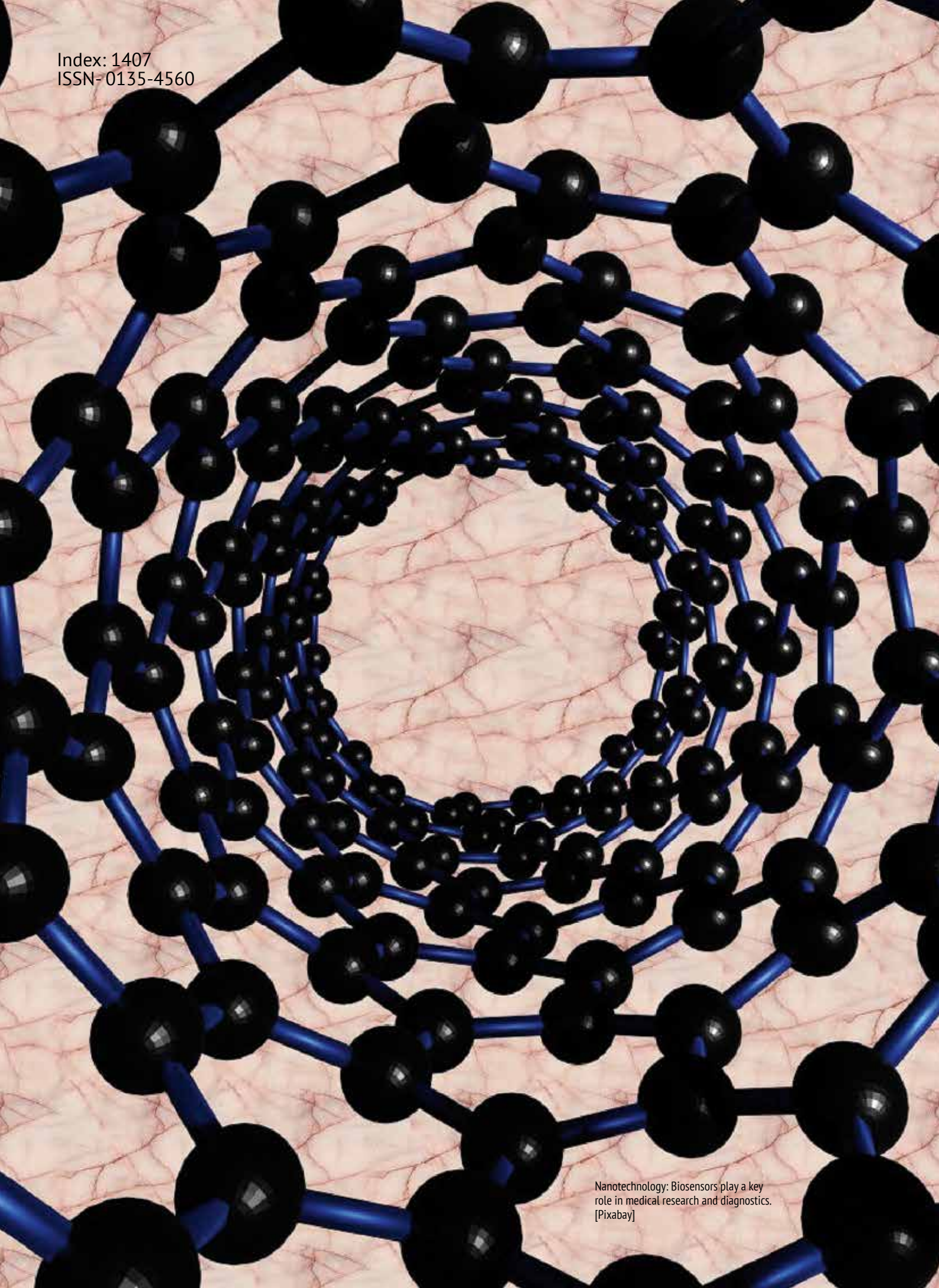

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