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THE STATUS OF CONSERVATION AND USE OF ANCIENT MANUSCRIPTS IN AZERBAIJAN:
AN OVERVIEW

Abstract

This article aims to provide an overview of the conservation and use of ancient manuscripts in Azerbaijan on the basis of the activities of the Institute of Manuscripts named after Muhammad Fuzuli of the Azerbaijan National Academy of Sciences. The approaches and technologies used in the conservation of ancient manuscripts are discussed and suggestions for improving the traditional and electronic use of manuscripts are made here.

Keywords: conservation, restoration, old manuscripts, digitisation of manuscripts, early printed books, Institute of Manuscripts, Azerbaijan

Introduction

There is such a saying: “Manuscripts do not burn”. It goes without saying that this idea is nothing more than a fantastic entourage that complements the historical-symbolic image of manuscripts made of papyrus, leather and paper in material. As in fact, all clay, the most durable material, wood, and parchment sooner or later spoils, papyrus wears out, coming to paper, it takes fire and burns very quickly. Otherwise, the original or copies of the ancient books of Alexandria would now be involved in studies, and the manuscripts burned by Vergil, Pushkin, Gogol, Dostoevsky, Jalil Mammadguluzade, Einstein, Nabokov and Akhmatova with their own hands wouldn’t burn and became the essence of the museums.

However, the conservation and transmission of ancient manuscripts to future generations remain an integral part of book culture, and the representatives of different fields – biologists, specialists in manuscript studies, restorers, radiologists and conservationists are constantly working in this direction.
Some issues of use of ancient manuscripts

Preservation, restoration and conservation of ancient manuscripts in Azerbaijan is one of the priorities of national culture. The collection, scientific and theoretical research and transliteration, restoration and preservation of ancient manuscripts and early printed books and making them available for researchers in Azerbaijan have been systematic since 1950. In the same year, an independent Institute of Manuscripts was established on the basis of the Manuscripts Fund of the Azerbaijan Academy of Sciences. At present, more than 90 percent of the country's ancient manuscripts and rare books are collected in this center. There are 12,000 ancient manuscripts more than a thousand years old, including unique manuscripts included in the UNESCO’s “Memory of the World Register”, and more than 5,000 early printed books printed in the XVIII-XX centuries by old printing methods (xylography, stone engraving etc.). Thus, giving a brief look at the conservation, restoration and use of ancient manuscripts available at the Institute of Manuscripts, in fact, it is possible to consider the specifics of working with ancient manuscripts in Azerbaijan as a whole.

Today, the ancient manuscripts are preserved in special storage conditions at the Institute of Manuscripts. It goes without saying that periodic hygienic and conservative inspection and restoration, as well as being in a relatively stable environment and under natural conditions make some paper materials physically and chemically more durable and resistant to biological influences in special storage conditions (relative humidity indicators are 50% \( \pm 10\% \), air temperature is between 17-20° C). Otherwise, the Fangmatan paper (a piece of paper dating to about 179 with a map on it) found during archeological excavations in China's Gansu province, in 1986 would not have survived to this day \[4\] and all paper manuscripts over 600 years old would have got spoiled.

It becomes once again clear that a professional approach is required for to keep, carry out sanitary-hygienic processes for, restore, preserve, process and conserve the material and cultural samples with the help of various technical means, by constantly updated technological methods, in accordance with relevant standards and norms, sanitary, hygienic processes, restoration, protection and processing, protection is required. At the Institute of Manuscripts like at the institutions of relevant purpose around the world, the conservation/restoration/hygiene processes are carried out by professionals of a separate scientific and research laboratory under special rules.

Both during the Soviet era and also during the independence years, similar instructions are given on the temperature-humidity-hygiene regime of storage of archival materials in the normative and methodical documents \[1\] guided by the Institute in this field: in July-August, as the humidity degree reached the maximum (6.0 - 7.5%) in various papers, conditions for additional humidity cannot be created in the manuscript fund during this period. During this period, changing the air on the shelves and boxes, placing new manuscripts received in the fund and carrying out works that bring moisture to the room should be limited. 3 months in winter (January-March) - as the humidity degree is at a minimum (4%), many strength properties of the paper are sharply reduced (up to 10 times). In this case, it is important that the humidity remains constant at normal levels. According to the rules, the normal temperature in the collection of manuscripts is 17-19° C, and the optimal relative humidity is between 50-55%. In such
stocks, sanitary days should be announced at least once a year, materials should be dusted, racks, shelves, floors should be wiped with a 2% formalin solution after dusting, and systematic wet wiping should be carried out. In order to protect the results of sanitary and hygienic measures, a wet mat soaked in 2% formalin or chlorine solution should be placed in front of the entrance to the fund, etc. In this case, it is important that the humidity remains constant at normal levels.

It goes without saying that such a standard approach to the issue is based on scientific principles, but it should be taken into account that sometimes the process of natural spoilage of ancient manuscripts and early printed books cannot be prevented by any measure and scientific-theoretical approach. It is known that a relative humidity of more than 65% creates conditions for the formation of fungal worms, which are very dangerous for ancient and early writing materials, especially for manuscripts. Though it is possible to relatively control and protect unfavorable environment for fungi following certain rules and using a hygrometer, it is not possible to fully regulate internal airflows (even at very low speeds) affecting documents, especially convection (vertical movement of hot air masses). As a result, an acidic environment is inevitably created, which accelerates the chemical destruction of paper, cover and dyes. If it is not possible to continuously control the temperature of the stored materials, thermal decomposition processes begin in the manuscripts and their covers. On the other hand, an increase in humidity indicators and relative humidity reaching, for example, 70% can lead to the simultaneous onset of both destruction and thermal decomposition for the manuscript and the formation of a synergistic effect (rapid change in the physical and chemical properties of ancient writing materials in our example). In this case, another question arises: if the hygrometer at the fund of the manuscripts always shows, for example, a relative humidity of 65%, and the thermometer has a stability of 18-20°C on the temperature scale, what kind of wear and biological damage can one talk about? We must look for an alternative answer to this seemingly rhetorical and reasonable question in a slightly different analysis: hygrometers and heat meters (or modern thermohygrometers fulfilling the functions of both) are not able to exactly measure relative humidity and temperature in all inaccessible areas where documents are located. In order to inspect the microatmosphere in each part of the fund (environment between documents, folders, shelves and pages), for example, each of the ancient manuscripts collected at the Institute of Manuscripts should be provided with an active (with the ability to save energy for a long time, self-regulating) microchip. By means of such microchips, it is possible not only to analyze only micro, but also nano thermohygro environment, find out the current place of the manuscript or book (even if it is outside the fund, with the help of GPS technology), its condition, physical, chemical, biological effects on it, and take a number of preventive measures. Without the use of such sensory technologies of the Industry 4.0, it is impossible to keep the ancient manuscript stocks under total physical and chemical control, figuratively speaking, “make the manuscripts speak and listen to their pain”. In other words, “verbal communication” with ancient manuscripts is not possible with the help of traditional methods due to the fact that under the present conditions, the manuscripts cannot "speak", they are a kind of “dumb” and we have to understand each other as if by non-verbal, hand and finger gestures, and the sense of touch and read what is written on their faces ("facial expressions"). And with this approach, we can often assess the condition of ancient manuscripts subjectively and mostly with a delayed attitude. However,
through the Internet of Things (IoT) technology, the ancient manuscripts in the collections can “speak” not only with us, but also with other technical means and even among themselves. Thus, as we have already mentioned, it is possible to build an extensive communication network in the collection implanting a small information device (chip) in each manuscript book and giving them a static (independent, unchanging) IP address (128-bit IPv6 protocol). The use of Radio Frequency Identification Systems (RFID) in such a network can lead to the creation of a completely new storage - protection - presentation infrastructure. Albeit briefly, let's look at the condition and movement of a manuscript in such an infrastructure: a manuscript book equipped with sensory and identification technologies can inform the central data management system several times a day about what chemical and biological processes take place in it, the degree of humidity and temperature between pages, what preventive interventions are needed, how it is currently treated (especially relevant to the manuscripts in the hands of readers), by whom and how much it was withdrawn from the collection during a certain period, whether it was ordered, the age, gender, education, scientific orientation of the applicants, etc. In addition, the physical location of the manuscript in the collection can be easily determined using the RFID reader. This can ensure the safety (prevention of damage or theft) of ancient manuscripts and the determination of the impact factor of manuscripts as a result of scientometric analysis.

Thus, we came to such a conclusion that if it were possible to regulate the wear of manuscripts from macromolecules to relatively small particles relying only on the indicators of thermohygrometers, thousands of ancient manuscript pages around the world would not be attacked by fungi, larvae, and pests; there would be no need for the restoration of cover, block, and text, literary-artistic, calligraphic finishing works, lettering (unique description of a letter or word) and conservation processes.

By the way, it should be noted that in recent years, there have been a number of remarkable changes at the Institute of Manuscripts in the preservation of ancient manuscripts and early printed books. Firstly, the collection’s macro and micro environment was improved and updated which allowed to protect manuscript materials from biological damage, especially from fungi, more effectively than in previous years. Although biological and chemical threats to the Institute's ancient manuscripts are prevented as much as possible, it is not possible to reduce the level of physical impacts by users. Empirical observations in the manuscript collections of foreign countries and the statistics we have obtained allows us to say that more than 10 contact of users with the same manuscript or book during the year creates a potential basis for the examination and restoration of that historical material. At the Institute of Manuscripts, the number of user requests for the same manuscript or book during the year usually does not exceed 10 times throughout a year. For example, if we look at the metric indicators in the last 3 years (2017-2019) in this field, we see that:

- In 2017, reader requests covered a total of 1196 materials. Two of them – Muhammad ibn Abdussalam's manuscripts (B-4748) in Arabic and Asi's “Divan” (B-7768) in Turkish were referred in maximum number - for 5 times, Nakam Ismayil bey's “Divan” (M-41) in Turkish, Muhammad Nafisi's Arabic manuscripts of “Shari Muajjid” (S-221) and 5 other manuscripts for 4 times, and 15 manuscripts and early printed books were referred for 3 times each. The remaining 1173 manuscripts were used only 1-2 times. In 2018, 1387 and in the first 8 months of 2019 – 798 ancient manuscripts and early printed books were presented to users from the
collections of the Institute of Manuscripts. During this period, the number of referring to the same material did not exceed 10 times. Thus, in 2018, the most (7 times) B-200 coded manuscript (“Gasida”, “Sharhi – risaleyi - vaziyya”), and in 2019, the most (8 times) A-212 coded manuscript (“Collection”) were made available to researchers. The purpose of bringing the indicators to the attention is to show that the user's contact with this or that material at the Institute is not at the maximum level. Though the number of repeated requests for the same code is not large, it is disappointing that the role of users in the damage to the manuscripts and publishing units of the Institute of Manuscripts is growing day by day. There are both objective and subjective reasons for this. First of all, some users do not follow the instructions given to them, knowing that such historically important documents must be handled with great care and in accordance with special rules. This is called “user illiteracy” all over the world. Secondly, as researchers come into contact with manuscripts “barehanded” without the use of special tools (special cotton-paper-based gloves, chalky papers not getting wet etc.), certain thermal and tactile effects are inevitable, which exposes the manuscripts to various physical and chemical reactions, infects them with diseases, and affects their future destiny. Thirdly, even if the manuscripts are handled in full accordance with the instructions, any physical or non-tactile contact, opening and closing of the manuscript, careful flipping through, or even switching from one temperature mode to another while moving to another room, the user's breath or meeting with ordinary lamp light have negative effect on its cover, artistic design elements, paint, glue, threads of block, pages, etc. over time. In this sense, despite the improvement of storage conditions at the Institute of Manuscripts in recent years, it is understandable that the number of restoration works has increased. It is no coincidence that only in 2015-2019, the cover, artistic design elements of 430 ancient manuscripts, and 31,400 pages of these and other manuscripts were restored and necessary steps were taken to preserve their historical, scientific and artistic significance at the Institute of Manuscripts. However, in order to minimize the need for restoration and raise the level of conservation to a higher level, there is a great need for the application of constantly updated storage and restoration technologies, fully equipped laboratories from material and technical point of view, modern service places, training of qualified young personnel and scientific and theoretical research in the relevant field at the Institute of Manuscripts, as well as many archives and manuscript treasures around the world. Given that almost no attention is paid to the study of the scientific and theoretical basis of this problem in the country, and the research conducted in this field can be counted on the fingers of one hand, it becomes clear how relevant the issue is.

**Conservation of ancient manuscripts**

Analyzing the above-mentioned needs and determining which measures and technological approaches are more important, we come to such a conclusion that before the physical restoration of historical documents, it is necessary to pay attention to their storage and protection, especially ensure fire safety. There are many examples in history for ancient manuscripts and books being destroyed as a result of fire. It is not a question of deliberate burning of rare manuscript treasures as a result of various wars, invasions and attacks throughout history: there are many examples of the destruction of manuscript and book collections due to internal fires
caused by carelessness or malfunction. From ancient times to the present day, manuscripts being exposed to such technical fires has affected not only individual moments of history, but also the biography as a whole, perhaps depriving several scientific researches of reliable, original sources.

Only in the XX century, 90 million copies of literature were destroyed by fires in various book and manuscript collections in the United States, Great Britain, and Germany. For example, when a fire broke out at the Institute of Scientific Information on Social Sciences of the Russian Academy of Sciences in 2015, 5.42 million copies of 10.2 million books were burned, including a large number of ancient and rare manuscripts, and 1 million books soaked during the fire were partially restored. 3 million books and manuscripts were frozen while being wet (for possible restoration in the near future), and although 900,000 publication units were protected, they lost their content (dye).

The fire protection system at the Institute of Manuscripts, including the security - fire alarm, smoke extraction and ventilation network were installed in accordance with the requirements of the Law of the Republic of Azerbaijan ‘On Fire Safety’. In other words, in the event of a fire in the building where the Institute is located or directly in the collection, it is planned to extinguish the burning ancient manuscripts and books with water. Though this traditional fire-fighting method is useful in many cases and has been tested for years, it is not effective in protecting paper and leather-based manuscripts from fire. The above-mentioned example (on the example of the Scientific - Research Institute of the Russian AS) shows that extinguishing fires with water in such collections have unpleasant consequences. Automatic gas firefighting, a relatively modern and expensive form of firefighting, is more suitable for the protection of ancient manuscripts and books from fire. Gas firefighting is carried out in two forms: in the first case, propane-type gases (FE-13, FM-200), HFC-125 branded gases stopping the burning process at the chemical level and having thermal properties are used. In the second case, compressed gases such as CO2 (carbon dioxide), argon, inergen are used, which reduces the concentration of oxygen in the air below 12% and causes the fire to be extinguished within 15 seconds. The advantage of the system is that a person can breathe at a concentration of less than 12 percent oxygen. However, it does not mean that gas firefighting is completely safe for human life. For example, in 2010, during the replacement of light bulbs in the collection of the Kiev National Library named after Vernadsky in accordance with the regulations, the wire of the fire control system was damaged and two employees of the storage place lost their lives when pure HFC 125 gas was released into the room. This gives us ground to say that either traditional or gas firefighting have both advantages and disadvantages.

The latest scientific innovation in the fire protection of ancient manuscript collections is the processing of a colorless and odorless liquid called Novec 1230, which has been tested since 2004. This chemical solution, known to science as “dry water” since 1968, has only begun to gain real value in recent years. Although 95% of its composition is ordinary water, Novec 1230 is in the form of a powder reminiscent of flour. “Dry water” used in automatic firefighting can extinguish a fire in a closed area in seconds. This solution absorbs heat energy at a very high level, creating 70% freezing effect and as a result, there is no harm to manuscripts or human health.
Interestingly, for example, the national archives of the USA and the UK have the above-mentioned security systems, but they protect valuable documents under completely different conditions [5]. As a result of the development of the mining industry in these countries in the late XIX and early XX centuries, and its decline in recent years, millions of square meters of idle, depleted and empty mines, especially salt mines, began to serve humanity again. At present, millions of manuscripts are preserved at such mines belonging to the US National Archives (mines and deposits in Kansas, Missouri and Illinois). Almost more than half of the 10 million (consisting of 11,500 boxes, 35 million pages) ancient manuscript collection of the British National Archives is kept at a depth of 3.5 km in a rock salt mine in Winsford - far from the center. The main reason for this is due to that fact that firstly, these places remained unused, and secondly, they have constant temperature (15-20°C) and normal relative humidity (due to the high absorption of salt) in all seasons.

**Ancient manuscripts and modern technologies**

Even if we preserve ancient manuscripts on racks and shelves that close automatically during a fire and establish a paper facsimile collection and place it in a completely different place, the process of wear will never stop. And sooner or later, all the manuscripts and books will disappear from the face of the earth with their traditional faces. In other words, even if the manuscripts do not burn now, in the future, time will “melt” and “burn” them. In this sense, modern automation, digitisation, optical recognition, 3D copying, the invention of cloud technologies and the ability to preserve and transmit the ancient book monuments that are our national and spiritual heritage to the future as a digital heritage is a new way of self-expression of the history. The Institute of Manuscripts, in its turn, taking advantage of this historical opportunity and the technology of the society of knowledge, has gained a number of success in recent years in the digitisation of manuscripts, performing auto-correction operations on electronic manuscripts, and creating an electronic catalog of ancient manuscripts and early printed books. Since 2014, the Institute has begun to use ATIZ BookDrive branded digital camera, large-format scanner, designed specifically for creating digital copies of historical documents. According to the results of the last 5 years (2015-2020), as a result of such technological process at the Institute of Manuscripts, 4250 manuscripts, including 98700 manuscript pages were digitised and placed on an internal server, and an electronic catalog of 10900 ancient manuscripts was created.

As we have mentioned, any physical and biological effects damage old cover, leather and paper. Manuscripts and early printed books being transported from the collections to the technical rooms for the purpose of digitization, placing them in a scanner, repeatedly turning over the pages, being exposed to even a small amount of infrared and ultraviolet radiation etc. inevitably damage ancient manuscripts. This is the case observed all over the world. However, given that this is the only way to conserve the ancient manuscript heritage electronically for future generations, of course, we have to accept the situation. On the other hand, it may sound paradoxical, but the complete digitisation of manuscripts without damage and their subsequent use only in digital form prolongs the life of the originals.
Conclusion and results

The harmful / useful activity that we mentioned above which is carried out with the idea that “if manuscripts burn, they will be replaced by electronic manuscripts” creates an optimistic mood about the future of our material and cultural heritage. However, one must not forget that electronic manuscripts can also be destroyed, deleted, damaged, and servers can fail. Another problem is related to the information carriers on which electronic manuscripts are transferred. It is known that during the evolution of information carriers (in the last 2 centuries) the technologies of storing data in machine-readable form have undergone a number of changes: in the early XIX century data was written on punched cards, in the XX century on magnetic tapes, then on diskettes and compact disks (CD). Paradoxically, much of that information, which has been digitized for delivering it to future generations, is no longer readable. It means that after some time it will also not be possible to transfer and read data from modern information carriers - flash cards, hard drives, servers, and we will have to refer to traditional manuscripts again. Then, it turns out that the information on paper is more reliable than digital information?! Time could answer this question, but in any case, it is more expedient to show purely technological solutions to the problem. In our opinion, it is possible to preserve ancient manuscripts in two optimal ways and pass them on to the distant future:

1. Reproducing ancient manuscripts from non-abrasive, fire and waterproof materials by 3D printers (a manuscript book printed on a 3D printer is visually and tactilely indifferent from the original. Here the smallest details, all texture and calligraphic granularity, colors, bulging on the cover and paper, peculiarities, etc. are repeated in the same way. Only, those manuscript books do not burn, damage, wear or get wet. At the same time, such 3D facsimile technology allows to protect manuscript collections from many force majeure circumstances, fires, etc.).

2. Conserving electronic manuscripts with the help of cloud technologies (storing them in the cloud) and storing them in “Data embassies” both electronically and in the form of 3D models.

This can help solving many problems in ensuring the security of traditional and electronic manuscript collections.

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Cavid Cəfərov

Azərbaycanda qədim əlyazmaların konservasiya və istifadə məsələsinə icmal baxış

XÜLASƏ

Məqalədə Azərbaycan Milli Elmlər Akademiyası Məhəmməd Füzuli adına Əlyazmalar İnstitutunun fəaliyyəti əsasında Azərbaycanda qədim əlyazmaların konservasiya və istifadə məsələlərinə icmal baxış həyatə keçirilmişdir. Burada qədim əlyazmaların mühhafizə zamanı istifadə olunan yanaşma və texnologiyalardan bəhs olunmuş, əlyazmaların qədim və elektron istifadənin təkmilləşdirilməsi istiqamətində təkliflər irəli sürülmişdür.

Açar sözər: konservasiya, bərpə, qədim əlyazmalar, əlyazmaların elektronlaşdırılması, əski çap kitabları, Əlyazmalar İnstitutu, Azərbaycan

Джавид Джафаров

Состояние сохранности и использования древних рукописей
в Азербайджане: краткий обзор

РЕЗЮМЕ

В данной статье предоставляется краткий обзор состояния сохранности и использования древних рукописей в Азербайджане на основе деятельности Института рукописей имени Мухаммеда Физули Национальной Академии Наук Азербайджана. В статье обсуждаются методы и технологии, используемые при консервации древних рукописей, и делаются предложения по улучшению традиционного и электронного использования рукописей.

Ключевые слова: консервация, реставрация, древние рукописи, оцифровка рукописей, старопечатные книги, Институт рукописей, Азербайджан.