

Factors of Manuscript Deterioration and Preservation Methods**عوامل تدهور المخطوطات وطرق حفظها**Nabila Rezki ^{1*}

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Abstract:

Manuscripts are important sources through which we learn about the civilizational, cultural, and historical memory of nations. They have an artistic value due to their antiquity and rarity and are preserved in museums and libraries. Given their importance as primary sources of information across ages, researchers have given them major interest. They have worked to protect and preserve them from various deterioration factors that lead to their extinction since they are organic archaeological artifacts highly susceptible to deterioration if not stored in suitable environments. Therefore, this study highlights the significance of manuscripts, the various factors of deterioration and extinction, and the means of preservation and maintenance to ensure their longevity for future generations. The study adopted the descriptive analytical method by explaining the effects of the damaging factors and analyzing the deterioration signs and their relationship with the surrounding environment. The study concluded with a number of necessary steps for preservation, most importantly digitization.

Keywords:

Manuscript, Deterioration, Preservation, Maintenance, heritage.

ملخص:

تعتبر المخطوطات مصادر مهمة نتعلم من خلالها عن الذاكرة الحضارية والثقافية والتاريخية للأمم. لها قيمة فنية بسبب قدمها وندرته، ويتم الحفاظ عليها في المتاحف والمكتبات. نظرًا لأهميتها كمصادر أولية للمعلومات عبر العصور، أولى الباحثون اهتمامًا كبيرًا بها. عملوا على حمايتها والحفاظ عليها من عوامل التدهور المختلفة التي تؤدي إلى انقراضها، حيث إنها قطع أثرية عضوية قابلة للتدهور بشكل كبير إذا لم تُخزن في بيئات مناسبة. لذلك، تسلط هذه الدراسة الضوء على أهمية المخطوطات، والعوامل المختلفة للتدهور والانقراض، ووسائل الحفظ والصيانة لضمان بقائها للأجيال القادمة. اعتمدت الدراسة على المنهج الوصفي التحليلي من خلال توضيح آثار العوامل الضارة وتحليل علامات التدهور وعلاقتها بالبيئة المحيطة. اختتمت الدراسة بعدد من الخطوات اللازمة للحفظ، وأهمها الرقمنة.

الكلمات المفتاحية: مخطوطة، تدهور، حفظ، صيانة، تراث.

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● Introduction

The protection of cultural heritage resources is greatly important, because they represent a momentous part and cultural value of individuals and nations' memory. Manuscripts and books constitute treasures of humanity's cultural heritage. Their significance manifests in their importance as scientific sources historians and archaeologists depend on to get and verify information. They are also considered as artistic masterpieces due to the techniques used in their paper manufacturing and preparation for writing, their decoration, and embellishment of the first pages. Additionally, they are regarded as rich sources for researchers in terms of content, form, and components.

Preserving manuscripts and rescuing them from various damaging factors is a crucial topic and a pressing concern for librarians and archaeologists in particular. Manuscripts are the most vulnerable and sensitive materials to deterioration and environmental conditions. They necessitate suitable conditions for preservation and display. Maintenance and restoration works must be done according to strict principles and regulations so that the aesthetic and scientific value of the manuscripts is not disrupted. Therefore, we seek, through this article, to answer the following questions:

1. What are the manuscript deteriorating factors?
2. What are the manifestations of this deterioration?
3. How can manuscripts be preserved and maintained?

1. Definition of Manuscripts

Manuscripts represent all the written works and books that have reached us in the handwriting of their author or a scribe before the advent of printing. The term can be broadened to include anything written by hand, such as letters, covenants, inscriptions on stones, or drawings on fabric... etc. The term is also used to refer to handwritten Arabic books, whether in the form of scrolls or bound pages compiled into booklets.²

2. Importance of Manuscripts

- Manuscripts contribute to the transmission of knowledge and sciences written in various languages.
- Manuscripts assist specialists in documenting history because of the diverse information contained in.

² Hammoud Rasha Said & Khalaf Ibrahim Houcine, Human Damage to Manuscripts and Methods of Preservation. Al- Malwiya Journal for Archaeological and Historical Studies, Vol. 3, Issue 5, 2016.

- They enable us to understand the different aspects of life of various people, including their economic and social conditions and the level of their progress or decline.
- The contribution in correcting errors made by many historians, filling gaps, and providing new additions about developments have not yet reached by some nations.³

3. Factors Affecting Manuscripts (Causes of Manuscript Deterioration)

Various factors affect manuscripts and cause different types of damage such as staining, decay, breakage, paper warping, and yellowing. These factors include:

3.1. Acids

Even at low concentrations, acids gradually cause paper deterioration. One of the reasons for the presence of acids in paper is the incomplete removal of acids from paper pulp during manufacturing. Additionally, sulphur gases in the atmosphere, especially in industrial cities, contribute in the formation of acids. It can be said that acids are the main cause of paper decomposition and degradation.

Acids in paper come from two main sources:

1. The paper itself contains acids of material residues from the manufacturing process.
2. Air pollution, especially in industrial cities.⁴

3.2. Humidity

Humidity is divided into two types: relative and absolute. Absolute humidity affects manuscripts by saturating them with large amounts of water molecules (H₂O), which initially exist as vapour and later accumulate and condense because of the fibres of the manuscript, especially the cellulose material that sometimes makes the manuscript text difficult to read. Additionally, humidity helps the growth of microscopic organisms on the surface of the manuscript caused by the presence of organic matter. Furthermore, accumulated water vapour on the surface of the manuscript helps attracting airborne impurities, such as iron oxides and other chemical substances.

³ Abd Allah Somaya, The Reality of the Manuscripts and Documents Department at the Central Library of the University of Benghazi: A Survey Study, Al-Manara Scientific Journal, Faculty of Arts and Sciences, Benghazi University, Libya, Issue 04, 2022, p. 38.

⁴ Obada Sebti Ali Abd Al-Mohsen, Factors Affecting Manuscripts, Prevention Methods, and Preservation Techniques, Al-Khizana Journal, Centre for Heritage Revival, Iraq, Issues 5-6, 2019, p. 142.

Humidity is also the main cause of ink decomposition in manuscripts, making them difficult to handle in most cases. ⁵

3.3. Temperature

Sunlight heat and waves of artificial lighting and heating devices lead papers and leather to dry out due to their inflexibility, and then crack and brittle. Increased and decreased temperatures also contribute to the growth of microorganisms that dissolve cellulose. Furthermore, thermal variations lead to paper shrinkage, yellowing, fragility and susceptibility to breakage. ⁶

3.4. Gases

Air contains various gases that lead to environmental pollution. They include:

3.4.1. Sulphur Dioxide

This gas emerges from the existence of absorbed atmospheric moisture. After oxidization, it transforms into sulphuric acid, which increases the acidity of the papers, making them fragile and susceptible to breakage.

3.4.2. Hydrogen Sulphide

This gas originates from biological and industrial reactions. Yet, its impact is less severe than other factors. Its reaction is mainly limited to affect metallic elements, which constitute some manuscript decorations. The effect manifests in black stains on the decorations.

3.4.3. Ammonia Gas

This gas arises from human secretions. With the combination of sulphur dioxide in the air, ammonia penetrates paper and leather, forming ammonium sulphate salt that appears as salt residues on the surface of the manuscript papers. ⁷

3.5. Light

Light is one of the factors that lead to manuscript deterioration over time. Its source can be natural from sunlight or artificial from various types of lamps. The sources are classified depending on their intensity. Light has direct and indirect effects on the manuscript. As for the direct effect, it

⁵ Labtar Kada & Ben Guendouz Nadia, Factors of Manuscript Deterioration and Methods of Preservation, Kan Historical Journal, Vol. 06, Issue 19, 2013, p. 150.

⁶ Shaheen Abd Al-Moez, Scientific Principles for the Treatment, Restoration, and Conservation of Books, Manuscripts, and Historical Documents, Egyptian General Book Organization Press, Cairo, Egypt, 1990, p. 10.

⁷ Radwan Abbas & Ben Maamar Boukhadra, The Experience of the National Manuscript Centre in Addressing Manuscript Deterioration and Protection Methods, Mediterranean Thought Journal, University of Tlemcen, Algeria, Vol. 10, Issue 01, 2021, p. 14.

manifests in photo oxidation and results in yellow or brown stains where light exposure is concentrated because of interactions with paper impurities like lignin. Violet and ultraviolet rays lead to fading of iron gall and pigment- based inks.

Light also chemically breaks down cellulose molecules during interaction with paper impurities such as acids, lignin, and adhesives, causing paper weakening. Photo oxidation appears as yellow and brown spots in areas exposed to light as a result of interactions with paper impurities like lignin.⁸

3.6. Biological Factors

Manuscripts and their components are naturally organic. Thus, their characteristics are prone to decomposition and deterioration under various conditions. Microorganisms can cause changes and damages to papers, covers, adhesives, and inks... etc. Manuscript restoration reports note that over seventy types of organisms, whether visible (insects and rodents) or microscopic (fungi and bacteria), attack and deteriorate manuscripts. This is due to the favourable climatic conditions, which help their spread and proliferation in manuscripts and documents' storage facilities.⁹

Biological factors include:

3.6.1. Fungi

Fungi cause biological deterioration in manuscripts. They are characterized by their ability to penetrate the internal part of the manuscript through threads. They also corrode materials due to secreting organic acids¹⁰. Fungal infestations emerge as whitish spots that turn brown or green. *Penicillium* and *Aspergillus* species are among the common fungi affecting manuscripts.

3.6.2. Insects

Insects are of different shapes, sizes, and life cycles. Some are visible to the naked eye and others necessitate a microscope to identify. They reproduce and spread rapidly. The organic composition of manuscripts provides an ideal food source for insects and suitable conditions for egg hatching and larval growth.¹¹

Insects affecting manuscripts include:

⁸ Ibid.

⁹ Fatmi Aisha, The Condition of Manuscripts Deposited in the Tlemcen Archaeological Museum, *Saoura Journal for Humanities and Social Studies*, University of Tahri Mohamed, Bechar, Algeria, Vol. 04, Issue 01, June 2018, p. 86.

¹⁰ Boujelaba Fouzia, Study of the Impact of Microorganisms on the Physical and Chemical Composition of Stone in Historic Buildings, *Rofouf Journal*, Ahmed Draia University, Adrar, Algeria, Vol. 10, Issue 02, July 2022, p. 615.

¹¹ Al-Sayyid Youssuf Mostapha, *Manuscript Preservation: Science and Practice*, Alam Al-Kutub for Publishing and Printing, Cairo, Egypt, 2002, pp. 61- 62.

3.6.2.1. Silverfish

They are wingless, cylindrical insects with scaly bodies. During increased humidity and intensified darkness, and with available food sources, such as manuscript papers, they cause surface nibbling, and lead to holes and manuscript deterioration.¹²

3.6.2.2. Termites (White Ants)

Termites feed on cellulose in an irregular manner. They lead to severe damage to manuscript papers and loss of content.

3.6.2.3. Bookworms

Bookworm larvae lay their eggs on manuscript edges. Once hatched, they burrow tunnels through the manuscript, and their secretions cause manuscript pages to stick together.¹³

3.6.2.4. Bacteria

Bacteria are microscopic living organisms characterized by their rapid division and intense reproduction. They form colonies that can be detected with the naked eye. They attack cellulose material, leading to mould formation.¹⁴

3.7. Human Factors

Intentional or unintentional human risks leading to the deterioration of manuscripts cannot be overlooked.

Some of the main causes include:

- Rough handling of manuscript pages, leading to tears and deformation of page corners.
- Browsing manuscript pages with unclean fingers or those stained with ink or grease, which lead to stains and damage.
- Folding pages to mark the reader's stopping point. This leads to paper breakage or losing some parts.
- Repeated photocopying results in manuscript deterioration and spine weakening.
- Incorrect restoration leads to pages tearing and damage.¹⁵

4. Manuscript Preservation

¹² Amara Samia Abd Al-Fattah, Harmful Insect Pests in Archaeology, Scientific Publications, 2003, p. 127.

¹³ Al-Sayyid Youssuf Mostapha, Op. Cit.

¹⁴ Al-Sayyid Youssuf Mostapha, Op. Cit.

¹⁵ Abd Allah Somaya, Op. Cit.

Manuscript preservation is a comprehensive scientific concept. It aims at reviving ancient written heritage. It involves dealing with manuscripts that are already damaged or vulnerable to deterioration. Undoubtedly, preservation is of a crucial role in removing signs of damage and restoring manuscripts as much as possible to their original state. This is through stabilizing inks, revealing texts obscured by stains and dirt, or treating and restoring paper and leather.¹⁶

5. Methods of Manuscript Storage

5.1. Horizontal Storage

Documents are stored on flat spaces such as shelves, tables, or spacious cabinets with dividers to prevent overlapping. This method is commonly used for storing large files and documents.

5.2. Vertical Storage

Files are placed side by side with labels indicating the file name and subject.

5.3. Upright Storage

Documents are stored in metal or cardboard boxes or arranged in bundles on shelves. They are placed side by side with a label summarizing the contents of the stored documents inscribed on the visible spine. This is called upright storage and it is the most commonly used method.¹⁷

6. Principles of Manuscript Restoration

Restoration is founded upon preserving the manuscript's authenticity using natural materials and avoiding synthetic ones whenever possible. The process of restoration should also be reversible, allowing for its removal when necessary.¹⁸

Some procedures should be taken before the restoration process. They include:

- Taking documentary photographs of the manuscript before restoration to prevent data loss and documenting the restoration process. This highlights the efforts involved and detects fraud or forgery.
- Identifying and precisely determining all damages.

¹⁶ Al-Sayyid Youssuf Mostapha, Op. Cit., p. 101.

¹⁷ Delhoum Intissar, Archival Management in Public Institutions and Administrations: A Field Study in Souk Ahras Province, a thesis submitted for the Master's degree in Library Science, Department of Library Science, Faculty of Humanities and Social Sciences, Mentouri University, Constantine, Algeria, 2006, p. 105.

¹⁸ Al-Sayyid Youssuf Mostapha, Op. Cit.

- When parts are detached, the specialist should collect and store them in an envelope or box for later use in restoration.¹⁹

7. Steps of Manuscript Restoration:

- Collecting and preserving detached parts for future use.
- Restoring damaged parts using Japanese paper and paper pulp through adhesion and edge peeling techniques.
- Repairing the spines of double pages by attaching them with adhesive tape at the back along the connection line, adhering to a unified space.
- Assembling gatherings from groups of double pages and stitching them together.
- Sewing the gatherings to form the manuscript's body.
- Reinforcing the spine with liquid glue, attaching a cloth cover, and preparing the cover for the manuscript.²⁰

8. Conditions for Manuscript Storage:

- Manuscripts should be stored in humidity levels between 50%-60%, temperatures between 16°C-20°C, and light intensity not exceeding 50-lux meter.
- Using curtains to protect documents from sunlight.
- Equipping all openings with mesh barriers to prevent insect entry.
- Storing rare and fragile manuscripts and books in suitable boxes and in a horizontal position.
- Isolating damaged manuscripts to prevent contamination.
- Providing adequate spacing between shelves to allow proper air circulation.
- Avoiding unsecured electrical wiring.
- The necessity of providing fire detection and prevention equipment.²¹

¹⁹ Mahmoud Hossam Al-Din Abd Al-Hamid, Technology of Conservation and Restoration of Cultural Collections: Manuscripts, Prints, Documents, and Recordings, Egyptian General Book Organization Press, Cairo, Egypt, 1979.

²⁰ Karjaa Zakaria, Manuscript Conservation and Restoration between Scientific Methods and Practical Reality: A Descriptive Study of the Manuscripts at the Ottoman Zawiya in Tolga Constituency, Biskra Province, Journal of Human and Social Sciences, Mohamed Kheider University, Biskra, Algeria, Vol. 11, Issue 01, 2022, pp. 768- 769.

²¹ Hammoud Rasha Said & Khalaf Ibrahim Houcine, Op. Cit., p. 29.

9. Digitization of Manuscripts

To protect manuscripts from deterioration factors, it has become a determined requirement to digitize them. This means transferring manuscript content to electronic media in the form of images or text. A digital manuscript is one that has been converted from its traditional form into a digital format, such as a CD, through photography, scanning, reprogramming, and data entry. This ensures that the original manuscript remains untouched, and reduces the risk of deterioration.²²

● Conclusion

Manuscripts are considered a historical and cultural fingerprint of past civilizations. They contain historical and civilizational facts and records. Researchers work on verifying and interpreting their content. After that, museums and preservation institutions work to protect them from deterioration factors, given their archaeological and organic nature is susceptible to environmental factors. Therefore, preserving manuscripts is regarded as the specialists' priority through regular maintenance, restoring the missing and deteriorated parts, digitization, and providing the appropriate storage conditions in storages, shelves and storefronts. The loss of these manuscripts would mean the loss of the valuable human knowledge and memory.

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