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**DIGITAL COLLECTION OF RUĐER BOŠKOVIĆ:  
THE IMPORTANCE OF CONSERVATION – RESTORATION WORKS  
IN THE DIGITALIZATION PROCESS**

**Abstract:** The implementation of digitization process of old and valuable material requires the participation of conservation and restoration services. The research presents the role of conservation – restoration profession in the process of material preparation for the digitization process on the example of the digitization project Collection of Ruđer Bošković works at the National University Library in Zagreb. It clarifies the role of the conservator in condition verification of the material before and after the scanning process, drafting of documentation and minimal conservation – restoration procedures that provide protection of the originals from possible damage during the process of digitization.

**Keywords:** digitization, conservation – restoration works, digital collection Ruđer Bošković, National University Library in Zagreb

## **1. Introduction**

In the operations of libraries, archives, museums problems occur of material damage and degradation among which is and those that is of great importance to world heritage. Awareness of experts on responsibility for the heritage protection collections is not enough - it is also important to raise awareness among the general public and those who are obliged to fund protection programs [1].

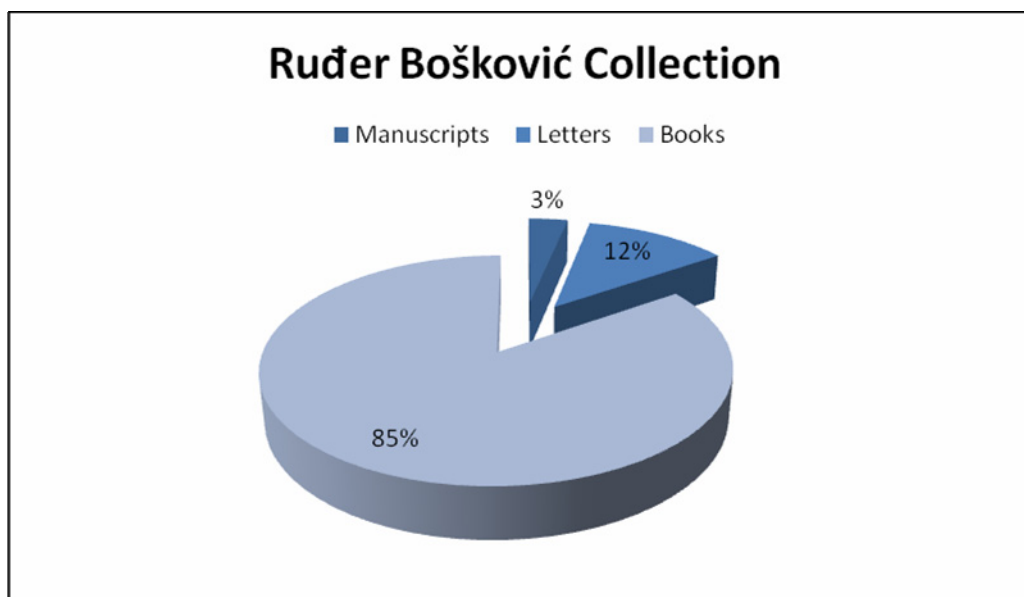
Digitalization for the protection of the original has two objectives. Just as drafting facsimile reprints and microfilm, rather than the originals themselves, digital copies can be used. This way, the originals are kept from possible damage during usage, transfer, transportation or other procedures. In addition, digital copies can be used as a backup which in the event of loss or substantial damage to the original can be at least partially compensate thus loss. In order to digitalization for protection to achieve its purpose, it is essential that produced digital objects represent good and quality the original, so they can sufficiently compensate and are adequately available for usage [2].

Sometimes it is impossible to begin with process of digitalization without prior minimal interventions on the material, and often entire working order to prepare material for scanning. To prevent possible new damages of the original, conservators and those carrying out the digitization process should closely cooperate. This largely depends on the selection of type of device that scans the material and the state of the original material considering on particular force submitted on paper. Considering the type of problem, and discussions about important issues, this article will draw attention to the importance of conservation – restoration services in the digitization process of rare books.

## **2. Digitization of Ruđer Bošković works at the National University Library in Zagreb**

The National University Library in Zagreb preserves within the frame of its general library fund Collection of manuscripts and rare books, and works of the most versatile Croatian scientist Ruđer Bošković (Dubrovnik, May 18, 1711 - Milan, February 13, 1787). Particularly relevant materials of

the greatest Croatian mathematician, astronomer, geodesist, physics, philosopher and poet are manuscripts, letters and printed works.



**Picture 1:** Different Ruđer Bošković neck work in Collection of manuscripts and rare books

On the occasion of the 300th anniversary of his birth, the National University Library has launched a project of restoration and digitalization of the material called "Digital collection of Ruđer Bošković". The aim of the project is to protect and make material available to researchers, scientists and the general public. The Croatian Ministry of Culture financially supported the project. The result of the project will be a representative Ruđer Bošković Digital collection and a relevant virtual exhibition.

### 3. Methodology of description

From the conservation – restoration aspect, a book is not only important to us because of its content: it is also a historical object, from which one can collect information about the binding mode, types of used materials and techniques and in terms of terms of protection.

Before beginning the treatment, material must be thoroughly documented, photographed and described in order to obtain the most accurate and detailed insight into the condition of the material, and to be aware of the problem of damaged originals. This includes a record of basic information about the material (title, author, signature, background), checking the integrity of publication, determining the order of pages, number of leaves (with old and rare books sequence is often mixed or some leaves are missing). The second part includes a detailed description of the current state of the original, the degree of damage / preservation, structure, binding and book block layout. Units with visible damage are photographed before, during and after the completion of the conservation – restoration work. Only then the method, procedure of performance and types of materials for work on the unit are selected.

### 4. Causes and damages

Paper has always been one of the most important carriers of the written cultural heritage. Paper is not eternal because it is made from a relatively unstable organic raw material; so it is more or less susceptible to natural aging process - its characteristics are changing, and the quality is limited. Paper

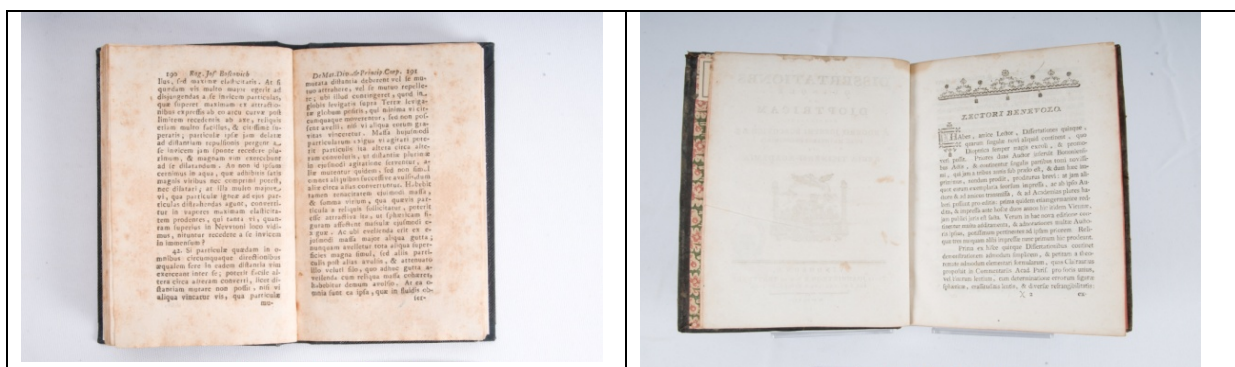
aging mechanism is under the influence of mutual activities of components of paper and material from the original environment where its influence is most evident in the loss of mechanical strength, chemical stability and optical properties of paper.

The terms durability and resistance are describing the longevity of paper. And while durability depends on the chemical resistance of its components, and on the influence of external factors, the durability of the paper depends mostly on the physical and mechanical characteristics of the basic raw materials, eg. fibres, fillers, binders, and on their contamination, and those from environment, influence on light, heat, moisture and microorganisms. Paper aging can cause and accelerate external factors (unfavourable microclimate storage conditions, natural disasters and inappropriate usage) and internal factors (poor quality of material from which they are made, method of manufacture, type of printing...) [3]. Depending on the type of damage to the paper and binding, and their dependency and close connection, we determine the extent of damage and the extent of conservation – restoration work.



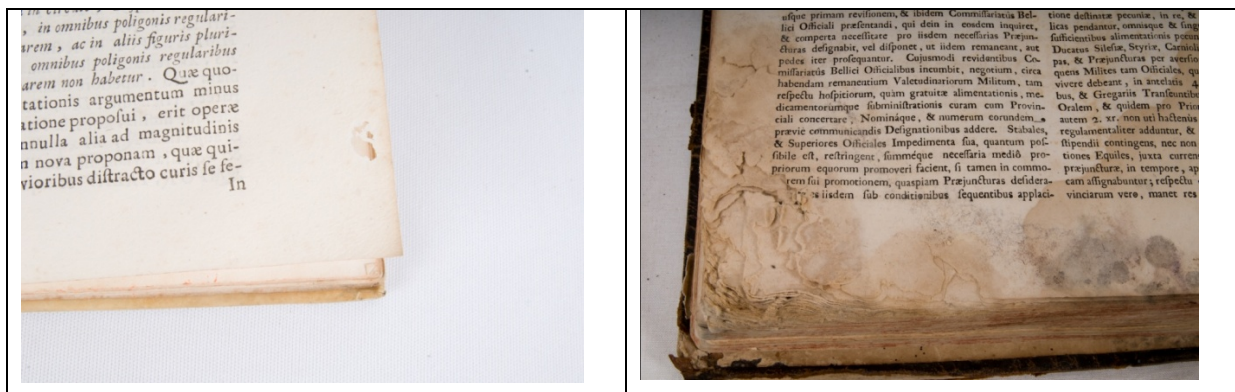
Picture 2: Mechanical damage of R. Bošković books

On picture 1 is presented mechanical damage of paper which can be observed in the form of scratches, cracks, holes, missing parts, folds, folding, cuts and grooves. Impurities can be deposited on the surface or inside the paper fibres or may be suddenly applied during various disasters.



Picture 3: Physical damage of R. Bošković books

The causes of physical damage (picture 3) are the light, temperature and relative humidity. Paper, binding, inks, photographic emulsions and pigments are sensitive to light. Under the influence of light, paper may turn yellow, fade or tarnish, and may encourage harmful chemical reactions. Causes of chemical damage on material are atmospheric pollution and contamination contained in the substance itself.



**Picture 4:** Biological damage of R. Bošković books

Microorganisms, insects, rodents cause biological infection (picture 4). Reproduction and growth of microorganisms depends on pH value, organic content, temperature, humidity and atmosphere. In any environment, the initial pH can allow the growth of microorganisms, but with the decrease in pH it can be reduced. At uncontrolled conditions of relative humidity and temperature, the paper is attacked by mould and fungus. The consequences are stains on the paper and weakening of the paper structure [4].

#### 4. Conservation – restoration work

There are different methods of saving the original from damage. With conservation we are stopping the aging process; and material degradation with disinfection, mechanical cleaning and neutralization. We restore exclusively materials characterised by durability, eg. glue strengthening, doubling/laminating, hand restoration, the restoration method by adding leaf pulp, the reconstruction of the old binding. Restoration is extremely expensive and time consuming, and all institutions cannot afford such protection.

We can make only small interventions on the material, which means a minimal impact of a conservator-restorer on the original itself. Even if minor interventions are required, a conservator-restorer must have extensive understanding and knowledge of restoration methods.

Interpretation must be based on authentic qualities of objects. If we want to transfer and preserve the object for future generations as genuine/authentic document, it is necessary to take care of genuine material. Durability extending during a single conservation process highly depends on the interpretation of conservator itself [5].

While reviewing the overall condition and preparation of material for the process of digitalization, 7 units have been allocated, that needed conservation – restoration works. The rest of the R. Bošković fund which consists of 3 manuscripts, 11 letters and 77 printed works is in a relatively good condition, and only a mechanical cleaning of the materials was required.

Here, the state of R. Bošković individual units before and after the completion of conservation – restoration work is presented.





**Picture 7:** Before and after the completion of conservation – restoration works

In the upper left section the picture shows a book block detached from the covers, and in the upper right section we see a rebind book. In the lower left section the damage of the spine and head is shown, and in the lower right section there is a picture of mechanically cleaned and restored spine. Missing leather spine was replaced with new coating similar in structure and colour to the original itself (picture 7).

After the described procedures, all letters and manuscripts and 13 most significant printed Ruđer Bošković works were digitized (3000 units). Digital copies of the material will be stored in the system for managing digital copies of the National University Library in Zagreb and will be available to general public throughout virtual exhibition of Ruđer Bošković's works.

## 5. Conclusions

The featured sequence in procedure indicates the importance of participation of a conservator -restorer in the digitalization process in order to prevent damage to the materials, especially to the rare and valuable ones.

In addition, if material is in poor physical condition which does not allow the process of digitization of the original, a microfilming process, and the restoration of the original must be done before digitization.

All conservation – restoration treatments should not obstruct or cover the value of a printed or written document - they must not damage or weaken the material from which the original is made, and should not damage its aesthetic appearance. All processes must be performed by a professional conservator-restorer.

Furthermore, the purpose and goal of implemented conservation – restoration work is to slow down the aging process, stabilize the material, to prevent effects of the harmful factors, long-term protect and extend the durability of library materials of national importance for future generations.

In this way, preconditions for exposing valuable digitized material to the new public (internet audience) in their authentic form are created.

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