

## THE CONSERVATION OF THE ROMAN MOSAICS IN THE MUSEUM OF SOUSSE IN TUNISIA: BETWEEN DOCTRINES AND PRACTICES

Zeineb YOUSSEF\*, Fakher KHARRAT

Unité de recherche PAE3C - Patrimoine architectural et environnemental:  
Connaissance, Compréhension, Conservation, Ecole Nationale d'architecture et d'urbanisme de Tunis,  
Université de Carthage, Rue el Kods, 2026 Sidi Bousaid, Tunisia.

---

### **Abstract**

*Our paper deals with the discipline of conservation of Roman mosaics based on the proceedings of the workshop of the Museum of Sousse. Thus, we highlight two main objectives. In the first place, it is a question of revealing the techniques adopted by professionals to handle mosaics. In the second place, we are going to interpret the works initiated to preserve the archaeological heritage in order to protect it in present time and transmit it to future generations. To this end, we paid attention to four Roman mosaics currently exhibited in the Museum and known under the names of: Orpheus Charming the Animals, Gladiator and Bears, Stud farm of Sorothus and Head of Medusa. They show different gaps at the level of their surfaces, and the method used to fill them seems to be interesting to analyze. The study on the conservation passes through two chained phases. We start with a small historical overview. Afterward, the intervention process is analyzed by handling three complementary elements that are: diagnosis of the existing state, the study of the medium processing and the study of the processing of the tessellatum surface which includes the pictorial composition of the mosaic. Furthermore, we have implemented an evaluation matrix with seven operating principles allowing the assessment of the appropriateness of the intervention. These principles are the following: minimal intervention, reversibility, compatibility, visibility, durability, authenticity and enhancement. Various accumulated outcomes are pointing out the techniques used to fill the gaps as well as the level of compliance with the principles of conservation. Accordingly, the conservation of mosaics in Tunisia is a practice that combines various techniques without really arguing about the choice of a particular theory.*

**Keywords:** Roman mosaics; Museum of Sousse; Conservation; Operating principles;  
Particular theory.

---

### **Introduction**

Mosaic is a part of a broad universal cultural heritage[1-3]; sometimes it represents a unique and rather essential source for the researchers on the everyday life of some of the previous civilizations [4]. Tunisia has one of the finest and largest collections of mosaics in the world [5]. Many pieces are so prestigious and some of the exhibited works are unique without any equivalent such as the mosaics of “Virgil” and “Triumph of Neptune”. Mainly collected during the nineteenth century, this collection is essentially exhibited in the Museums of Bardo, Sousse and El Jem. Restored, protected or reconstituted, they bear witnesses to creative and hard work [6], and demonstrate the different modes of appropriation of antiquity in the area of

---

\* Corresponding author: [youssefzeineb@yahoo.fr](mailto:youssefzeineb@yahoo.fr)

Roman Africa. Figure 1 shows an outstanding example of an ancient Roman mosaics widely known under the name of “Neptune”, the Greek God of the see.



**Fig. 1.** Mosaic *Neptune* valorized and currently exhibited at the Museum of Sousse.

This work of research brings attention to a special collection of ancient Roman mosaics currently assembled and exhibited at the Museum of Sousse, which covers a period from the second century to the fourth century. These mosaics came from multiple archaeological excavations realized in the ancient sites of the coastal cities in the east shore of the Mediterranean [5] such as the catacombs of Sousse, Thysdrus (currently called El Jem) and Salakta (province located in the city of Mahdia).

Frequently, the archeological conservation in the field is conducted in difficult conditions, making decisions for appropriate treatment methods extremely hard [7-13]. In our case, the conservation was mainly undertaken in the halls of the Museum under such privileged circumstances, which helped the professionals to achieve an important success.

In this paper, we examine more closely the discipline of conservation and restoration of ancient Roman mosaics, based on the proceedings of the workshop of the museum of Sousse in Tunisia. Indeed, through this paper we aim to reach satisfying answers to the problematic that raises two principal inquiries. What are the different methods and techniques adopted by the professionals to handle mosaics, and to which national and international schools of conservation these techniques belong? Also, how do we interpret and assess the work of restoration already initiated to preserve the archaeological heritage in order to protect it in present times and transmit it to future generations?

To reach this end, we paid attention to four Roman mosaics currently exhibited in the Museum of Sousse. These mosaics are very famous and known under the names of: Orpheus Charming the Animals, Gladiator and Bears, Stud farm of Sorothus and finally Head of Medusa.

In the light of the announced problematic, we highlight two main objectives. In the first place, it is a matter of revealing and explaining the specific techniques used during the work of conservation and restoration of this delicate and precious category of cultural heritage. In the second place, we provided an important effort to focus on assessing the different methods adopted for conservation of the ancient mosaics exhibited in the Museum of Sousse, in order to find out any doctrinal references involved during the intervention process [14-17]. Thus, the

present paper is structured with three complementary parts and closed by a conclusion. The first part is devoted to present the study cases or the specimens, which are the four selected mosaics currently exhibited in the Museum of Sousse. The second part defines the protocol of analysis that includes a detailed explanation of the procedure to follow throughout the research, as well as the presentation of the evaluation matrix implemented to judge the appropriateness of the restoration work. The third and final part focuses on studying and assessing the restoration of the study cases. Finally, the work is brought to an end with a conclusion that seems to be necessary in order to synthesize the paper and criticize the gathered results.

## Materials and Methods

### *Presentation of the Four Case Studies*

Several reasons led us to choose the following four case studies. Different groups of specialists have restored and preserved all the chosen four mosaics. The work of restoration was chiefly undertaken in the principal exhibition hall within the Museum of Sousse. These different mosaics have been dealt with through an intervention process with similar phases sometimes and other various ones that differ from one mosaic to another. This process includes three important phases. It starts with the diagnosis of the general state of the mosaics and its problems; in the second time comes the treatment of the background and finally the treatment of the *tesselatum* surface. In fact, most of the selected specimens show different voids or gaps at the level of their surfaces, and the method adopted to fill them seems to be very interesting to analyze. The presentation of the four case studies, with many details related to their origin, date of discovery and image are summarized in Table 1.

**Table 1.** Presentation and Description of the Four Case Studies

Name	Era, Origin et discovery	Description
Mosaic 1 : Orpheus Charming the Animals (MC1)	<ul style="list-style-type: none"> <li>• III rd S. after. J-C</li> <li>• Originally from Sousse</li> </ul>	Roman mosaic representing <i>Orpheus</i> (mythological traveling hero) playing the lyre in front of an audience of animals.
Mosaic 2 : Gladiator and bears (MC2)	<ul style="list-style-type: none"> <li>• Last third of IIIrd S. after .J-C</li> <li>• Originally from Sousse</li> </ul>	Roman mosaic showing a gladiator and bears. Found in such a good status at the time of its discovery, it was placed in the Museum of the fourth Tirailleurs where it was seriously damaged during the bombing of 1943.
Mosaic 3 : Stud farm of Sorothus(MC3)	<ul style="list-style-type: none"> <li>• End of IIInd or beginning of IIIrd S. after.J-C</li> <li>• Originally from Sousse</li> <li>• Discovered in 1886 at the <i>Domus of Sorothus</i> in Sousse.</li> </ul>	Two medallions containing clashed horses and two other fragments with complex scenes: a mountainous area, a grassy plain crossed by a river where many horses are fighting.
Mosaic 4 : Head of Medusa (MC4)	<ul style="list-style-type: none"> <li>• IIInd S. after.J-C</li> <li>• Sousse</li> <li>• Discovered in <i>Dar Zmêla</i>, at the suburbs of Sousse</li> </ul>	A polychrome mosaic showing the " <i>Head of Medusa</i> ". This mythological creature is represented with a special decoration of colorful flakes that are coming from the center, reminding the hypnotic power of Medusa, the mortal God.

### *Presentation of the Protocol of Analysis*

The present work dealing with the discipline of conservation of the ancient Roman mosaics follows two principal research methods. The first method consists on establishing a small investigation project that is organized with various techniques. These techniques of direct and indirect investigation combine observation, interviews with professionals as well as the deep study of documents and archives that turn around the four case studies and follow their evolution in time. Afterward, the second method involves an evaluation matrix, which is formed by seven operating principles or concepts allowing the assessment of the appropriateness of the

restoration. These principles are the following: minimal intervention, reversibility, compatibility, visibility, durability, authenticity and enhancement. Originally, this matrix was defined as an assessment system that was designed by the researcher Fakher Kharrat. It is based on the generating principles of conservation included in the international charters of restoration such as the charters of Venice and Athens [18].

By applying the mentioned matrix to the chosen mosaics, an assessment will take place that goes from “Not applied” to “Very well applied” and also from one to five. Afterwards, we will interpret the results of the assessment with a figure called Radar. This particular figure has seven rays representing the seven operating principles, and also contains the values of the scale of appreciation that goes from one to five. Thus, we find it very essential to define a scale made of values of appreciation that is formed with five units (1-5). These values going from one to five respectively correspond to “Not applied”, “Weakly applied”, “Moderately applied”, “Well applied” and finally “Very well applied”.

## Results and Discussions

### *Mosaic MC1: Orpheus Charming the Animals*

The restoration of this first mosaic started with the diagnosis of its state that was described as average. In the second step, the intervention process continues with the scraping of the old cement background and replacing it with a new one made of plaster. Due to this operation, we clearly see that the principle of reversibility was very well applied. Next, comes the treatment of the *tesselatum* surface. In fact, many of the gaps found at the level of this surface were filled by painting and repeating the same existing motifs and compositions (Fig. 2 and 3). While painting all the new drawings, the professionals proceeded without any theoretical reference, but only with analogy and imagination. Other gaps were left empty without any drawing detail (Fig. 3). Finally, the final and enhancing procedures included many actions of dry cleaning, or with water or with chemicals products such as Paraloid B72 dosed at 3% or 5%.



Fig. 2. Mosaic MC1 restored and currently exhibited at the Museum.

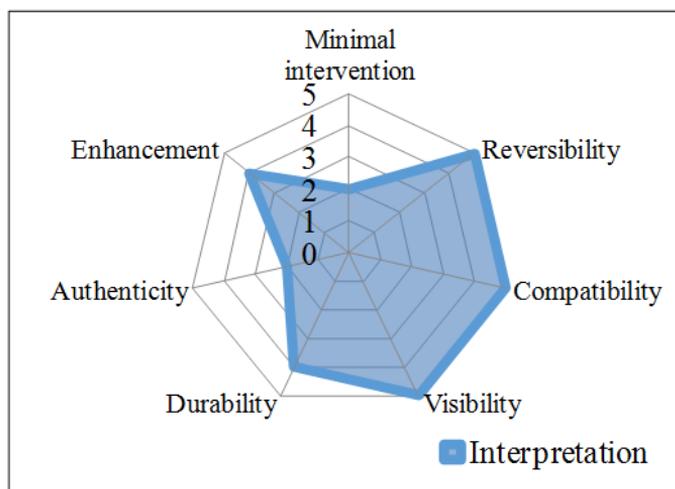


**Fig. 3.** Two fragments of the restored mosaic: in the first figure, we clearly notice the difference between the old parts (tesserae) and the new added painting. However, the second figure shows white surface representing a non-filled gap.

Figure 2 displays the first case study MC1 as currently exhibited in the Museum.

By interpreting the undertaken work, the following graph or Radar (Fig. 4) shows convergence towards maximal values for the principles of reversibility, compatibility, visibility and durability. For the other two principles, the radar shows minimum values demonstrating that they were not very well applied during the restoration.

In fact, for the principle of minimal intervention, the proportion of the intervention was important and remarkable. The original parts are clearly distinguished from those newly added. Therefore, we find the intervention clearly visible; it is not negligible especially when it comes to filling the gaps with painting new drawings in order to complete the whole picture of the mosaic. Speaking about the materials used during the restoration, the inclusion of the plaster for the new background led to a successful application of the principle of reversibility. In addition, the introduction of new materials (plaster, B72 and white cement) and the various new techniques ensure compatibility with the original parts as well as regular maintenance. As a result, the intervention is highly sustainable over time. On the other hand, despite the interesting enhancement that made the mosaic more attractive and beautiful to see, the work of restoration did not properly respect its authenticity.



**Fig. 4.** Assessment of the restoration, mosaic MC1.

**Mosaic MC2: Gladiator and Bears**

In 1943, this mosaic was gravely damaged because of the bombing that took place in the old museum of Sousse. It was fragmented into many pieces with considerable loss of several parts [1]. All these facts explain the serious state of deterioration, especially the dominance of empty spaces or gaps in the picture of the mosaic.

The intervention process is similar to that of the first mosaic. After diagnosing the existing state that was described as very critical, there was the substitution of the ancient background with a new one entirely made of plaster. Then, the professionals completed the disruptions caused by the multiple white gaps by imagining and creating new components of the scene (Fig. 5), on which absolutely no previous information exists. Here we can speak about a large falsification that fakes the picture of the mosaic.

In this case study, the intervention on the *tesselatum* surface was important and even exaggerated. We can clearly distinguish the new drawings that filled some of the gaps, from the old parts (Fig.6). Although it has increased the beauty of the mosaic and gaps no longer disturb the visitor’s perception, unfortunately the restoration made the value of authenticity fade away. Thus, the principle of enhancement is very well applied, but on the contrary, the two principles of minimal intervention and authenticity are not applied at all. The new plaster background, the different materials used in the step of the final cleaning procedures ensure compatibility with older parts as well as easy maintenance. All of this explains how much the principles of reversibility, compatibility and durability are very well respected all along the process.



Fig. 5. The drawings of new components.

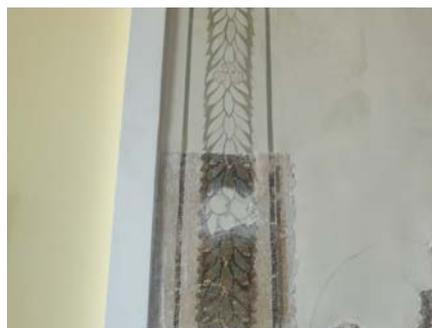


Fig. 6. Filling of the empty spaces by painting

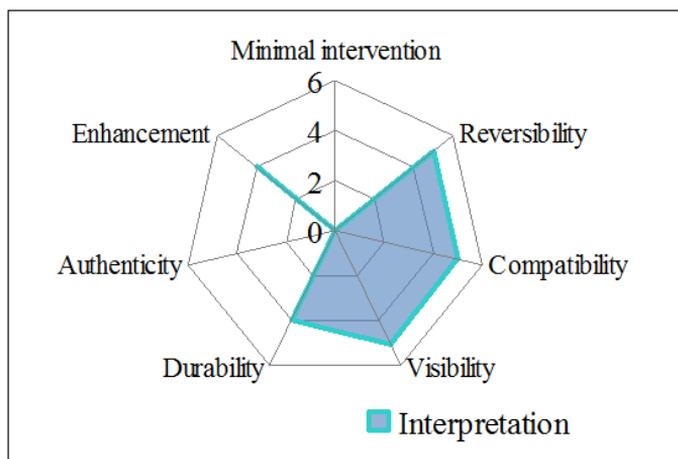


Fig. 7. Assessment of the restoration, mosaic MC2.

Therefore, figure 7 interprets the conservation. It is formed with particular shape that shows convergence towards maximal values for the well-applied principles; and minimal values for those not applied.



Fig. 8. The first work of restoration in 1950.

### ***Mosaic MC3: Stud Farm of Sorothus***

Originally, this famous Roman mosaic decorated the floor of a prestigious house that belongs to a wealthy owner of many racehorses [1]. Currently, only two medallions and two fragments remain of the entire mosaic. For a long time, one of these fragments was taken to be exhibited alone in the Museum of Bardo in Tunis.

Before starting any work of any kind, this mosaic was found destroyed and in such a critical state of deterioration. This situation required an important and urgent restoration making the intervention process of this case study a bit special. In fact, the first step of the process was the creation of a new organization of the different pieces. The old horizontal arrangement of the mosaic (Fig. 8) has been completely changed because of the addition of another fragment coming back from the Museum of Bardo. Afterwards, the old background was removed and replaced by a new one made by plaster, giving good respect to the principle of reversibility. The intervention process continues and the next step consists on focusing on the gaps that exist at the level of the *tesselatum* surface. From the first work of restoration in 1950, these gaps were treated and filled in by drawing horses and other figures (Fig. 8). For the new restoration in 2013, we do not see any big modifications, only the drawings were enhanced especially the colors and few details (Fig. 9). Fig.10 illustrates our explanation and establishes a comparison between the old and new work of restoration proceeded on this third case study. Finally, an important time was dedicated to the final procedures such as dry cleaning and light scraping, in order to prepare the exhibition of the mosaic.

The principle of authenticity was very well respected and thus the mosaic is enhanced. In addition, the intervention was primarily to preserve the physical status of the mosaic; restorers have not completed the scene or added new components. Consequently, we describe the restoration as minimal, sustainable, reversible and pleasing at the same time. All the principles of conservation were well applied while working on this third mosaic.

The interpretation by the following Radar (Fig.11) illustrates our previous analysis. The figure shows convergence towards important values for the principles of minimal intervention, enhancement, authenticity, durability and visibility. As for the principles of reversibility and compatibility, we see maximal values since they have been very well applied.



Fig. 9. The new work of restoration in 2013.



Fig. 10. Comparison between the new and previous restoration

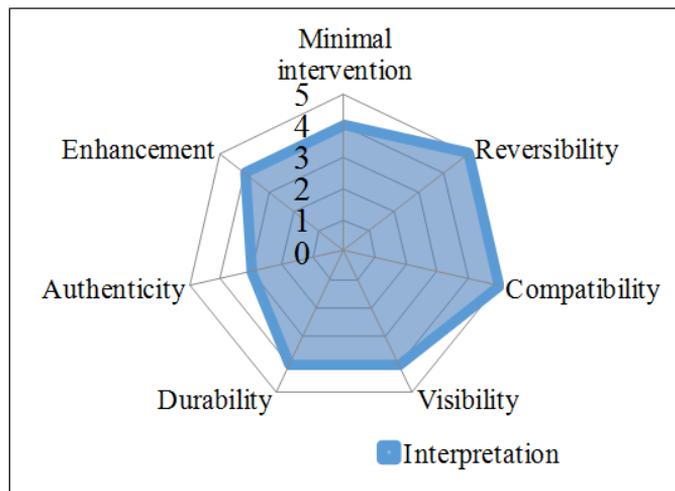


Fig. 11. Assessment of the restoration, mosaic MC3.

**Mosaic MC4: Head of Medusa**

Many polychrome marble tiles that are in very good condition form the mosaic named “Head of Medusa”. It is completely intact and do not contains any empty space or gap (Fig. 12). That is why, in this case the intervention process was limited to the protection and safeguarding of the *tesselatum* surface. It was organized with two main phases. As a beginning phase, the old cement background was scraped and replaced with a new one entirely made of concrete. Consequently, because of the use of concrete, the principle of reversibility was totally lost. As a second and final phase, lots of efforts and resources were dedicated to the final cleaning procedures. Figure 13 shows some of the actions of cleaning and preparing the mosaic MC4 to be exhibited. Essentially, these final procedures are similar to each exhibited mosaic at the Museum of Sousse. They include all actions of cleaning whether dry, with water or with a chemical product such as Paraloid B72 dosed at 3% or 5% and used every time. In addition to cleaning, it is very important to mention the significant time spent for smoothing the *tesselatum* surface in order to abolish the defects and have a perfect plane surface. These defects appeared when the mosaic was divided into four pieces during transportation time for the period of the project of renovation of the Museum of Sousse in 2011.



**Fig. 12.** Mosaic MC4 preserved and currently exhibited at the Museum.



**Fig. 13.** The final cleaning procedures with water and chemical product.

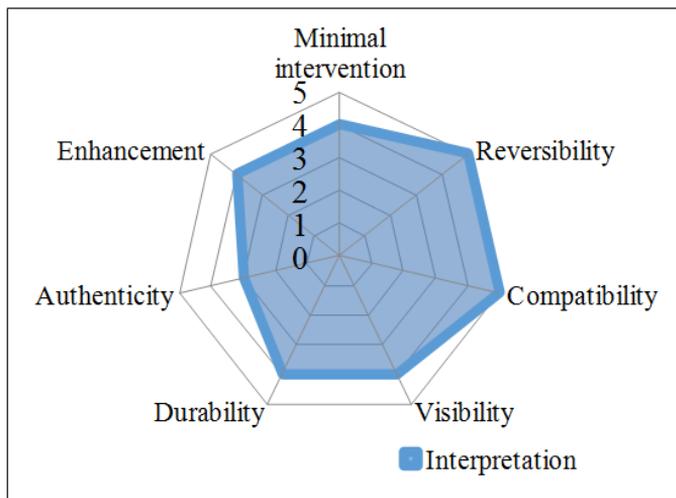


Fig. 14. Assessment of the restoration, mosaic MC4

Other than the principle of reversibility that was neglected and totally lost, we find that all the other principles of conservation were very well applied during the restoration time. In this case, where the mosaic is intact, the intervention focused only on changing the background. So, it is a minimal intervention that saved the authenticity of the mosaic. Besides, its exhibition in such a remarkable place at the Museum raises its inner value as an exceptional cultural heritage.

On the other hand, the new materials introduced and the various techniques seen during the restoration process will ensure the compatibility with the original ancient parts and sustainability over time. Consequently, the interpretation of this conservation through the Fig. 14 shows only one convergence to a minimal value for the non-respected principle of reversibility; and convergence to important and maximal values for the other principles of conservation. In this case study, the restoration is relevant and well completed.

A variety of methods is used during the conservation process. Figure 15 shows multiple techniques and procedures adopted by the professionals specifically working on the Roman mosaics in the Museum of Sousse. For every restorer, the treatment of the gap at the level of the *tesselatum* area represents a challenge that is more much critical than important. Many solutions and procedures are adopted. In some cases, we clearly see that the gaps are left neglected, giving the aspect of empty surfaces only painted with white color. In other cases, gaps are filled in with painting where there is a systematic reproduction of the existing patterns, imagination and invention of new components, or addition of missing tiles in order to mend the defects and have a complete restitution of the picture. As a result, sometimes the true historical value is preserved and the mosaic is well highlighted. However, in lots of other cases, the treatment of gaps that favors the identical reproduction of the original representations can give pleasing results appreciated by the visitors, but the new produced picture totally lose authenticity, which definitely leads to a falsification.



Fig. 15. Some techniques and procedures adopted by the professionals at the Museum of Sousse to handle this precious and unique archeological heritage.

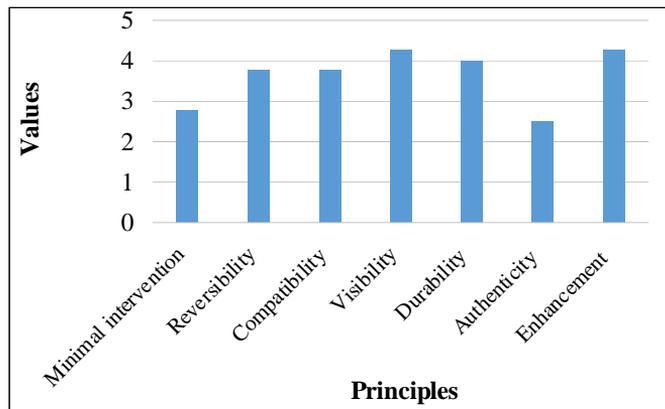


Fig. 16. Interpretation of the seven operating principles of conservation

In the table 2, we recapitulate the assessment values going from 1 = Not applied to 5 = Very well applied, showing how much these principles of conservation were respected during the intervention process of the four mosaics. It also displays the average of these values for each principle.

**Table 2.** The Assessment of the Appropriateness of the Restoration

Principles of conservation	Workshop of the Museum of Sousse				Average
	MC1	MC2	MC3	MC4	
Minimal intervention	2	0	4	5	2,75
Reversibility	5	5	5	0	3,75
Compatibility	5	5	5	4	3,75
Visibility	5	5	4	3	4,25
Durability	4	4	4	4	4
Authenticity	2	0	3	5	2,5
Enhancement	4	4	4	5	4,25

When analyzing closely these displayed values, we affirm that the restorers of ancient Roman mosaics at the Museum of Sousse gave big respect to the principles of reversibility, compatibility and durability. This important convergence towards maximal values reflects their efforts to become competent and master the various techniques used during the restoration work. Moreover, another important value is found for the principle of enhancement. In fact, thanks to the significant restoration, gaps are filled in and no longer capture the viewer's eye. The mosaic is well exhibited and carefully maintained in good shape, giving that this principle is often very well applied. On the other hand, Table 2 displays a set of average values for the principles of authenticity and minimal intervention; a maximal value for the principle of visibility. In most cases, the intervention is clearly visible, it is not minimal and we can, easily distinguish the new added or painted parts. Thus, the conservation of the picture of the mosaic came in the first place with less consideration of the conservation of its authenticity and historic value. Figure 16 interprets the average values of each of the seven principles of conservation.

## Conclusion

The direct observation, the analysis and the interpretation of the restoration of the ancient Roman mosaics exhibited in the Museum of Sousse show us that there is variety of methods used that can be either identical or different. Indeed, all of them follow three concomitant and chained phases: 1) diagnosis of the state to identify the intervention process from the beginning; 2) treatment of the background; 3) treatment of the *tesselatum* surface.

In summary, the restoration of Roman mosaics in the Museum of Sousse in Tunisia does not follow a particular doctrine or theory. There is no distinctive recipe for the intervention process and professionals do not baptize a specific theory. Indeed, there are only a set of practices that combines different techniques without actually following or choosing a particular school of conservation such as the Italian, French or British schools well known for their reliable references.

## Acknowledgments

The authors express thankfulness to all the specialists working on the Roman mosaics in the Museum of Sousse for their invaluable aid, time and precious responses.

### Funding body

During the preparation of this paper, the research unit PAE3C gave financial support to the authors and ensured to provide all the necessary means.

### References

- [1] M. Vecco, *A definition of cultural heritage: From the tangible to the intangible*, **Journal of Cultural Heritage**, **11**(3), 2010, pp. 321 – 324.
- [2] T.H. Tuan, S. Navrud, *Capturing the benefits of preserving cultural heritage*, **Journal of Cultural Heritage**, **9**(3), 2008, pp. 326-337.
- [3] L. Smith, **The Uses of Heritage**, Routledge, London & New York, 2006.
- [4] J.E. Tunbridge, G.J. Ashworth, **Dissonant Heritage: The Management of the Past as a Resource in Conflict**, Wiley, Chichester, 1996.
- [5] M. Yacoub, **Splendeur des Mosaïques de Tunisie**, Agence de Mise en valeur du Patrimoine et de promotion culturelle, Tunis, 1995.
- [6] A. Zarrouk, *Le traitement des lacunes : entre intervention sur la matière et son influence sur l'image. Etude comparative entre deux types de biens culturels : les édifices de la Médina de Tunis et les mosaïques exposées au Musée de Bardo*, **Master Thesis**, National School of Architecture and Urban Planning of Tunis, 2010.
- [7] M. Uguryol, *The conservation of the mosaic of the “House of the Ionic Capitals” in Hierapolis (Pamukkale, Turkey)*, **Journal of Cultural Heritage**, **14**(3), 2013, pp. E125-E132.
- [8] C. Boito, **Conserver ou restaurer, les dilemmes du patrimoine**, (Translated from Italian by J.-M. Mandosio, presented by F. Choay), l’Imprimeur, Paris, 2000.
- [9] E. Bowitz, K. Ibenholt, *Economic impacts of cultural heritage: Research and perspectives*, **Journal of Cultural Heritage**, **10**(1), 2009, pp. 1-8.
- [10] F. Choay, **L’Allégorie du Patrimoine**, Seuil, Paris, 1996.
- [11] S.D.S. Salazar, Marques, J.M. Montagud, *Valuing cultural heritage: the social benefits of restoring and old Arab tower*, **Journal of Cultural Heritage**, **6**(1), 2005, pp. 69-77.
- [12] X. Greffe, *Is heritage an asset or a liability?*, **Journal of Cultural Heritage**, **5**(3), 2004, pp. 301- 309.
- [13] C. Holtorf, T.M. Kristensen, *Heritage erasure: rethinking ‘protection’ and ‘preservation’*, **International Journal of Heritage Studies**, **21**(4), 2015, pp. 313-317.
- [14] M.F. La Russa, M. Ricca, C.M. Belfiore, S.A. Ruffolo, M.A. De Buergo Ballester, G.M. Crisci, *The contribution of earth sciences to the preservation of underwater archaeological stone materials: An analytical approach*, **International Journal of Conservation Science**, **6**(3), 2015, pp. 335-348.
- [15] A. Moropoulou, A. Bakolas, M. Karoglou, E.T. Delegou, K.C. Labropoulos, N.S. Katsiotis, *Diagnostics and protection of Hagia Sophia mosaics*, **Journal of Cultural Heritage**, **14**(3), 2013, pp. E133-E139.
- [16] I.C.A. Sandu, E. Murta, F. Eusebio, R. Veiga, L. Jorge, V.S. Muralha, M.F.C. Pereira, T. Busani, N. Leal, S. Ferreira, *Creating the illusion: the marble and stone-like decoration of the main altarpiece of St. Francis Church, in Viseui*, **International Journal of Conservation Science**, **6**(SI), 2015, pp. 473-486.

- [17] M. M. Dewoolkar, D. Porter, N. J. Hayden , *Service-Learning in Engineering Education and Heritage Preservation*, **International Journal of Architectural Heritage** 5(6), 2011, pp. 613-628.
- [18] M.M. Abdelmegeed, E. Badogiannis, G. Kotsovos, E. Vougioukas, *Structural damage assessment of historic traditional masonry buildings: a case study*, **International Journal of Conservation Science**, 6(2), 2015, pp. 165-176.
- 

*Received: February, 25, 2015*

*Accepted: November, 10, 2015*