

CONSERVING AND PREVENTIVE CONSERVATION PLAN OF PHOTOGRAPHIC ARCHIVE BELONG TO KHEDIVE ISMAIL PASHA BACK TO 19TH CENTURY STORAGE IN VEHICLES MUSEUM

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ABSTRACT:

The Royal Vehicles Museum contains five albums of Albumin photographs dating from the 19th century. These photographs are poorly preserved in the basement of the Royal Vehicle Museum which is located on one of the most crowded streets, July 26 St., near the Nile River in Cairo. Due to the poor storage conditions of wooden boxes without treatment, it is unsafe against insects and microbiological damage, so they are vulnerable to rapid because the albumin photographs are composed of organic and inorganic materials, which makes them vulnerable to rapid damage. This paper presents documentation, preservation, and conservation of albumen photographic print-outs. Temperature, humidity, and UV were measured in the storage area by Data Luger. The deterioration aspect of the Royal Album and the albumen photographs has been identified. A condition report has been planned to record all the archaeological and historical information belonging to the album. SEM_EDX was used to identify the surface morphology and determine the type of silver salts used. The microbiological test was performed to identify fungi and bacteria. Growth requirements are determine. A portable scanner has digitized albumen photographs. USB Digital Microscope strongly enlarge 300 × has been used to identify cracks, crevices, dirt, and other damages on the album and photographs. A stereo microscope 500× shows the structure of albumin photo prints.

1. INTRODUCTION

Photography is a distinctive resource of heritage resources, with its meanings, connotations and an important fact to be searched. Egypt was one of the greatest and most developed nations in Photographic technic. This paper presents the treatment and conservation of a set of albumin photographic prints that exist within King Farouk's collections and are kept in the Royal of vehicles Museum.

Historical Vehicles Museum is one of the historical wonders belonging to the Ministry of Antiquities, where it is one of the rarest historical museums in the world, where the settings lack this kind of museum in only a few countries such as Austria, France, Russia, and England. The museum dates back to the reign of Khedive Ismail Pasha, who ruled Egypt (1879 - 1863), and is the first thought of in the construction of a special building for Khedive vehicles and horses. King Fouad in 1928 start to build another building attached to the stables administration buildings, a part that later turned into a museum and then added to one of the old dormitories, which was built during the reign of Khedive Ismail.

Royal Vehicles Museum is located on one of the most famous streets of the capital, which is July 26 Street in Cairo near the Sultan Abul-Ela Mosque neighborhood of Bulaq. This museum is located near the Nile River, in the town center, where traffic congestion and frequent vehicle exhaust thus do not control the humidity and pollutant gases, allowing for photos saved in that region rapidly deteriorating. The museum includes five albums of photographs, dating from the 19th century. When previewing the album, you can find that it contains 85 pages, and each page has one photo, all the photos are Albumin which is recorded and documented special services vehicles of Khedive Ismail. Some of them were one shoot and some others have been taken in two phases and were assembled in one piece due to the large size of the vehicle, each photo is located on a separate page, and these

photos represent in the first section of the album royal vehicles special Khedive Ismail and each vehicle has its own name, while the second section includes photos of servants of vehicles Khedive Ismail. On the face of the album, there is the royal emblem has put, as well as the name of the photographer on the cover the outside, all of which are coated with red leather from the outside, and made in an excellent manner, and in good condition, so they need regular preservation to ensure the cleanliness of albums from dust, and saved well.

2. METHODOLOGY

2.1. Archaeometry Study

2.1.1. Visual Investigation: Visual inspection of the album turned out to be in stable condition and good with some dirt on the sides and edges.





Figure 1. the album cover and some of the pictures inside, representing the types of chariots that were used during the reign of Khedive Ismail and the servants of these chariots, which are still preserved in the Royal Chariots Museum until now, notice the names of the vehicles written below each photo

2.1.2. USB Microscope 300X: Checked by using a digital microscope connected by a computer (USB Digital Microscope) strongly enlarge 300 ×, where is USB Digital Microscope is one of the first tools conservator to examine the details of archaeological materials and identify cracks, crevices, dirt, and other aspects of damage by using non-destructive methods.



Figure 2. Describes the album's surface using a digital microscope strongly enlarge 300 ×, we were note royal emblem which is covered with gold leaves



Figure 3. Digital microscope show peeling and color change on the surface of the atmosphere as a result of exposure to light.



Figure 4. Digital microscope show the first page, the ink, the color of the farm



Figure 5. Digital microscope show the second page, the surface, the ink

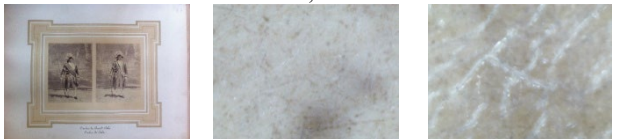


Figure 6. Digital microscope show the first photo, surface of paper, surface of photo, we were note the shape of albumin



Figure 7. Digital microscope show spot of steel the result of the use of iron ink

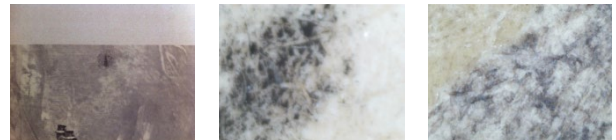


Figure 8. Digital microscope show spot of silver halides due to an error in the manufacturing



Figure 9. Digital microscope show textile structure of the joint between the user pages

2.1.3. Stereo-microscope: The surface of the photos is checking in album royal images Ismail Pasha, using a stereo microscope 500×, to study the surface of albumin, to make sure that there is breakage found in a layer albumin which is one of the characteristics of albumin.

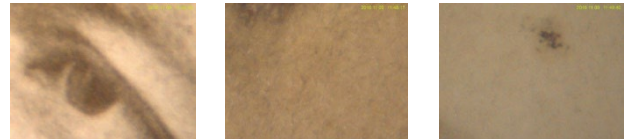


Figure 10. Stereo microscope 500×, shows the structure of albumin photo prints, where the shape of the eye characteristic of albumin prints shows, as well as the characteristic shape of the surface of the albumin, in addition to the form of single color stains on the surface of one of the image

2.1.4. UV Photography: It was used bulbs UV specifications: UV9600 - puissant ultraviolet light - 30 watt long wave. The radiation used here from the rays of the type above the long-violet or so-called black light symbol UVA, the wavelength between 400-320 nm, and the amount of energy each shipment photon 3.94 - 3.10 eV, lamps and black light Fluorescent black light lamps are lighting issue ultraviolet Violet long UVA and some of the visible light, where the use of these lamps same regular spot lighting the way with the exception that they use phosphorus only cover glass bulb replaces a cover glass for colour purple bluish-called glass Wood, a glass-coated anodized nickel in order to prevent any visible light-wave length higher than 400 nm. I have been using black light lamps to examine album of photos, pages, and so in a dark room in order to make sure if what I was no watermarks or the appearance of any layers in the images signs, or any signs of damage to biodiversity, has been confirmed as the lack of infrastructure layers of images and the absence of watermarks on the paper used as a prop by product of the images as well as album pages, but some white spots white spots which are thought to indicate the presence of biological evidence of biological evidences have emerged and therefore there is no biological damage, so was the work of a biological tinge in places these spots to get to know the existence of a biological damage or not.

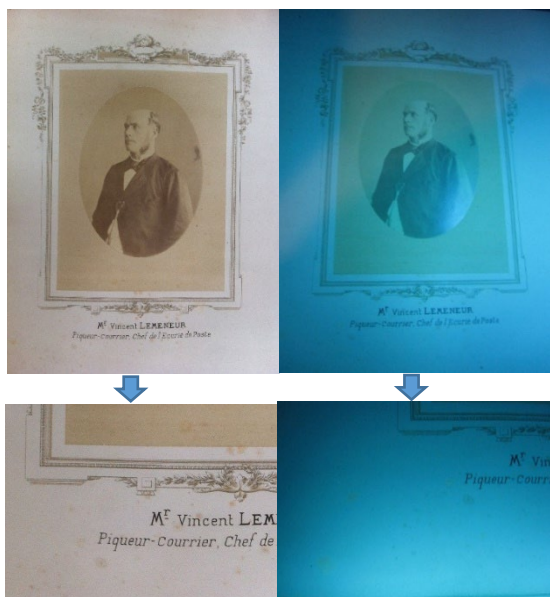


Figure 11. A photo of one of the album pages before and after UV photography, and note the Fluorescence spots that indicate biological damage, we did not find any stamps or watermarks

2.1.5. SEM-EDX: SEM-EDX was used to examine the surface layer of albumen emulsion, in addition to the surface albumen analysis to study the elements that make up the samples and identify the halides of the silver.

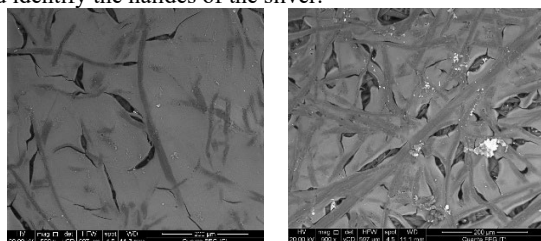


Figure 12. Electronic microscope image scanner (strongly enlarge 500 ×) of a control sample of the emulsion albumin of photographs by exposure to damage factors.

Element	Wt %	At %	K-Ratio	Z	A	F
C K	45.65	58.97	0.1706	1.0320	0.3621	1.0003
N K	10.17	11.26	0.0147	1.0229	0.1409	1.0004
O K	25.38	24.62	0.0426	1.0147	0.1655	1.0001
S K	5.76	2.79	0.0528	0.9568	0.9488	1.0100
ClK	0.49	0.21	0.0042	0.9151	0.9396	1.0148
AgL	11.16	1.61	0.0954	0.7752	1.1012	1.0016
CaK	1.40	0.54	0.0126	0.9437	0.9487	1.0000
Total	100.00	100.00				

Table 1. Schedule analysis unit elemental analysis (EDX) shows the elements in the sample taken from the emulsion albumin photo before the exposure factors damage physicochemical processes

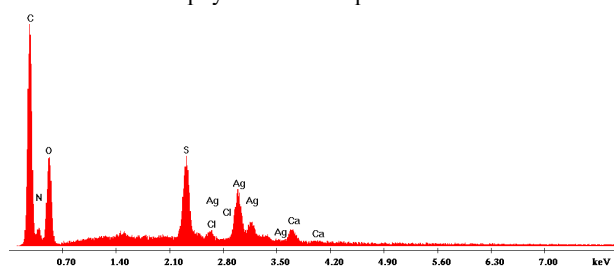


Figure 13. Pattern analysis of microscopic electronic scanner signal unit elemental analysis (SEM-EDX) of a control sample

of the emulsion albumin Photo by exposure to factors that damage physicochemical

A scan of the surface of the albumen sample showed clear and free of impurities in some areas and in other areas some salts appeared on the surface of the albums, perhaps due to the process of preparing the sensitive paper, where the elemental analysis shows the presence of calcium. In general, the albumin layer is stable and in good condition. The elemental analysis showed that the sensitive silver salts used are silver chloride.

2.1.6. Microbiological Test: Biological swabs were taken from various places in the album in order to work microbiological analysis to confirm the presence of biological infection or not which is about the number of two biological swabs. The samples were suitable for the cultivation of microbial growth so as to know the amount and types of microbial load on the archaeological specimen's environments.

After the end of the incubation period was taken shoots that emerged in the dishes and conducted purification process to get on the objects in the image can be pure with the completion of laboratory experiments Portal has been growing fungi on Environment cellulose agar and gelatin to see its analytical capacity:

Media used:

Czapek's medium: it was used for isolation, maintenance, and growth of fungal isolates.

	g/L ⁻¹
Cellulose	30.0
NaNO ₃	2.0
K ₂ HPO ₄	1.0
MgSO ₄ .7H ₂ O	0.5
KCl	0.5
FeSO ₄ .7H ₂ O	0.01
Agar	15.0
Distilled water	750 ml

Table 2. Cellulose environment agar

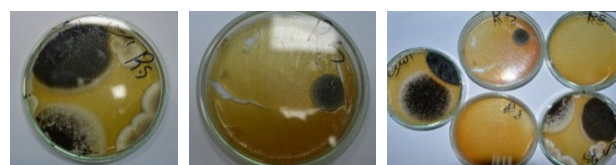
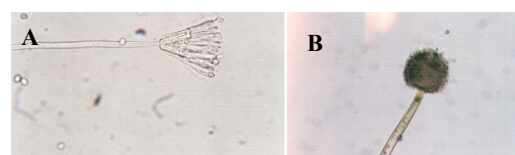


Figure 14. Showing media dishes after completion of the period of incubation was taken shoots that have emerged in the dishes and conducted purification process that has to get the objects in the image can be pure with the completion of scientific experiments

The objects that have been purified were it was grown in private food environments by definition and the work of microbial sliced them to know the morphological characteristics and to compare the qualities of the standard morphological existing books and specialized scientific references the definition of microorganisms Domsch et al definition., (1980) and Gilman (1959).



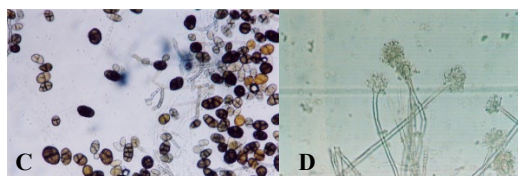


Figure 15. Microorganisms found on the surface of photos.
 A: *Penicillium* sp., B: *Aspergillus Niger*. C: *Stemphylium* sp.
 D: *Aspergillus terrus*

Sample	Czapek's medium
Photo's Album	<i>Aspergillus niger</i>
	<i>Stemphylium sp.</i>
	<i>Penecillium sp.</i>
	<i>Aspergillus niger</i>

Table 3. Result of microbiology test

2.2. Preservation and Conservation Processes

preservation work included for the photo album in several stages beginning to take a copy of each image to ensure a copy of which was reserved, then different records and documentation methods both archaeological or restorative work, then come preservation steps of dry cleaning for photos and album using soft brushes and special erasers for photographs.

2.2.1. Digitization: Digitization is one part of a larger process of preservation that's at the core of promoting cultural heritage. Taking photographs of buildings before they're demolished, scanning old photos that are slowly fading, and preserving treasured objects are all ways we can help preserve our past. In addition to preserving tangible objects, digitization may also involve recording the intangible culture like personal memories, traditions, anecdotes, and oral histories to preserve stories and language.

Digitization of photographic prints by copying and duplicating is one of the principal way to conserving photographic artefacts, where *copying* for photographic conservator can be particularly helpful in preserving discoloured, stained, and faded prints in albumin prints, while *duplicating* make it easy to correct and change to original transparent materials such as negatives, positives, and transparencies by producing photographic duplicates.

There are many reasons for the importance of Digitization technique to the conservation photographic artefacts such as:

- Convert a potentially unstable image into one having improved stability.
- Make an exact duplicate or copy for use so the original can be safely filed.
- Preserve valuable information without particular concern for producing a copy.
- Produce an improved rendition of the original by removal of physical damage such as stains, cracks, tears, etc.
- Improve poor tone reproduction by reducing contrast in the duplicate to print better on present day materials.
- Provide a photographic image of an artefact prior to physical or chemical treatment of the original.
- Make a record and document of the steps taken during the restoration procedures.
- It also assist way of producing copies in quantity with high quality.

Digitization technique in the preservation and conservation of photographic artefacts is not the same as the copying work offered by professional photographer by using Portable Scanner it is non-distractive method without light or UV, it involves

making copies, miniatures, or even tinted copies from old and damaged picture often of a familial or of a sentimental nature. Besides copying to the desired size, they spot, etch, do pencil work, airbrush to repair cracks and soiled areas, reconstruct missing portions, and remove figures or details. These artistic techniques are often incorrectly referred to as restoration, they are not recommended for use on archival collections.



Figure 16. Application method of Digitization applied on the album of albumin photographic prints to get a copy of the image using Portable Scanner.

2.2.2. Documentation: Documentation for the photographic prints condition at the time of receipt and the previous conservation treatments should be requirement and is fulfilled according to the Ethics and Standards Committee of the American Institute for Conservation, as follow:

Technological: this reveals the technical aspects of the photographs which play a big role in the history of the technique and also help in the identification of any alteration that the structure of the image and paper support undergo. The identification of the structure is very important before preservation processes.

The Diagnoses: this is what several important decision in conservation usually depend upon. This diagnoses usually needed someone who had an experience with the studied object, its history, material, and the main factors affecting the photos. The goal is to interpret the physical state of preservation of the photos, its emulsion and paper behavior and the retouching procedure, so it is possible to intervene with the right criteria at the right level.

The documentation process has two goals. The first one includes artistic work documentation for what already exists and trials to understand the original condition. The second is dealing with the deterioration and alteration aspects that caused the change of the original state of the albumin photographs prints.


Object Identification Data	Archaeological Data			Description
Object No.: 4 ي	period	Ottoman Empire		
	century	19 th Century		
	artist	Aimée Bousseton		
	Owner	Khedive Ismail		
Other No.: 404	place	Vehicles Museum		
	Dimensions			
It is housed in Royal Vehicles Museum.	length	width	thick	Material: Albumin
	58 cm	47 cm	7 cm	

Table 4. Decumintation of the royal album of Ismail Pasha






Category	Deterioration aspects	Image
Discoloring	Change of color in lather used in packaging as a result of oxidation processes	
Fading	Fade in color casing used in packaging	
Splits	Separation and flake in the surface layer of the lather is used in packaging	
Previous conservation	Old textile and adhesive material had been used to reduce the movement between the pages.	
Weakness in edges	Flake, and weakness in the edges of the cover	

Table 5. Deterioration aspect of the cover



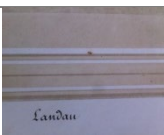
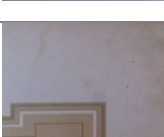
Category	Deterioration aspects	Image
Impact of the Iron ink on paper	The spread of acid found in the Iron ink corresponding page	
Microbiology stains	Brown spots as a result to biological damage	
Stains	Rust spots	
stains	Water stains on the edges of papers	

Table 6. Deterioration aspect of the albumin photos

2.2.3. Mechanical and Chemical Cleaning: A soft brush was used to remove dust from the surface of the cover and from the inside of the surface of the pages, where soft dust not sticking to the pages of the album was removed, then this was followed by the use of elastomers to clean the surface of dust and sludge whether on the surface of the album or on the surface of the inner pages without affecting the photographs. As there are dirt on the

surface of the album.



Figure 17. Mechanical cleaning for pages and joint using a soft brush.

Ethyl alcohol solution diluted with water at a ratio of 1: 3 was used to clean greasy spots from the surface of the cover, using a magnifying glass. Stains and dirt attached to the surface of the cover have been removed.



Figure 18. Chemical cleaning using ethyl alcohol

2.3. Displaying for the Album

Measure both temperatures, relative humidity, light intensity, and UV using the Data Lugar device to control the surrounding environmental conditions, where we observe fluctuations in moisture as a result of the museum's proximity to the Nile, plus temperature stability.

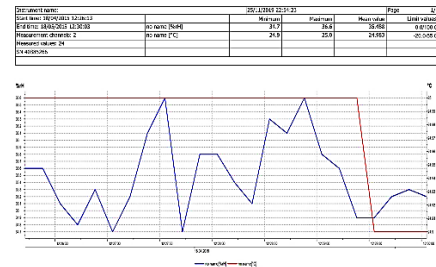


Figure 19. Measurement of Temperature and RH in the displaying area.

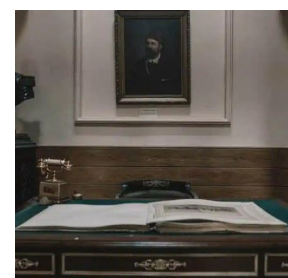


Figure 20. Displaying of the album

The album was displayed in a temperature and humidity controlled room at 18 °C ± 2 °C with 35% RH, consistent with Khedive Ismail Pasha's possessions.

3. CONCLUSION

Albumin thin films were examined on photographic material in the archives of the Royal Chariot Museum, Cairo. Photographs were examined with a USB digital microscope as well as with a stereo microscope to identify areas of damage. The condition of the album and the photos are documented, as the signs of damage and weakness are documented. Photographs have been digitized using a portable scanner so as not to affect album damage. Conservation and preservation processes for the album have been done. The silver salts used were identified as silver chloride. Different species of common fungi were identified, to determine the growth requirements of temperature and humidity. The album has been preserved in a room with $18\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ with 35% RH.

4. RECOMMENDATION

- Technically it should be relevant and acceptable aesthetic appearance.
- But overshadowing the form vitrine on the segment located inside.
- That is characterized by stability on solid ground, where we must move as a unit if there is any ground movement, "such as the earthquake."
- To be constructed, including material vitrine not give an echo it characterized as stable.
- Required to be open and close vitrine easy.
- There are no gaps between the doors or in a glass vitrine so as to reduce insects and dust and air pollution.
- To be the availability of indirect lighting system, and there is the opinion of the man who said that he could highlight a particular system on the photos from a vitrine outside in order to avoid the effect of light on the photographs.
- To be the availability of moisture absorbents and other materials.
- To be the use of central air-conditioning inside the exhibition hall and the vitrine.
- Must use special absorbent filters for dust and air pollutants.
- It must materials used in commends Vitrine be chemically inert until Aunt her interaction with the material presented with the changing circumstances.

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APPENDIX A.

LIST OF ABBREVIATIONS AND EXPRESSIONS

Albumen (Egg white): the common name for the clear liquid contained within an egg. Egg white consists primarily of about 90% water into which is dissolved 10% proteins.

Digitalizing: It is a process made by the conservator to the representation of an object, image, sound, document, or signal (usually an analog signal) by generating a series of numbers that describe a discrete set of its points or samples. Digitization is of crucial importance to data processing, storage, and transmission because it "allows information of all kinds in all formats to be carried with the same efficiency".

Photographic emulsion: Is a light-sensitive colloid used in film-based photography. Most commonly, in silver-gelatin photography, it consists of silver halide crystals dispersed in gelatin or sometimes in albumin. The emulsion is usually coated onto a substrate of glass, films (of cellulose nitrate, cellulose acetate or polyester), paper, or fabric. Photographic emulsion is not a true emulsion, but a suspension of solid particles (silver halide) in a fluid (gelatin in solution). However, the word emulsion is customarily used in a photographic context. Gelatin or gum Arabic layers sensitized with dichromate used in the dichromate colloid processes carbon and gum dichromate are sometimes called emulsions. Some processes do not have emulsions, such as platinum, cyanotype, salted paper, or collotype.

Photographic printing: Is the process of producing a final image on paper for viewing, using chemically sensitized paper. The paper is exposed to a photographic negative, a positive transparency (or slide), the negative or transparency may be placed atop the paper and directly exposed, creating a contact print.

Scanning Electron Microscope with elemental analysis unit (SEM-EDX): It is non-destructive technique to study the surface and the components of the sample. A kind of high resolution microscopy where images are obtained by scanning the sample with an electron beam which gives information about the topology and electrical conductivity of the sample.

Attenuated Total Reflectance (ATR): An attachment to an IR spectrophotometer where the sample can be placed on a small crystal, often made of diamond, and examined as long as good contact between sample and crystal remains. This eliminates the need for sample preparation as long as one dimension of the sample is small enough to fit under the metal pin.

Ultraviolet-visible spectroscopy (UV-Vis): refers to absorption spectroscopy or reflectance spectroscopy in the ultraviolet-visible spectral region. This means it uses light in the visible and adjacent (near-UV and near-infrared [NIR]) ranges. The absorption or reflectance in the visible range directly affects the perceived colour of the chemical transitions.

APPENDIX B

INSTRUMENTAL ANALYSES PROCEDURES (DESCRIPTION AND LOCATION)

FTIR-ATR: The chemical characterization of sample was performed with a JASCO FTIR spectrometer 6100. Each spectrum was obtained in the transmission mode with TGS detectors and the rate of Scanner was 2mm/Sec. the spectra ranged from 4000 to 400 cm^{-1} with a resolution of 4 cm^{-1} . ATR "Attenuated total reflectance", at National Research Center, Spectroscopic Department.

Light Optical Microscope: Observation of samples was performed using a USB Microscope 300 \times , at Conservation Lab in Royal Vehicles Museum.

Stereo Microscope: Observation of samples was performed using Stereo Microscope with Camera: 240mm. Zoom Range: 0.68-4.5X. Model NO.: NXSP series. Specification: ISO, CE. HSCode: 8486402900. Magnification: 500-1000X. Number of Cylinder: Binoculars. Principle: Optics. Zoom Ratio: 1:6.6, at Conservation Lab in Royal Vehicles Museum.

SEM-EDX: Scanning electron microscope (EDX) signal unit was used. Using a SEM Quanta 250 FEG (field emission gun) model attached to an EDX (energy dispersive X-ray analytics) unit, with an acceleration voltage of 30 kV. , 14x magnification up to 1,000,000 and accuracy for Gun.1n), FEI Corporation, The Netherlands, at National Research Center, SEM Lab.

UV Fluorescence Lamp: Using in Documentation, portable UV torch (p-946-0160-12 led), at Conservation Lab in Royal Vehicles Museum.

Microbiological Test: Czapek's medium: it was used for isolation, maintenance and growth of fungal isolates, it has the following composition: Aldo environment agar, Cellulose environment agar, and Gelatin environment agar, at Research Center in the Ministry of Antiquities.

Portable scanner: Digitalizing the albumin photos of royal album using Scan in color at high resolution, up to 900DPI, JPEG and PDF output format, windows[®]xp, windows[®]7, windows[®]8, at Conservation Lab in Royal Vehicles Museum.

Data Luger: Measuring the temperature, relative humidity, light, and UV in surrounding aria using data Luger: ELSEC – 764 UV + Monitor. Serial No: 8920. www.elsec.com. Gutchpool Farm, Gillingham, Dorset SP8 5QP. United Kingdom, at Conservation Lab in Royal Vehicles Museum.