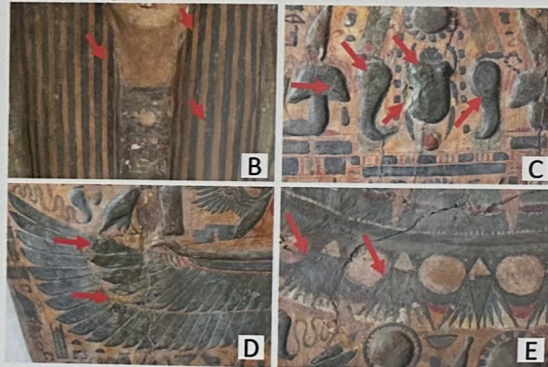


## Introduction

This study describes the results of a multi-technical analytical protocol applied on polychrome coffin lid from Bab El-Gasus tomb (second cachet) to distinguish between original and retouched parts. The coffin was moved to the Egyptian Museum (EM) and to Greco-Roman Museum. Just the coffin lid was moved to the Grand Egyptian Museum (GEM) with GEM no. 22452. Yellow coffins consist of a wooden support, mud layer, thick coarse preparation layer, fine preparation layer yellow background, pigments and finally a layer of varnish.

From naked eye investigation the upper part of the coffin lid especially the green and yellow stripped lines of the wig has differences on its appearance like pale and dark, and applied in an incorrect manner which is different from other stripped wig parts. Half of modeled scarab has a glossiness than other parts and the necklace decorative elements were applied without clear edges (Figure A). Retouched parts have a different texture of its surface (Figures B,C,D and E). All of these notes give indication about doubts about which is original and which is not.



## Green Shades

Two degrees of green color, dark and light were observed on the figures. Figures bodies were in dark green except women's bodies and crowns were colored with light green (Figure F).



## Materials and Methods

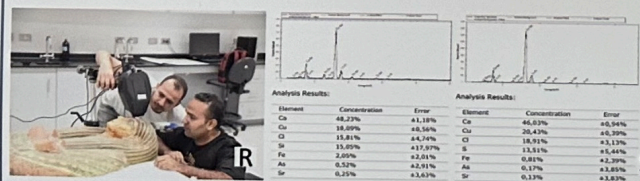
**Multispectral Imaging (MSI):** DSLR camera Nikon D810, Ultraviolet Fluorescence (UVF) performed with radiation of source 365nm black light. and Visible Induced Infrared Luminescence (VIL) performed with Filter IR 90 cut filter and radiation source white led lamp. Infrared False Color (IRFC) were performed by combining visible image and VIL image channels by computer software (Photoshop). **Reflectance Transformation Imaging (RTI):** Nikon D700 is performed with black spheres, Nikon Speedlight flash as light source. **X-Ray fluorescence (XRF):** analysis was conducted using a portable EDXRF spectrometer (Elio Spectrometer, Xglab srl, Milan, Italy) **Wood Identification:** OPTICA Light Microscope were used for wood section slides

## Results

**1- MSI:** UVF gives a clear mapping about distribution of added materials and also applied varnish layer distribution on the polychrome surface. The dark violet places give strong evidence of previous conservation work and shows that this coffin had been exposed to different treatment processes like using wax and repainting of different colors such as the blue color which is in the mask part and the orange color in the hands and chain which is totally retouched and appears as dark violet under UV. Hand, chest and the body of the god represent retouched areas (Figures G,H,I and J). VIL yielded a bright white luminescence which refers to the presence of Egyptian Blue (Fig. K,L,M and N). IRFC confirm VIL Images with comparing the appearance of dark green which represent Egyptian Blue. Egyptian Blue appeared in red color and malachite appeared in green color (Figures O,P and Q) (1). All of these results were compared and with XRF analysis.



**2- XRF:** Different representative spots of green were selected and investigated (Figure R). For Dark green color samples according to XRF spectrum is Egyptian blue, the elements that presented the highest concentrations were silicon (Si), copper (Cu), and calcium (Ca). This result provides evidence for the presence of copper-based pigment that is most likely Egyptian blue, calcium copper silicate (CaCuSi<sub>4</sub>O<sub>10</sub>). For light green From XRF analysis, the elements that presented the highest concentrations for some spots on the green painted layer were calcium (Ca) and copper (Cu). This result provides the possibility for the presence of malachite basic copper (II) carbonate 2 CuCO<sub>3</sub>·Cu(OH)<sub>2</sub> (Figure S and S).



**3- RTI:** Using RTI and analyzing photos with various filters revealed broad brushstrokes in the ground layers of the coffins (Figure T), suggesting that the white under-layers were not burnished before applying colored decoration. These brushstrokes, approximately 4 cm wide, form scattered half-circular patterns, resembling modern paint application techniques. They are particularly visible in specular mode (Figure U) due to the use of coarse pigments and a water-based binding medium, which prevent the formation of a smooth film upon drying. Finer lines, likely made with fine brushes and hollow pens, are discernible with normal visualization filters (Figure V). The specular filter also highlights the grainy surface and thickness inconsistencies of the yellow painted layer (Figure W).



**3- Wood Identification:** Fragmentary wooden samples were sectioned for microscopic slides (cross section or transverse, tangential and radial section) and observed (Figure X,Y and Z). *Ficus sycomorus* was identified as the wooden support.



## Conclusion :

Multispectral Imaging results were helpful for distinguishing between retouched and original parts.

## Acknowledgment:

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