

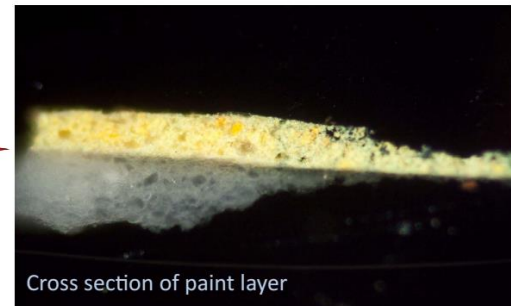
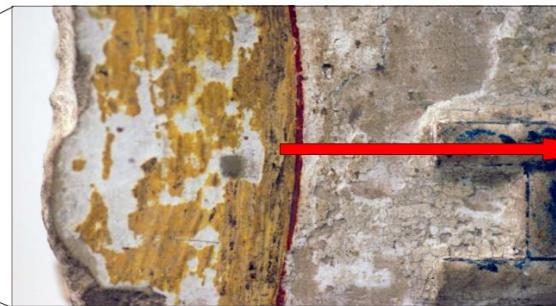


# Chemical analyses proving the use of lead in a 26<sup>th</sup> Dynasty painted fragment from the Palace of Apries in the Ny Carlsberg Glyptotek, Copenhagen

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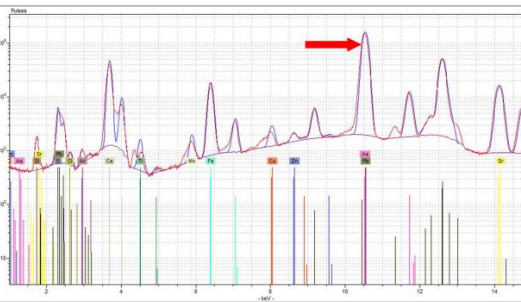
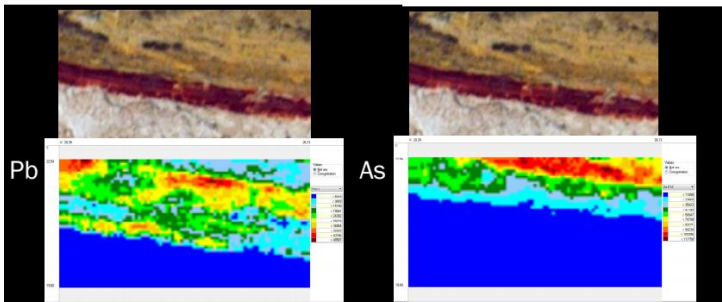
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Flinders Petrie's excavations at the north end of Memphis in 1909 unearthed remains of the royal palace of Apries from the 26<sup>th</sup> Dynasty, 589–568 BCE. That same year the Glyptotek in Copenhagen received a number of painted limestone relief fragments belonging to the palace (Bagh 2011). Unfortunately Petrie gave no details as to where in the palace the fragments were found and the original setting remains today unknown. However, it is safe to say that they are pieces of a monumental wall decoration that could have adorned the great gate of the palace.



### Is there Pb, As, or Pb+As in the yellow paint layer ?

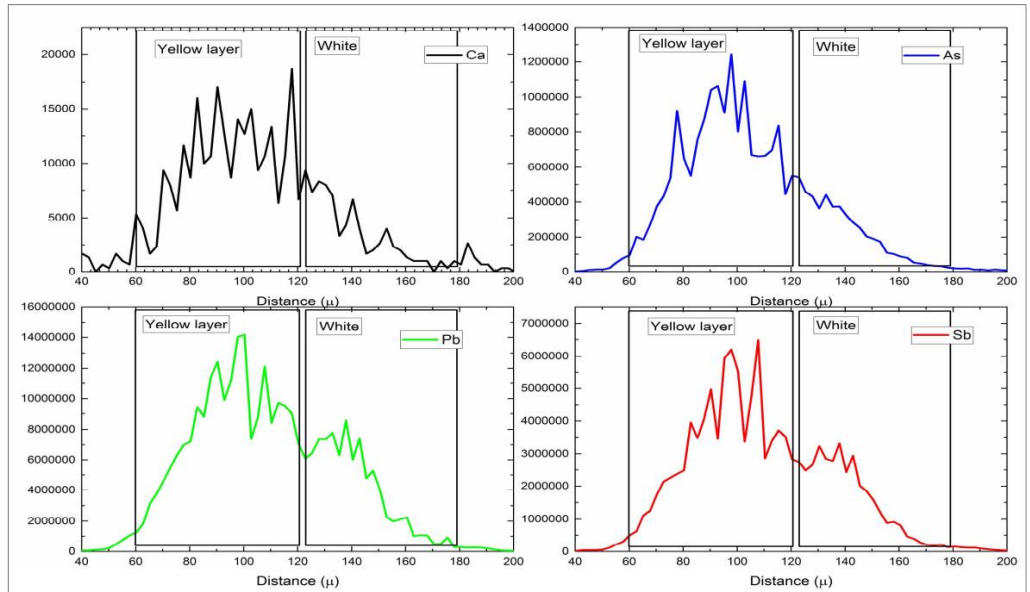
Analyses were performed with non-destructive ARTAX-800 micro-XRF from Bruker with a spatial resolution of 70 micrometres. In the data acquired on the yellow paint layer the K-alpha line of As overlaps with the L-alpha line of Pb, but in this case the instrument was equipped with a Mo X-ray tube causing a further overlap, this time with the S K-alpha line, the Mo K-alpha line and the Pb M-alpha line. The XRF data therefore leaves the identification of Pb uncertain.



K-alpha line of As overlaps with the L-alpha line of Pb

### LA-ICP-MS analysis of a cross section of the paint layer

The issue was resolved using LA-ICP-MS on a mounted and polished cross section, which showed beyond any doubt the presence of Pb, As and Sb simultaneously.



We used a Jena/Bruker M90 Aurora ICP-MS with a CETAC LS-213 Laser Ablation input operated at 10 Hz and 85 % laser power. The data are not yet quantified. The data shown are for the isotopes Ca44, As75, Sb121, and Pb208.

**Conclusion:** Even though the XRF is unable to resolve the issue, there is indeed Pb, As and Sb in the yellow colour pigment.

**Reference:** Bagh, T. (2011). 'Finds from W. M. F. Petrie's Excavations in Egypt in the Ny Carlsberg Glyptotek' in *Meddelelser fra Ny Carlsberg Glyptotek*. No. 13 Copenhagen: 37–43.