

The restoration of a helmet belonging to the Rouen Museum of Antiquities allowed an in-depth study at the Centre de Recherche et de Restauration des Musées de France. The techniques used, such as radiography, CT scan and X-Ray fluorescence mapping, coupled with iconographic and archival research, allowed us to uncover the material history of this object, which was modified during a highly interventionist restoration.

Fig.1: The radiographic study of the helmet, made up of shots taken from different angles, gives us information on the material condition of the object:

- Evaluation of the state of degradation of the original fragments
- Location of the restoration from 1965 (fill and re-assembly)
- Implementation of the fill, which integrates original fragments of various sizes with modern metal shards.

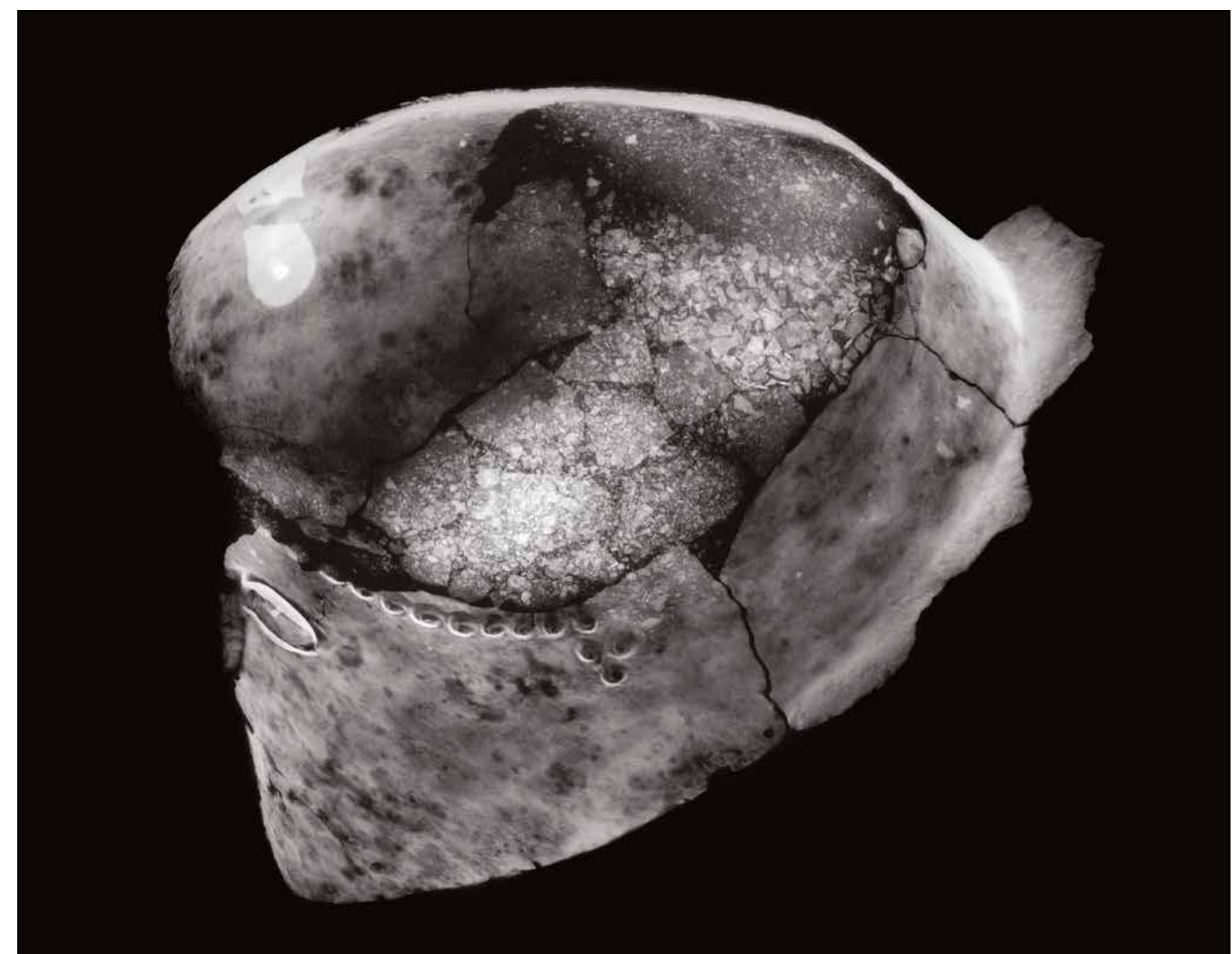


Fig.1 : 3/4 top x-ray ©C2RMF, E.Lambert

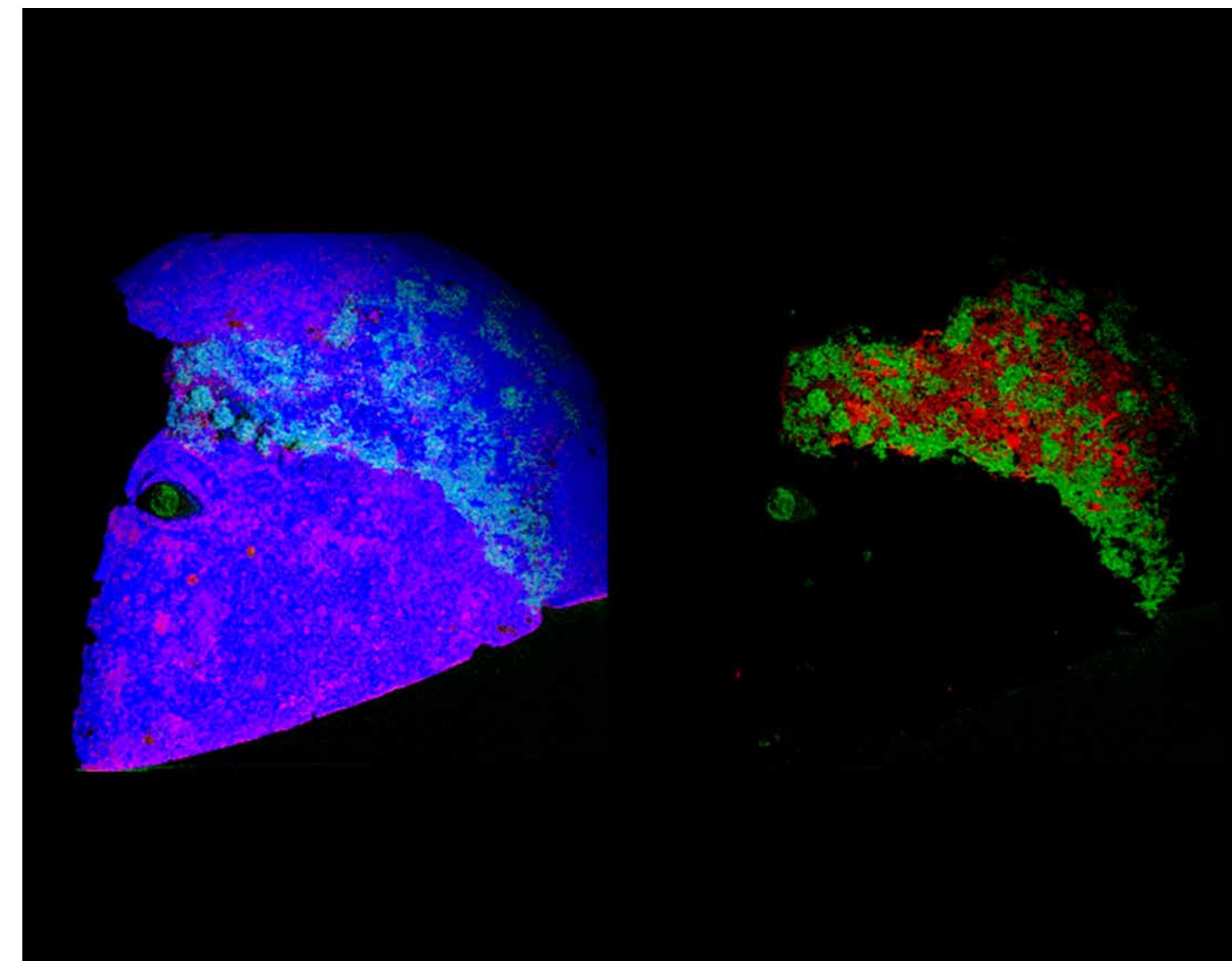


Fig.2 : XRF mapping, the two maps presented are generated from a series of 234 images ©C2RMF, E.Laval

Fig.2: XRF mapping has been carried out to see the distribution of elements on the surface.

It provides information about the composition of the original materials and the ones used for restoration. For example :

- The left image shows in blue the distribution of copper and in pink that of tin present in the original alloy,
- In the picture on right picture, the lead used in the retouching of the fill is shown in green. The zinc, in red, probably indicates a modern brass filler.



Fig.3 : Tomographic cross-section ©C2RMF, E.Lambert



Helmet of Rouen ©C2RMF, A.Chauvet



Fig.5 : Crest attachment detail ©C2RMF, A. Chauvet

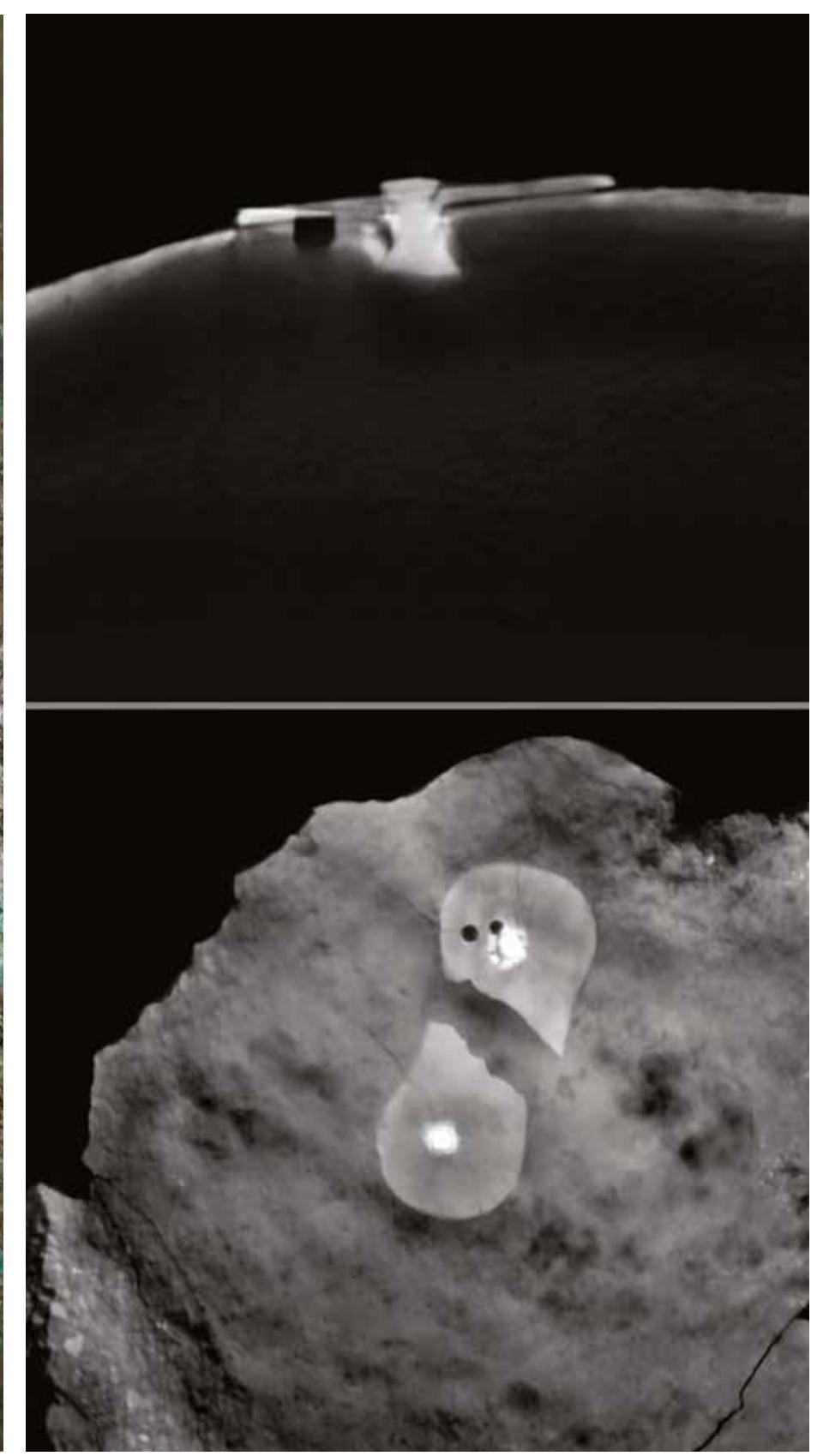


Fig.6 : CT Scan of the crest attachment ©C2RMF, E.Lambert

Fig.3: In addition to the X-rays, X-ray tomography was performed at the c2rmf :

- 720 images were made with a 420kV X-ray tube in order to reconstruct a 3D volume of the helmet.
- The cross-sectional view of the helmet allows, for example, to observe the stratigraphy of the polyester resin fill. The stratigraphy is composed as follows (from bottom to top): a textile reinforcement, original fragments, modern brass crumbs and an illusionist polychromy.



Fig.4 : Apulo-corinthian helmet of museo Jatta, Bari ©

Fig.4: The Rouen helmet is very similar to that from the tomb of Campanale Stragapede at Ruvo di Puglia (figure on the left) dating from the late 5th century BC. The inlays of the eyes on these helmets is quite rare.

- Apulo-corinthian helmets were influenced by Corinthian helmets but designed to be worn as a cap (like some Pericles figures). They did not cover the face. Over time, the shape of the Corinthian type was closed, leaving a face-shaped decoration.
- The presence of a short neck guard and a frontal carina is characteristic.
- Unfortunately, the re-assembly done in 1965 following an unfortunate de-restoration did not take into account the original shape.



Fig.7 : detail of the inlaid eye ©C2RMF, A.Chauvet

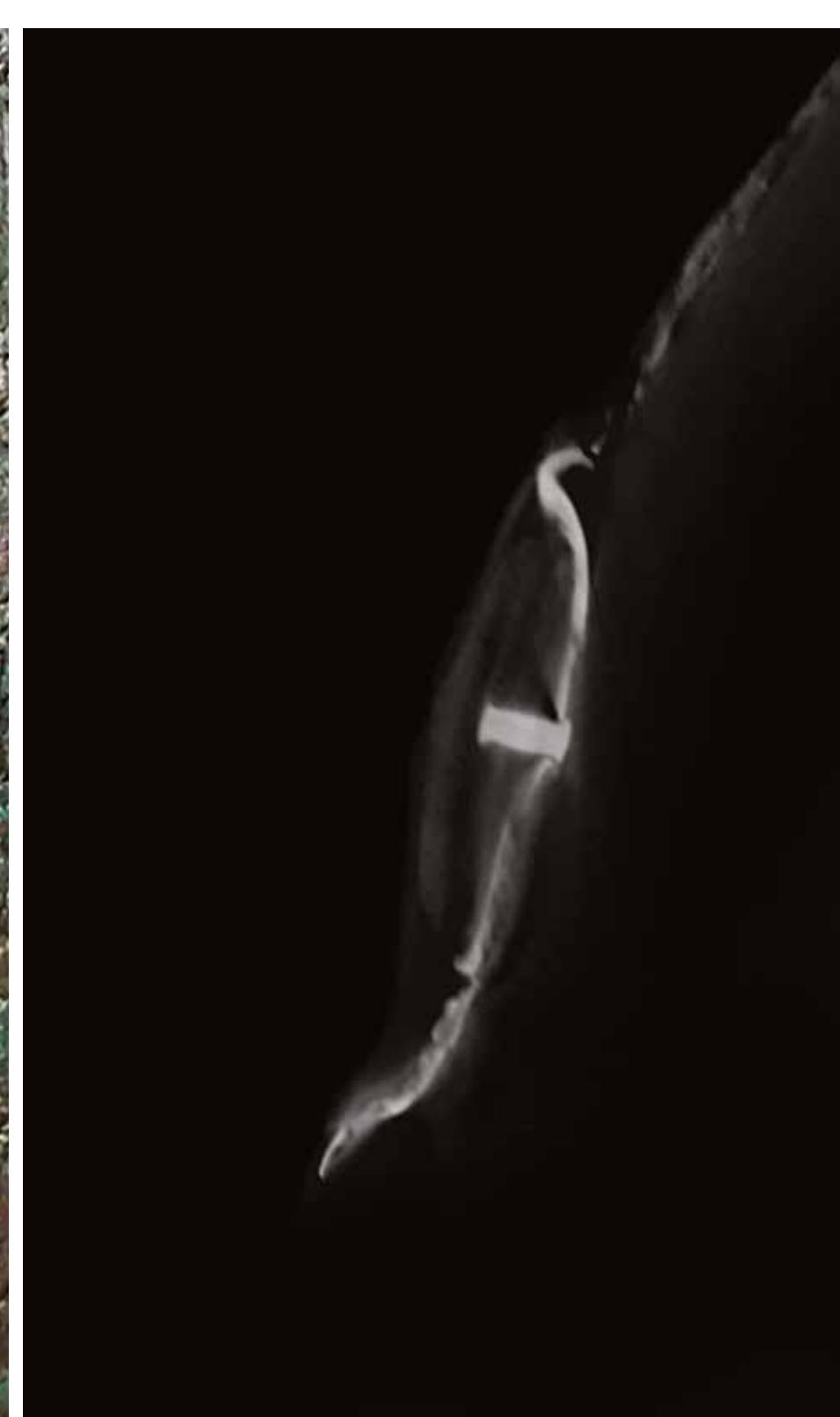


Fig.8 : Tomographic cross-section of the inlaid eye ©C2RMF, E.Lambert

Fig.5 et 6:

- The older rivet holes under the crest attachment suggests a repair that attests to the functional role of the helmet.

Fig.7 et 8:

- A metal rivet inserted halfway through the sclera of the bony eye holds it to the bronze wall.
- Microscopic observation and Proton-induced X-ray emission (PIXE) analysis of the eye showed that the sclera is made of bone and the iris is composed of a mortar probably coated with a carbon black paint mixed with a lead oxide filler.

The information obtained through a multidisciplinary study conducted at the C2RMF provided a new interpretation of this helmet. Indeed, the Rouen helmet had been presented since 1840 as a Corinthian helmet with an enamelled ivory eye inlaid in the bronze. However, typological studies, which completed the C2RMF's material study, have shown that it is in fact an Apulo-Corinthian helmet produced in southern Italy in the second half of the 5th century BC. The combination of imaging techniques used to carry out this preliminary study has provided valuable information on the material history of this helmet. The results of this research have given rise to a scientific and pedagogic valorization of this object, which until now was little documented.