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Characterising the unique polychrome sinopia under the Lod Mosaic, Israel: pigments and painting technique

Rebecca Piovesan [a,*], Lara Maritan [a], Jacques Neguer [b]

[a] Dipartimento di Geoscienze, Università degli studi di Padova, Via Gradenigo 6, 35131 Padova, Italy
[b] Conservation Department, Israel Antiquities Authority, Rockefeller Museum Building, POB 586, 91004 Jerusalem, Israel

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ABSTRACT

A sinopia, usually a monochrome preparatory drawing made on a mortar substrate, was used in the Graeco-Roman world either as a base for frescoes or to facilitate the application of coloured mosaic tesserae on walls or floors. In 2009, during the detachment of the Lod Mosaic (Israel), an unexpected and, for the Classical Roman era, a unique, polychrome sinopia was revealed under one of the floor panels. The palette of colours includes red and yellow ochre, green earth, carbon black and the valuable red pigment cinnabar, all applied with the fresco technique, as attested by microstratigraphy.

1. Introduction

In Ancient Greece and the Roman world, a sinopia, or preparatory drawing, was frequently used as a guide, before coloured mosaic tesserae were applied to walls and floors. This technique was largely used until the sixteenth century, when it was gradually replaced by other preparatory techniques. In the Classical era, a typical sinopia was drawn with only one pigment, mainly red ochre or carbon black (Eastaugh et al., 2008; Roncuzzi and Fiorentini, 2002). In the same period, polychrome sinopiae were used mainly in Hellenistic art and particularly in the preparation of *emblemata*, precious mosaic central panels pre-created through the *opus vermiculatum* technique by skilled craftsmen in refined workshops, and later inserted into wider floors or walls (Roncuzzi and Fiorentini, 2002). In 2009, the finding of a polychrome sinopia during the lifting of the Roman mosaic of Lod, 20 km south-east of Tel Aviv (Israel, the ancient Roman province of *Syria Palestina*) was therefore unique, and was a doubly extraordinary discovery in the history of classical art, for both the presence and the polychromatism of its drawing.

The Roman mosaic from Lod, one of the most beautiful and famous pavements of the Roman Empire, was fortuitously discovered in 1996 and excavated by the Israel Antiquities Authority (Avissar, 1998). The sinopia appears only under one panel (412 × 169 cm), depicting a marine scene, with fishes and ships (Fig. 1), on the very well-preserved wide floor (about 150 m^2) of the imposing Roman villa of Lod (IV century AD) (Haddad and Avissar, 2003; Haddad, 2004). The ichnography of the scene indicates that the owner of the villa was a rich merchant who probably reached his position thanks to maritime trade.

Despite its finesse and accuracy, several characteristics of the panel depicting fishes indicate beyond doubt that this is not an *emblemata* panel. First of all, the dimensions of the tesserae (from 5 to 10 mm in length) are oversized; in real *emblemata* tesserae are extremely minute, with a density of 63 tesserae per square centimetre, which means a length of no more than 4 mm per side (Roncuzzi and Fiorentini, 2002). Secondly, macroscopic analysis of the mortar shows the presence of joints in the highest and finest preparatory layer (*sovranucleus*), indicating daily applications of mortar (*giornata*), a method peculiar of the on-site creation of a mosaic; the fish panel clearly belongs to one of these *giornata* wider than its dimension and enclosing almost all the northern area of the floor. All this information indicates that the panel was not set in place separately. In addition, the sinopia was embedded precisely on the top of the *sovranucleus* (which shows no hiatus

* Corresponding author. Tel. +39 049 8279143; fax +39 049 8279134.
E-mail addresses: rebecca.piovesan@unipd.it, rebecca.piovesan@gmail.com (R. Piovesan).

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Fig. 1. The Lod mosaic: a) fish panel; b) bird panel.

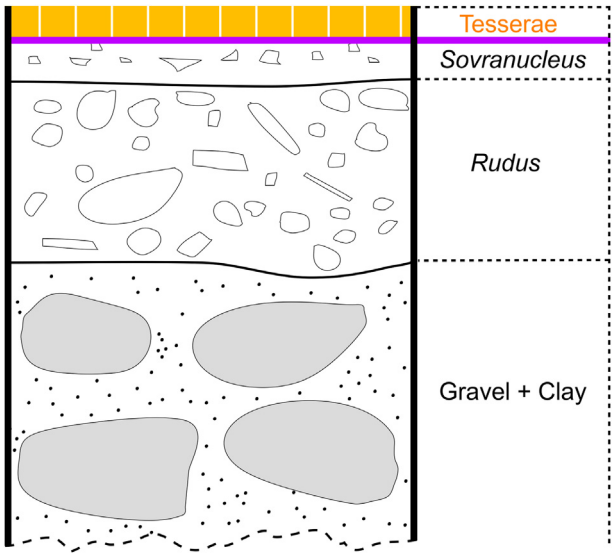

Fig. 2. Stratigraphy of Lod mosaic floor. Red line: position of synopia painting. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

with the adjacent portions of mosaic) and at the base of the tesserae (Fig 2).

The main aims of this study were to characterise the red, green, yellow and black pigments (Fig. 3a–c) adopted to prepare the rare polychrome sinopia, and to define the microstratigraphy of the paint. In particular the latter will supply information on the technique used to paint the sketch, and in particular verify whether it was originally created as a fresco.

2. Materials and methods

A set of 7 fragments of *sovranucleus* in four colours (red, yellow, green, black) was selected from the fish panel polychrome sinopia (Fig. 3d–i), and 1 from the red-monochrome sinopia found under another panel, depicting several species of birds, in the southern area of the floor (Fig. 1). In the latest sample, the red pigment was concentrated inside a lead strip a few millimetres thick, suggesting that a pointed tool or a string, coloured with red pigment, was pressed on the fresh mortar to create a sketch to guide the arrangement of the tesserae (Fig. 3l).

Macroscopic observations indicate the classical stratigraphy of Roman mosaics, as described by Vitruvius in the first century BC (Vitruvius, 2001). It was formed of a thick preparatory layer of gravel and clay, used to level the ground and to form a solid base for the floor; this was then covered by a *rudus*, a layer of rough mortar, in turn covered by a *sovranucleus*, a layer of finer mortar; the sinopia was painted on this layer, and lastly the tesserae were emplaced (Fig. 2).