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Between sculpture and painting: the relief frescoes of Knossos as perception technology

ABSTRACT

The relief frescoes of Knossos mark a revolution in the decoration of architectural spaces, in which the painter's brushes interact with the sculptor's tools to create new textures and visual experiences. Their poor state of preservation, however, makes studying them a challenging task. While earlier scholarship on the Knossian examples extensively examined their dating, subject matter, and spatial distribution, this study explores some technical aspects of relief painting and what they might have allowed makers/viewers to achieve. Plasticity, volume, and colour were crucial in the making of these works. We argue that by adding texture and depth, the relief decoration that was popular across different media and materials during the Neopalatial and Final palatial periods at Knossos expanded the spectrum of perceptibility and allusion at a time when such concerns were most pronounced.

KEYWORDS: Knossos, wall painting, sculpture, relief frescoes, technology, perception, Aegean, art, colours, impasto, incavo, stiacciato, Neopalatial, Final Palatial

INTRODUCTION

Relief frescoes are considered iconic of Knossian art because of the large number of fragments known from the site.¹ While many more sites have now been added to the list of those with relief painting in the Aegean, and the dating of the earliest figural relief representations have come under scrutiny,² the Knossian corpus remains one of the most remarkable in terms of breadth, and hence one of the most important for understanding Aegean relief painting. From the time of their first discovery by Arthur Evans and his team, early scholarship focused extensively on identifying the subject matter and spatial distribution of the paintings. Instead, this study wishes to explore some technical aspects of relief painting and what they might have allowed makers/viewers to achieve. Since the studies of Mark Cameron and Bernd Kaiser in the 1960s and early 1970s, very little work has been carried out on the technologies of relief frescoes. A particularly

¹ Kaiser 1976; Shaw 1998; Blakolmer 2001; 2006; 2010; 2018. Earlier studies: Müller 1915; Sapouna-Sakellarakis 1969.

² Haysom 2018.

welcome starting point is thus provided by the works of Richard Jones and Effie Photos-Jones on Minoan paintings and of Ann Brysbaert and of Constance von Rüden on painted plaster, including the relief fragments from Tell el-Dab'a in the Nile Delta.³

Despite the numerous Knossian examples available for study, none is preserved intact – all the relief frescoes have come down to us in fragments.⁴ Study and interpretation of them is further complicated by their condition, often accompanied by limited archaeological documentation and a problematic state of preservation. We know that from early on Evans employed skilled workers and specialists to assist with the removal, storage, and conservation of painted fragments, with Émile Gilliéron père et fils forming the most celebrated partnership. While some effort was made to apply principles and rules to early conservation of the fragments so as to restore and present them to the public (drawing a clear distinction between originals and representations),⁵ the desire to recreate complete compositions was stronger than the fragmentary state of the reliefs. This goal resulted in numerous problematic reconstructions and misinterpretations, even at the level of the fragments' orientation within a composition.

Visitors to the Heraklion Archaeological Museum can see a few of the most renowned but heavily restored relief frescoes, such as the Priest-King ('Prince with Lilies'), the Bull Relief, and the Tethered Griffins. We know, for example, that there were several iterations in the reconstruction of the Priest-King before it acquired its present form.⁶ In the Charging Bull Relief, discovered in 1900 in fragments over an area to the north of the Central Court (North Entrance Passage), the dimensions of the fresco seem to have changed over time, especially when new fragments were added to the horns. In its current display at the museum, the horns are set at an angle of 45° in relation to the top of the head, whereas in the 1930s reconstruction at Knossos they are shown thrusting forwards.⁷ Evans hailed the Bull Relief as "one of the noblest revelations of Minoan art"⁸ and was convinced that it must have decorated a monumental portico flanking the west end of the North Entrance Passage. It was on this basis that a replica of Evans's restoration was placed in a re-created portico there in 1930. Regardless of its exact placement, however, like many other similarly bull-related frescoes, this large-scale relief depicting either a bull capture or a bull-leaping scene appears to be associated with one of the axes leading to the central court. In this respect, it may have signposted activities that potentially took place in the area.⁹

³ Jones and Photos-Jones 2005; Brysbaert 2008; von Rüden 2015; von Rüden and Skowronek 2018.

⁴ Akrotiri is an exception in that fuller representations including relief elements are preserved, e.g., the rosette and lozenges relief fresco from Xeste 3 (Doulas 1992, 174-175, figs. 136-137; Blakolmer 2018, with additional references). Relief fragments earlier than the final destruction are mentioned (Blakolmer 2006, 10, n. 4 with references). The full publication of all known examples from Akrotiri is a desideratum.

⁵ Blakolmer 2010.

⁶ Sherratt 2000; 2005. For the most important attempts to reconstruct this figure see Evans 1930, 497-515, who used the fragments to reconstruct an 'East Hall' decorated with relief frescoes. Also, Coulomb 1979; Niemeier 1987; 1988; Shaw 2004; Tsitsa 2018, 418-419 for additional technical considerations.

⁷ Evans 1930, 158-177; Shaw 1995; Blakolmer 2010. This reconstruction was based on the work of Gilliéron père. It was also displayed at the 1936 Royal Academy of Arts exhibition in London (Galanakis 2015 and Evans Fresco Drawings P/1a, A.J. Evans Archive, Ashmolean Museum, University of Oxford). On the north entrance passage see Hood 2005, 56-58 with additional bibliography. Also, Kaiser's reconstruction 1976, pl. 35. On the restoration see Kriga 2018; Tsitsa 2018, 423.

⁸ Evans 1930, 172.

⁹ Shapland 2022, 93 with further discussion.

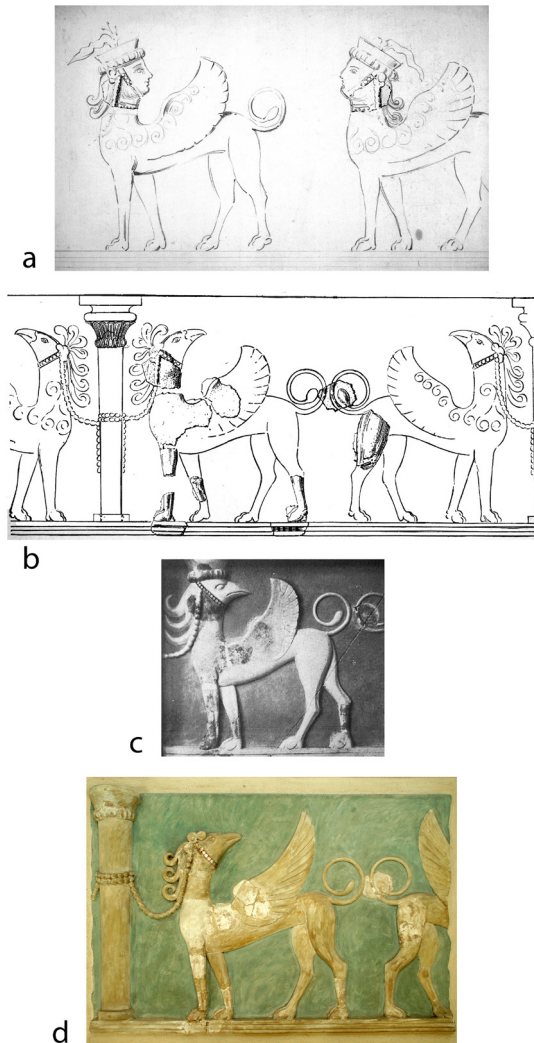


Fig. 1. a) Pencil and ink sketch showing fragments of the Griffin Relief in their original restoration by E. Gilliéron père as two sphinxes walking to the left; b) the same frieze as reconstructed for final publication (Evans 1930, fig. 355); c) reconstruction on display in the Heraklion Museum in the 1950s (Platon 1955, pl. XI.2); d) the current reconstruction on display. © A. J. Evans Archive, Ashmolean Museum, University of Oxford & Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development (AMH T31).

What has become known as the ‘Relief Frieze with Griffins Tethered to Columns’ offers an instructive example of the troubled conservation and reconstruction histories of the Knossian reliefs.¹⁰ The fragments – some executed almost in the round – were found in 1901 in the fill above the North-South corridor in Evans’ conjectured East Hall (north of the Domestic Quarter), and were the subject of several restoration drawings by Gilliéron père. Evans initially identified some of the fragments as portions of the forepart of a sphinx – an interpretation that persisted almost to the time of final publication, judging from Gilliéron’s drawing produced in preparation for the *Palace of Minos*

(Fig. 1a).¹¹ The other restoration drawings were based on representations of tethered griffins known from signet rings and seals (Fig. 1b).¹² Yet the version that was on display in Heraklion at least until the 1960s combined elements from Gilliéron père’s various restorations (Fig. 1c). For example, the crest of the griffin is formed by what Evans later understood to be a capital from a “Minoan palm column”.¹³ The orientation of the head was also different, like the sphinx restoration by Gilliéron. Similar differences can be noted in the crest, plumage, and mane as well as the position of the back legs. Crucially, the fragment where the tails of the two griffins supposedly came side by side, according to Evans’s publication, preserves traces of only one

¹⁰ Cameron 1976, vol. III, 164-165; Kaiser 1976, 279-282; Hood 2005, 75-76.

¹¹ Evans Fresco Drawings Q/2a, A.J. Evans Archive, Ashmolean Museum, University of Oxford.

¹² Evans Fresco Drawings Q/1, Q/2, Q/3, A.J. Evans Archive, Ashmolean Museum, University of Oxford.

¹³ Evans 1930, 513, fig. 358. While four pairs of light vertical incisions are still visible on the so-called “palm capital”, Evans’s reconstruction is conjectural, and this fragment may not even refer to a “palm”. The necking of the capital resembles that found on primarily ovoid and conical rhyta in clay, stone, and faience (e.g., Koehl 2006, nos. 204, 207, 279-280, 545, 561).

griffin's tail – evidence that Gilliéron seems to have taken into consideration in his sphinx restoration drawing, but which was ignored by Evans.¹⁴ Under Nikolaos Platon's instructions, the painter Thomas Fanourakis and the young artist Kostis Petrakis remodelled the fragments in the early 1960s to make the tethered griffin panels agree more, though not entirely, with Evans's published version (Fig. 1d).¹⁵

Given the interest scholarship has shown in these reliefs and the problems they present, this paper adopts a technical approach. By examining some carefully selected examples, we discuss the interrelationship between flat and relief wall paintings and what this might tell us about the making and perception of relief representations in the late Neopalatial and Final Palatial periods. In this respect, we approach relief frescoes as one of the technologies of perception available at the time. We argue that by adding texture and depth, relief decoration helped to further naturalise the built environment, thus increasing the spectrum of perceptibility and allusion at a time when both were needed the most, at least at Knossos.

FROM FLAT TO RELIEF PAINTING: TECHNICAL CONSIDERATIONS

The process of creating wall paintings follows similar steps in different cultures and time periods over thousands of years. Clearly, however, what is to be painted varies significantly, as do certain technical choices and preferences. These three elements combine to create a framework which can be used to distinguish modes of operation in ancient painting. In Minoan times, for example, the aggregates and the binder (lime) were prepared in appropriate proportions to create the plaster.¹⁶ In several areas at Knossos, a layer of mud plaster was initially applied to the masonry, where traces of straw can still be seen (Fig. 2a). Remains of mud plaster are preserved on the back of some painted fragments, as well as in situ in a few areas of the site. However, mud plaster is not a rule for the substrate: at Knossos, in the few places where small fresco fragments still survive in situ, no such layer has been detected beneath them, and only lime plaster can be observed. Following preparation of the wall, successive layers of coarse plaster were applied

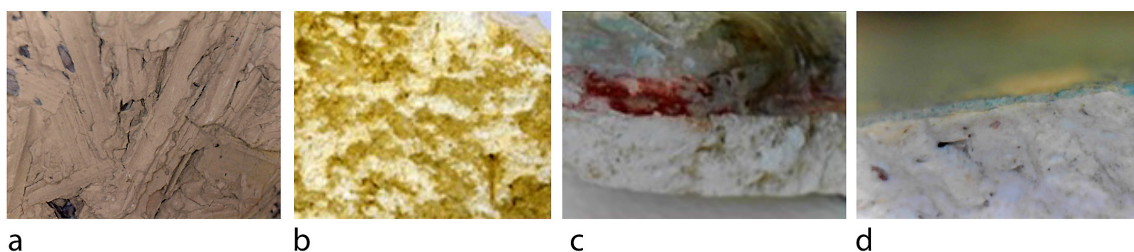


Fig. 2. Layers in a Minoan wall painting: a) mud plaster with straw impressions; b) coarse lime plaster; c-d) fine lime plaster followed on the uppermost surface by the pigment layer(s). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

¹⁴ Evans (1930, 511, figs. 360-361) was influenced by a signet ring and a sealstone from Mycenae showing two heraldically opposed griffins.

¹⁵ Platon 1960, 505; 1961-62, 282; Tsitsa 2018, 422-423.

¹⁶ Aggregates are important, as they can regulate the weight of the relief, avoid cracks in the surface, and either speed up or postpone the plaster's setting process (von Rüden and Skowronek 2018, 215). This contrasts with Heaton's original observation that Minoan plaster contains a low amount of aggregates (Heaton 1911, 699 – his observation is not a "rule"); see also Cameron et al. 1977.

(Fig. 2b), with the final, often thin, layer being fine-grained (Fig. 2c). It was to this last layer that the pigments were applied (Fig. 2d).¹⁷

Some techniques that form the focus of our approach here were either limited to Crete or occur there with greater frequency, namely the *incavo* and *impasto* techniques alone or combined, as well as the practice of incising and painting in relief. Brief reference to portable plaster objects is also made here for comparison. The level of interrelationships revealed between flat and relief frescoes and between painting and sculpture suggest direct know-how transfer between different crafts, with specialists most likely working closely together.

INCAVO

One of the special techniques employed by the Cretan Bronze Age craftsman to flat frescoes was *incavo*,¹⁸ which involves cutting away part of the still-damp plaster and filling in the created cavities with another, differently coloured plaster to create a strong contrast. The latter infilling process is called *impasto* (more below). The cavity is usually a few millimetres deep. A typical early example of *incavo* with *impasto* is the floor decorated with quatrefoil patterns from Phaistos, dating to Middle Minoan II-III (Figs 3-4a).¹⁹ It is a technique with time constraints: for good adhesion to be achieved between the two differently coloured plasters, the cavity needs to be relatively damp, but not too much so, allowing the fill-in plaster to be applied without without altering the shape of the cavity or diffusing into the colour of the background. The fragments



Fig. 3. Meanders with *incavo* and *impasto*, floor section, Chalara, Phaistos (Tziraki 2019, 167, fig. 83). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development (AMH T78).

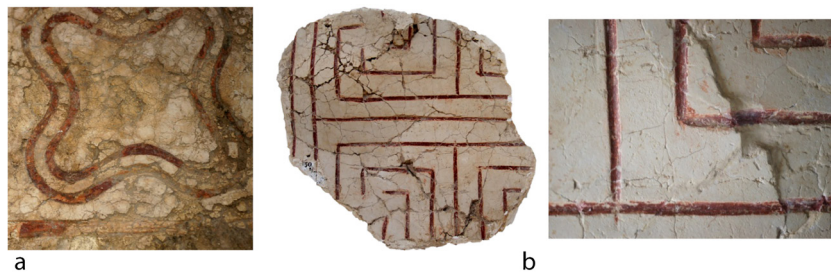


Fig. 4. a) *Incavo* and *impasto* technique on a floor from Phaistos (AMH T55); b) the “Labyrinth Dado” fresco from Knossos (including detail on the right) with *incavo* but without *impasto* (AMH T50). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

¹⁷ Evely 1999, 152-163; Brysbaert 2008.

¹⁸ Cameron 1976, vol. I, 290 (a “special technique”); Immerwahr 1990, 206-207, n. 12; Evely 1999, 163.

¹⁹ Militello and Palio 2001; Tziraki 2019, 167. According to Immerwahr (1990, 207, n. 12), this technique was used especially for floors. Also, Evely 1999, 163 where it is observed that some of the *incavo* work may have been used to mask mistakes (e.g., the yellow floor in a house on the Royal Road: Cameron 1976, vol. I, 214).

of the so-called 'Labyrinth dado' fresco from the East Wing of the palace at Knossos,²⁰ attributed to Middle Minoan III, offer an interesting use of *incavo* (Fig. 3b): here the technique is not accompanied by *impasto*. In other words, there is no in-filling of the cavities. Instead, red colour was directly applied to the small cavities to further accentuate the incision. Each one is V-shaped in section and in this respect different from the Phaistian examples (where it is U-shaped), at a width of just 2-4 mm, and shallow (ca. 2 mm). Microscopic examination revealed fine strokes of red colour in the cavity, which end right on the edge of the flat white surface of the plaster.

IMPASTO

As noted above, *incavo* and *impasto* are occasionally combined. But just as in the case of the Labyrinth fresco, where only *incavo* was used, there is also the application of *impasto* directly on the painted surface to create a micro-relief impression of minimal thickness (Fig. 5). In a small fragment of late Neopalatial or Final palatial date from Knossos, a thin layer of white *impasto* was applied to the orange-coloured painted (background) surface.²¹ On the white *impasto*, and before it dried, red nails were created with fine brushstrokes. The different fingers are outlined in thin red. Paint of the same colour was also used to highlight each finger's contour, thus distinguishing them more clearly from each other and the painted background.²²



Fig. 5. Two fingers of a woman with red nails from Knossos (max L: 6cm) (AMH T83).

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INCISING

Incised lines have been observed in many Minoan frescoes, including miniature examples, mainly on bands around the perimeter though also on architectural elements. These incisions are different from the guiding lines that were created by stretched threads, and which were meant to delimit a frame in a composition in Aegean painting.²³ A good example of this technique comes from the West Porch, where part of a fragment including a bovine hoof was found in situ, possibly dating to the Final Palatial period (Fig. 6).²⁴ Although it was well preserved, Evans erroneously described it in the *Palace of Minos* as set on a white background rather than the

²⁰ Hood 2005; Shaw 2012.

²¹ Cameron et al. 1977, where it is noted that this infilling was carried out when the background plaster was still soft. For areas indented in the plaster see also Brysbaert 2008, 117.

²² For colour on nails see the Adorants and Saffron-gatherers from Xeste 3 at Akrotiri (Doulas 1992, 141, fig. 104).

²³ Incisions were also made to create a grid: Egan 2015; Shaw 2016; Kriga 2018.

²⁴ Evans 1928, 674-678; Cameron 1976, vol. I, 673-674; Hood 2005, 66. Evans noted two underlying layers with "sufficient traces to show that the bulls (sic) represented were in violent action like that of the Tiryns fresco" with a further explanation that "the successive layers of painted stucco were only about 1 centimetre thick and were formed of very pure lime plaster. Behind this was a solid backing of clay plaster 7 cm thick" (Evans 1928, 676). These observations cannot be confirmed, however, as the painting is now encased in plaster.

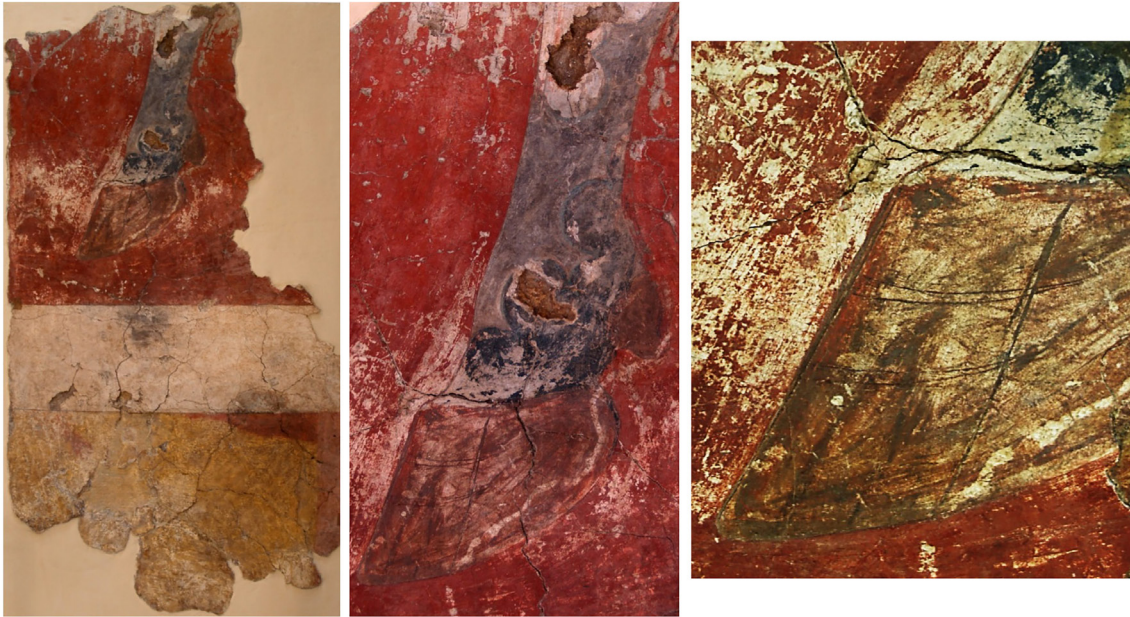


Fig. 6. A fragment from the West Porch (left, full view, centre & right, details). Incised lines can be observed on the outline of the bovine's leg (centre & right) and in the form of curved triangles inside the hoof (AMH T1). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

actual red one;²⁵ he also attributed it to a charging bull, but the hoof's position in relation to the baseline (white band) and dado imitating slabs of veined stone below would agree more with an animal that is recumbent, making an effort to stand or moving slightly (as also known from representations on rings, seals and other media).²⁶

The outline on the leg and hoof of the bovine was probably incised to separate the application of pigments, because incision lines are also to be found between the brown hoof and the grey leg. However, this instance also features a succession of additional, hitherto overlooked, curved incisions inside the hoof, adding texture to augment perspective and an illusion of depth to a curved shape such as the animal's hoof.²⁷

INCAVO, IMPASTO, INCISING AND PAINTING

The well-known 'Lillies' panel from Amnissos, dating to the late Neopalatial period,²⁸ is a leading example of how different techniques were combined in Minoan painting (Fig. 7). The peculiarity of this painting lies in the fact that the removal of plaster with the incavo technique here creates an entire composition not just limited to simple geometric shapes, as noted in the cases mentioned above. The buds, flowers, stamens and even flower stalks are excised from plaster and refilled with impasto pigment.²⁹ The depth of each cavity is limited, which may in part explain the loss of whitish impasto. What we see today is the sub-layer of white plaster

²⁵ Evans 1928, 676.

²⁶ The suggestion that this is a recumbent animal is also made by Shapland (2022, 94, with references).

²⁷ Tsitsa and Savou 2012, 202, figs 6-7 (these incisions were not visible prior to conservation due to incrustations).

²⁸ Cameron 1976, vol. III, 92; Tsitsa 2018, 408-409.

²⁹ Cameron 1976, vol. II, pl. 157A.



Fig. 7. The Amnissos “Lily panel”, where different techniques are combined in a composition (AMH T15).
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under the red background colour. The strong white colour represents the loss of impasto, which – wherever it is still preserved (only in very few cavities) – is whitish grey.

The Amnissos painting is the only complete representation we are aware of that combines all these different techniques. The dark leaves at the base of the lily stems, the red background, and the horizontal bands have all been painted with a brush, and display no signs of the incavo technique. Only fine incisions are observed, possibly with a sharp tool, which delimit the different colours on the geometric elements of the background. The combination of different incavo, impasto, fine incising, and brush painting techniques in one composition makes this a remarkable example of what painters were capable of during this period – one which also witnessed a surge in relief frescoes at and around Knossos.

ESTABLISHING COMMON TECHNICAL KNOW-HOW IN FLAT AND RELIEF PAINTING

Although modern scholars researching relief frescoes have placed emphasis on the representation of human and bovine forms, Minoan relief painting actually encompasses a range of themes also observed in two-dimensional, flat, wall or floor paintings: decorative compositions (bands, spirals, geometric elements), animals (real or imaginary), the environment (plants and colourful rocks), human creations (weapons, textiles and other objects) as well as people (men and women, on different scales). It is quite possible that the inspiration for the making of relief frescoes came from other techniques, such as relief pottery, stone carving, figurine making (in various materials), and the miniature arts (e.g., signet rings and seals, which create relief impressions when pressed on clay); and as shown above, from combined technical knowledge already available in two-dimensional painting.

The more general interest in relief decoration during the late Neopalatial period (from jewellery to ivory carving, relief stone and metal vessels, etc.) suggests a concern for three-dimensionality, allusion and illusion, which, combined with volume and colour, expand the spectrum of

perceptibility in Aegean art.³⁰ It is within this framework that we situate the technology of relief painting.

Relief frescoes represent a complex form of artistic creation that combines many features of two-dimensional painting and three-dimensional glyptic/plastic arts, as noted above. Experiments with plaster and the possibilities it offered led artists to bolder creations. Up to a point, the makers of relief frescoes followed the same steps as those in the making of a two-dimensional, flat, painting (Fig. 2). The main difference obviously relates to the preparation of three-dimensional representation: reliefs are initially formed with a layer of coarse lime plaster. Markings are often observed on this coarse-grained level, so that the next fine-grained plaster layers can achieve better adhesion, after which paint is applied as in flat paintings. Relief fresco makers draw on (pre-)existing knowledge to a considerable extent, in the sense that they combine techniques already available in Middle Minoan II-III, such as *impasto*, *incavo*, incising and colour application, with the addition of medium and high relief modelling.

Regardless of their construction materials, however, reliefs vary according to how much they protrude from the flat background, the main categories being: 1) high relief, where forms project by several centimetres, and occasionally by half or more of their natural circumference from the background; 2) low relief, where the subject protrudes only slightly; and 3) medium relief, where form projection falls somewhere in between the other two categories (Fig. 8). The wide variety of dimensions is suggestive of free shaping. Only repeating decorative reliefs (e.g., the Zakros spirals) could justify the use of a mould. In this respect, the painter is also a sculptor when making three-dimensional representations.

It goes without saying that walls are not the only surfaces where plaster met inlaying and/or painting in Minoan Crete.³¹ The same cross-referencing of techniques, medium and matter can be observed in plaster-made objects, e.g., the famous Knossos board game³² inlaid with gold leaf,



Fig. 8. Examples of Knossian relief frescoes: *left* – high relief (AMH T8); *middle* – medium relief (AMH T37); *right* – low relief (AMH T92). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

³⁰ Knappett 2020, esp. 92-97; some of these concerns were shared across the wider eastern Mediterranean in the 17th-15th c. BCE, as shown by the papers in Becker et al. 2018; on illusion see also Kriga 2018, 141.

³¹ Tsitsa 2018, 410.

³² Evans 1921, 463-485; Hillbom 2004.



Fig. 9. Detail of the Knossos board game (AMH Y46) and of a plaster tripod (the latter from Zapher Papoura tomb 14) (AMH Π4460). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

bone and rock-crystal; in the three-legged plaster offering tables known from Knossos, Archanes, Nirou Chani and several other sites outside Crete (Fig. 9);³³ and in horns of consecration.³⁴ These examples date from at least the early Neopalatial period, suggesting that knowledge of plaster and three-dimensional modelling existed and was practised prior to the use of plaster modelling in figurative relief frescoes. As in the case of painted wall surfaces, the core is sometimes made of mud plaster, with traces of straw and coarse plaster also visible in portable objects. As with wall paintings, a final, finer-grained, layer of plaster is applied to them before they can be painted.

Preliminary examination of several relief fresco fragments from Knossos currently in the storerooms of the Heraklion Archaeological Museum strengthens the interrelations between three- and two-dimensional representations alluded to here. The creators of these works either trained together, were exposed to similar practices or, in certain instances at least, the same people may have been involved in creating both two- and three-dimensional works (Fig. 10).³⁵

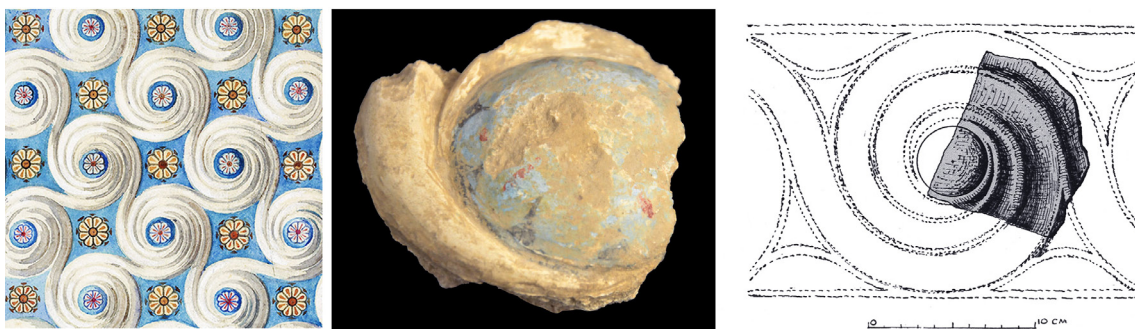


Fig. 10. Sculpting and painting in action. The Spiral relief ceiling from the Early Keep Area: *left* – reconstruction by Theodore Fyfe as published by Evans (1930, pl. XV); *middle* – relief spiral fragment with painted rosette (AMH T88); *right* – sculpted stone spiral fragment from a frieze in the South-West Porch (Evans 1928, 166, fig. 84). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

³³ E.g., Polychronakou-Sgouritsa 1982 on the mainland examples.

³⁴ Tsitsa 2018, 420-422. Also, the application of plaster on roofs and ceilings, see Chapin 2018.

³⁵ See e.g., Tsitsa 2018, 417-418, fig. 13a-b (papyrus flower in low relief compared to a ceramic relief papyrus on a pithos from the Royal Villa).

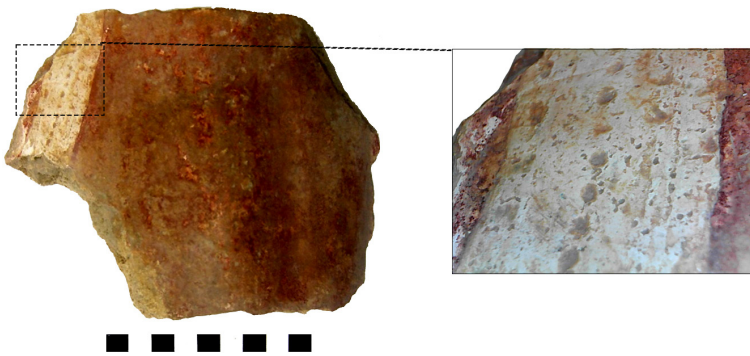


Fig. 11. Relief fragment from Knossos, with inset detail probably showing a man's body with garment band in white impasto (AMH T93). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

INCAVO

At Knossos, a relief fragment from north of the North Portico (Early Keep area) preserves part of a sculpted body. The red colour indicates a male body while the white strip at the end is most likely a piece of fabric. The garment was created with white impasto, with light, thin incisions marking its edge (Fig. 11).³⁶ A series of small circular depressions is visible parallel to the incisions, resembling a micrographic adaptation of the incavo technique. These shallow circular cavities may have had a 'dividing' and/or decorative role and are otherwise unknown from other frescoes.

IMPASTO

The southern light area of the Hall of the Double Axes in the East Wing of Knossos yielded a sizeable relief fragment (20x17 cm) that Evans attributed to a life-size man's thigh "showing the edge of a brilliantly coloured loin-cloth",³⁷ whereas Kaiser interpreted it as belonging to a woman bull leaper³⁸ by associating the fragment with others showing bull(s) found in the area (Fig. 12).

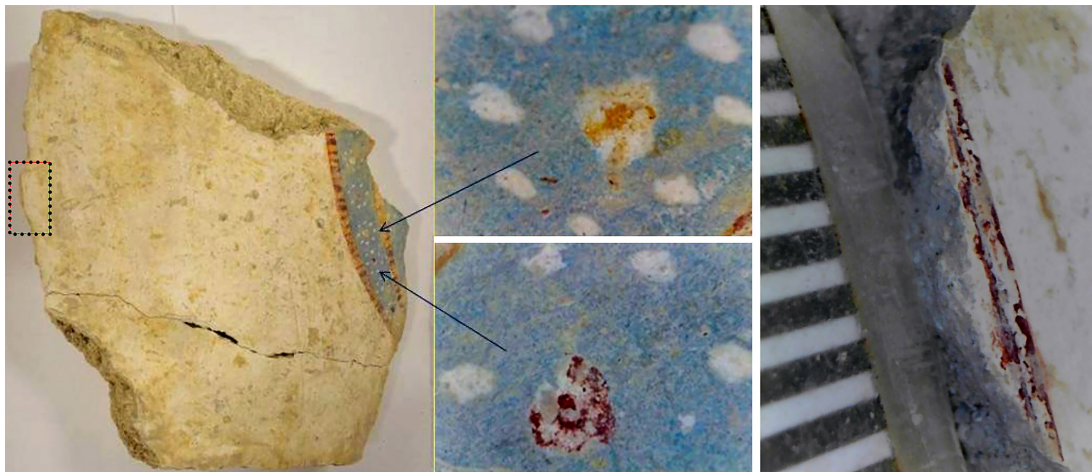


Fig. 12. *left* – relief fragment probably showing part of a woman's body from Knossos with a richly decorated garment (AMH T86); *centre* – details of the rosettes; *right* – red pigment visible on edge of the fragment. © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

³⁶ Kaiser 1976, 274, fig. 427, pl. 32 with reconstruction.

³⁷ Evans 1930, 330-331, fig. 220; Cameron 1976, vol. II, pl. 42e.

³⁸ Kaiser 1976, 282-283 ("Stierspringerin"), fig. 436 (right).

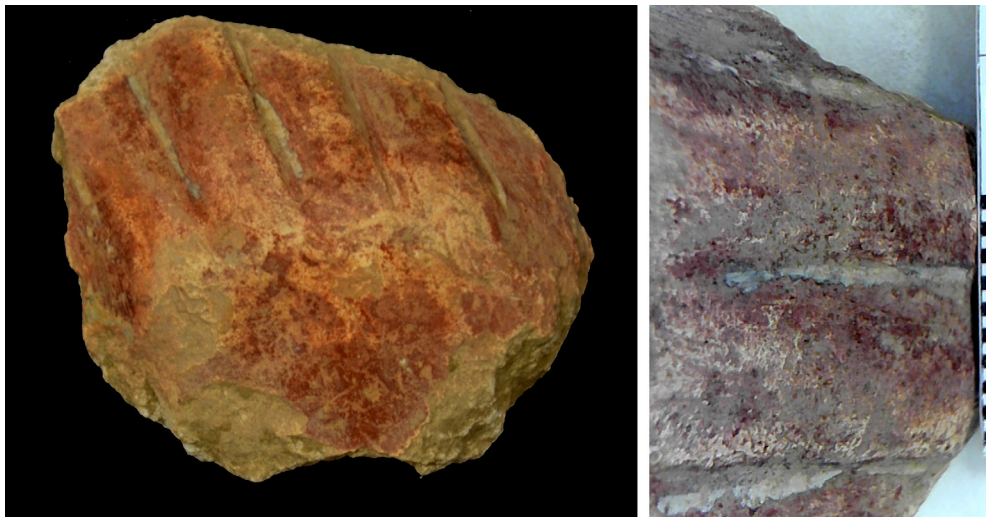


Fig. 13. Part of a clenched fist from the North Threshing Floor, Knossos. Between the clenched fingers, white impasto with blue pigment (AMH T94). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

In the blue bands, white impasto dots create circular rosettes. A larger white impasto dot was made at the centre of each rosette. While that central dot was still damp, another colour was used to mark the ‘flower’ (ochre alternating with red). Examination of this fragment under the microscope reveals traces of red pigment grains on the left side as one looks at the fragment, where a very small part of the flat background is still preserved. These coloured grains could suggest that the embossed figure was set against a red or at least multicoloured background, part of which was red.

In the example of the hand clenched into a fist from the North Threshing Floor,³⁹ the fingers were sculpted and a dark red pigment was added for the skin colour (Fig. 13). To distinguish the fingers from the rest of the hand, white impasto was applied to the base joints, which reveal traces of a light blue pigment when viewed under the microscope.⁴⁰

INCISING

The three-coloured peacock tail feathers on the crown of the Priest King form a typical example of this technique in relief painting (Fig. 14). Although

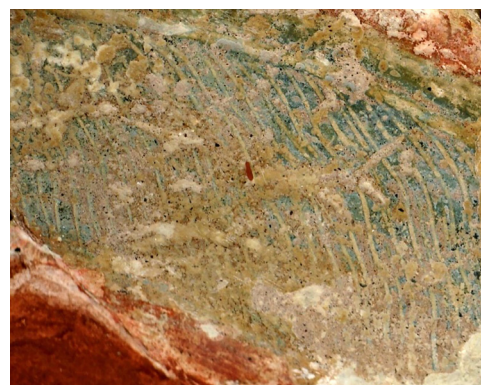


Fig. 14. Incised lines that create a feather pattern/texture on the plumes of the Priest King’s reconstructed crest (AMH T7). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

³⁹ Kaiser 1976, 268, fig. 412; Cameron 1976, vol. II, pl. 17C. This fragment resembles the ‘boxer’ with clenched fist and muscular arm, said to be from the North-East Magazines (Cameron 1976, vol. I, 400 and 555, vol. II, pl. 17A). A unique MM II cornelian figure seal, said to be from Crete and now at the Ashmolean, is similar in shape (CMS VI, no. 144).

⁴⁰ However, analysis with spectroscopic techniques is required to ascertain the true colour applied to the joining points.

poorly preserved, the incisions are clearly visible through macroscopic photography and in archival photographs.⁴¹ After creating a very low relief for the feathers, the artist applied pigment while the plaster was still damp and then used a tool with a thin sharp end for the incisions. By removing the pigment, the incisions revealed the plaster's white substratum, creating texture and further emphasizing the structure of the plumage. Giorgio Vasari cites a similar sculptural technique in Renaissance Italy, the *rilievo stiacciato* (shallow or low relief),⁴² which he describes as being particularly difficult and demanding.⁴³ In this technique, the work is partly prepared with finely chiselled lines and partly carved in low relief. In some ways, it looks more like a two-dimensional image than a three-dimensional sculpture. Vasari emphasized that it was difficult to render subjects gracefully with this technique, as experience and a very good advance design were required for such a low relief of just a few millimetres to be successful.⁴⁴

OF COLOURS & APPLICATION OF RELIEF DECORATION

Important information about pigments and their application techniques comes from a low relief mimicking veined rocks, in the area north of the North Portico (Early Keep area) (Fig. 15).⁴⁵ On a red background a succession of colours – blue, red, white and yellow/ochre – can be observed. Traces of coloured lines can also be seen in the perimeter of the embossed subject. Where ochre is the fill colour, the outline has turned red; black veins and outlines were applied to the blue-coloured rocks with a brush; and details on the white impasto were made in red with dots and freehand wavy lines.

Two female breasts from Knossos, said to be from the area of the Blocked Corridor, provide us with additional information regarding the making of these reliefs.⁴⁶ Their condition has deteriorated since their discovery, with the largest loss observed in what was originally the best preserved of the two breasts (Fig. 16). Nevertheless, this loss has also proven beneficial for study of the reliefs, as it allows us to observe their structure more closely. Most of the underside

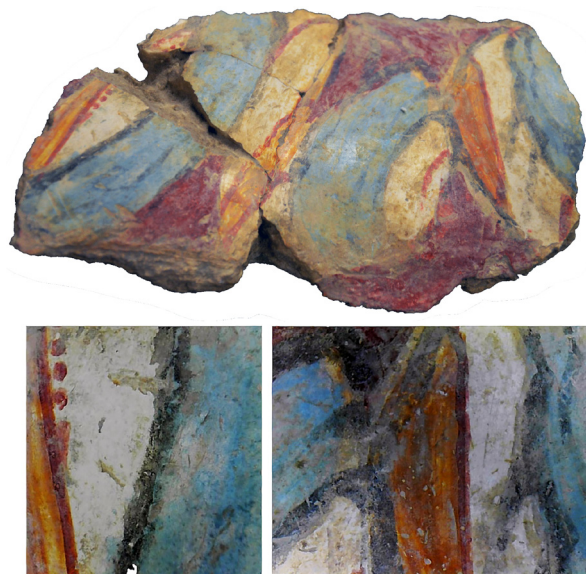


Fig. 15. Low relief fresco fragment showing colourful veined “rocks” (AMH T91). Details shown in the upper register. © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

⁴¹ They were visible at the time of publication: Evans 1928, 773, fig. 504a.

⁴² Vasari 1907, 156-157.

⁴³ Godby 1980.

⁴⁴ Vasari 1907, 156-157.

⁴⁵ Kaiser 1976, 273-274, fig. 426.

⁴⁶ Evans, 1921, 531, fig. 387, who mentions traces of red pigment; Cameron 1976, vol. II, pl. 41a-b; Kaiser 1976, pl. 451b. They probably date to the Late Neopalatial or Final Palatial period.

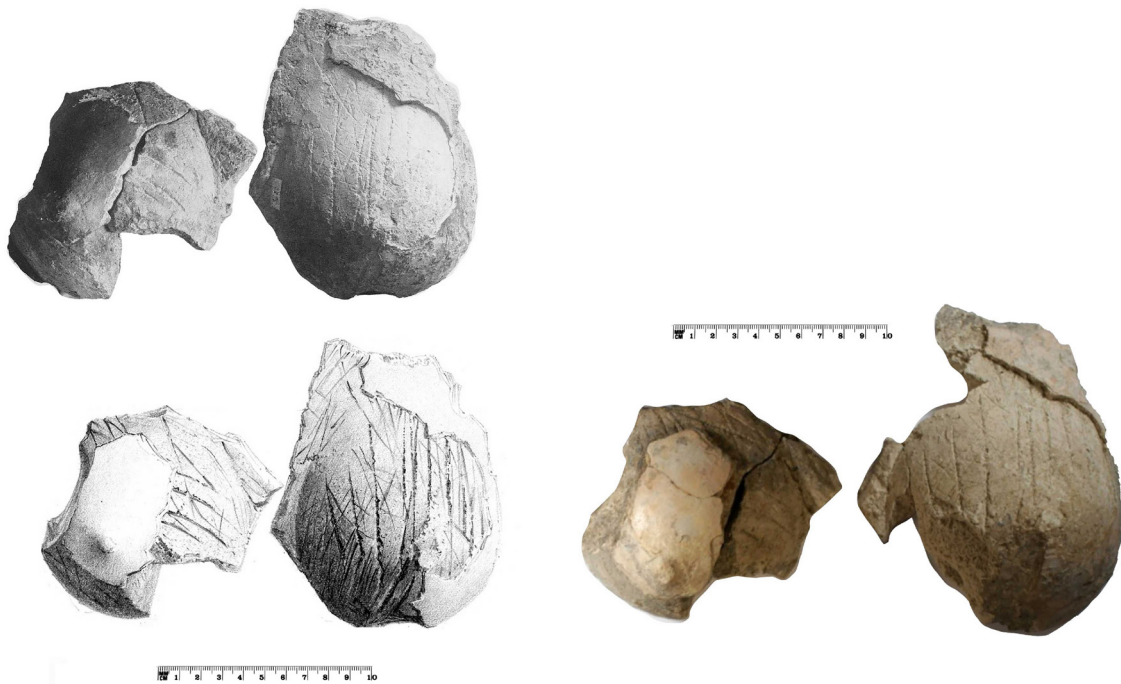


Fig. 16. A pair of female breasts. *Left* – photograph and drawing showing state at the time of Evans's excavation (Evans 1930, 509, fig. 354A and Evans Fresco Drawing R 2/c); *right* – photograph showing current state. © A.J. Evans Archive, Ashmolean Museum, University of Oxford & Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development (AMH T95α, β).

consists of a thick coarse-grained layer that forms the relief. Remains of mud plaster and traces of plant fibres are visible on the back. The next layer of plaster – of greater thickness and on top of the coarse-grained material – bears several net-shaped incisions (Figs 16-17). The creation of an incised 'grid' helped achieve better adhesion between layers.⁴⁷ Traces of red pigment found at the edges of this incised layer and also at worn areas at the back, may have been the blueprint for the creation of the breast in relief. The next, fine-grained, layer has a pale orange tint. The painter incorporated some pigment in the plaster, possibly iron oxide, perhaps so as to lend the final painted surface a warmer tone. The top layer consists of thin white impasto, which is almost a millimetre in thickness. This is applied over the orange-coloured layer, and bears traces of black lines in a few places. It is not clear whether these lines were part of the decoration of the woman's clothes or something different altogether.

Fig. 17: Section of one of the female breasts from Knossos. A layer of coarse-grained plaster is followed by a fine-grained one, with the final layers consisting of orange pigment and fine white impasto (AMH T95α). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.



⁴⁷ As already noted by Kaiser 1976, 296; von Rüdén 2015, 361; von Rüdén and Skowronek 2018, 215.

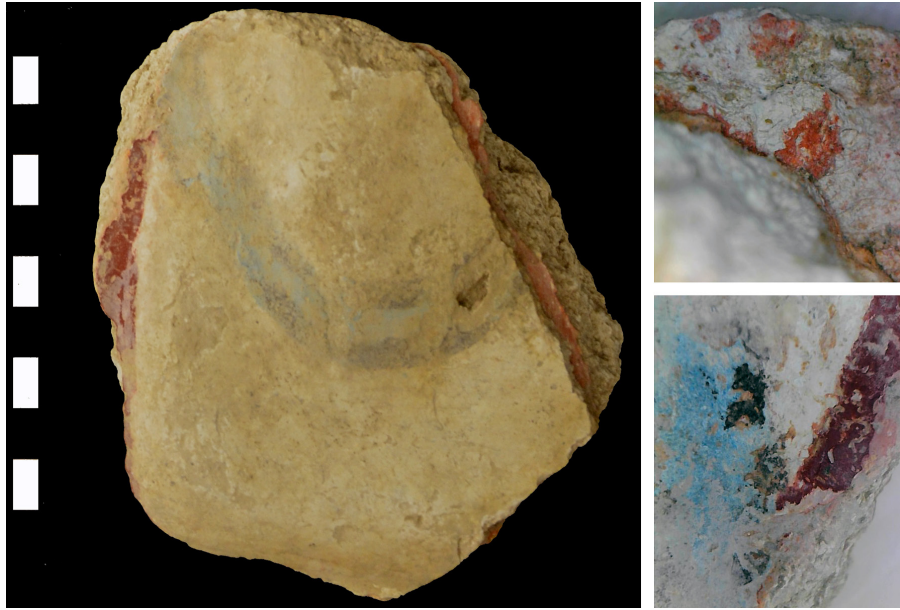


Fig. 18. *left* – low relief fresco from Knossos showing an ankle and jewellery. The orange layer is visible under the final painted layer and below the relief (AMH T92). Part of the red, flat, background is visible above the orange layer and next to the raised ankle; *right* – microscope details of the orange pigment (top) and of the blue anklet with black outline and the red, flat, background (bottom). © Heraklion Archaeological Museum/ Hellenic Ministry of Culture/ Hellenic Organization of Cultural Resources Development.

Just as in flat painting, the makers of relief frescoes guided themselves by indicating the area that was meant to be raised, as observed in a low relief fragment from the area of the Bull Relief and Spiral fresco.⁴⁸ This shows what appears to be a woman's leg with a blue U-shaped anklet set against a deep red background (Fig. 18).⁴⁹ While the relief was still relatively damp, a black outline was painted around the blue anklet. Precisely at the point of breakage, a thin orange layer can be observed below the final fine-grained plaster layer. Noticed by Kaiser here and in a few of the other relief frescoes (though not in every known example), it was taken to represent a sort of guide or pattern for marking out the elevated parts of the relief painting.⁵⁰

CONCLUSIONS

This paper has discussed some technical elements regarding the making of Knossian relief frescoes so as to highlight their close connection to two-dimensional, flat, paintings. The techniques that artists followed constitute an amalgam of knowledge which developed over a long period of time and across different media. They also reveal concerns for relief decoration more generally, using different materials that ranged from metals and stone to bone, faience and clay.

⁴⁸ Cameron 1976, vol. I, 596 (LM I), vol. II, pl. 41d; Kaiser 1976, 278, fig. 437 (right), pl. 42.

⁴⁹ Günkel-Maschek 2020, Ch. 4.

⁵⁰ Kaiser 1976, 296. For a similar observation see von Rüden 2015, 361; von Rüden and Skowronek 2018, 215 (Tell el-Dab'a reliefs).

Furthermore, the reliefs attest to detailed knowledge of plaster's capabilities and limitations. For example, the interest in contrasting colours (between the flat background and the relief structure) further points to a need to create a special visual effect, whereby plasticity and volume helped expand the spectrum of perceptibility on behalf of the viewer. This interest is further promoted with the addition of details that would have enhanced the viewing experience (and were thus necessary), but which were not easily visible from a distance.

Architecture, sculpture, and painting became one at the end of the Neopalatial period and the beginning of the Final Palatial period at Knossos, creating a truly iconic form of visual expression that continued to exercise influence centuries later all across the Aegean.⁵¹ Some of these relief frescoes probably formed the largest three-dimensional representations ever to be produced in the Bronze Age Aegean. Relief painting combined knowledge of both *incavo* and *impasto* techniques, as well as incising and painting application. Knowledge from *appliqué* and painted pottery decoration were also combined.⁵² The experience of a sculptor was also required to render plasticity in the relief appearance of the works of art, especially as concerns free shaping, and less so for mould-making. The painter's paintbrush certainly interacted with the sculptor's tools in creating some of the most remarkable and memorable works, which remain controversial for us today for the reasons mentioned at the outset of this paper.

While the techniques applied to the making of the Knossian relief frescoes appear to have developed and were first used in (mostly late) Protopalatial and early Neopalatial times,⁵³ the concept of figural, complex, relief frescoes primarily preoccupied artists in the late Neopalatial period, which was a time of great artistic experimentation for Knossos in particular, though with wider implications across Crete and the whole southern Aegean. With technique and matter combined in the service of form, volume, and (re)presentation, the reliefs further supported the need for more naturalised viewing experiences when it came to the visual arts of the period, with layering, plasticity, and even trickery (the illusion and allusion mentioned above) becoming part and parcel of the Knossian viewing experience.⁵⁴ The malleability, strength and visual affordances of plaster combined to create atmospheric effects in Knossian space at a time when this was especially needed, both socially and politically,⁵⁵ with relief becoming a technology that augmented perception and blurred the lines between reality and (re)presentation.⁵⁶

⁵¹ On the relationship between built space and painting, see especially Güntel-Maschek 2020.

⁵² Cameron's (1976, vol. I, 549-579) detailed discussion on the general relationship between painting and pottery decoration; also, Kriga 2018.

⁵³ On the process of nature-moulding and nature-printing see Evans 1935, 109 and Shapland 2022, 164-167. Nature-moulding on ceramics was particularly popular in MM IIB-III, showing marine as well as terrestrial animals (e.g., the bull on a bucket vase from Anemospilia near Archanes [Sakellarakis and Sakellarakis 1997, 548-562] and the lion attacking a bull on a lentoid flask from Akrotiri [Knappett 2020, 92-93, fig. 3.14]). On *appliqué* pottery see Kriga 2018; Tzachili 2018; Blakolmer 2020.

⁵⁴ On the process of imprinting, memories, and experiences in a multi-sensorial manner with relief objects, Knappett's discussion is relevant here (2020, Ch. 3). On how reliefs shape, generally, viewing experiences see also Plant 2022 (Roman relief ceilings) and Pentcheva 2006 (Byzantine icons).

⁵⁵ Shapland 2022, Ch. 3 and p. 217 associates this surge in relief frescoes, especially of cattle, with "a shift to ranching in Crete, with the Knossos palatial collective taking over cattle ownership from the domestic collectives and bringing them together in herds which were allowed to roam the lowlands of Crete". On (stone) relief as an element of Knossian propaganda see Logue 2004.

⁵⁶ On the interwoven relationship between representation and technology in Aegean art: Sherratt 2021.

BIBLIOGRAPHY

- Becker, J., Jungfleisch, J. and von Rüden, C. (eds) (2018), *Tracing Technoscapes: The Production of Bronze Age Wall Paintings in the Eastern Mediterranean*, Leiden.
- Blakolmer, F. (2001), "Das minoisch-mykenische Stuckrelief. Zur Definition einer palatialen Kunstgattung der ägäischen Bronzezeit", in Blakolmer, F. and Szemethy, H. D. (eds), *Akten des 8. Österreichischen Archäologentages am Institut für Klassische Archäologie der Universität Wien vom 23. bis 25. April 1999* (Wiener Forschungen zur Archäologie 4), Vienna, 19-36.
- Blakolmer, F. (2006), "The Minoan Stucco Relief: A Palatial Art Form in Context", in Tampakaki, E. and Kaloutsakis, A. (eds), *Πεπραγμένα Θ' Διεθνούς Κρητολογικού Συνεδρίου, Ελούντα, 1-6 Οκτωβρίου 2001. Α3: Προϊστορική Περίοδος, Τέχνη και Λατρεία*, Heraklion, 9-25.
- Blakolmer, F. (2010), "Small is Beautiful. The Significance of Aegean Glyptic for the Study of Wall Paintings, Relief Frescoes and Minor Relief Arts", in Müller, W. (ed.), *Die Bedeutung der minoischen und mykenischen Glyptik: VI. Internationales Siegel-Symposium aus Anlass des 50 jährigen Bestehens des CMS, Marburg, 9.-12. Oktober 2008* (CMS Beiheft 8), Mainz am Rhein, 91-108.
- Blakolmer, F. (2018), "Sculpted with the Paintbrush? On the Interrelation of Relief Art and Painting in Minoan Crete and Thera", in Vlachopoulos, A. (ed.), *Χρωστικές / Paintbrushes. Wall-painting and vase-painting of the second millennium BC in dialogue: Proceedings of the International Conference on Aegean Iconography held at Akrotiri, Thera, 24-26 May 2013*, Athens, 142-151.
- Blakolmer, F. (2020), "The 'Brilliant Child Prodigy of the Eastern Mediterranean. An Introduction", in Blakolmer, F. (ed.), *Current Approaches and New Perspectives in Aegean Iconography* (Aegis 18), Louvain-la-Neuve, 8-17.
- Brysbaert, A. (2008), *The Power of Technology in the Bronze Age Eastern Mediterranean: The Case of Painted Plaster* (Monographs in Mediterranean Archaeology 12), London and Oakville.
- Cameron, M. A. S. (1976), *A General Study of Minoan Frescoes with particular reference to unpublished wall paintings*, Unpublished PhD thesis, University of Newcastle upon Tyne.
- Cameron M. A. S., Jones R. E. and Philippakis, S.E. (1977), "Scientific Analyses of Minoan Fresco Samples from Knossos", *BSA* 72, 121-184.
- Chapin, A. P. (2018), "It's a Plasterpiece! The Neopalatial Plasters of Gournia", *Kentro* 21, 14-16.
- Coulomb, J. (1979), "Le 'Prince aux lis' de Knossos reconsidéré", *BCH* 103:1, 29-50.
- Doumas, C. (1992), *The Wall-Paintings of Thera*, Athens.
- Egan, E. C. (2015), "Working within the Lines: Artists' Grids and Painted Floors at the Palace of Nestor", in Lepinski, S. and McFadden, S. (eds), *Beyond Iconography: Materials, Methods, and Meaning in Ancient Surface Decoration* (Selected Papers on Ancient Art and Architecture 1), Boston, 187-204.
- Evans, A. J. (1921), *The Palace of Minos*, Vol. 1, London.
- Evans, A. J. (1928), *The Palace of Minos*, Vol. 2, London.
- Evans, A. J. (1930), *The Palace of Minos*, Vol. 3, London.
- Evans, A. J. (1935), *The Palace of Minos*, Vol. 4, London.
- Evely, D. (ed.) (1999), *Fresco: A Passport into the Past. Minoan Crete through the Eyes of Mark Cameron*, Athens.
- Galanakis, Y. (2015), "Exhibiting the Minoan Past: From Oxford to Knossos", in Cappel, S., Güntel-Maschek, U. and Panagiotopoulos, D. (eds), *Minoan Archaeology: Perspectives for the 21st Century. Proceedings of the International PhD and Post-Doc Conference at Heidelberg, 23-27 March 2011* (Aegis 8), Louvain-la-Neuve, 17-34.
- Godby, M. (1980), "A Note on Schiacciato", *The Art Bulletin* 62:4, 635-637.

- Günkel-Maschek, U. (2020), *Minoische Bild-Räume: Neue Untersuchungen zu den Wandbildern des spät-bronzezeitlichen Palastes von Knossos*, Heidelberg.
- Haysom, M. (2018), "The Find Contexts of Knossian Relief Wall Paintings. Some Ramifications", in Becker, J., Jungfleisch, J. and von Rüden, C. (eds), *Tracing Technoscapes: The Production of Bronze Age Wall Paintings in the Eastern Mediterranean*, Leiden, 253-278.
- Heaton, N. (1911), "Minoan lime-plaster and fresco painting", *Journal of the Royal Institute of British Architects* 18, 697-710.
- Hillbom, N. (2004), "The Knossos game board", *OpAth* 29, 39-71.
- Hood, S. (2005), "Dating the Knossos frescoes", in Morgan, L. (ed.), *Aegean Wall Painting: A Tribute to Mark Cameron*, Morgan (BSA Studies 13), London, 45-81.
- Immerwahr, S. A. (1990), *Aegean Painting in the Bronze Age*, University Park, PA.
- Jones, R. E. with Photos-Jones, E. (2005), "Technical studies of Aegean Bronze Age wall painting: methods, results and future prospects", in Morgan, L. (ed.), *Aegean Wall Painting: A tribute to Mark Cameron* (BSA Studies 13), London, 199-228.
- Kaiser, B. (1976), *Untersuchungen zum minoischen Relief*, Bonn.
- Knappett, C. (2020), *Aegean Bronze Age Art: Meaning in the Making*, Cambridge.
- Koehl, R. (2006), *Aegean Bronze Age Rhyta* (INSTAP Prehistory Monographs 16), Philadelphia.
- Kriga, D. (2018), "Appliquéd Pottery Decoration and Stucco Relief Wall-paintings in Crete and Thera in the Second Millennium BC", in Vlachopoulos, A. (ed.), *Χρωστικές / Paintbrushes. Wall-painting and vase-painting of the second millennium BC in dialogue: Proceedings of the International Conference on Aegean Iconography held at Akrotiri, Thera, 24-26 May 2013*, Athens, 128-141.
- Logue, W. (2004), "Set in stone: the role of relief-carved stone vessels in Neopalatial Minoan elite propaganda", *BSA* 99, 149-172.
- Militello, P. and Palio, O. (2001), *Gli Affreschi Minoici di Festòs. La Casa Tardo Minoica I di Chalarà a Festòs*, Padova.
- Müller, K. (1915), "Frühmykenische Reliefs aus Kreta und vom griechischen Festland", *Jdl* 30, 242-336.
- Niemeier, W.-D. (1987), "Das Stuckrelief des 'Prinzen mit der Federkrone' aus Knossos und minoische Götterdarstellungen", *AthMitt* 102, 65-98.
- Niemeier, W.-D. (1988), "The 'Priest King' Fresco from Knossos. A New Reconstruction and Interpretation", in French, E. B. and Wardle, K. A. (eds), *Problems in Greek Prehistory. Papers Presented at the Centenary Conference of the British School of Archaeology at Athens, Manchester, April 1986*, Bristol, 235-244.
- Pentcheva, B. V. (2006), "The performative icon", *The Art Bulletin* 88:4, 631-655.
- Plant, J. (2022), "Hard as Rock and Light as Air: Stucco Ceilings in Roman Domestic Space", in Haug, A., Hielscher, A. and Taylor Lauritsen, M. (eds), *Materiality in Roman Art and Architecture. Aesthetics, Semantics and Function*, Boston, 113-130.
- Platon, N. (1955), *A Guide to the Archaeological Museum of Heraklion*, Heraklion.
- Platon, N. (1960), «Η αρχαιολογική κίνησης εν Κρήτη κατά το έτος 1960 (Έργον Επανεκθέσεως του Μουσείου Ηρακλείου)», *KretChron* 14, 504-505.
- Platon, N. (1961-62), «Η αρχαιολογική κίνησης εν Κρήτη κατά το έτος 1961 (Αρχαιολογικόν Μουσείον Ηρακλείου)», *KretChron* 15-16, 282-283.
- Polychronakou-Sgouritsa, N. (1982), «Μυκηναϊκές τριποδικές τράπεζες προσφορών», *AEphem*, 20-33.
- Sakellarakis, Y. and Sakellarakis, E. (1997), *Archanes. Minoan Crete in a New Light*, Athens.
- Sapouna-Sakellarakis, E. (1969), «Συμβολή εις την μελέτην του Μινωικού αναγλύφου», *AAA* II.3, 399-406.
- Shapland, A. (2022), *Human-Animal Relations in Bronze Age Crete. A History through Objects*, Cambridge.

- Shaw, M. C. (1995), "Bull Leaping Frescoes at Knossos and their Influence on the Tell el-Dab'a Murals", in Bietak, M. (ed.), *Trade, Power and Cultural Exchange: Hyksos Egypt and the Eastern Mediterranean World 1800-1500 B.C. An International Symposium, November 3, 1993, Metropolitan Museum of Art* (Ägypten und Levante 5), Vienna, 91-120.
- Shaw, M. C. (1998) "The painted plaster reliefs of Pseira", in Betancourt, P. and Davaras, C. (eds), *Pseira II: Building AC (the Shrine) and Other Buildings in Area A* (University Museum Monograph 94), Philadelphia, 55-76.
- Shaw, M. C. (2004), "The 'Priest-King' Fresco from Knossos: Man, Woman, Priest, King, or Someone Else?", in Chapin, A. P. (ed.), *Χάρις: Essays in Honor of Sara A. Immerwahr* (Hesperia Suppl. 33), Princeton, 65-84.
- Shaw, M. C. (2010), "A fresco of a textile pattern at Pylos: the importation of a Minoan artistic technique", in Krzyszkowska, O. (ed.), *Cretan Offerings. Studies in Honour of Peter Warren* (BSA Studies 18), London, 315-320.
- Shaw, M. C. (2012), "New light on the Labyrinth Fresco from the palace at Knossos", *BSA* 107, 143-159.
- Sherratt, S. (2000), *Arthur Evans, Knossos and the Priest-King*, Oxford.
- Sherratt, S. (2005), "Arthur Evans and the first of the Priest-Kings", in Dakouri-Hild, A. and Sherratt, S. (eds), *Autochthon: Papers presented to O. T. P. K. Dickinson on the occasion of his retirement, Institute of Classical Studies, University of London, 9 November 2005* (BAR-IS 1432), Oxford, 229-241.
- Sherratt, S. (2021), "Representations and hidden technologies", in Bennet, J. (ed.), *Representations. Material and Immaterial Modes of Communication in the Bronze Age Aegean* (Sheffield Studies in Aegean Archaeology 13), Oxford, 107-121.
- Tsitsa, E. (2018), "From Minoan Artists to Swiss Restorers through the Prism of Conservation", in Vlachopoulos, A. (ed.), *Χρωστήρες / Paintbrushes. Wall-painting and vase-painting of the second millennium BC in dialogue: Proceedings of the International Conference on Aegean Iconography held at Akrotiri, Thera, 24-26 May 2013*, Athens, 406-423.
- Tsitsa, E. and Savou, I. (2012), «Εργασίες συντήρησης μινωικών τοιχογραφιών», in Andrianakis, M., Varthalitou, P. and Tzachili, I. (eds), *Αρχαιολογικό Έργο Κρήτης II. Πρακτικά της 2ης Συνάντησης, Ρέθυμνο 26-28 Νοεμβρίου 2010*, Rethymno, 194-202.
- Tzachili, I. (2018), "Vases with Plastic Decoration Depicting Landscapes from the Vrysinas Peak Sanctuary", in Vlachopoulos, A. (ed.), *Χρωστήρες / Paintbrushes. Wall-painting and vase-painting of the second millennium BC in dialogue: Proceedings of the International Conference on Aegean Iconography held at Akrotiri, Thera, 24-26 May 2013*, Athens, 118-127.
- Tziraki, E. (2019), «83. Λεπτομέρεια τοιχογραφημένου δαπέδου με απεικόνιση λαβυρίνθων», in Mandalaki, S. (ed.), *Daedalus, in the Footsteps of the Mythical Craftsman. Exhibition catalogue, 10 May 2019-1 March 2020*, Heraklion, 167.
- Vasari, G. (1907), *Vasari on Technique (being the introduction to the three arts of design, architecture, sculpture, and painting, prefixed to the lives of the most excellent painters, sculptors, and architects)*, translated by L. S. Macle hose, London.
- Von Rüden, C. (2015), "Transmediterranean knowledge and Minoan style reliefs in Tell el-Dab'a. An attempt at paradigm shift", in Cappel, S., Güntel-Maschek, U. and Panagiotopoulos, D. (eds), *Minoan Archaeology: Perspectives for the 21st Century. Proceedings of the International PhD and Post-Doc Conference at Heidelberg, 23-27 March 2011* (Aegis 8), Louvain-la-Neuve, 355-366.
- Von Rüden, C. and Skowronek, T. (2018), "Between Common Craft Tradition and Deviation. The Making of Stucco Reliefs in the Eastern Mediterranean", in Becker, J., Jungfleisch, J. and von Rüden, C. (eds), *Tracing Technoscapes: The Production of Bronze Age Wall Paintings in the Eastern Mediterranean*, Leiden, 213-232.