

THE MM THREE-SIDED SOFT STONE PRISM

SHAPE

CHARACTERISTICS OF THE SHAPE

The term *three-sided prism* is borrowed from geometry to refer to an axially symmetrical seal shape with triangular cross section and a total of five faces, i.e. a pentahedron (*fig. 1*). As a rule, the three ‘slanting’ faces of the prism – hereafter seal faces – are engraved, each with a different image. The two triangular faces – hereafter profiles – are pierced in the centre by the stringholes. The channel joining the profiles runs along the axis of the seal.⁵³

⁵³ Basic criteria for defining the shape of a seal are the geometrical shape of its body and the direction of the stringhole channel. Seals which have a triangular prismatic body and stringhole channel which runs vertically to their axis, thus piercing through two of the ‘slanting’ faces, such as CMS II,1 nos. 461, 486, and 487 are not seen as three-sided prisms. The reason for this is that by their piercing, the two ‘slanting’ faces are defined as the back of the seal. The axial perforation of seals with axially symmetrical geometrical shapes, e.g. three-sided prisms, four-sided prisms, or cylinders, creates the potential of rotary movement when impressing the seal. The whole area around the axis of the seal can serve as a field for engraving even if it is not always used that way. On the other hand, a perforation which runs vertically to the axis of a seal which has one of the aforementioned geometrical shapes will create an object which can only be used to stamp a sealing surface vertically, e.g. a seal which is similar in concept to buttons and Petschafte (for an overview of the shapes of Minoan seals, see Yule 1980 a, 24–31; for a detailed account of the various seal shapes, see Yule 1980 a, 31–117). Good examples for illustrating the importance of the direction of the stringhole channel for the determination of the shape of the seal are CMS II,1 nos. 11, 74, and 126. Being made of the lower canine of a wild boar, all these seals are triangular and have an axial cavity (for the characteristics of boar’s tusk, see Krzyszkowska 1990, 47–48, 75). However, the position of the stringhole channel and, as a consequence, that of the engraving, differs in each of them. The stringhole channel of CMS II,1 no. 11 is located vertically to the axis of the seal and runs through two (?) of the long faces on their upper part in such a way that only the two triangular faces become suitable for engraving. The positioning of the perforation in the upper part of the seal body makes the triangular face which is placed further away from it more appropriate for engraving. For that reason, the seal can be seen as a gable-shaped variation on a stamp cylinder (see also Yule 1980 a, 91). On the other hand, the positioning of the stringhole channel under the interfacial edge of the two semi-ellipsoidal faces of CMS II,1 no. 74 defines these two faces as the back of the seal and makes the third ‘slanting’ face appropriate for receiving engraving. In this case, the concept of the seal resembles that of buttons. Finally, the triangular pulp cavity of CMS II,1 no. 126 serves as a stringhole channel such that the triangular faces are made unusable for engraving and all three ‘slanting’ sides are offered as potential fields for engraving. The concept of this last seal is similar to that of the three-sided prisms, four-sided prisms, and cylinder seals. Thus, in these three cases of seals with similar geometrical shapes, the direction of the stringhole channel creates three different seal shapes with a gable-shaped section, i.e. a stamp cylinder (CMS II,1 no. 11), a button (CMS II,1 no. 74), and a gable (CMS II,1 no. 126) (for a discussion on this last shape and its differentiation from the prisms, see pp. 20–22).

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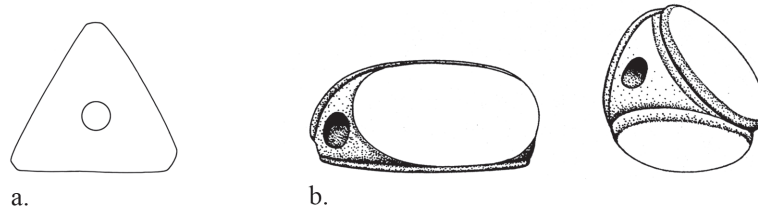


Fig. 1 The MM three-sided soft stone prism: a. frontal view of a profile; b. oblique view (the latter adapted from Yule 1980 a, 28).

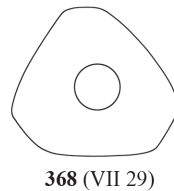


Fig. 2 Prism with slightly convex seal faces.

Some unfinished pieces have only one or two engraved seal faces.⁵⁴ Apart from these, only two apparently finished pieces bear engraving on one side only, i.e. **107** from Tholos B or Γ at Platanos, and **221** from the Agora in Malia. The fact that the first was deposited in a tomb and the second is abraded suggests that these are finished pieces.

In the majority of cases, the seal faces are flat (*fig. 1*). In a few rare cases, a frontal view of the profiles creates the impression that the seal is somewhat swollen, suggesting that its seal faces are very slightly convex (*fig. 2*).⁵⁵

Ellipsoidal seal faces are the most common.⁵⁶ Apart from these, round, rectangular, trapezoidal, semi-ellipsoidal, and irregular faces are also encountered.⁵⁷ A face is designated elongated ellipsoidal/rectangular when the difference between length and breadth of face equals or is larger than 6 cm.⁵⁸ Faces with a curvilinear outline which, at first glance, creates

⁵⁴ E.g. **138**, **139**, **156**. **34** is puzzling in view of the fact that although it has only two engraved seal faces it is somewhat abraded, which would suggest that it was in use and thus finished. However, the fact that parts of sides b and c are broken off as well as the fact that the quadruped on side a seems to be incomplete would suggest rather that the piece was not finished (broken during engraving [?]). Unlike the MM prisms, LM three-sided prisms often have only two or one engraved side, e.g. CMS II,3 no. 254; CMS III nos. 505, 506.

⁵⁵ Also described as flat in the catalogue because the term *convex* would be misleading in terms of their configuration.

⁵⁶ E.g. **48**, **55**.

⁵⁷ Round: e.g. **45**. Rectangular: e.g. **70**, **182**. Trapezoidal: e.g. **62**. Semi-ellipsoidal: e.g. **98**. Irregular: e.g. **299**.

⁵⁸ Less than 6 cm: e.g. **70**, **183**. 6 cm or larger: e.g. **311**, **394**.

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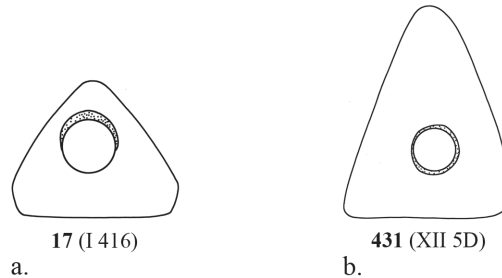


Fig. 3 a. Gable-shaped prism; b. Wedge-shaped prism.

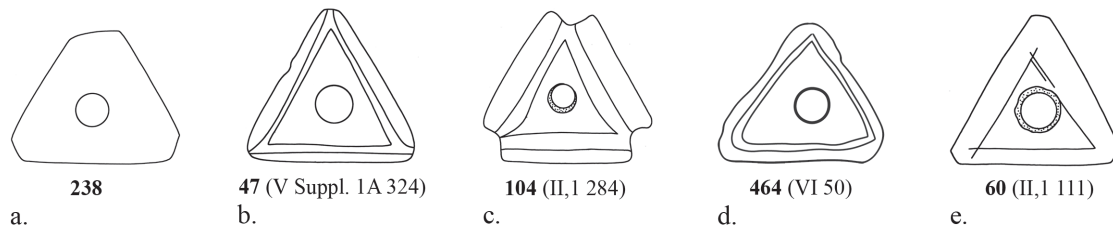


Fig. 4 Examples of various configurations of the profiles of prisms: a. with broad, flat interfacial edges; b. with grooves around the seal faces; c. with very deep grooves which set off the seal faces from the body of the seal; d. with grooves only on the profile (adapted from CMS VI); e. with scratch marks on the profile.

the impression of a square or rectangular shape respectively are referred to as compressed round or compressed ellipsoidal.⁵⁹

Most often, the three seal faces have approximately the same shape and size, the seal being perfectly axially symmetrical (*fig. 1*). Occasionally, two faces which are ellipsoidal or semi-ellipsoidal are narrower than the third, so creating gable-shaped prisms (*fig. 3 a*).⁶⁰ In some rare cases, one face is narrower than the remaining two, so that the seal resembles a wedge (*fig. 3 b*).

The seal faces meet each other at the interfacial edges. In pieces which are workshop fresh, these are broad and flat forming distinct areas between any two seal faces (*fig. 4 a*). In 42.2 % of the prisms for which an entire view was available, three grooves form a complete triangle around the stringhole on the profiles.⁶¹ Most often, a single ‘fused groove’

⁵⁹ E.g. **2, 10, 349**.

⁶⁰ E.g. **98, 124**.

⁶¹ In 9.2 % of the studied prisms, the only view available was that of the seal faces. In these cases, it has not been possible to establish the existence or not of grooves.

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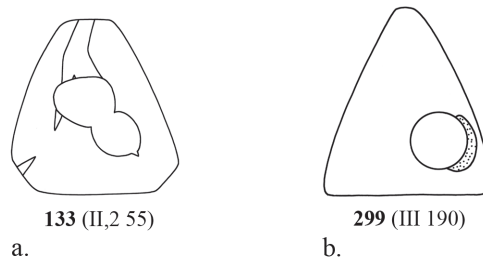


Fig. 5 Examples of non-canonical stringholes: a. eight-shaped; b. acentric.

emanates from each of the angles of this triangle and runs along the interfacial edges (*fig. 4 b, c*). As a result of this, each seal face is outlined by a groove. In rare cases, the grooves form a triangle on the profiles only, the interfacial edges remaining plain (*fig. 4 d*).⁶² This phenomenon could reflect a situation in which the grooves were initially seen as a means of differentiating between the three seal faces and a subsequent perception of them as a simple feature of the seal form. The depth and breadth of the grooves varies. They range from thin and very shallow to broad and very deep. Depending on the configuration of the grooves, the seal faces can be scarcely, moderately, or very markedly set off from each other and from the body of the seal.⁶³

In some cases, scratch marks can be discerned either all around the seal faces or only on the profiles (*fig. 4 e*).⁶⁴ The fact that occasionally such marks appear as part of grooves could suggest that they are either incipient or obliterated grooves.⁶⁵ In other cases, they could simply represent subsidiary tool marks created during the processing of the stone.⁶⁶ In a small number of cases, the seal faces are slightly set off plastically from the body of the seal.⁶⁷ This feature can but need not be combined with grooves.

The profiles are roughly equilateral triangles or else, in the cases of gable-shaped or wedge-shaped pieces, isosceles triangles. Profiles configured as isosceles triangles have either three acute angles or two acute and one right angle. Pieces with rectangular seal faces have flat profiles. By contrast, on pieces with curvilinear seal faces, the corners of the profiles slope inwards, thereby lending a convex quality to the resulting profile. Occasionally, in such examples the surface of the triangle outlined by the grooves extends

⁶² E.g. **464**. In this example, the lack of grooves on the interfacial edges does not seem to be due to abrasion but instead seems to represent the original state of the prism. For similar effects created by abrasion, see p. 23.

⁶³ E.g. **104, 105, 217**. The configuration of the seal faces on these pieces is easily comparable to that of the seal faces on the cube CMS II,1 no. 64 and to those on some stamp rings and bottles, e.g. CMS II,1 nos. 14, 21, 26, 28, 31–36.

⁶⁴ E.g. **491, 495, 504**.

⁶⁵ E.g. **70, 190**.

⁶⁶ E.g. **60**. Such scratches could have been created for example when the seal was being given its shape.

⁶⁷ E.g. **23, 300, 417, 577**.

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further than the seal faces so that the body of the seal is longer than its engraved faces.⁶⁸ Seal faces which are set off from the body of the seal plastically can project further than the triangle formed around the stringhole. In these cases, the profiles appear slightly concave.⁶⁹

In the majority of examples, the stringhole is round and is placed at approximately the centre of the profile (*fig. 1 a*). However, keyhole-shaped or eight-shaped stringholes as well as acentric perforations are also encountered (*fig. 5*).⁷⁰ Most likely, the first two represent two attempts to correctly align the stringhole channel opened from opposite ends of the prism.⁷¹

The prisms range in length from 0.70–2.80 cm with most examples ca. 1.00–2.00 cm. By length is meant the dimension which runs in line with the axis of the seal and thus with the stringhole channel. This can be the longer dimension of the seal faces or, occasionally, their shorter dimension.⁷²

DIFFERENTIATION FROM GABLES

Gables are seals which physically resemble prisms.⁷³ Like the prisms, they also have a triangular cross section, three faces which have the potential to be engraved, and two triangular profiles whose centre is pierced by the stringhole. However, they are distinguished from prisms in three basic aspects. First, the gable presents faces of differing size and shape: one is large, while two are markedly narrower (*fig. 6*). The larger face can be round, ellipsoidal, or more seldom, rectangular. The most common shape for the narrower seal faces is that of a semicircle or a semi-ellipse but occasionally they can also be round, ellipsoidal, or rectangular.⁷⁴

Secondly, since the three faces vary in size, the gable is axially asymmetrical. Its profiles are flat isosceles triangles with two acute and one obtuse angle or, in rare occasions, a right angle.⁷⁵ The broader angle is formed at the interfacial edge of the two narrower faces (*fig. 6*). Because of the wide angle formed at their joint and their smaller size, these faces

⁶⁸ E.g. **21**.

⁶⁹ E.g. **577**.

⁷⁰ Keyhole-shaped or eight-shaped stringholes: e.g. **65, 133, 436, 540, 557**. Acentric perforations: e.g. **4, 252, 290, 299**.

⁷¹ Evely 1993, 155. The possibility that one of the combined stringholes on one profile of **133**, whose engraving on the horizontal spindle cannot be ruled out, is a marking that served to affix the seal in a dop stick seems rather vague (for such markings, see Evely 1993, 155, 161). This is due to the fact that none of the twin holes is superficial as they both penetrate the stone.

⁷² E.g. **73, 84**.

⁷³ E.g. CMS II,1 nos. 126, 155, 158, 287, 346, 393; CMS II,2 nos. 14, 53, 215, 310–312; CMS IV no. 121; CMS XI no. 140; XII no. 3D.

⁷⁴ Semicircular or semi-ellipsoidal: e.g. CMS II,2 nos. 53, 215, 311; CMS XI no. 140. Round: e.g. CMS II,2 no. 260. Ellipsoidal: e.g. CMS II,1 no. 287; CMS IV no. 121. Rectangular: e.g. Demargne 1939, 122 fig. 1.

⁷⁵ E.g. Dimopoulou 2000, 28 no. 5. The semicircular shape of two faces and the fact that they are engraved with the same image suggest that the seal is a gable.

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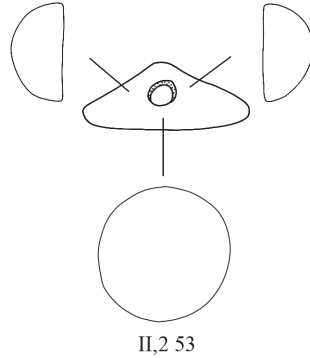


Fig. 6 Example of a gable.

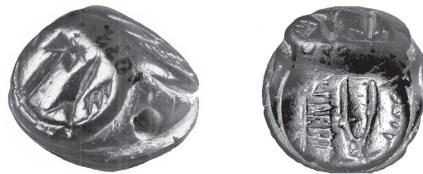


Fig. 7 The gable CMS VI no. 14.

create the impression of a single unit, providing a slightly arched back for the larger face. This impression is intensified in cases of gables such as CMS VI no. 14. In this example, only the large face and the curved parts of the narrow faces are outlined by grooves, the interfacial edge of the narrow faces remaining plain (*fig. 7*).

Thirdly, while the large seal face of the gable always carries engraving, the narrower faces need not be engraved.⁷⁶ When engraved, the narrow seal faces either show different images, as is the case with the prisms, or similar images, which are always different from the engraving on the large seal face.⁷⁷ Narrow faces bearing similar devices were probably not intended for sealing but functioned instead as the decorated back of the seal.

The evidence suggests that, as opposed to prisms, the gables have a main face, the base, and two secondary faces whose initial function was to serve as the back of the seal.⁷⁸ The concept of these pieces is clearly different from that of the prisms whose three sides are equally important and have the same function, i.e. to serve as sealing devices. Prisms can

⁷⁶ For some gables with one engraved face, see CMS II,1 nos. 94, 97, 155, 346, 373.

⁷⁷ Different images: e.g. CMS II,1 no. 389; CMS II,2 nos. 215, 311, 312; CMS XII no. 3D; Demargne 1939, 122 fig. 1. Similar images: e.g. CMS II,1 no. 496; CMS II,2 no. 53; Dimopoulou 2000, 28 no. 5.

⁷⁸ This opinion has already been expressed by Xenaki Sakellariou 1958 b, 459.

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stand on any of the three seal faces as opposed to gables which are meant to stand on the larger seal face.

The existence of gables with three faces engraved with different devices could suggest that with time (?) the three faces acquired the same significance and were meant to serve sphragistic purposes. As a criterion for differentiating between gable-shaped prisms and gables with three engraved faces, a size difference of 4 mm between the large and the narrower seal faces of each piece has been set.⁷⁹ In gable-shaped prisms, this size difference is less than 4 mm, whereas in gables it equals or exceeds that number. As a result, the profiles of the gable-shaped prisms are high triangles whose one angle can be a right angle but not exceed 90°. On the other hand, the profiles of the gable-shaped prisms are flat triangles whose one angle is always obtuse (compare *fig. 3 a* and *fig. 6*). It would seem that whereas the ideal of the craftsman who manufactured a gable-shaped prism was the creation of an axially symmetrical form, in the case of the gable, the creation of an asymmetrical form was deliberate.

ALTERATION OF THE SHAPE BY ABRASION

It is not always easy to differentiate between abrasion caused by effects of deposition and wear and tear brought about by use in ancient times. For that reason, when the cause of abrasion is unknown, the general term *abraded* is used to refer to the state of the seal. The term *weathered* is only used when it is considered certain that the abrasion came about by the action of natural processes whereas the term *worn* presupposes wear and tear caused by use.

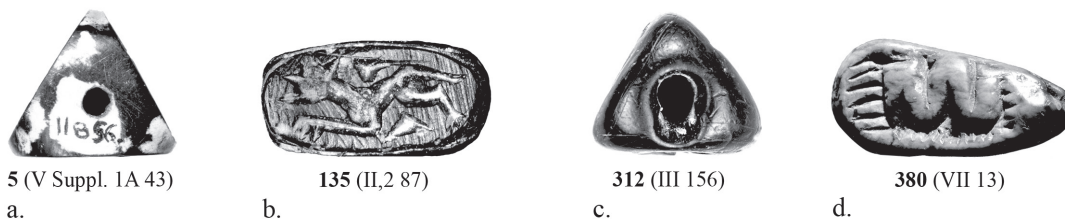


Fig. 8 Different state of preservation of the prisms: a. workshop fresh; b. unfinished; c. d. abraded.

Pieces which are workshop fresh are crisp and show sharp edges and flat interfacial edges (*fig. 8 a*). Unused steatite intaglios often display a milky coat on their surface.⁸⁰ Saw and file marks in the form of rough or fine lines respectively can often be discerned on the surface of unfinished pieces (*fig. 8 b*).

⁷⁹ For the gable-shaped prisms, see p. 18.

⁸⁰ For this coat, see p. 31.

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The main effect of abrasion is the rounding of the seal edges (*fig. 8 c–d*). The flat surface between the seal faces on the interfacial edges disappears. Rounded breaks can sometimes cause confusion regarding the exact shape of the seal (*fig. 8 d*). This is the case with **208** where it is not immediately clear whether the seal is a gable-shaped prism or a canonical prism whose two seal faces have become narrower by a break on their interfacial edges and its subsequent rounding by abrasion.⁸¹ A deepening approximately halfway along one of the interfacial edges on certain abraded pieces could also represent a rounded break.⁸²

Very often, the grooves which outline the seal faces are obliterated. The process of this obliteration starts from the interfacial edges, the parts of the grooves which run on the profiles being the last to be worn away. Most often, the seal faces of abraded prisms which have grooves only on the profiles were originally outlined by these grooves.⁸³

Occasionally, one side of the stringhole is elongated in such a way that the latter takes the shape of a non-canonical ellipse (*fig. 8 c*). This deformation is caused by the action of the string. On the other hand, an occasional uniform flare at the open ends of the stringhole channel⁸⁴ is not necessarily brought about by the string but could also be connected with the process of drilling.⁸⁵

Intense abrasion can result in more or less severely obliterated motifs, so that a piece can appear to have only one or two engraved seal faces.⁸⁶ Rounded seal edges, shiny surfaces, and a soapy texture suggest that blank seal faces were initially engraved. In the case of centred-circles consisting of more than one concentric ring, it is often difficult to tell whether the external rings were also initially crescent-shaped or whether part of the intaglio has been obliterated.⁸⁷

Most often, rounded edges and breaks as well as shallow intaglios are the result of wear and tear on the seals in ancient times. Rounded breaks could have come about not only by wear and tear but also by the refinishing of a broken seal. They are of particular interest as they suggest that the seals continued being used even after they were broken.

DERIVATION OF THE SHAPE

Several Bronze Age three-sided prisms are known from areas outside the Aegean (*fig. 9*). The so called Karnak prism is a three-sided prism of black steatite said to have been bought in Karnak, Egypt (*fig. 9 a*).⁸⁸ Ward dates it on stylistic and iconographic grounds to the Sixth

⁸¹ The second possibility seems more likely because a considerable part of the devices which are cut on the two narrower seal faces is missing.

⁸² E.g. the deepening on **128**.

⁸³ This seems to be the case for example with **15**, **64**, **96**. For these grooves, see pp. 18–19.

⁸⁴ E.g. **571**.

⁸⁵ As shown in the experimental work of Gorelick – Gwinnett (Gorelick – Gwinnett 1979, 20–21, 32).

⁸⁶ E.g. **38 b**, **38 c**, **378 b**, **381 c**, **382 b**, **385 a–c**.

⁸⁷ E.g. the outer rings of the triple centred-circles **359 b**, **359 c**.

⁸⁸ Evans 1897, 362–363 fig. 28; Evans 1909, 123 fig. 58. Information on this piece from Evans 1897, 362.

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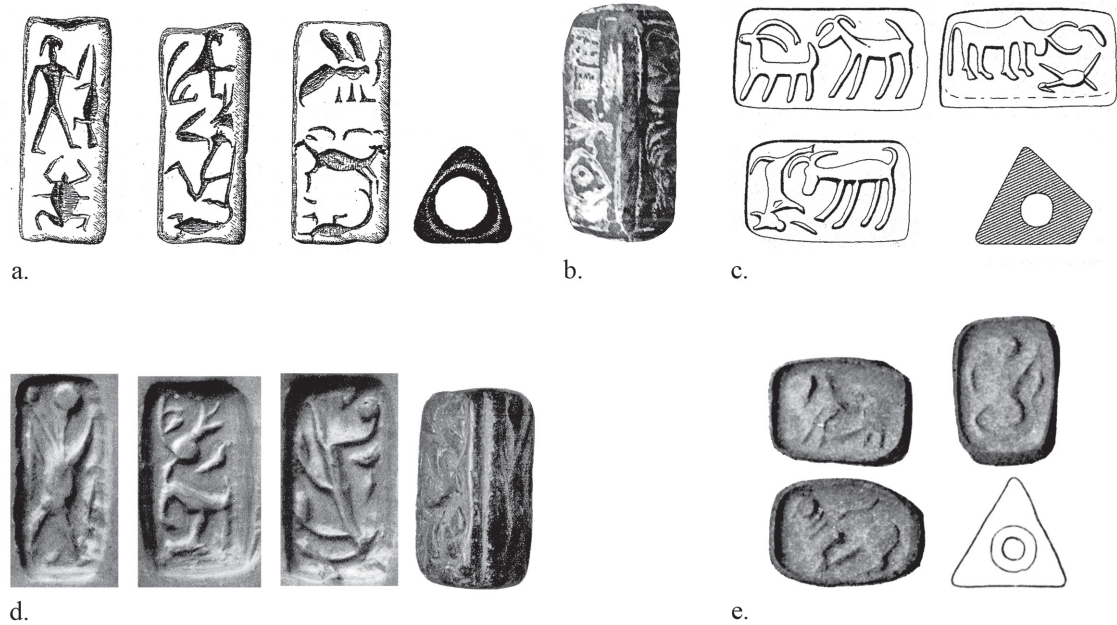


Fig. 9 Bronze Age three-sided prisms from areas outside the Aegean: a. bought in Egypt (adapted from Evans 1909, 123 fig. 58); b. from Bahrain (adapted from Weisgerber 1980, 86 fig. 15); c. from Oman (adapted from Weisgerber 1980, 85–86 fig. 15); d. Syrian (?) (adapted from Erlenmeyer – Erlenmeyer 1958, pl. XXIX fig. 1 a–c, pl. XXX fig. 9); e. from Turkestan (adapted from Schmidt 1908, 169 no. 400, pl. 45 no. 8).

Dynasty or the immediately following period.⁸⁹ Another piece has come to light in Bahrain (*fig. 9 b*).⁹⁰ The seal, whose profiles show a triangular frame around the stringhole, is cut in soft stone. According to the excavator, this piece belongs stylistically and iconographically to the Harappan Culture. A variation on a three-sided prism is a seal with trapezoidal section, which comes from Oman (*fig. 9 c*).⁹¹ The piece is made of soft stone and was excavated from a Maysar-1 context. According to the excavator, the style and iconography of this seal suggest local production, imitating Harappan prototypes.⁹² A three-sided prism from a private Swiss collection is published in Erlenmeyer – Erlenmeyer as Syrian (*fig. 9 d*).⁹³ The piece is carved on soft stone, has grooves which extend only on the interfacial edges, and is dated by the authors to the 3rd millennium. Finally, a three-sided prism has come to light

⁸⁹ Ward 1971, 91.

⁹⁰ Weisgerber 1981, 218–219, fig. 54.

⁹¹ Weisgerber 1980, 85–86 fig. 15. Information on this piece from Weisgerber 1980, 73, 83, 85–87.

⁹² Weisgerber 1980, 86–87; Weisgerber 1981, 219.

⁹³ Erlenmeyer – Erlenmeyer 1958, pl. XXIX fig. 1 a–c, pl. XXX fig. 9. Information on this piece from Erlenmeyer – Erlenmeyer 1958, 352–355.

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in Anau, Turkestan (*fig. 9 e*).⁹⁴ The piece is apparently made of soft stone and has come to light in a context dated to the Anau Culture III. According to its excavator, it belongs to the first half of the 2nd millennium or somewhat later and is an import into the area from western Asia, perhaps Syria.

All the above prisms are dated to the 3rd or 2nd millennium and are either local products or imports from neighbouring Eastern cultures. On chronological grounds, an influence from some of these examples on the creation of the Minoan prism, whose first representatives are dated no earlier than MM IA,⁹⁵ would seem possible. However, apart from their shape, these seals show no other elements shared by Minoan seals. This fact, as well as the rarity of the form outside the Aegean, the great numbers of examples which come from Crete, and the lack on the island of any three-sided prism with devices foreign to the Minoan repertoire and recognisable as belonging to another culture could suggest an indigenous and independent genesis of the Cretan prism.

Various opinions have been expressed concerning the appearance of the form on the island. Evans was of the opinion that the prism was a Minoan invention created by smoothing out, engraving, and axially perforating triangular splinters of stone.⁹⁶ Matz on the other hand, saw the three-sided prism as the Cretan variation on the Near Eastern cylinder seal. He considered that the three-sided shape better served the Minoan principles of decoration than the cylinder seal from which it originated.⁹⁷ Chapouthier linked the Cretan prism to the Hittite gables with one engraved face, which were widespread in Cappadocia and North Syria at the end of the 3rd millennium.⁹⁸ In the Minoan seal, he saw a form that came about by the adoption of the Anatolian gable, its subsequent engraving on all three faces, and its final transformation to a three-sided prism. This transformation would be connected, according to him, with the need to facilitate the sealing process with all three seal faces. Xenaki Sakellariou agreed with Evans in that she saw the Cretan three-sided prism as a Minoan invention inspired by naturally occurring shapes.⁹⁹ Moreover, she believed that the adoption of a form with three engraved sides led to the engraving of the smaller sides of the already existing gable, a seal which up to this point had only one seal face.¹⁰⁰ Kenna also saw the form as an independent Minoan creation inspired by a natural, in his opinion possibly organic, shape. He put forward the hypothesis that the rounded prismatic shape of the upper vertebra of a mammal could have served as the inspiration for the creation of this kind of seal.¹⁰¹ He suggested that this vertebra not only had a convenient

⁹⁴ Schmidt 1908, 169 no. 400, pl. 41 no. 10, pl. 45 no. 8. Information on this piece from Schmidt 1908, 166, 169, 182–183.

⁹⁵ For this subject, see pp. 56–58, 147.

⁹⁶ Evans 1897, 330. For an earlier argumentation of Evans in favour of the indigenous character of the prisms, see Evans 1894, 324–335, especially 330–335.

⁹⁷ Matz 1928, 101.

⁹⁸ Chapouthier 1951, 42–44.

⁹⁹ Xenaki Sakellariou 1958 b, 458.

¹⁰⁰ Xenaki Sakellariou 1958 b, 458–459.

¹⁰¹ Kenna 1960, 29.

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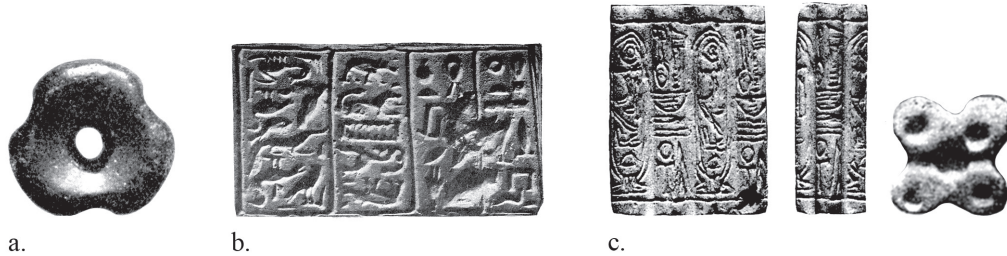


Fig. 10 Examples of cylinder seals with more than one seal face: a. three pannelled cylinder seal, Djemdet Nasr period (adapted from Erlenmeyer – Erlenmeyer 1958, pl. XLIV fig. 76); b. four pannelled cylinder seal, Early Dynastic Period (adapted from Flinders Petrie 1917, pl. VII 163); c. four-pannelled cylinder seal, Middle Kingdom (adapted from Frankfort 1939, pl. XLVI o, p, q).

shape and size for wearing but also had an amuletic character. In his opinion, this latter could have led to the creation of a stone seal which had a similar shape as the vertebrae and consequently, carried a similar amuletic significance. Finally, Poursat rejected Evans's and Xenaki Sakellariou's opinion that the form was inspired by natural stone shapes. He considered this possibility unlikely because most of the earlier prisms and gables, which he saw as sometimes typologically indistinguishable, are made of ivory and not of stone.¹⁰² He saw the three-sided prism as a Cretan creation which came about in an attempt to combine more than one faces in one seal and suggested that this process can be best followed in gables and three-sided prisms of Yule's Border/Leaf Complex, which are earlier than the bulk of the MM three-sided prisms.¹⁰³

Among the above mentioned authors, only Matz and Chapouthier saw a foreign influence in the creation of the Cretan three-sided prism. Matz's opinion that the Minoan prism is a transformation of the Near Eastern cylinder seal could be supported by the fact that the profiles of a certain kind of early Mesopotamian three-faced cylinder seal of the Djemdet Nasr period are somewhat similar to the profiles of some three-sided prisms with deep grooves around the seal faces (*fig. 10 a*).¹⁰⁴ In these cylinder seals, the field is divided along its length into three panels, each of which represents a separate seal face bearing different or similar images.¹⁰⁵ At first glance, a connection between the two shapes would not seem

¹⁰² Poursat 1995, 211–212. Poursat gives the term *ivory* following the descriptions on CMS II,1. In this volume, the term was often used erroneously for describing a variety of soft whitish materials, such as bone, boar's tusk, and white paste. Corrections on the material of the seals can be found on the copy of CMS II,1 which is kept in the CMS Archive in Marburg and on the CMS Seal Database which will be available on the internet.

¹⁰³ Poursat 1995, 210–212.

¹⁰⁴ Erlenmeyer – Erlenmeyer 1958, 358–359, pl. XXX fig. 10; 361, pl. XLIV fig. 76. Compare for example Erlenmeyer – Erlenmeyer 1958, 361, pl. XLIV fig. 76 to the profile of **105**.

¹⁰⁵ Erlenmeyer – Erlenmeyer 1958, 358–359, pl. XL fig. 58; Doumet 1992, 22 no. 20.

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implausible. The concept of these cylinders seems very similar to that of the Minoan three-sided prism, even if the cylindrical shape of the cylinder seal would still allow it to roll over while impressing, as opposed to the triangular section of the three-sided prism which does not allow unhindered rolling. The grooves of the Minoan three-sided prisms could be seen as remnants of the features which initially divided the cylinder seal into more than one panel.

However, the evidence does not allow such a correlation. If the Minoan prism was inspired by such cylinder seals, the grooves would have no reason to extend on the profiles but would instead only run on the interfacial edges, such as is the case with the three-sided prism shown in *fig. 9 d*.¹⁰⁶ Apart from that, no panelled cylinder seals are known from Crete. More to the point, consideration of two four-panelled Egyptian cylinders with different configurations, one dating to the Early Dynastic Period and the other to the Middle Kingdom,¹⁰⁷ would suggest that independent experimentations resulting in similar products can take place in different places and periods and need not always be connected to each other (*fig. 10 b, c*).¹⁰⁸

Leaving aside the panelled cylinder seals, Matz's view does not take into consideration two basic facts. The first is the scarcity of Eastern cylinder seals from Cretan contexts which can be dated with certainty to a time earlier than that of the genesis of the Minoan three-sided prism.¹⁰⁹ The second is that examples of Minoan cylinder seals already exist in MM I and continue being produced in MM II.¹¹⁰ The fact that the cylinder seal had already been adopted or was being adopted by the Minoans at the time of the genesis of the three-sided prism and the contemporaneous use of the two forms in MM II suggests that there was a clear differentiation between the two seal shapes and speaks against the opinion that the one derives from the other.

Chapouthier's view that the three-sided prism came about by the adoption of the Hittite gable, the subsequent engraving of all its sides, and its transformation into a seal whose three engraved sides could be used for sealing does not take into consideration the fact that

¹⁰⁶ This could in a way be related to such cylinder seals. The only Minoan (?) prisms with grooves only on the interfacial edges are **364** and **368**. For more on these prisms, see the section 'The British Museum Prisms', pp. 141–143.

¹⁰⁷ Early Dynastic Period: Flinders Petrie 1917, 10–11, pl. VII 163. Middle Kingdom: Frankfort 1939, 299, pl. XLVI o, p, q.

¹⁰⁸ For the subject of independent experimentations resulting in similar products, see also Yule 1987, 166–167.

¹⁰⁹ The only example of a foreign cylinder seal which has been found in a context which predates the genesis of the prisms is the North Syrian CMS V Suppl. 1B no. 332. The context of the piece is reported to have contained EM II, EM III, and MM I sherds (CMS Suppl. 1B, 315). Apart from that, stray finds of cylinder seals which are dated to a time earlier than the genesis of the prisms have also been recovered from the island, such as the Early Dynastic CMS II,2 nos. 206, 287.

¹¹⁰ MM I: e.g. CMS IV nos. 100–102; CMS V Suppl. 3 nos. 137–138; CMS XI no. 73. MM II: e.g. CMS II,2 no. 59; CMS XII no. 79. For the dating of CMS IV nos. 100–102 in MM IA late/MM IB, see Sbonias 1995, 59–60, 118. For more examples of Minoan cylinder seals, see Panagiotopoulos 2002, 85–86 with footnote 825.

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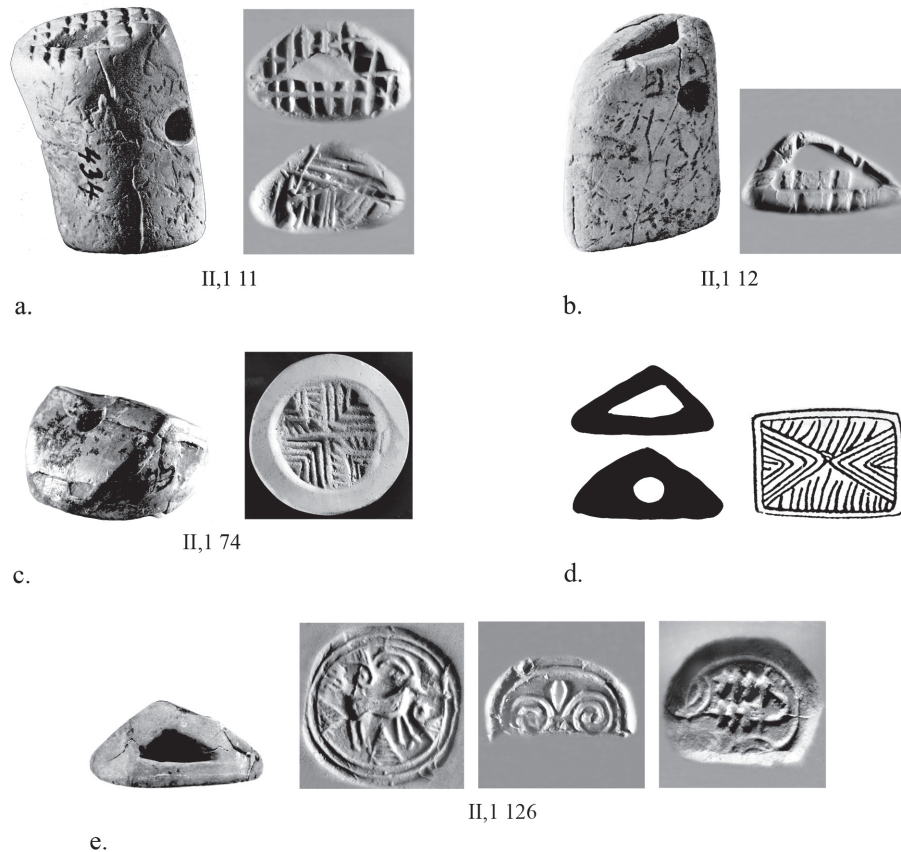


Fig. 11 Examples of seals made from boar's tusk: a. stamp cylinder with two seal faces; b. stamp cylinder with one seal face; c. gable-shaped button; d. gable with one seal face (adapted from Panagiotopoulos 2002, pl. 44 no. E10); e. gable with three seal faces.

the gable with one engraved side already existed in Crete as early as EM III¹¹¹ and thus predates the Anatolian variant. If the hypothesis of eastern provenance of the shape of the Minoan gable were to be pursued, it would also be possible to turn to Neolithic/Chalcolithic gables from greater Mesopotamia.¹¹² However, in this case it would be impossible to justify the large lapse of time between these examples and the first Minoan gables of the EM III. Moreover, no evidence of imported gables exists from early contexts in Crete.

For these reasons, it would seem justifiable to search for the genesis of the form within the island itself. With the exception of Poursat who sees the genesis of the prism in the desire to create a multi-faced seal, the remaining authors saw the three-sided prism as a

¹¹¹ Yule 1980 a, 57–58.

¹¹² For some such examples, see Homès-Fredericq 1970, 13, pls. IV 56, V 58, XII 165.

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form whose creation was inspired by naturally occurring shapes, whether these be splinters of stone or pieces of bone. This opinion, albeit modified to a certain extent, can be supported by the evidence provided by EM seals. Various early stamp cylinders and gables made of boar's tusk have a roughly prismatic shape and a triangular opening which runs in line with their 'slanting' faces (*fig. 11*).¹¹³ The opening is a natural feature of the lower canines of the wild boar.¹¹⁴ In the EM II/EM III gable-shaped stamp cylinders CMS II,1 nos. 11 and 12, the stringhole channel runs vertically to the line of the axis of the seal, such that the triangular faces serve as seal faces (*fig. 11 a, b*).¹¹⁵ The stringhole channel also runs vertically to the seal axis in the contemporaneous gable-shaped button CMS II,1 no. 74 (*fig. 11 c*).¹¹⁶ However, in this example, not the triangular but the larger round face bears the engraving. The three 'slanting' faces of the Prepalatial gable Panagiotopoulos 2002, 155 no. E10 from the MM I/MM II upper layer of Tholos E in Archanes are free to be engraved because the triangular pulp cavity serves as a stringhole channel (*fig. 11 d*).¹¹⁷ However, similarly to CMS II,1 no. 74, only the broad face is engraved. This changes in the MM IA late/MM IB gables CMS II,1 nos. 126 and 287 whose triangular pulp cavity serves as a stringhole channel and all 'slanting' faces are engraved (*fig. 11 e*).¹¹⁸

The above examples show that from an early stage in Minoan glyptic, a natural triangular prismatic shape had been in use which went through several experimental stages in the process of its transformation to a seal. These were mainly connected with choosing the direction of the perforation and the faces to be engraved. Since in all the aforementioned seals the raw material and geometrical shape remain the same, it would be logical to consider these pieces as the products of experimentation with various ways of configuring a seal.

At a somewhat later stage and with the increasing use of stone for the manufacture of seals, the seal shapes which were made from bone would be imitated in stone. Of particular interest for the transition from the use of bone to that of stone is the fact that the two stringholes of the Archanes gable have a different shape, the one being triangular and the other circular (*fig. 11 d*). While the triangular end corresponds to the pulp cavity of the tooth, the round one is, according to Panagiotopoulos, artificially bored.¹¹⁹ The need to bore one end would have come about from the desire to use as a stringhole channel the pulp cavity on a seal made from the part of the boar's tusk in which the cavity ended.¹²⁰ This piece could be seen as a link between the tusk gables with axial stringhole channel and

¹¹³ CMS II,1 nos. 11, 12, 74, 126, 287; Sakellarakis 1981, 526, pl. 170 nos. 4–5, fig. 6 no. 2.

¹¹⁴ Krzyszkowska 1990, 47.

¹¹⁵ For the dating of these seals, see Sbonias 1995, 74.

¹¹⁶ For the dating of this seal, see Sbonias 1995, 74.

¹¹⁷ For the dating of this seal, see Panagiotopoulos 2002, 55.

¹¹⁸ For the dating of this seal, see Sbonias 1995, 108.

¹¹⁹ Panagiotopoulos 2002, 155.

¹²⁰ For the use of the same part of the tusk for the manufacture of another seal, see CMS II,1 no. 11 (while the triangular pulp cavity is visible at the centre of side a, it is not seen on side b). For the section of a boar's tusk, see Krzyszkowska 1990, 48 fig. 20.

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the ones made of other materials and which, lacking a natural axial opening to serve as a stringhole channel, were artificially bored in line with their long faces.

As regards the development of the prism, one possibility would be that it developed as an independent form which imitated the shape of seals made of bones whose shape is closer to that of the prisms than that of the gables. However, the fact that the ‘slanting’ sides of most of the existing prisms are engraved suggests that the development of the geometrical shape of the three-sided prism was closely connected with the desire to engrave three seal faces. This, as well as the almost total lack of prisms made of bone,¹²¹ could be taken as an indication that the form developed from a triangular shape whose three sides were already engraved. As Chapouthier noted, the existence of stone gables with three seal faces could have led to the modelling of the shape of the stone seal in such a way that all its engraved sides could be comfortably used for sealing.¹²² From that point of view, Poursat’s opinion that the development of the canonical prism originates in the need to create a seal with more than one seal face seems justified.

Not only the geometrical shape, but also the idea of engraving more than one face of the seal seems to have had its roots on the island. The fact that the EM II/EM III stamp cylinder CMS II,1 no. 111 has two seal faces suggests that multi-faced seals exist from the very start of Minoan glyptic. Their production increases with time and by MM IA/MM IB, the habit of engraving more than one face of a seal has become a common decorating practice mainly for stamp cylinders but also for discs, cubes, and various other forms.¹²³ Within this framework, it would seem natural that also the triangular axially perforated prismatic forms would at some point start receiving engravings on more than one face.

¹²¹ The material of **399** could be steatite, bone, or some kind of paste.

¹²² Chapouthier 1951, 43–44.

¹²³ Stamp cylinders: e.g. CMS II,1 nos. 83, 224, 382, 392. Discs: e.g. CMS II,1 no. 268. Cubes: e.g. CMS II,1 nos. 64, 368. Other forms: e.g. CMS II,1 nos. 147, 148, 152, 374, 391. For a dating of these seal forms, see Sbonias 1995, 47–48, 56–61; Yule 1980, 91.

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MATERIAL

The great majority of prisms are made of soft materials.¹²⁴ Among these, stone is the most common, whereas artificial substances and perhaps bone are used more rarely. Occasionally, medium-hard stones are also employed.¹²⁵

All the materials are of local provenance (*fig. 12*). Steatite is the most common of all and represents 95.4 % of the used materials. The stone, composed largely of the mineral talc, is an aggregation of various minerals and has Mohs hardness 1–2.¹²⁶ It is the softest stone used for the manufacture of Minoan seals¹²⁷ and can easily be engraved with hand tools.¹²⁸ Because it is so soft, it can be carved with a single cut by a blade,¹²⁹ a technique which can create results similar to wood carving.¹³⁰ The stone has a soapy texture and appears in various colorations of matt or pale translucent white, yellow, green, brown, and black. The occasional opacity of a whitish variety can sometimes create the impression that the stone is not steatite, as is the case with **89** and **227**. A milky white coat often appears on the surface of the intaglios. This is most often met on pieces which are workshop fresh and does not seem to be inherent to the stone. It is probably a reaction of the material to external factors, such as the use of the seal, deposition circumstances, or, more probably, the engraving process.¹³¹

In comparison to the sources of other soft stones, the known sources of steatite occur infrequently on the island.¹³² A noteworthy outcrop is found in north-central Crete near the modern village Fodele whereas two large deposits are encountered in the neighbourhood of the Dikti mountains, one in the Sarakina Valley and the other in the Katharo Plateau.¹³³

¹²⁴ The term *soft materials* refers to those materials which can be engraved by hand tools as opposed to hard materials which can only be cut by tools mounted on an horizontal spindle and operated by fast rotary motion. The hardness of materials is measured by the Mohs scale of mineral hardness, which characterises the scratch resistance of various minerals through the ability of a harder material to scratch a softer material (for the Mohs scale, see Schumann 1989, 22–23). Easily engraved by hand are materials whose hardness is less than Mohs 4. Most Minoan seals which are made of such materials are cut freehand. Materials with hardness Mohs 4–5 are characterised as medium-hard as they can still, albeit with greater difficulty, be engraved with hand tools. Minoan seals made of such materials are cut either freehand or, most often, with tools rotated on the spindle. Hard materials have hardness greater than Mohs 5. Since they are not suitable for freehand engraving, the Minoan seals which are made of such materials are cut with tools operated on the spindle.

¹²⁵ For a discussion of the three-sided prisms which are cut from medium-hard stones, see pp. 36–37.

¹²⁶ Müller in CMS III, 17.

¹²⁷ The material of the ‘white pieces’, which was a certain kind of paste, must have been even softer (Walter Müller, pers. comm.).

¹²⁸ For more information on this stone, see Müller in CMS III, 17–18.

¹²⁹ Müller in CMS III, 17.

¹³⁰ Walter Müller, pers. comm. For examples of intaglios resembling wood carvings, see **5**.

¹³¹ Müller in CMS III, 17–18.

¹³² Becker 1976, 363.

¹³³ Near Fodele: Becker 1976, 371. Sarakina Valley: Warren 1969, 130; Becker 1976, 368. Katharo Plateau: Becker 1976, 368–369.

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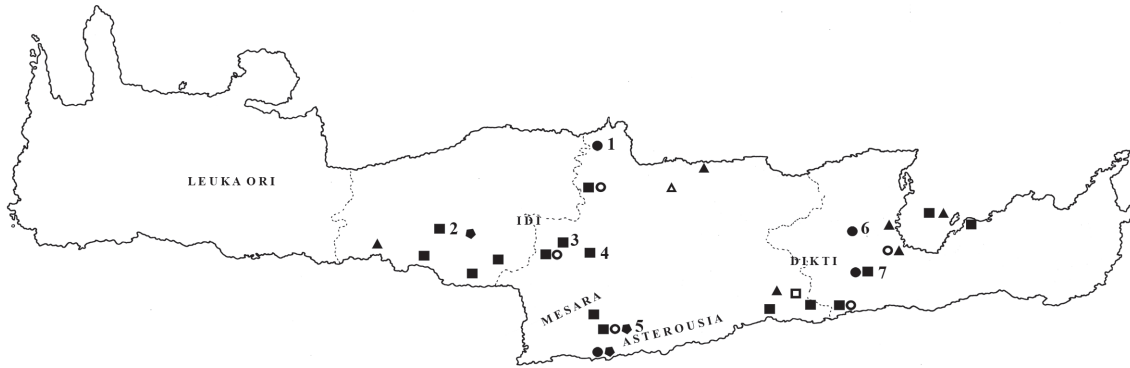


Fig. 12 Soft stone and medium-hard stone sources in Crete (data from Seager 1910; Evans 1935; Warren 1969; Becker 1976; Hughes Brock 2000): ●/○ steatite; ■/□ chlorite; ▲/△ breccia; ◆ sepiolite (the outline shapes show possible sources). The most important outcrops are marked with numbers: 1 Fodele; 2 Spili; 3 Vorizia; 4 Kamares – Zaros; 5 Miamou – Krotos; 6 Katharo Plateau; 7 Sarackina Valley.

The east Cretan sources seem to be the most plausible candidates for Minoan exploitation since steatite prisms are widely distributed in the eastern part of the island.¹³⁴ However, no evidence exists so far to link these sources to any Bronze Age activity.¹³⁵

Chlorite is the second most commonly used material for the manufacture of the prisms. The stone constitutes 2.6 % of the used materials. It belongs to the schist family and is mostly composed of chlorite minerals. The variety used in Minoan glyptic has a hardness Mohs 2–3.¹³⁶ Despite the fact that the stone is somewhat harder than steatite, it is still very soft and can easily be engraved with hand tools. While often scratching and chafing are required in order for it to be engraved, examples of chlorite prisms whose intaglios have been created by single cuts also exist.¹³⁷ The material is rougher than steatite but when abraded or smoothed out its surface also acquires a soapy texture. Its colour varies from green to brown and black, the green and brown varieties becoming considerably darker when abraded. Due to this latter characteristic, a distinctive feature of the stone is a dark surface patterned with lighter spots representing strokes which reveal the original colour of the stone. Only green and black varieties are used for the manufacture of the prisms.

¹³⁴ For this subject, see the section ‘Malia/Eastern Crete Steatite Prisms’, pp. 63–115, especially pp. 112–114.

¹³⁵ Warren considers that neither the Fodele nor the Katharo sources were in use by the Minoans (Warren 1969, 140). On the other hand, due to their proximity to Malia from where come a great number of steatite prisms, Müller sees the Katharo sources as the most plausible candidate for the Minoan exploitation of the material (Müller in CMS III, 18).

¹³⁶ Müller in CMS III, 19.

¹³⁷ Scratching and chafing: e.g. **31 a–c**, **57 a–c**, **60 a**. Single cuts: e.g. **105 a–c**, **217 b**. I am indebted to Walter Müller for his readiness to provide valuable guidance on the subject of differentiation between the various ways in which hand tools were manipulated for engraving soft stones.

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In older publications the stone is often identified as black or green steatite or as black marble.¹³⁸

Various chlorite sources have been identified in Crete. The most extensive outcrops have been located in the vicinity of the Mesara in south-central Crete, one near the town of Vorizia, one between the villages Kamares and Zaros, and one to the south in the area around the villages Miamou and Krotos.¹³⁹ Another noteworthy outcrop has been located further west in the vicinity of the town of Spili.¹⁴⁰ While no evidence of ancient mining from these sources exists, the concentration of large chlorite outcrops in south-central Crete, which is the only area where chlorite prisms have come to light,¹⁴¹ would suggest that one or more of these sources were used for the extraction of the material in Minoan times.¹⁴²

The remaining 2 % of the materials used for the manufacture of the prisms are medium-hard stones, other soft stones and minerals, and artificial substances. Breccia, pebble stone, and pseudo-jasper are the medium-hard stones represented.¹⁴³ The term *breccia* refers to structure, not composition, and is used to denote bedrock composed of angular pieces bonded together in a matrix of a different material.¹⁴⁴ The matrix can be clay, limestone, or pebble¹⁴⁵ and the enclosed pieces any soft or hard stone. Because the hardness of the matrix can only vary from soft to medium-hard,¹⁴⁶ it is the hardness of the enclosed pieces which determines the overall hardness of the rock. This can be soft or, most often, medium-hard or hard.¹⁴⁷

The three breccia prisms are manufactured from an orange and black stone which seems to be similar or to belong to the *Kakon Oros* variety.¹⁴⁸ Warren describes one kind of this breccia as being composed of a yellow limestone matrix with enclosed black dolomite pieces and another as a 'black dolomite matrix with red pieces and veins, which are themselves sometimes outlined by white calcite veins'.¹⁴⁹ **457** and **577** seem to be

¹³⁸ Black/green steatite: e.g. chlorite seals in CMS II,1, such as **103** and **104**. Black marble: e.g. **341**.

¹³⁹ Near Vorizia: Becker 1976, 370. Between Kamares and Zaros: Becker 1976, 364. Around Miamou and Krotos: Becker 1976, 365.

¹⁴⁰ Becker 1976, 369–370.

¹⁴¹ For this subject, see the section 'Mesara Chlorite Prisms', pp. 120–134, especially p. 134.

¹⁴² Warren considers these sources as the most plausible candidates for the extraction of the chlorite which was used for the manufacture of Minoan stone vases from EM II–LM I (Warren 1969, 130). Moreover, he notes that the use of chlorite for vases is most popular in the Mesara. This information and the fact that it is mostly chlorite that is used for the manufacture of prisms which come from the area suggest an extensive use of the stone in the Mesara in MM times. For the chlorite prisms of the Mesara, see the section 'Mesara Chlorite Prisms', pp. 120–134.

¹⁴³ Breccia: **440**, **457**, **577**. Pebble stone: **282**, **328**. Pseudo-jasper: **353**.

¹⁴⁴ Warren 1969, 127; Müller in CMS III, 17.

¹⁴⁵ Müller in CMS III, 17.

¹⁴⁶ Soft: when it is clay or soft limestone. Medium-hard: when it is pebble (Walter Müller, pers. comm.).

¹⁴⁷ If pieces of soft stone are enclosed in a soft matrix, the breccia will also be soft. The breccias used in Minoan glyptic range from medium-hard to hard.

¹⁴⁸ The term *Kakon Oros variety* refers to the specific variety of the stone and not to its provenance. Sources of this variety of breccia have also been located elsewhere in the island (for these sources, see below).

¹⁴⁹ Warren 1969, 127.

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manufactured of a stone very similar to the first while **440** is similar to the second kind of the Kakon Oros variety. The first type would have Mohs hardness equivalent to that of the enclosed dolomites, i.e. 3½–4.¹⁵⁰ Medium-hard breccias can be engraved with difficulty with hand tools by scratching and chafing.

The Kakon Oros to the east of Heraklion is the best known deposit of breccias.¹⁵¹ Other sources, mainly in the eastern part of the island, have been reported in the areas of Viannos, Agios Nikolaos, Kalo Chorio Mirampelou, Pseira, and Sellia.¹⁵² It would seem probable that **577**, which came to light on Pseira, was made of local material as Seager noted the existence of large deposits of breccia of the Kakon Oros type near the site.¹⁵³ However, in the publication of the piece, Nikolaidou remarks that there are no sources for the type of breccia from which the prism is made on Pseira itself.¹⁵⁴

The term *pebble stone* refers to various kinds of limestone which have been abraded by water transportation or the surge of the sea.¹⁵⁵ The pebble stones used for the prisms have hardness Mohs 4,¹⁵⁶ a light ochre colour, and can be engraved with hand tools by scratching and chafing. Pebble stones are found all over the coastline of Crete and their at times convenient shape and smooth appearance would have led to their collection for the manufacture of the odd seal.

Pseudo-jasper is a conventional designation for a certain kind of limestone which is similar in its appearance to jasper but softer, having hardness ca. Mohs 4–5.¹⁵⁷ Like jasper, the stone occurs in brownish red, green, or black varieties and has a relatively rough texture. As a rule, pseudo-jasper is cut with fast rotating tools mounted on the horizontal spindle,¹⁵⁸ **353** being the only possible exception cut with hand tools (?).¹⁵⁹

Three pieces are made of soft materials which could represent clay minerals. According to CMS VI, **523** is sepiolite or a related clay mineral.¹⁶⁰ **171** shows similar qualities;¹⁶¹ **191**

¹⁵⁰ Schumann 1989, 72.

¹⁵¹ Evans 1935, 234–235; Warren 1969, 127.

¹⁵² Evans 1935, 234–235; Warren 1969, 127; Becker 1976, 371.

¹⁵³ Seager 1910, 37 and pl. VIII.

¹⁵⁴ Nikolaidou 1998, 111.

¹⁵⁵ Müller in CMS III, 21.

¹⁵⁶ Walter Müller, pers. comm.

¹⁵⁷ The designation of the stone follows the standardised terminology of the CMS (see Müller in CMS III, 15 footnote 30). For details, see Müller in CMS III, 21 ('Kalkstein'). The information provided here draws on this paragraph and on data provided by personal communication with Walter Müller.

¹⁵⁸ E.g. an unpublished three-sided prism kept at the Heraklion Museum. For the horizontal spindle, see pp. 43–44.

¹⁵⁹ CMS II,2 no. 79 is engraved partly with hand tools and partly with tools operated on the spindle. For more on this subject, see 'Appendix 3', pp. 307–308.

¹⁶⁰ CMS VI no. 83; CMS VI, 19; Hughes Brock 2000, 111. For a seal which is indisputably made of sepiolite, see CMS V Suppl. 3 no. 374.

¹⁶¹ While examining the prism in the Heraklion Museum, the author described its material as 'stone (?), ash grey colour, very light, similar to white pieces but not the exact same material'. These features seem very similar to those of **523** (CMS VI no. 83; for the material of this piece, see also CMS VI, 19).

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is described in CMS II,2 in an identical way to **171**,¹⁶² which could suggest that the two pieces are made of the same material. Sepiolite is a clay mineral¹⁶³ with hardness Mohs 2–2½ but becomes even softer when wet.¹⁶⁴ The mineral is very light, has a porous texture, a whitish colour, and like steatite, can be easily engraved with a single cut by a blade.¹⁶⁵

Good sources of sepiolite are found in southern Crete in the area south of Krotos and in the form of pebbles in the wider area of Lentas.¹⁶⁶ The mineral is also found in the area of Gerakari in the Amari valley.¹⁶⁷ Its role in Minoan glyptic is minimal, which suggests that no systematic exploitation of any sources was undertaken. Instead, chance finds of sepiolite must have served as an additional raw material for the manufacture of seals.

Three or four prisms are manufactured from artificial substances, two or three from a kind of paste and one possibly from faience or a related vitreous material.¹⁶⁸ The term *paste* refers to a soft malleable mixture composed of one or more powdered minerals, some artificial substance(s), and a binding agent.¹⁶⁹ After the mass is partly or fully dry, it is used as a material for seals.¹⁷⁰ Its hardness is comparable to steatite, i.e. Mohs 1–2. Like steatite, this material can be carved with a single cut by a blade and when half dry, possibly even more easily.¹⁷¹ The paste of which the prisms are made is related to that used for some of the ‘white pieces’ but it is not the same.¹⁷² Possible remains of a greenish and brownish glaze on **258**¹⁷³ could indicate that, like the ‘white pieces’, these seals were also originally glazed and hence fired. The paste used for the manufacture of the prisms has a yellowish beige colour.

Faience is a synthetic vitreous substance consisting of ‘a body material composed of crushed quartz or sand, lime and an alkali’ and ‘coated with a glaze composed of the same

¹⁶² They are both described as ‘grauweißer Stein’ and not, as with other pieces which have a similar appearance, as white or light coloured steatite, e.g. CMS II,2 nos. 102, 145, 165, 176.

¹⁶³ Hughes Brock 2000, 111.

¹⁶⁴ Schumann 1989, 88.

¹⁶⁵ Walter Müller, pers. comm.

¹⁶⁶ Hughes Brock 2000, 111.

¹⁶⁷ Hughes Brock 2000, 111.

¹⁶⁸ Paste: **252**, **258**, **A.5** (?). **A.5** is either soft stone or some kind of paste. Sbonias notes that **252** is either stone or mass (Sbonias 2010, 203). According to Walter Müller, the severe cracks on the piece indicate exposure to strong heat and would speak in favour of paste. Soft stones such as steatite become hard when exposed to large temperatures (Walter Müller, pers. comm.). Faience or a related vitreous material: **395**.

¹⁶⁹ As is the case with the material of the ‘white pieces’, the exact constitution of this paste remains elusive. For the constitution of the material of the ‘white pieces’, see Pini 1990, 123–124.

¹⁷⁰ Pini 1990, 123–124.

¹⁷¹ According to Pini, when half dry, the paste from which the ‘white pieces’ are manufactured would have the softness of leather (Ingo Pini, pers. comm.).

¹⁷² Information for **252** in Sbonias 2010, 203, 220; for **258** in the CMS Archive. For the material of the ‘white pieces’, see Pini 1990, 123–124.

¹⁷³ Information in the CMS Archive.

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ingredients'.¹⁷⁴ The resultant mass is malleable¹⁷⁵ such that it can be formed by hand or in a mould.¹⁷⁶ It is believed that, at least when in a half dry state, the material is soft enough to be engraved with a blade. When the desired form is achieved, it receives glazing and is then fired.¹⁷⁷

The only prism made of a vitreous material is **395** from the Helladic mainland. The material used has a powdery texture with small craters on the surface and a yellowish beige colour. The texture suggests faience or a related substance,¹⁷⁸ i.e. a material different from that of the similarly coloured **252** and **258**. This is the only known prism made from such a substance¹⁷⁹ and, if it was actually made in Crete, it probably constituted an individual attempt to employ in glyptic a technique which had already started to flourish in other media at the beginning of the MM period.¹⁸⁰

399, which is described in CMS XII as ivory, seems to lack the characteristic structure of this material.¹⁸¹ For that reason, it is considered more possible that the piece is made of bone, steatite, or paste. Like steatite and paste, bone is soft and can easily be engraved with a single cut by a blade.

THE USE OF MEDIUM-HARD STONES FOR THE MANUFACTURE OF PRISMS

The three-sided prisms which are cut from medium-hard stones can be classified into three categories. The first includes seals engraved freehand or by the employment of fast moving drills and files applied to the fixed seal from above.¹⁸² The second is represented by one piece which seems to have been engraved partly freehand and partly by the use of fast rotating tools operated on the horizontal spindle.¹⁸³ The third category includes pieces cut by tools mounted on the spindle.¹⁸⁴

¹⁷⁴ Panagiotaki et al. 2006, 191–192.

¹⁷⁵ Polinger Foster 1979, 2; Panagiotaki et al. 2006, 193.

¹⁷⁶ Panagiotaki et al., 2006, 193.

¹⁷⁷ Panagiotaki et al., 2006, 194.

¹⁷⁸ A precursor of faience? (Walter Müller, pers. comm.).

¹⁷⁹ A three-sided prismatic bead of 'pale blue faience' which comes from a LM IA context in Pyrgos at central Crete is unengraved (Evans 1928, 75–76, fig. 34 f).

¹⁸⁰ Polinger Foster 1979, 59.

¹⁸¹ Walter Müller, pers. comm. This observation is made under the constraint of having to deduce the structure of the material from the CMS photographs. For the characteristic structure of ivory (lamination), see Krzyszkowska 1990, 34–36, 41–47, 57.

¹⁸² **282**, **353** (?), **440**, **457** (?), **577**. For the techniques used to cut **353** and **457**, see footnote 189. It is not certain whether **328** was engraved by fast moving drills applied to the fixed seal from above or by tools operated on the spindle. For this subject, see pp. 45–46. For the tools and the techniques which were employed for engraving the prisms, see pp. 37–47.

¹⁸³ CMS II,2 no. 79. For more on this piece, see 'Appendix 3', pp. 307–308.

¹⁸⁴ CMS II,2 nos. 150, 168; CMS XII no. 94. Younger identifies the material of the last piece as conglomerate (Younger 1987, 13). However, its description would more likely suggest breccia (for the differences between the two stones, see Warren 1969, 127, 130).

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Three-sided prisms made of medium-hard stones are included in this study only when they belong to the first category, i.e. when they have been engraved with a so called soft material technique.¹⁸⁵ The technique and iconography of such pieces point to them as marginal representatives of the prisms. The three-sided prisms of the third category are engraved with the technique that was common for cutting hard stones and therefore belong to a different stylistic environment. The piece belonging to the second category is cut with both soft material and hard stone techniques and hence placed halfway between soft material and hard stone engraving.

Moreover, certain elements of the prisms of the first category also place these seals between soft material engraving and hard stone engraving. On **440 a**, the tubular drill has been used to create perfect circles put together in a device which is otherwise only encountered on hard stone seals.¹⁸⁶ The traces of a first attempt to create the left circle under this element could suggest a lack of familiarity with the harder stone. The fact that all sides of the prisms **353** and **457** show hieroglyphic inscriptions brings them close to hard stone glyptic.¹⁸⁷ Whereas this trait is found only once on a soft stone prism, it is very common in the iconography of hard stone three-sided and four-sided prisms.¹⁸⁸ Moreover, the great care in the execution of the intaglios which, at first glance,¹⁸⁹ create the impression that they were cut with tools which were operated in the spindle¹⁹⁰ as well as the elaboration of some of the motifs which function as hieroglyphic signs,¹⁹¹ place these two pieces on the cusp between soft material and hard stone engraving.

TOOLS AND TECHNIQUES

Three techniques are used in the MM period for engraving seals. In this study, these are named the freehand technique, the vertical pressure technique, and the mechanical spindle

¹⁸⁵ For a detailed discussion of the soft material techniques, see pp. 38–43, also 44–47. Despite the difficulty in determining the exact way in which **328** was cut (see footnote 182), the piece is included in this study because it is part of a group of prisms which are cut in soft materials and show very similar iconography and technical execution. For this group, see pp. 45–46, 150–152 (the White Prisms Cluster).

¹⁸⁶ E.g. CMS XII no. 93 b.

¹⁸⁷ For these pieces, see also pp. 68–70, 99–100. (the Cluster of the Medium-Hard Hieroglyphic Prisms).

¹⁸⁸ Soft stone prism: **69**. Hard stone three-sided and four-sided prisms: e.g. CMS XII nos. 105–107, 109–110, 117.

¹⁸⁹ The intaglios of the two pieces are too deep and some of their walls are too vertical to have been engraved on the spindle (e.g. the vertical walls of the *Disc* on **457 b**). Moreover, some of the intaglios have a flat base which was probably created by cutting with a blade and chafing (such as the *Double axe* **353 a** and the *Disc* **457 b**). Also, irregularities on the intaglios of **457** suggest intensive chafing. However, the possibility that some of these intaglios were first created by tools operated on the spindle and then deepened by freehand abrasive work cannot be ruled out.

¹⁹⁰ The curving outlines of the *Double axe* **353 a**, the *'Arrow' b* **353 c** and **457 a**, and the *'Key sistrum'/'plough'* **457 c**, are characteristic of engraving with tools which are operated on the spindle (*fig. 20 b, d*). For that reason, there exists the possibility that these seals copy devices from hard stone seals.

¹⁹¹ Characteristic of hard stone engraving are the lines which issue from the sides of the *Shamrock b* **353 b** and of the *'Arrow' b* **353 c** (*fig. 20 c, d*) (for the first compare the respective motifs on CMS VI no. 105 d; CMS X no. 312 c; CMS XII no. 105 b. For the second, compare those on CMS IV no. 29D b; CMS XII no. 105 a).

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technique. The first two, which can be referred to as soft material techniques, are mostly used for engraving soft materials. The third is mainly employed for cutting hard stones, being thus a hard stone technique. The employment of each of these methods can be deduced by their results and by iconographic evidence of seal engraving from other cultures.¹⁹²

It is mainly the freehand technique and the vertical pressure technique which are employed for cutting prisms. However, it is possible that the mechanical spindle technique was used for engraving individual pieces.

FREEHAND TECHNIQUE

The freehand technique was employed from the very start of Minoan glyptic. The tools are manipulated with free hands at all angles against the seal, which is either held with one hand or is fixed in front of the engraver. The great majority of the devices cut on prisms were produced by freehand engraving.

For cutting soft materials, the knife seems to have been the most widely employed tool. The initial faceting of the seal could easily be achieved by its use, although saw and abrasive work would also serve.¹⁹³ The blade would be suitable for all engraving processes, from scratching guidelines with its point to cutting through and paring away the stone. Burins and points are further candidates for these jobs¹⁹⁴ but the convenience of the blade which can be used in different ways would have made it, at least in the case of the softest materials, widely used. For working steatite and other materials of the same hardness, no abrasives would be required.¹⁹⁵ On the other hand, abrasive materials would often have been applied for cutting through the somewhat harder chlorite and, most probably always, for medium-hard stones.¹⁹⁶ Stone slabs, splinters, or powdered stone would have served as abrasives and polishers.¹⁹⁷

The tools would have been made of obsidian or metal,¹⁹⁸ with metal being a more plausible candidate for work on medium-hard stones.¹⁹⁹ Metal saws, pointed and slant-edge burins, scrapers/tranchets, needles/points as well as obsidian blades, bone awls, and possible whetstones have been found in Quartier Mu, partly in the vicinity of the Seal Cutter's Workshop.²⁰⁰ While the fact that these tools come from a wider area within the

¹⁹² For an Egyptian depiction of engraving a seal with the freehand technique, see Evely 1993, 95 fig. 41, 5. For a representation of the Roman horizontal spindle, see Evely 1993, 159 fig. 65 above.

¹⁹³ Evely 1993, 150.

¹⁹⁴ Evely 1993, 152.

¹⁹⁵ Evely 1993, 150–152.

¹⁹⁶ Walter Müller, pers. comm.

¹⁹⁷ Evely 1993, 111–116, 152.

¹⁹⁸ Evely 1993, 150–152.

¹⁹⁹ Gorelick – Gwinnett 1992, 61.

²⁰⁰ Poursat 1996, 106–109.

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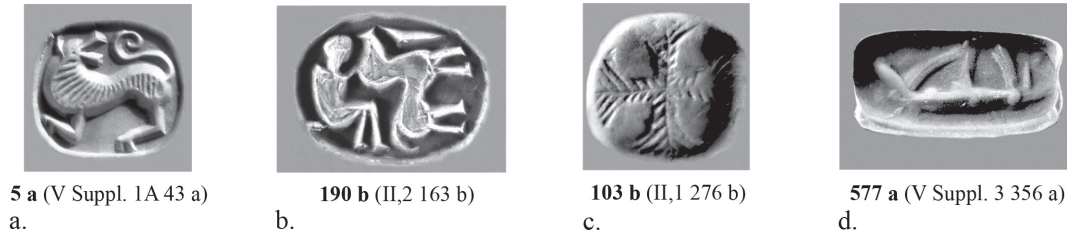


Fig. 13 Intaglios cut in the freehand technique: a., b. steatite; c. chlorite; d. breccia.

Quartier does not allow a conclusive association with the Workshop,²⁰¹ it is possible that at least some of them belonged to its equipment.

Most often, the intaglios engraved with the freehand technique show irregularities and rough tool marks (*fig. 13 b, d*). When cutting through steatite or other materials of the same hardness, the blade penetrates the surface with one cut at either vertical or slightly slanting angles creating characteristically deep and clear intaglios (*fig. 13 a*). This cut is often enough to create the design but some chafing or abrasive work is also frequently used to improve and achieve uniformity (*fig. 13 b*). Two combined cuts create intaglios with V-profiles²⁰² whereas further widening and flattening of the surface between the cuts results in characteristic board-like intaglios, Evely's 'blanks', with angular U-profiles (*fig. 13 a, b*).²⁰³ The final paring out cuts often penetrate somewhat deeper than the inner flattened surface of the intaglio creating a distinctive outline which underlines the abandonment of abrasive work (*fig. 13 b*). While not as common, 'blanks' with no outlines and ones with U-profiles are also found.²⁰⁴ In these cases, care has been taken to soften the harsh angles created by the penetration of the blade by chafing or the use of abrasives.²⁰⁵ Occasionally, 'cup sinkings' with irregular outlines and flat bases are actually circular 'blanks' created by cutting.²⁰⁶ Shallow scratching can be incipient engraving or, in cases where it is very irregular, it can suggest apprenticeship or trial work.²⁰⁷

As a rule, freehand work on chlorite requires more chafing than in steatite. More intensive chafing is observed for example in the creation of deep neatly cut 'blanks'.²⁰⁸ On the other hand, the existence of clear V-profiles formed by the combination of deep single cuts suggests that this material can also be cut by the use of a blade only.²⁰⁹ Shallow

²⁰¹ Poursat 1996, 106.

²⁰² 

²⁰³ . Evely 1993, 148, 149.

²⁰⁴ 

²⁰⁵ E.g. **269 a**, **269 c**.

²⁰⁶ E.g. **64 b**.

²⁰⁷ Incipient engraving: e.g. **163 b**. Apprenticeship or trial work e.g. **181**.

²⁰⁸ E.g. **60 a**, **60 b** (Walter Müller, pers. comm.).

²⁰⁹ E.g. **104**.

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V-profiles and U-profiles are indicative of either a greater difficulty in cutting the stone or, more probably, a different engraving method (*fig. 13 c*). In these cases, the engraving is not the result of deep forcible penetration of the blade but of more intensive horizontal chafing probably assisted by some abrasive. Curvilinear lines are often shaped by a combination of smaller linear elements.²¹⁰

For medium-hard stones, the use of saw and abrasive work for faceting the seal seems more probable than the use of the blade. For the engraving process, abrasive would have been required. Shallow intaglios with V- and U-profiles which indicate greater difficulty in penetrating the stone characterise freehand engraving of such stones (*fig. 13 d*). The U-shaped intaglios are testimonies of intensive horizontal chafing possibly combined with some abrasive action. Longer curvilinear lines are often replaced by more than one straight line connected at an angle.²¹¹

VERTICAL PRESSURE TECHNIQUE

The vertical pressure technique was in operation from EM II onwards.²¹² The tools are applied vertically or at a slight angle to the face of the seal which is fixed.²¹³ They are not manipulated freehand, but with a constant backwards and forwards rotary or linear movement which generates fast motion. The rotary power can be produced either by the hands of the craftsperson who turns the shaft of the drill between his/her two palms²¹⁴ or most likely by a fiddle bow operated by one hand.²¹⁵ In both cases, a means of holding the drill in position would be necessary, whether this be an assistant, a device applied vertically to the free end of the drill,²¹⁶ or in the case of the fiddle bow, the engraver's free hand. The technique is only used for the production of centred-circles, lines, and 'cup sinkings', a feature which suggests that it was unsuitable for the production of other shapes. At the outset of its employment in EM II, the technique was only used in a linear repetitive manner.²¹⁷

Fast backwards and forwards rotary motion can, as already mentioned, be generated by a fiddle bow. Vertical pressure tools were used for engraving the seal and for opening the stringhole channels. Saws/files²¹⁸ and drills were, at least when cutting into stones

²¹⁰ E.g. the inner part of the *Coil spiral 336 c*.

²¹¹ E.g. the lines on **577 b**.

²¹² E.g. the seals of Sbonias's Grid/Bone Complex (Sbonias 1995, 74–79).

²¹³ Betts 1989, 12.

²¹⁴ Rotary power, albeit slower, can also be generated by the use of one hand for turning if the other needs to keep the drill in place.

²¹⁵ For an image of a similar modern method for drilling stringhole channels, see Müller 2000, 201 fig. 5.

²¹⁶ E.g. Müller 2000, 201 fig. 5.

²¹⁷ See Sbonias's Grid/Bone Complex (Sbonias 1995, 74–77).

²¹⁸ Saws are tools with dentation on one or two sides and are mainly used for cutting through the material. Files achieve cutting through abrasion brought about by the use of repetitive backwards and forwards motion. Files can either resemble saws but have no dentation, in which case they are mostly used to create straight lines in the

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harder than steatite, possibly combined with some abrasive.²¹⁹ Solid drills would be used for opening the stringhole channel²²⁰ and for creating ‘cup sinkings’. The fact that the existing centred-circles are perfectly centred, suggests that a special kind of drill was used for their creation. This can be named the toothed drill and is envisaged as a three-, four-, or multiple-pronged tool with longer middle spike, so that it can be securely fixed to the stone when applied vertically onto it.²²¹ Fast backwards and forwards rotary motion of the tool would have opened a round cavity at the point where the middle prong was fixed and one or more circles at the point of motion of the side prongs.²²² Another less likely candidate for creating such motifs would be a cup drill. This would have been composed of a solid drill with a semi-globular cup-shaped implement attached to its body.²²³ In one case, a piece otherwise engraved freehand also displays the use of the tubular drill employed with fast motion.²²⁴

For the creation of ‘cup sinkings’, the combined use of the solid and tubular drill is also attested to (*fig. 14*).²²⁵ Some of the ‘cup sinkings’ on **58 a**, **58 c**, **84 b**, and **219 a** have a diameter 0.25–0.30 cm and show a circular core (*fig. 14 a–c*). In the first two cases, this core corresponds to the unengraved surface while in the third it is engraved shallower than the rest of the intaglio. This peculiarity does not seem to belong to the iconography of the devices but instead suggests that the ‘cup sinkings’ in question are left unfinished. It seems that in order to open these ‘cup sinkings’, a solid drill was inserted inside a tubular drill and the combination was then presented to the seal face and rotated backwards and forwards under vertical pressure. The tubular drill would have been used first to open a circular cavity and after that, the solid drill would have been employed to abrade the raised centre. This method, also attested on other prisms,²²⁶ would probably also have been used to hollow out the rest or at least some of the other ‘cup sinkings’ found on the same seal faces. The same process leaves very distinctive traces in the intaglios of MM hard stone three-sided prisms²²⁷ and is extensively used in talismanic seals. In these latter examples,

intaglios; or else they can be splinters or blocks of stone or organic material used to give the seal its final form by reducing roughly-shaped pieces to a perfect form and by rounding sharp angles.

²¹⁹ Experiments by Gorelick – Gwinnett and other researchers have shown that drilling with flint on steatite does not require abrasive (Gorelick – Gwinnett 1979, 30).

²²⁰ Gorelick – Gwinnett 1992, 60–61; Evely 1993, 150, 152; Poursat 1996, 106; Müller 2000, 199–202.

²²¹ Betts 1989, 10; Evely 1993, 151 *fig. 64* shaped bit, 80 *fig. 34* toothed.

²²² Each of the rings of the centred-circles of **409 b** is composed of two lunettes. In these cases, the drilling seems to have taken place in two operations. First, the drill would have been held obliquely against the seal face and rotated backwards and forwards, so that the one half of the ring and the central dot was created and then, the same would have been done in the opposite direction.

²²³ CMS II,2, xvi–xvii *fig. 1*.

²²⁴ **440 a**.

²²⁵ I am indebted to Walter Müller for discussing with me the process by which ‘cup sinkings’ were opened by the combined employment of these two tools.

²²⁶ E.g. **88 c** and **184 a** where the ‘cup sinkings’ are finished.

²²⁷ E.g. CMS II,2 nos. 79 a, 230 a, 230 c; CMS III no. 181 a, 181 c; CMS VI nos. 95 b, 98 a, 98 c, 99 a, 99 c, 105 b, 106 b; CMS VII no. 45 a–c; CMS XII no. 93 a, 93 c.

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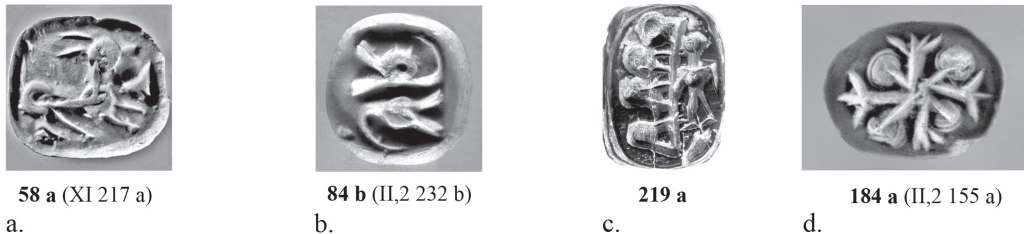


Fig. 14 ‘Cup sinkings’ opened by the combined use of a tubular and a solid drill: a. the hindquarters and the chest of the *Agrimi*; b. the upper *Head of ‘dog/lion with hook’*; c. the upper ‘*String vessel*’; d. the ends of the *Cross pommée*.

‘cup sinkings’ often show a so called ‘collar’²²⁸ which is not very different from the ‘outline’ of the ‘cup sinkings’ of **184 a** (*fig. 14 d*). Onassoglou sees the preference for this technique for opening ‘cup sinkings’ as the result of the greater suitability of the tubular drill, as opposed to the solid drill, for deeply cutting and hollowing out the stone.²²⁹

The most likely answer to the question of why the core of the ‘cup sinkings’ was only partly or not at all removed in the aforementioned prisms is either that the use of the solid drill was forgotten or that it was considered unnecessary. The latter seems to have been the case in **58 a** (*fig. 14 a*). Here the chest of the animal seems also to have been made solely with the tubular drill. However the drill-marks are partly obscured by the existence of two lines – one connecting the boring to the neck of the animal, another linking it to the hindquarters. It seems possible that these lines constitute a successful attempt to ‘cover’ the core of this boring.

While the fiddle bow would probably have been made of wood and string, the remaining tools would have been made of either obsidian or metal,²³⁰ with obsidian being a more plausible candidate for the drills used to open the stringhole channel.²³¹ Wood or reed operating with the use of an abrasive, constitute further candidates for drills.²³² The thick edge of the tool used to open hollow ‘cup sinkings’, the great depth into which it penetrates, and the small inner diameter differ markedly from the configuration of the first tubular drills used on medium-hard and hard stones. Betts has convincingly argued that the tubular drill is an invention connected with hard stone engraving and the use of the horizontal spindle.²³³ It therefore seems possible that another kind of tubular drill, perhaps one made

²²⁸ Onassoglou 1985, 180.

²²⁹ Onassoglou 1985, 180.

²³⁰ Evely 1993, 150–152.

²³¹ Poursat 1996, 106.

²³² Evely 1993, 152, 157.

²³³ Betts 1989, 10–12.

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of some organic material²³⁴ and employed only in combination with a solid drill in order to create ‘cup sinkings’ was in use in the case of the ‘cup sinkings’ with a ‘collar’. However, the thinness of the walls of the tubular drill used in **184 a**, its diameter of 0.20–0.25 cm, and the fact that it comes from the Malia Workshop, in the vicinity of which metal tubular drills with a diameter 0.20 cm have been recovered,²³⁵ could suggest that the tubular drill used here was made of metal (*fig. 14 d*).

The drills, if not all the tools used for cutting medium-hard stones, would more probably have been made of metal.²³⁶ The fact that such a tubular drill has been used in the intaglio of a breccia prism²³⁷ shows that this tool was available and allows for the supposition that it could have been used for opening the stringhole channel of at least some of the prisms cut in medium-hard stones.²³⁸ At the Malia Workshop, metal tubular drills were employed for engraving medium-hard and hard stones.²³⁹ Moreover, the use of the tool for opening the stringhole channel of a cornelian piece has been verified.²⁴⁰

MECHANICAL SPINDLE TECHNIQUE

The mechanical spindle technique makes its appearance in MM II with the introduction of the horizontal spindle.²⁴¹ The spindle is ‘supported in a wooden frame between two uprights’.²⁴² Different implements can be attached to it in various ways, such as small disc wheels and drills to one or both ends and larger metal or stone wheels as well as polishing blocks on its body. The spindle is then rotated backwards and forwards by means of a fiddle-bow operated by an assistant, so that the engraver can freely manipulate the seal, by holding it in their hands or having it attached on a dop,²⁴³ against the various implements which rotate at high speed.²⁴⁴ The mechanical spindle technique frees both the hands of the engraver and the seal so that the later can be presented to the various implements at all

²³⁴ Reed?

²³⁵ Poursat 1996, 106–107.

²³⁶ Gorelick – Gwinnett 1992, 61.

²³⁷ **440 a**.

²³⁸ Gorelick – Gwinnett argue in favour of the use of a copper tubular drill for opening the stringhole channel of MM medium-hard and hard stone seals (Gorelick – Gwinnett 1992, 61).

²³⁹ CMS II,2 nos. 128, 150, 168.

²⁴⁰ Poursat 1996, 106–107.

²⁴¹ Betts 1989, 13. Betts names the device a bow lathe (Betts 1989, 12). Gorelick – Gwinnett note that, strictly speaking, the term *lathe* refers to a device that turns the object while the tools are presented to it (Gorelick – Gwinnett 1979, 25). This would describe an apparatus functioning in the same way as the potter’s wheel and different from the seal cutting device where the tools are turned and the seal is presented to them. For that reason, Gorelick’s – Gwinnett’s term horizontal spindle is preferred by the present author.

²⁴² Betts 1989, 13.

²⁴³ For a modern reconstruction of a dop, see Müller 2000, 198 fig. 2. For a dop stick, see Evely 1993, 159 fig. 65 down left.

²⁴⁴ Betts 1989, 13. For a modern reconstruction of such a spindle, see Müller 2000, 195–198.

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angles and all possible shapes can be created. However, on prisms, if employed at all,²⁴⁵ the technique is only used for the production of centred-circles, lines, and ‘cup sinkings’.

Disc wheels with various breadths of edges²⁴⁶ and solid as well as tubular drills can be attached to the spindle and used for cutting the intaglios. Files and polishers, used for faceting the seal, can also be operated on the spindle.

The spindle implements would have been made of stone or metal,²⁴⁷ organic materials being further likely candidates for drills and polishing blocks. Abrasives, while possibly required when cutting medium-hard stones, would have been unnecessary for cutting softer materials.

VERTICAL PRESSURE TECHNIQUE VERSUS MECHANICAL SPINDLE TECHNIQUE

The similarity of the devices and the intaglios created by the two techniques which produce fast motion does not always allow the positive identification of the one or the other by their results.²⁴⁸ The use of the vertical pressure technique is considered certain in cases where fast motion drills are used in intaglios which are otherwise engraved freehand (*fig. 15 h*).²⁴⁹ However, in cases of intaglios which are engraved only with lines, centred-circles, and ‘cup sinkings’, it is often impossible to define the way in which the fast motion tools were operated.

Some iconographic observations relating to the configuration of the devices created by the two techniques on seals of various materials can provide some indication as to the way they were created. Centred-circles with multiple rings are only attested in soft materials, and the majority are perfectly centred. On the other hand, most examples of centred-circles encountered in hard stones are imperfectly centred.²⁵⁰ The absence of centred-circles with multiple rings and the fact that the centred-circles on hard stone seals are imperfectly centred could suggest that on these seals centred-circles were created by separate operations, one for cutting the central dot and one for engraving the surrounding ring. This suggests that engravers using the spindle had no special implement for creating centred-circles in a single operation.²⁵¹ Thus it seems likely that even after the introduction

²⁴⁵ For more on this subject, see below ‘Vertical pressure technique versus mechanical spindle technique’, especially p. 45–46.

²⁴⁶ Onassoglou 1985, 173–179, fig. 3 C1, C2.

²⁴⁷ Betts 1989, 13; Evely 1993, 155–157.

²⁴⁸ I am indebted to Walter Müller for his readiness to discuss the characteristics of the intaglios created by the two techniques.

²⁴⁹ E.g. **92 a**, **188 b**, **288 b**, **307 c**, **569 c**. In these examples, the ‘cup sinkings’ and the centred-circles have been executed with the vertical pressure technique whereas the remaining elements have been cut freehand. In such cases, the use of the spindle seems improbable because if this piece of equipment were available it would have been used for cutting all devices.

²⁵⁰ E.g. CMS VII no. 45 a.

²⁵¹ E.g. a toothed/cup drill specifically designed for use in the spindle or a composite drill assembled from a solid drill fixed within one or more tubular drills of different diameters.

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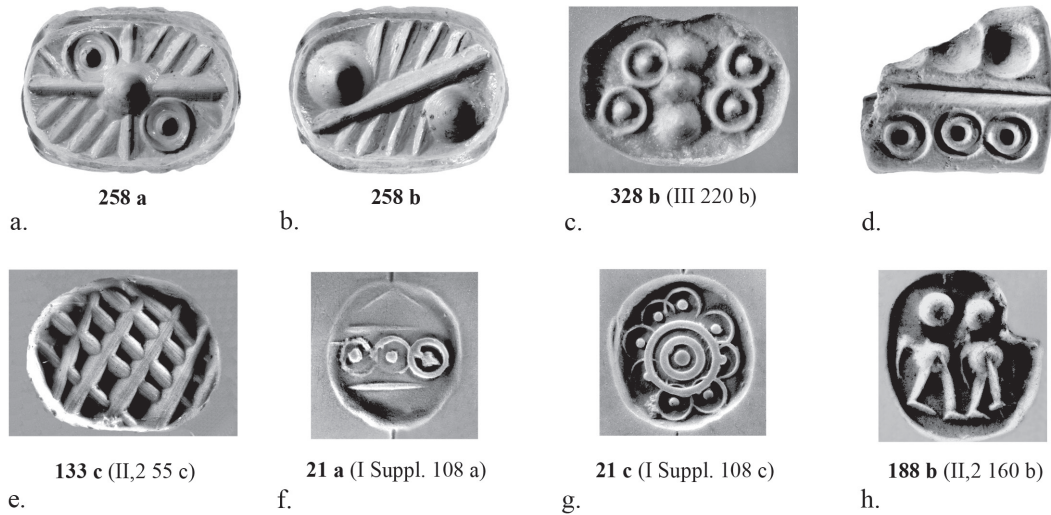


Fig. 15 Examples of intaglios cut in fast motion techniques. In a.–d. are shown prisms and a cushion which could have been cut with the mechanical spindle technique (adapted from Dimopoulou 2000, 30 fig. 2 no. 18, 31 fig. 3 no. 28). In the intaglio depicted on h. only the ‘cup sinkings’ have been executed with the vertical pressure technique.

of the spindle centred-circles on soft materials continued to be executed with the vertical pressure toothed/cup drill.²⁵²

One must also consider the possibility that a group of prisms cut in whitish soft and medium-hard materials were engraved by tools operated in the spindle (*fig. 15 a–c*).²⁵³ The intaglios of these pieces have characteristically smooth walls marked by fine parallel striation. Most, but perhaps not all, centred-circles are perfectly centred.²⁵⁴ The lines have V- or U-shaped profiles and cut through both or one of the seal face edges, in this latter case, tapering towards their other edge.²⁵⁵ The ‘cup sinkings’ have perfectly round outlines and conical profiles.

One of these prisms, **258**, and the cushion Dimopoulou 2000, 36 no. 28 are so similar that their engraving in the same technique cannot be doubted (*fig. 15 a, b, d*). Cushions were created because of the greater suitability of their convex faces for engraving on the spindle. This, as well as the very regular intaglios of the two pieces could suggest that they and the remaining related prisms were engraved by tools mounted on the spindle. In favour

²⁵² For these drills, see p. 41.

²⁵³ **252, 258, 328, 395, A.5.**

²⁵⁴ One of the centred-circles on **328 b** seems to be imperfectly centred.

²⁵⁵ **252 b, 252 c, 258 a–c, A.5 a–c.**

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of this could also speak the fact none of these seals shows centred-circles with multiple rings.

The perfectly centred centred-circles on CMS VI no. 99 c, which is made of hard stone and is cut on the spindle, attest to the fact that such devices can also be created by the mechanical spindle technique. The circles which surround the 'cup sinkings' on CMS VI no. 99 c and those on CMS VI no. 99 b were probably created by the same tubular drill. This would mean that the centred-circles on CMS VI no. 99 c were either cut by a composite drill attached to the spindle and composed of a solid and a tubular drill, the tubular being the one used for cutting the circles on CMS VI no. 99 b; or more probably, that the centred-circles on CMS VI no. 99 c were formed in two separate operations, the central dots and the circles being marked with paint or scratching before the presentation of the stone to the rotating tools.

Despite the above evidence, the possibility that the pieces of the group in question were engraved by vertical pressure tools cannot be ruled out. Two further observations support this view. Certain steatite seals display very similar 'cup sinkings' with conical profiles that are combined with centred-circles showing multiple rings. In addition **259**, most probably engraved in the vertical pressure technique, comes from Poros Katsampas, where **258** and the cushion Dimopoulou 2000, 36 no. 28 were also found.

THE INTAGLIOS ENGRAVED BY THE TECHNIQUES WHICH PRODUCE FAST MOTION

Centred-circles, lines, and 'cup sinkings' created by the vertical pressure and the mechanical spindle technique show perfect outlines and have regular and smooth intaglios with fine striations on their walls (*fig. 15*). Lines are variously deep and show V- and U-profiles. They can have the same width all along their length and extend over the edges of the seal face (*fig. 15 b, e*).²⁵⁶ In other cases, they cut through one edge of the seal face but stop within it, showing an occasional tapering at the exit (*fig. 15 a, b*).²⁵⁷ Shallow lines with tapering edges constrained within the seal face are also encountered (*fig. 15 f*).²⁵⁸

The rings of the centred-circles often have deep, upwards slightly widening U-profiles, but V-profiles, and angular U-profiles also occur. Often, the central 'cup sinking' penetrates the stone deeper than the surrounding rings.²⁵⁹ On most occasions, the inner rings of centred-circles with multiple rings are deeper than the outer rings, the latter often resembling only superficial scratches.²⁶⁰ Some rings are not closed but actually form crescents (*fig. 15 g*). In

²⁵⁶ E.g. **83 a**, **133 c**, **259 b**. Such lines can suggest the use of a file applied vertically onto the fixed seal. This technique was used in EM II for the creation of grids, such as those on CMS II,1 nos. 11 a, 13, 17, 20, 26.

²⁵⁷ E.g. the lines on **252 b**, **252 c**, **258 a-c**, **259 a**. Such results can theoretically be produced by both manipulation against wheels and also the use of file.

²⁵⁸ E.g. **21 a**, **442 b**, **442 c**. Tapering points can often suggest the use of fast rotating wheels (Evely 1993, 158; compare also the lines on CMS VI no. 98 c which is cut on the spindle). However, filing can also create similar results.

²⁵⁹ E.g. **320 a-c**.

²⁶⁰ E.g. **320 a-c**.

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centred-circles with multiple rings, these are the outer, shallower rings. This could indicate that, in these cases, the inner ring and the central ‘cup sinking’ were created by one action whereas the outer ring(s) were cut in a separate operation.

The outlines of the ‘cup sinkings’ are round whereas their profiles are V-or U-shaped.²⁶¹ ‘Cup sinkings’ with V-profiles are deep but their slanting walls create a characteristically soft impression (*fig. 15 a–d*).²⁶² ‘Cup sinkings’ with U-profiles can either be fairly shallow and have slanting walls or be deep and penetrate the stone vertically (*fig. 15 h*).²⁶³ In the case of a seal which is otherwise engraved in the vertical pressure technique, it is uncertain whether the flat based ‘cup sinkings’ with slightly triangular outlines have been created freehand or by vertical pressure tools.²⁶⁴

THE PROCESS OF MANUFACTURE

The discovery of numerous unfinished prisms in the Seal Cutter’s Workshop at Malia sheds light on the process of the manufacture of these seals.²⁶⁵ The first step for the creation of a prism would be to cut a piece of the raw material to the approximate size of the desired seal and to give it a roughly triangular shape. Parallel lines along the length of small pieces of debitage produced by sawing suggest the employment of the saw for this operation.²⁶⁶ After that, the piece would receive its final form by filing. Fine parallel lines running vertically or slightly diagonally to the length of the prism are a witness to this action, which concentrates first on the faces and then moves on to the smoothing of the angles.²⁶⁷

The perforation of the stringhole channel is the operation which causes the most accidents. As a rule, this seems to have taken place before the engraving.²⁶⁸ However, the existence of a few pieces with engraved sides and unfinished stringhole channels attest also to the opposite procedure.²⁶⁹ To make sure that the drill does not accidentally take a slanting direction while piercing and cause the fracture of the stone, the action takes place in two separate operations. The drilling starts from both profiles and the two channels meet, not always perfectly aligned, in the centre of the stone.²⁷⁰

²⁶¹ V-shaped: e.g. **133 a**, **252 b**, **252 c**, **258 a–c**, **328 a**, **328 b**.

²⁶² While the exact technique employed for the creation of such ‘cup sinkings’ is not clear, their conical smooth profiles are not inconsistent with Evely’s description of borings created by drills operated on the spindle: “a symmetrical ‘entry and exit’ pattern, of a crisply pointed or neatly rounded form, with regular and parallel striations in the furrow itself” (Evely 1993, 77). For tapering borings on soft stones, see also Gorelick – Gwinnett 1987, 19 fig. 8 a; 20 figs. 10 a, 10 b, 11.

²⁶³ Shallower with slanting walls: e.g. **282**. Deep penetrating the stone vertically: e.g. **187**.

²⁶⁴ **A.2 b**, **A.2 c**. In these cases, the operation of the tools on the spindle can be ruled out.

²⁶⁵ For the Malia Workshop, see pp. 59–62.

²⁶⁶ Poursat 1996, 105.

²⁶⁷ Poursat 1996, 106.

²⁶⁸ Poursat 1996, 106. To the best knowledge of the author, no prism exists which doesn’t have a stringhole channel.

²⁶⁹ E.g. **150**, **159**, **168**, **173**, **211**.

²⁷⁰ The process of opening the stringhole channel from the two profiles is attested in **251**.

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After the engraving, the final polish follows,²⁷¹ which gives shine and obliterates any traces of sawing and filing.

‘TRIAL’ PIECES

Three unfinished pieces from the Malia Workshop have irregular intaglios largely created by what seem to be random cuts (*fig. 16 a*).²⁷² In some cases, a roughly recognisable design can be made out, such as a human figure or a ship.²⁷³ The incongruence in the quality of these intaglios with the quality of most Malia Workshop seals suggests that they are the work of an inexperienced hand,²⁷⁴ who could perhaps have been experimenting on pieces rejected by the head craftsman.

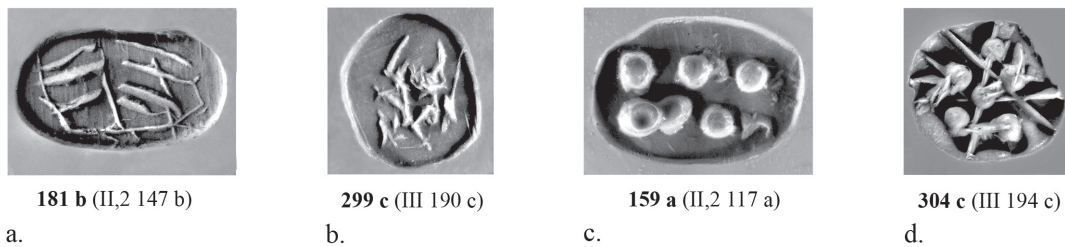


Fig. 16 ‘Trial’ pieces

299 is of special interest because of the contrasting quality of its intaglios. As opposed to **299 a** which is skilfully engraved with an animal attack scene, **299 b** and **299 c** show irregular, linear cuts of the type met on the three aforementioned prisms from the Malia Workshop. A badly designed *Scorpion* can be made out in **299 c** (*fig. 16 b*). While the lack of file marks attests to the receiving of final polishing, the lack of rounded edges and the flat interfacial edges suggest that the seal is hardly used. Further characteristics of the piece are two irregular trapezoidal seal faces, one accentric stringhole which almost touches the edges of **299 b**, and a small break into the stringhole channel in the intaglio of **299 b**. It is therefore possible that **299 a** was engraved by an experienced craftsman before the piece was abandoned for some reason²⁷⁵ and passed on to an inexperienced person who engraved the remaining sides.

²⁷¹ Poursat 1996, 106.

²⁷² **157**, **181**, **211**. The fact that they are unfinished is attested by the file marks on their seal faces. There exists the possibility that also **152** and **204**, both of which come from the Malia Workshop, were apprenticeship or exercise pieces.

²⁷³ Human figure: **157 a** (see *Man in profile*). Ship: **181 b** (see *Ship*).

²⁷⁴ For more on these pieces, see pp. 77–78 (the Irregular Cut Style).

²⁷⁵ Perhaps due to the chipping at the hindquarters of the *Bovine*? It is also possible that the piece was rejected because

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159 from the Malia Workshop is engraved only with ‘cup sinkings’ (*fig. 16 c*). The fact that the piece is broken and bears file marks could suggest that it broke during manufacture – while piercing the stringhole channel (?) – and was then used for practising vertical drilling. Similar might have been the case with **180** although the fact that the seal face is broken halfway along one of the ‘cup sinkings’ could suggest that the break was caused while drilling it.²⁷⁶

Deep lines cut through the seal face edges and through the images on **304**, becoming partly integrated into the motifs (*fig. 16 d*). More irregular but also deep scorings cut through the motifs of **33 a** and **33 c** without making sense as an organic part of them. Since the engraving of the representational motifs on these seals displays a certain competence, the existence of such lines in their intaglios is bewildering. The CMS suggests that the deep lines on **304 a** and **304 c** were engraved later than the rest of the intaglios.²⁷⁷ However, the fact that the arms of the “*Ladder band*” **304 b** also cut through the seal face edges and are as deeply engraved as the lines on **304 a** and **304 c** would imply that the engraving was created at a single stage. A possible explanation for this phenomenon would be that such lines represent experimentation with filing for the production of straight lines. The fine execution of some motifs on these seals could suggest they were for some reason rejected and subsequently used as trial or practice pieces. CMS III no. 114 a also shows similar lines which are, however, more successfully linked to the depicted device.

While **79** is made of steatite, its intaglios are unusually smooth and shallow. This feature suggests chafing and perhaps the use of some abrasive. Characteristic is the preference for straight lines as is obvious by the use of lines for rendering the legs of the *Spider*, the connection of the *Spider* and the *Head of an agrimi* by a *Bar*, and the image put together of lines on **79 b**.²⁷⁸ Also in this case, the engraver could have been experimenting with the potential of creating straight lines by filing.

ASSESSING THE QUALITY OF WORKMANSHIP

Alongside the description of each prism in the catalogue there also appears, inter alia, an estimation of the quality of workmanship. Each piece is assessed with regard to the rest of the prisms. Among the existing examples can be recognised smaller or larger familiarity with the material and the tools, different degrees of care in the execution of the intaglios, and different degrees of dexterity. Since the prismatic shape is on most occasions well executed, the evaluation of the workmanship is mostly based on the way in which the intaglio has been worked.

the perforation process from one profile took a slightly slanting course and pierced through the neighbouring side **299 b**. This would have happened before engraving **299 b** and **299 c** but after engraving **299 a**.

²⁷⁶ **154 c** and **220 c** might have been similarly used. However, the small number of preserved ‘cup sinkings’ on these pieces does not allow ruling out the possibility that these consisted part of other motifs.

²⁷⁷ CMS III, 313.

²⁷⁸ For the devices of the composition, see *Line K* and *Line/Bar*.

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Differences in technique and the hardness of the used materials as well as abrasion can distort one's perception of the quality of workmanship. The assessment takes into account that the use of different techniques results in intaglios which show different degrees of regularity. Both **101** and **258**, for example, are described as being of very good workmanship despite the fact that the intaglio of the former is clearly more irregular than that of the latter. This difference is due to the different techniques employed for engraving the two pieces. However, within the limits of the technique used to carve each piece great familiarity with the material and dexterity in the use the tools and the execution of the devices is evident.

The hardness of the material is also taken into consideration in the attempt to estimate the quality of workmanship. Engraving medium-hard stones with hand tools, for example, will only allow the creation of shallow intaglios. Thus, despite the shallow and somewhat loose intaglio, the workmanship of **577** is described as good because freehand work on breccia is a much more demanding task than it is in steatite. The successful attempt to carve this material with tools and techniques created for work on soft materials shows care and dexterity in the engraving.

Abrasion can often create a false impression with regard to the quality of workmanship. Most often, the crisp intaglios of pieces which are workshop fresh create an impression of skilful engraving as opposed to intensely abraded intaglios of the same competence, which can appear amateurish in comparison. Comparing the heavily abraded **578 b** and the scarcely and moderately abraded **501 a** and **367 b** respectively clearly shows how much the impression of skilfulness can depend on the degree of abrasion. Although all three pieces are of good workmanship, the partly obliterated intaglio of **578 b** creates the false impression of hasty execution.²⁷⁹

DISTRIBUTION, DATING, AND FIND PLACES

Only 25 % of the prisms included in this study have a secure provenance.²⁸⁰ Some of them come from closed, albeit not always well-stratified, contexts and others are stray finds.

²⁷⁹ Compare also **578 a** to **367 c**.

²⁸⁰ The collection of the material finished in 2007 (exceptionally, **A.21** was included at a later stage because of its interesting iconography). Excavators and guards of archaeological sites are considered absolutely trustworthy sources. The information provided by other people who hand in a piece and, as a consequence, by collectors and art dealers is not 100 % secure. The finder can for various reasons – fear of raising the interest of the Greek Archaeological Service in their property or that of potential ‘treasure hunters’, in order to raise the value of a piece by citing a known archaeological site as the find place – give false information regarding the find place of the piece(s) he/she hands in.

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FIND PLACES OF PRISMS WITH SECURE PROVENANCE AND DATING OF THEIR CONTEXTS²⁸¹

Palaikastro

Block B, Courtyard II: **87**.

Block B, Room 37: **88**. The room was part of a LM house (?).

Ossuary Ta Ellinika: **89**. Context MM I/MM IIA (?).

Ossuary Tou Galeti i Kefala: **78**. Context MM I/MM II.

Kato Zakros

House C (?): **77**.

Pit I (?), about the mouth of: **76**. The pottery from the pit is MM III/LM IA.

Pseira

Plateia Building: **577**. Context LM IB.

Mochlos

Excavation dump: **3**.

Grave X: **95**. Context MM/LM I.

Kavousi

Burial Cave: **8, 9**. The pottery from the cave was mainly MM I, but forms with EM III parallels were also found. The contexts were disturbed but the fact that **9** was found inside one of the two larnakes suggests that the seals did actually belong to the burials. The recovery of two vessels of the ‘Chamaizi’ type, examples of which have also been found at the MM IIB destruction layer of the Quartier Mu, allows for the hypothesis that the cave was used down to the MM II period.

Trapeza

*Ossuary (?)*²⁸² *Cave*: **129**. Most pottery is EM II–MM I but some MM II and MM III sherds were also found.

Agios Charalampos

Ossuary Cave: **4–6, 10**. The pottery in the cave was FN–MM IIB with a few LN and LM I–LM III sherds.

²⁸¹ For the relevant bibliography, see ‘Appendix 1’.

²⁸² For the subject of the character of this cave as an ossuary as opposed to a burial cave, see footnote 2442.

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Malia

Agora: **221**. Surface find.

Palace, northeast border area of: **385**. Surface layer which could have contained excavation dump from the Palace.

Palace, Room ε: **219**. Context MM II.

Palace (?), southwest of: **A.1**.

Pierres Meulières: **116**. Area of the ‘Maison des Morts’, near the Cist Grave 1.

Quartier Γ: **115**. The exact find circumstances of the piece are unknown. The houses of the Quartier were in use from the end of EM–MM III.

Quartier Δ, Building II: **A.21**. The piece was found in a LM I context.

Quartier E, House E: **126**. The house shows signs of occupation from MM I–LM III. The exact find circumstances of the piece are unknown.

Quartier E, House Eβ: **218**. The piece was found in a MM II context.

Quartier Mu, Building A and immediate neighbouring area: **223–227, 238**.²⁸³

Quartier Mu, Building B and immediate neighbouring area: **222, 250**.

Quartier Mu, Potter’s Workshop and immediate neighbouring area: **249, 253, 254, 256**.

Quartier Mu, Seal Cutter’s Workshop and immediate neighbouring area: **134–212, 220, 228–237, 239–248, 251, 255, 257**.

Among the aforementioned prisms of Quartier Mu are excavated pieces and stray finds. The context of the excavated pieces is MM IIB. From Dessenne’s Workshop α surface finds were often recovered which were partly accumulated during a longer period of time.

Quartier Mu, South Workshop: **7**. The piece could come from a MM IB fill.

Quartier N: **1, 2**. **1** was found in a sondage under the LM IIIB layer, context LM I (?). The context of **2**, which is workshop fresh, is LM IIIA2/B.

Unknown finding spot: **117**.

²⁸³ For the dating of Quartier Mu, see below.

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Smari

Trouli, Complex A, Room 2: 260. Context MM II.

Knossos

Profitis Ilias Cemetery, Grave VII: 133. Context MM III.

Poros Katsampas

'Building with Frescoes': 258. The building dates to the early LM IA ("the so-called 'transitional' MM IIIB–LM IA").

Buildings or filling deposits outside or below the 'Building with Frescoes': 259. Context MM II.

Koumasa

Tholos A: 86. The pottery from the tholos is reported to belong to EM III–MM I. However, the recovery in the tomb of the cushion CMS II,1 no. 146 would suggest that the grave was still used in MM II. The stratigraphy was disturbed but the seals come from the upper burial layers. Vases reported to have come from the area between the Tholos A and the Tholos B date to EM III–MM I/MM IIA.

Apesokari

Tholos B: 216, 217.

Platanos

Tholos B: 103–106. The tholos was in use from EM III–MM II but finds of MM IA–MM II predominate. The stratigraphy was disturbed.

Tholos B or Γ: 107. Tholos Γ was in use from EM III–MM I.

Moni Odigitria

Tholos B, East Room C (not used for burials): 252. According to the excavator, the seal was found in the upper layers of an EM III/MM IA context.

Agia Triada

Tholos A: 101, 102. The tholos was in use from EM II–MM II.

Agia Eirini, Kea

Grave 31: 359. The grave is dated to middle/late MBA, to a phase which possibly corresponds to MM IIB/MM IIIA.

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Midea, Argolis

Acropolis: **395**. The piece was found in the layers of earth and stones deposited above the LH IIIB2 destruction layer. The pottery from these deposits was MH–LH IIIB2.

DISTRIBUTION

Pieces with secure provenance

Prisms have been recovered in central and eastern Crete as well as in two locations outside the island (*fig. 17 a*). The greatest concentration is observed in Malia where 79 % of the pieces have come to light. More than 80 % of these were recovered in the Seal Cutter's Workshop. 11 % of the material comes from nine locations in eastern Crete and 7 % from five sites in the Mesara. The Heraklion – Knossos area has yielded 2 % of the examples and 1 % has been recovered in sites outside the island, at Agia Eirini in Kea and at Midea in the Argolis. Apart from Malia, more than one piece has been recovered in Platanos, Agios Charalampos, Palaikastro, Kato Zakros, Mochlos, Kavousi, Apesokari, Agia Triada, and Poros Katsampas.²⁸⁴

It becomes clear that the majority of examples come from a single location, a seal workshop which collapsed at a time when it was producing a large quantity of prisms. By contrast, only minimal numbers of other seal forms were being produced in this workshop immediately prior to the destruction. The fact that prisms have come to light in most parts of the Malia town would support the idea that this settlement played a significant role in the production of these seals. The 11 % which represents the pieces coming from the town,²⁸⁵ excluding those from the Workshop and the fragments from Quartier Mu which can be identified with certainty as products of the Workshop, is rather high when compared with the 11 % which represents the prisms recovered in the rest of east-central and eastern Crete and the 9 % which corresponds to the pieces recovered in central Crete.²⁸⁶ While the fact that Malia is the best researched MM town has to be taken into consideration, the limited number of pieces from sites like Palaikastro and Kato Zakros suggests that Malia was one of the most important, if not the most important, production centre of the prisms.

The prisms which come from the Mesara tholoi and those from the Heraklion – Knossos area represent individual examples in contexts which contained numerous seals of other

²⁸⁴ Malia: 124 pieces, 100 of which come from the workshop. Apart from these latter, at least five of the pieces recovered in other areas within the Quartier Mu seem to have originally come from the workshop (**222**, **238**, **250**, **253**, **254**, and perhaps **225**). Platanos: 5 pieces. Agios Charalampos, Palaikastro: from each place 4 pieces. Kato Zakros, Mochlos, Kavousi, Apesokari, Agia Triada, Poros Katsampas: from each place 2 pieces.

²⁸⁵ 17 pieces.

²⁸⁶ The border between central and east-central Crete is taken to be the notional line Epano Archanes–Ligortynos–eastern border of the Asterousia mountains.

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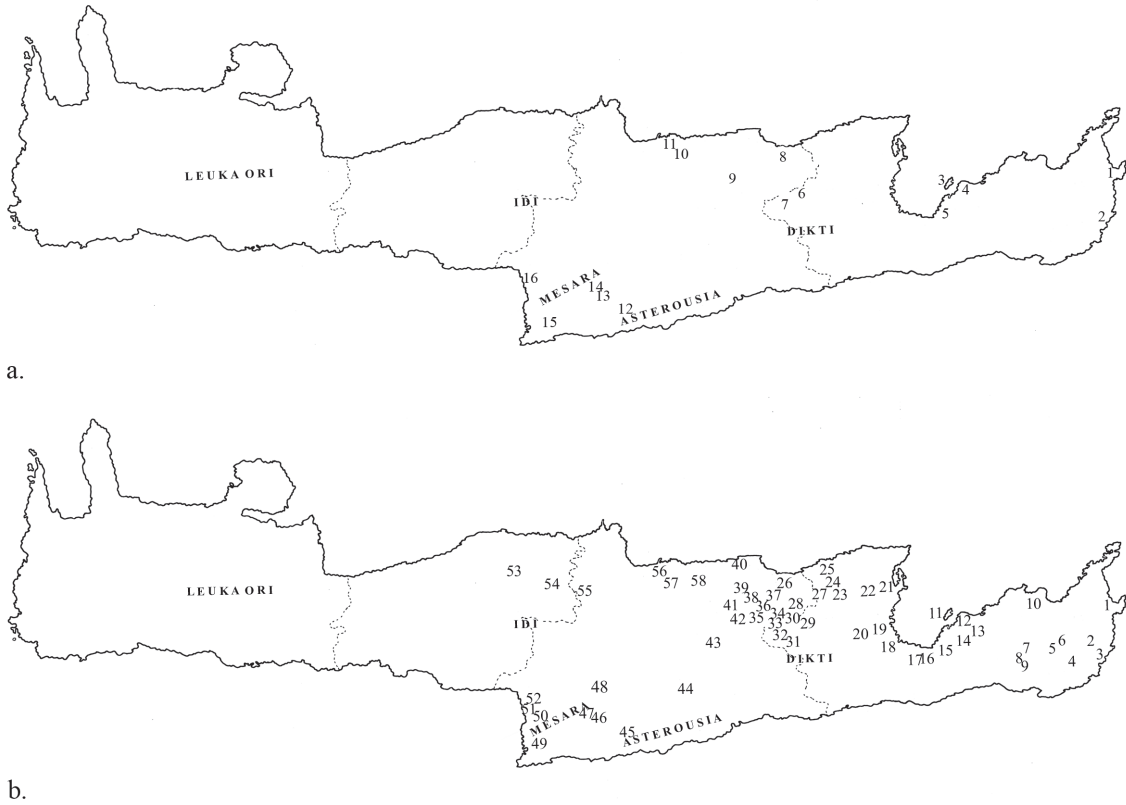


Fig. 17 Distribution of the prisms: a. find places of prisms with secure provenance: 1. Palaikastro; 2. Kato Zakros; 3. Pseira; 4. Mochlos; 5. Kavousi; 6. Trapeza; 7. Agios Charalampos; 8. Malia; 9. Smari; 10. Knossos; 11. Poros Katsampas; 12. Koumasa; 13. Apesokari; 14. Platanos; 15. Moni Odigitria; 16. Agia Triada; (17. Agia Eirini, Kea; 18. Midea, Argolis). b. find places of prisms with secure and uncertain provenance: 1. Palaikastro; 2. Epano Zakros; 3. Kato Zakros; 4. Lamnoni; 5. Nea Praisos; 6. Sitanos; 7. Sykia; 8. Adromyloi; 9. Lithines; 10. Siteia; 11. Pseira; 12. Mochlos; 13. Turloti; 14. Lastros; 15. Kavousi; 16. Pacheia Ammos; 17. Gournia; 18. Koprana; 19. Lato i Etera; 20. Kritsa; 21. Elounta; 22. Kasteli; 23. Neapoli; 24. Anaulochos; 25. Milatos; 26. Malia; 27. Vrachasi; 28. Kراسي; 29. Trapeza; 30. Pinakiano; 31. Psychro; 32. Agios Charalampos; 33. Kato Metochi; 34. Gonies; 35. Askoi; 36. Avdou; 37. Mochos; 38. Potamies; 39. Kalo Chorio Pediados; 40. Gouves; 41. Smari; 42. Kasteli; 43. Choumeri; 44. Ligortynos; 45. Koumasa; 46. Apesokari; 47. Platanos; 48. Gortys; 49. Moni Odigitria; 50. Kamilari; 51. Agia Triada; 52. Agios Onoufrios; 53. Choumeri; 54. Axos; 55. Gonies; 56. Poros Katsampas; 57. Knossos; 58. Artsa; (59. Agia Eirini, Kea; 60. Midea, Argolis; 61. Egypt).

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forms.²⁸⁷ In the Mesara, the majority of prisms have been recovered from Tholos B in Platanos. However, the significance of this predominance, if any, is not clear.

A comparison of the distribution of pieces with secure and uncertain provenance

The addition to the distribution map of pieces with uncertain provenance does not significantly change the picture created above (*fig. 17 b*). Concentrations are observed in the east-central and eastern part of the island, the Mesara plain, and the Heraklion – Knossos area. Many clusters of find places are now observed outside Malia. A significant concentration of find spots is seen to the south of Malia and another in the Lasithi Plateau. Scattered find places appear in the area of the Mirampelo eparchy as well as along the coastline of the Mirampelo gulf from Elounta to Mochlos. Another concentration is observed at the far eastern part of the island in the area defined by Palaikastro, Sykia, Lithines, and Zakros. In the Mesara, quite a significant cluster of find places is observed in areas where tholos tombs have come to light, while a new find place is also reported to the northeast of the plain. To the north, three find spots are added in the west-central part of the island. Two pieces are said to have come from Egypt.

Again, the largest concentration of finds is observed at Malia, the town having yielded 59 % of the pieces with provenance. 29 % of the remaining prisms have been recovered in other areas of east-central and eastern Crete. From the Mesara comes 7 % of the material, from the Knossos – Heraklion area 3 %, from the west-central part of the island less than 1 %, and from places outside Crete 1 %. Apart from Malia, most of the added locations are represented by single finds. In the Mesara, Platanos and Moni Odigitria stand out as having yielded 27 % and 23 % of the prisms recovered in the plain or its vicinity respectively. 70 % of the pieces from the Knossos – Heraklion area come from Knossos.

The evidence confirms the opinion that the prisms enjoyed great popularity in Malia, which stands out as a vital centre of their production. The form was also popular in the surrounding area of this town and in the eastern part of the island.²⁸⁸ On the other hand, these seals seem to have been less favoured in central Crete.

DATING

With the exception of the pieces recovered from Quartier Mu, only a very limited number of prisms has been recovered in well stratified contexts. According to its excavator, one piece has MM IA as terminus post quem non.²⁸⁹ The excavator of another piece suggests

²⁸⁷ For the seals from Agia Triada, see CMS II,1 nos. 6–103; from Koumasa CMS II,1 nos. 133–169; from Platanos CMS II,1 nos. 241–349; from Profitis Ilias CMS II,2 nos. 43–68; from Poros Katsampas Dimopoulou 2000. The seals from Apesokari and Moni Odigitria still await publication.

²⁸⁸ Xenaki Sakellariou points out this fact even before the discovery of the workshop (Xenaki Sakellariou 1958 a, 92 footnote 1; 1958 b, 451, 455).

²⁸⁹ **252**. See below and p. 147.

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that it could have come from a MM IB layer.²⁹⁰ One further example is reported to come from a tholos used down to MM I but the recovery of MM II seals in the same tomb suggests that it was still in use in MM II.²⁹¹ Three pieces have been recovered in contexts in which MM I pottery was predominant but in all cases indications exist that the contexts were used later in MM.²⁹² Five examples come from MM I/MM II and MM II contexts whereas the excavated pieces from Quartier Mu were found in the MM IIB destruction layer.²⁹³ One example comes from a MM IIB/MM IIIA and another from a MM III grave.²⁹⁴ Individual pieces have been recovered in an early LM IA, a possible LM I, a LM I, and a LM IB context.²⁹⁵ Finally, one example came to light in a LM IIIA2/B context.²⁹⁶

The large number of pieces recovered in the MM IIB destruction layer of Quartier Mu suggests that the prisms reached their floruit in MM II. The dating of the beginning and end of prism production must be assisted by stylistic considerations. The piece reported to have come from a context no later than MM I at Moni Odigitria belongs stylistically to a group of prisms which reached its floruit in MM II/MM III.²⁹⁷ This feature could suggest that the tomb where it was found was in use until later in the MM period. For that reason, this prism cannot be taken as secure evidence that the production of the prisms started in MM I. As regards the recovery of a prism from a MM IB layer, it is not certain that the piece did actually belong to this layer.²⁹⁸

One indication as to the inception of prism development is provided by **62** from ‘Kalo Chorio Pediados’. The piece finds good stylistic parallels among seals whose shapes are well placed in EM III/MM IA. Moreover, its engraving is stylistically comparable to that of two stone blocks from the Palace of Knossos which were dated by Evans to the early MM.²⁹⁹ Further support for a MM I date for the onset of prism production is provided by a group of prisms from the Mesara which find stylistic parallels among seals dated to late MM IA/MM IB.³⁰⁰

While the shape loses its popularity after the end of MM II, some pieces seem still to have been produced in MM III and perhaps in early LM I (?).³⁰¹ This is suggested not only by the contexts of the prisms but also by the contexts of seals of other forms which are

²⁹⁰ **7**.

²⁹¹ **86**. For the dating of the Tholos A of Koumasa, see p. 381.

²⁹² **8, 9, 129**.

²⁹³ MM I/MM II and MM II contexts: **78, 89, 219, 259, 260**. Quartier Mu: **7, 138–209, 220, 222–224, 226, 228–235, 238, 247, 248, 251, 253, 256**.

²⁹⁴ MM IIB/MM IIIA grave: **359**. MM III grave: **133**.

²⁹⁵ Early LM IA context: **258**. Possible LM I context: **1**. LM I context: **A.21**. LM IB context: **577**.

²⁹⁶ **2**.

²⁹⁷ **252**. For the group in which this piece belongs, see the section ‘Central Crete Ornamental Prisms’, pp. 148–159, especially pp. 150–152, 158–159.

²⁹⁸ **7**.

²⁹⁹ For the dating of this piece, see p. 147.

³⁰⁰ For these prisms, their related seals, and their dating, see pp. 122–126, 128–131, 134–136.

³⁰¹ For a discussion of the dating of **258** which comes from an early LM IA context, see pp. 158–159.

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stylistically related to certain prisms.³⁰² Given the general absence of prisms from contexts later than LM IB, **2**, which has been discovered in a Postpalatial context, is seen as a much older heirloom or chance Postpalatial find.

To summarise then, context evidence and stylistic considerations suggest that the prismatic form first evolved during MM IA and persisted as late as MM III/early LM IA but that the floruit of three-sided soft stone prisms was undoubtedly the MM II period.

THE FIND PLACES

With one exception all pieces from Malia have been recovered in the residential part of the town. The great majority of examples come from a seal cutter's workshop³⁰³ and are fragments discarded after accidental damage during the engraving process. Most of the remaining pieces came to light in the various town quarters. Only one example has been recovered in the Palace and two from its vicinity.³⁰⁴ These three pieces are the only existing prisms coming from a Minoan palace or its immediate vicinity. The prism which does not come from the residential part of the town was recovered in a neighbouring burial site.³⁰⁵

In the rest of east-central and eastern Crete, more pieces come from burial than from residential contexts.³⁰⁶ This raises the question as to whether the prisms had a greater, or at least different value, in places outside Malia. Pieces from burial and ossuary caves in Kavousi and Lasithi are workshop fresh or only slightly abraded, a feature which might indicate a purely funerary purpose.³⁰⁷ However, the fact that other pieces from burial contexts in Mochlos and Palaikastro are considerably abraded suggests intense use before their final deposition.³⁰⁸

In the Mesara, no prisms have been recovered in residential contexts, which could be connected with the absence of excavated settlements in the area. Most pieces found in the tombs show signs of abrasion, which would suggest that they were in use before their final deposition.³⁰⁹ **252** from Moni Odigitria seems, as Sbonias notes, not to have had a funerary purpose since it was found in one of the compartments of the tholos which was not used for burials.³¹⁰

Two prisms from the Heraklion – Knossos area come from a residential context and one was recovered in a grave.³¹¹ The first two examples come from a residential and industrial quarter of the settlement in Poros Katsampas in which also a seal cutter's and jewellery

³⁰² For the dating of some prisms in MM II/MM III, see pp. 158–159.

³⁰³ For the Seal Cutter's Workshop in Malia, see pp. 59–62.

³⁰⁴ Palace: **219**. Vicinity of the Palace: **385, A.1** (?).

³⁰⁵ **116**.

³⁰⁶ Burial contexts: **3–6, 8–10, 78, 89, 95, 129**. Residential contexts: **76, 77, 87, 88, 260, 577**.

³⁰⁷ Workshop fresh: **5, 6, 9, 129**. Slightly abraded: **4, 8, 10**.

³⁰⁸ **95, 78**.

³⁰⁹ E.g. **101, 102, 216, 217, 103, 106** but not **107** which is apparently workshop fresh.

³¹⁰ Sbonias 2010, 203.

³¹¹ Residential context: **258, 259**. Grave: **133**.

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workshop of a somewhat later date has come to light.³¹² They are both workshop fresh and show close stylistic similarities with seals found in the broader area dating from MM I–LM IA.³¹³ It could be suggested that the two prisms represent fresh products of a ‘workshop’ which was already producing seals in MM I. The third piece comes from a grave in the Profitis Ilias cemetery and is workshop fresh, suggesting that it had a clear funerary purpose.

The prism from Agia Eirini, Kea was recovered in a burial context.³¹⁴ Its considerable abrasion suggests intense use before deposition. Finally, the Midea prism, also considerably abraded, comes from a residential context.³¹⁵

THE SEAL CUTTER’S WORKSHOP AT MALIA

The Seal Cutter’s Workshop at Malia is briefly presented here because of the significance of its discovery for the study of prisms.³¹⁶ The Workshop was excavated in 1956 by André Dessenne³¹⁷ at which time most of the seals also came to light.³¹⁸ Further research motivated by the lack of precise dating and the need for a clear plan of the architectural remains was undertaken in 1965 and 1977 by Jean-Claude Poursat.³¹⁹

The building forms part of Quartier Mu, a town quarter situated at approximately 140 meters northwest of the Malia Palace.³²⁰ The Quartier consists of two large buildings of probably official nature, Building A and B, surrounded by seven smaller constructions, five of which have been identified as houses of craftspeople.³²¹ The quarter seems to have been constructed in early MM II and was certainly destroyed in MM IIB.³²² After this date it was not reoccupied.³²³

The Workshop is situated to the north and northeast of the two large buildings. The actual working space consists of part of a two storey house identified by Poursat as the house of the craftsperson and family.³²⁴ The working area was restricted at the northernmost room of the upper storey.³²⁵ The building, which stands partly on earlier constructions of unknown function, was possibly erected at the start of MM II.³²⁶

³¹² Late LM IA (Dimopoulou 2000, 34–35).

³¹³ For these seals, see Dimopoulou 2000, 28 no. 5; 32 nos. 6, 7; 34 no. 19; 36 no. 28.

³¹⁴ **359**.

³¹⁵ **395**.

³¹⁶ For a detailed discussion of the Malia Workshop, see Poursat 1996, 7–22, 103–110, 149–153.

³¹⁷ Dessenne 1957, 123–127. For a short summary of this paper, see p. 4.

³¹⁸ Poursat 1996, 7.

³¹⁹ Poursat 1996, 7.

³²⁰ Poursat in Poursat – Godart – Olivier 1978, 13.

³²¹ Poursat in Poursat – Godart – Olivier 1978, 26–27; Poursat in Detournay – Poursat – Vandenabeele 1980, 231–232; Poursat 1992, 9.

³²² Poursat in Poursat – Godart – Olivier 1978, 25.

³²³ Poursat in Poursat – Godart – Olivier 1978, 13.

³²⁴ Poursat 1996, 7.

³²⁵ Poursat 1996, 7, 13 fig. 4; 15, 19 fig. 8.

³²⁶ Poursat 1996, 7.

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Raw material in the form of blocks of steatite, smaller pieces of other stones, e.g. schist, breccia, and rock crystal, as well as various tools have been recovered within and in the vicinity of the Workshop.³²⁷ A total of 140 seals have been found in the building and the immediately surrounding area.³²⁸ Most finds are seal fragments discarded after accidental damage during the engraving process. This is clearly attested to by the fact that most pieces have not received a final polishing. The seals represent, as Poursat points out, the production of the Workshop in the period immediately before the MM IIB destruction of the building.³²⁹

77.8 % of the seals recovered are soft stone prisms. This disproportionately large number suggests that the Workshop was either specialising in this type of seal or that, prior to the destruction, it had been working on a special order. In no other Minoan context is such a large preponderance of a single seal form attested.

Steatite engraved in the freehand technique assisted by vertical drilling for the creation of 'cup sinkings' is used for the manufacture of 91.4 % of the seals. Prisms, four-sided prisms, conoids and truncated conoids, as well as hemicylinders are most often made of this material.³³⁰ Other soft materials are only represented by individual pieces, e.g. schist for a button and white paste for a half-ovoid.³³¹ In order to manufacture Petschafte, only medium-hard and hard stones are used whereas two three-sided prisms and a foliate back are cut in harder stones.³³² Medium-hard and hard stone seals are cut by tools operated on the horizontal spindle.

The existence of large amounts of raw steatite, the clear predominance of steatite seals, the lack of large amounts of other raw materials, and most importantly, the fact that steatite seals with similar iconography come from various other locations in Malia³³³ suggest that the Workshop was mainly working with that material. Of great interest is the fact that, with one exception,³³⁴ the few medium-hard and hard stone seals represented lack the stringhole channel³³⁵ and some of them are not engraved at all. This could suggest that while the craftsman was experimenting, often successfully, with engraving harder stones, he/she

³²⁷ Poursat 1996, 103, 106–109.

³²⁸ CMS II,2 nos. 86–198; CMS II,3 no. 151; Poursat 1996, 104–105 nos. HM 2520–HM 3023.

³²⁹ Poursat 1996, 110.

³³⁰ Four-sided prisms: e.g. CMS II,2 nos. 108 (?), 153, 157, 185; Poursat 1996, 104 nos. HM 2520, HM 2521. Conoids and truncated conoids: e.g. CMS II,2 nos. 96, 97, 127, 142, 166, 173 (CMS II,2 nos. 142 and 166 are fragments of one piece); Poursat 1996, 104 no. HM 2524. Hemicylinders: e.g. CMS II,2 nos. 135, 141, 161 (?).

³³¹ Schist: CMS II,2 no. 149. White paste: CMS II,2 no. 109.

³³² Petschafte: CMS II,2 nos. 128, 129, 130, 136. Three-sided prisms: CMS II,2 nos. 150, 168. Foliate back: CMS II,2 no. 148.

³³³ For the prisms which come from other places in Malia, see pp. 78–85. For other seals, e.g. CMS II,2 nos. 76, 77, 80.

³³⁴ Poursat 1996, 105 HM 2655 bis. A deep crack along the breadth of this seal could perhaps have been caused while working on the stringhole channel.

³³⁵ CMS II,2 nos. 128, 129, 130, 136, 148, 150, 168. See also the medium-hard stone three-sided prism CMS II,2 no. 79 from the town of Malia and the quartz Petschaft CMS III no. 109 which also lack the stringhole channel.

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had not yet mastered the art of piercing such materials for the creation of the stringhole channel.

The steatite seals display a varied repertoire of representational and ornamental devices, as well as those constituting hieroglyphic signs executed in a summary fashion.³³⁶ Humans, animals, plants, and various objects stand individually or are combined with each other on the seal face. Repetition and supplementation compounds are common.³³⁷ Descriptive, ‘pictographic’, and ornamental images as well as hieroglyphic inscriptions are found.³³⁸

The iconography of the harder stones is similar to that of the steatite pieces. A different iconographic tendency is represented by a schist button decorated with centred-circles and short strokes.³³⁹ A ‘white piece’ which belongs to a clearly defined MM IA–MM IB group does not seem to have been produced at the Workshop.³⁴⁰

THE ROLE OF THE SEAL CUTTER’S WORKSHOP AS A SUPPLIER OF PRISMS IN THE TOWN OF MALIA

The large dimensions of Buildings A and B, the rich finds, the recovery in them of hieroglyphic documents, and their immediate proximity to a series of workshops speak in favour of an official character³⁴¹ and suggest that the workshops were controlled by the authority lodged in them. The large quantity of prisms that came to light at the Seal Cutter’s Workshop raises the question of its role as a supplier of prisms for the two buildings and for the town of Malia in general.

21 seals and 34 sealings of different seals have been recovered in the destruction layer of the two buildings; another 10 seals are either surface finds or lack precise provenance.³⁴² 8 of the seals are prisms and 6 steatite seals of other forms which belong stylistically to the same group as the steatite seals found at the Workshop.³⁴³ Three sealings impressed on clay documents can be attributed with certainty to such steatite seals.³⁴⁴ Also the prisms found in Malia outside Quartier Mu belong stylistically to the same group of seals.³⁴⁵

Stylistic considerations suggest that some of the aforementioned seals were manufactured at the MM IIB workshop³⁴⁶ whereas others were the products of other Maliote (?)

³³⁶ For a discussion of the iconography of the prisms which come from the workshop, see pp. 365–369.

³³⁷ For the repetition compounds, see pp. 304–317; supplementation compounds, pp. 317–323.

³³⁸ For the nature of the images encountered on the prisms, see pp. 341–356.

³³⁹ CMS II,2 no. 149.

³⁴⁰ CMS II,2 no. 109. For the dating of the group, see Sbonias 1995, 118.

³⁴¹ Poursat in Poursat – Godart – Olivier 1978, 26–27; Poursat in Detournay – Poursat – Vandenaabeele 1980, 231–232.

³⁴² For the seals, see Detournay – Poursat – Vandenaabeele 1980, 157–191; **238**, **250**. For the sealings, see Detournay – Poursat – Vandenaabeele 1980, 192–229; CMS II,6 nos. 176–209.

³⁴³ Detournay – Poursat – Vandenaabeele 1980, 166–167 no. 236, 171–175 nos. 240–243, 176 no. 245. For the group in question, see the section ‘Malia/Eastern Crete Steatite Prisms’, pp. 63–115.

³⁴⁴ Detournay – Poursat – Vandenaabeele 1980, 221 nos. R 31–R 33, 220 figs. 310–312.

³⁴⁵ For the large majority of the prisms from Malia, see the section ‘The Malia/Eastern Crete Steatite Prisms’, pp. 63–115

³⁴⁶ For a detailed discussion of the prisms which come from places in Malia outside the MM IIB workshop and for

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workshops.³⁴⁷ Since the MM IIB workshop building was erected at the start of MM II, it would seem likely that some of the prisms found scattered throughout the town were the products of one or more hands working in a workshop active in this building earlier in MM II.

their relationships to it, see pp. 78–85.

³⁴⁷ **2** for example, belongs to a cluster of prisms whose characteristics are not represented on the seals which come from the Workshop. For this cluster, see pp. 82–84.