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AEGEAN SEALS OF THE LATE BRONZE AGE: MASTERS AND WORKSHOPS.

INTRODUCTION[1]

1. PRELIMINARY REMARKS

For over a century the seals of the Late Bronze Age Aegean have been admired and studied. Their scenes with human figures have illuminated

[1] This article and the succeeding series aim to divide Aegean sealstones and rings of the Late Bronze Age, and the sealings they impressed, into stylistic groups, to distinguish their artists and workshops, and to give these dates on the basis of examples from stratified deposits, thereby establishing a tighter overall chronology for Late Bronze Age glyptic. The study derives from extensive collaboration between the authors during the Winters of 1978 and 1981 in Durham, North Carolina, and during the Summer of 1979 in Bristol, collaboration based on parallel work done both by JGY for his Ph. D. dissertation (esp. pp. 405–460) and by JHB over a number of years with preliminary results being presented to the London Mycenaean Seminar in 1967 and 1976.

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Most abbreviations used in these articles are standard and may be found in AJA 82, 1978, 3–10 and 84, 1980, 3–4. The following may be less obvious:

AGDS	Antike gemmen in deutschen Sammlungen (Munich, 1968ff.)
AM	Ashmolean Museum
AT	D. Levi, Le cretule di Hagia Triada, ASAtene 8–9, 1925–6, 71–156
Chronology	A. Furumark, Mycenaean Pottery: II Chronology (Stockholm, 1972)
CMCG	A. X. Sakellariou, Les Cachets Minoens de la Collection Giamalakis, Études Crétoise X (Paris, 1958)
CMS	Corpus der minoischen und mykenischen Siegel (Berlin, 1964ff.), often omitted but presumed before volume citations like "I 144".

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cult practices, and their animal studies constitute our only complete documentation of a major art form in the Aegean Bronze Age. They therefore deserve a full art-historical treatment, which involves two fundamental questions – who made them and when?

a) The origin of the artists ('Minoan' or 'Mycenaean')

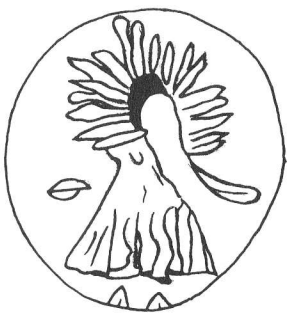
Certain scenes and motifs have been regarded as characteristically Mycenaean, but in each case there are also Minoan examples. For instance, CMS I 16, the 'battle in the glen' ring from Shaft Grave IV, is usually called Mycenaean, though it has close compositional parallels among sealings from both Ayia Triada and Knossos.[2] Second, the crested boar's tusk helmet, usually regarded as Mycenaean, appears on an Ayia Triada sealing (HMs 494 = AT 6) and on sealstones whose style and materials are pre-Mycenaean Cretan (CMS VII 195, here Fig. 1, IX 166 and 167). Third, 'heraldic' or 'architectonic' poses (The Lion Gate, or CMS I 46, here Fig. 1) are often considered a feature of Mycenaean

CS	V. E. G. Kenna, Cretan Seals (Oxford, 1960)
Diss.	J. G. Younger, Towards the Chronology of Aegean Glyptic in the Late Bronze Age (Cincinnati, 1973), University Microfilms 73–24, 867.
GGFR	J. Boardman, Greek Gems and Finger Rings (London, 1970)
HM	Herakleion Museum (numbers refer to the inventory: HM = seals, HMm = rings, HMs = sealings)
KMS	H. Biesantz, Kretisch-mykenische Siegelbilder (Marburg, 1954)
Kn	Knossos. Sealings from Knossos are published preliminarily in KSPI (see below) or given Betts numbers, Some Unpublished Knossos Sealings and Sealstones, BSA 62, 1967, 27–45
KSPI	M. A. V. Gill, The Knossos Sealings: Provenience and Identification, BSA 60, 1965, 58–98
KZ	Sealings from Kato Zakro: D. G. Hogarth, The Zakros Sealings, JHS 22, 1901, 76–93 and D., Levi, Le cretule di Zakro, ASAtene 8–9, 1925–6, 157–201
NMA	National Museum, Athens
Sk	S. Marinatos, Τὸ μινωϊκὸν μέγαρον Σκλαβοκάμπου ArchEph 1939–1941, 69–96

The sealings from Ayia Triada, Kato Zakro, Sklavokampos, and Gournia are all assumed to have a LM IB context.

JHB studied and drew most of the Heraklion sealstones, rings, and sealings in 1965–1967 with the permission of Dr. St. Alexiou; our stylistic judgements are made on the basis of these drawings and may be revised when these sealtypes are published in the appropriate CMS volumes.

[2] KN HMs 526 (three examples), 595, and 596 (= AT 114); 369 (= PM IV 600, fig. 594) and KSPI no No. 116; see BSA 60, 1965, 87, fig. 4 and Kadmos 6, 1967, 19, fig. 9.



CMS VII 195

CMS I 5

CMS I 46

R 88 (PM IV, 608 g)

Figure 1

art; but compare sealings from Ayia Triada (e.g. HMs 577 = AT 49) and from Knossos (e.g. HMs 233 = KSPI R88, here Fig. 1). Fourth, CMS I 5 (here Fig.1) with the bearded profile head of a so-called 'Mycenaean chieftain' has its only parallels in motif, size, shape, and style amongst the products of a Knossian sixteenth century engraver and close colleagues,[3] whose work will be defined in a later article.

[3] TUAS 6, 1981, 2–8.

CMS V 432

CMS I 410

CMS VII 130

CMS I 263

Figure 2

Stylistic distinctions between Minoan naturalism and Mycenaean formalism have been phrased in various ways: Rodenwaldt[4] saw in Minoan art a Märchenwelt, Biesantz (KMS 76f.) an Auflösung as opposed to a Mycenaean Erstarrung, Forsdyke[5] an 'impressionism' as opposed to a Mycenaean 'formalism'. Vermeule[6], however, has rightly

[4] G. Rodenwaldt, Der Fries des Megarons Mykenai, Halle 1921, 60.
[5] E. Forsdyke, Minoan Art, London 1929, 24 (= ProcBritAc 1929, 66).
[6] E. T. Vermeule, The Art of the Shaft Graves, Oklahoma 1975, 33f.

called attention to the formalism of LM IA pottery, while the swing of the necklace in the Lady's hand on Mycenae's Citadel House fresco surely shows Auflösung. In any case, the application of these categories to seals is problematic.

Sakellariou[7] has distinguished a Minoan style (A), with flowing forms and freedom of movement, a Mycenaean style (B) with harsh modelling and sketchy details, and a third style (C) that appears both in Crete and on the Mainland with schematic and mechanical engraving. Are, however, the bulls on CMS V 432 (here Fig. 2) and 433 from the Nichoria Tholos, and on the grand lentoids HM 1656 and 2393 from the Knossian Warrior Graves[8], Minoan by virtue of their large, smoothly modeled bodies or Mycenaean because of their finicky profile lines and nervously rendered heads?

Kenna submitted the Vapheio gems first to the criteria of Biesantz (Minoan 'atectonic' as opposed to Mycenaean 'tectonic'), and then to those of Evans, Furumark, and Matz (Minoan dynamism as opposed to Mycenaean repetition). This vagueness allowed him, for example, to call CMS VII 99 and 130 (here Fig. 2) Minoan despite pieces clearly by the same artists (and in the latter case so recognized by himself)[9] from Mainland contexts (CMS I 235 and 263, here Fig. 2).

Sakellariou calls a seal Minoan or Mycenaean according to where it was found, and in CMS I (p. xxiii) dates the seals found on the Mainland to LH periods and those from Crete to palatial phases; but seals from the Islands caused her difficulties: the ivory ring CMS I 410 (here Fig. 2) comes from a level that predates Phylakopi's megaron, in which a fragment of a Linear A tablet has recently been found, but she called it LH II.

In CMS V Pini, despite an assertion to the contrary (". . . nicht alle Siegel aus mykenischen Kontexten unbedingt mykenisch sein müssen . . .", p. xxv), also seems to regard most seals from the Mainland as Mycenaean and those from Crete as Minoan; even though many from Mainland contexts were made in Crete and exported, as Pini himself notes (e.g., in his dates for V 190 and 213), and presumably vice versa.

Seals from the Islands again cause Pini problems: several from Keos, in contexts containing both Minoan and Mycenaean pottery, are held to be Minoan imports (p. xxiii), but those from Delos (CMS V 312–316, here Fig. 3) are all regarded (p. xl, index VB) as Helladic.

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7 A. X. Sakellariou, Μυκηναϊκὴ Σφραγιδογλυφία, Athens 1966, 104–111.

8 HM 1656 (= BSA 47, 1952, 243–277, fig. 16, III. 21) and HM 2393 (= BSA 69, 1974, 195–257, fig. 14a).

9 V. E. G. Kenna, Some Eminent Cretan Gem Engravers, Festschrift für Friedrich Matz, Mainz 1962, 4–13.

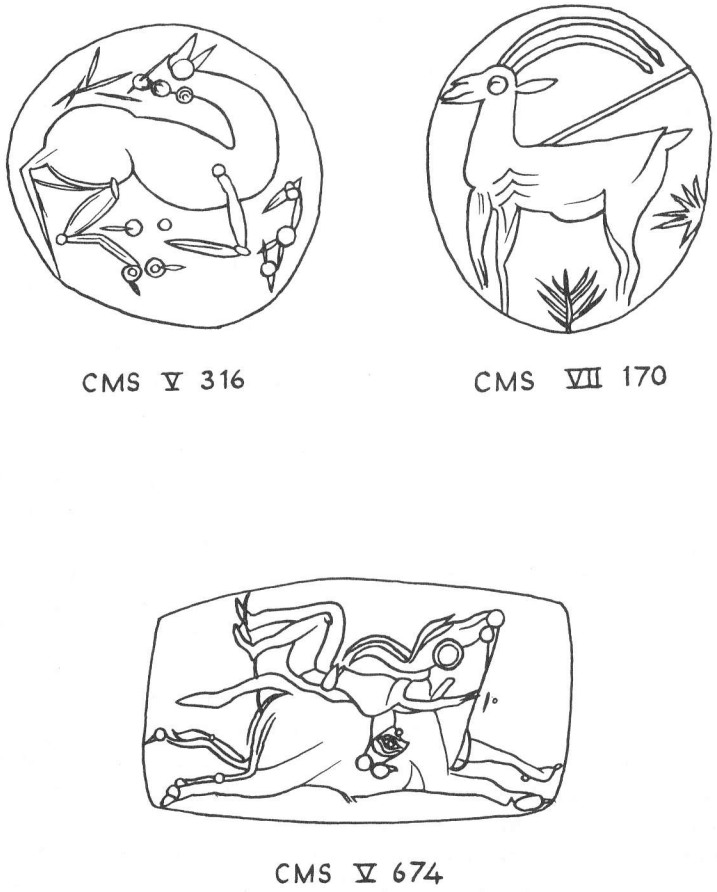

Figure 3

Authors of other CMS volumes (e.g. XIII and X) have declined to diagnose a seal as Minoan or Mycenaean, even when it has a secure provenience, and have used the label LM/LH for those belonging to the Late Bronze Age.

Our own object is to isolate groups of seals, rings, and sealings as the products of individual masters, workshops, or schools. Distribution of the pieces within any one group may then indicate whether an artist was working at some particular place in Crete, in Messenia, the Argolid,

or Boeotia, or in the Islands. In some cases he may have travelled or his products been dispersed quite widely. The distinctions may have to be far more complex than those between seals found in Crete and labelled 'Minoan' and those found on the Mainland and labelled 'Mycenaean'.

b) Chronology

I. Through stylistical analysis of seals, by determining a progression from early to late features, and then by relating this stylistic typology to ceramic or absolute dates. Evans (PM IV 484–619) presented a somewhat linear development of style from crude to naturalistic. Kenna followed a similar method in CS, and dated Cretan seals to various ceramic phases from EM II to LM IIIC with two Transitional Periods, and Mainland seals to parallel phases (but without Transitional Periods). In CMS IX (1972) the van Effenterres date seals only as Pre-Palatial, Neo-Palatial and Mycenaean, sub-headed 'Crète et Continent'. The last category seems to beg questions of provenience and style: are the Shaft Grave seals Minoan imports or are they Mycenaean? which sealings from Knossos were impressed by Minoan and which by Mycenaean seals? how Mycenaean are the seals made in Crete after the LM IB destructions?[10]

The later volumes of CMS (XIII 1974, V 1975, X 1950) are less confident about a glyptic typology closely linked to the ceramic chronology. Stylistic development may not be simply linear, and variant styles and techniques may be characteristic of different artists or schools within a single period. For instance, the technique which Boardman (GGFR p. 48) has called 'Cut Style' and dated to the final phase of the Knossian palace, developed as early as LM IB[11] from the Talismanic Style and was contemporary with very different and more naturalistic styles.

II. Through the arrangement of excavated seals in the order of their context dates. Karo[12] was the first to group seals in this way, but in 1910 he could cite only a few examples: the seals and rings from the Shaft Graves and Tsountas' Chamber Tombs at Mycenae, those from Vapheio

[10] For the present authors' critique of these methods, see JGY in JHS 95, 1975, 285–286 and 96, 1976, 253–255; JHB in JHS 97, 1977, 228–229 and CMS X pp. 14–16.

[11] E.g. HM 2505–2507 from LM II levels of the Unexplored Mansion at Knossos (AR 1972–3, p. 58, fig. 39); and elements of the style can be found amongst the LM IB sealings from Ayia Triada, e.g. HMs 580a (= AT 42).

[12] G. Karo, AthMit 35, 1910, 178–182.

and Kalyvia (Mesara), and the sealings from Knossos and Kato Zakro.[13] In 1932 Wace[14] recognised the importance of the seals from his dated Chamber Tombs at Mycenae, but his analysis was brief and included few parallels, and it was not until 1954 that Biesantz (KMS 125–167) could produce a long list of seals from dated contexts. He employed it, however, mainly as an aid for detecting forgeries. Nor were his listings as widely used by others as they deserved; they apparently escaped the notice of Blegen who in 1961 pointedly suggested, a propos the discrepant dates of the Knossos and Pylos destructions: "there are problems too connected with seals and seal impressions that might benefit from a critical collation based so far as possible on pieces with a certified provenience from stratified deposits[15]." In Μυκηναϊκὴ Σφραγιδογλυφία (1966) Sakellariou based her analysis of seal motifs on the pieces in NMA, "since they present no problems of authenticity or provenience, and since all come from excavation . . ." (p. 2, trans. JGY). She still, however, did not arrange her material chronologically by context, and her three styles, A, B, C, instead of succeeding one another, are all found to be contemporary, covering the whole of the Late Bronze Age.

A list of seals from dated contexts which expanded the Biesantz list was presented by JHB to the London Mycenaean Seminar in 1967, but it has not so far been published and only tentative conclusions were drawn, mostly in connection with the date of the Knossos sealings, a crucial issue at that stage, as Blegen had noted.[16] Boardman (1970) gives some context lists (GGFR 390f., 393 and 394f.), but his work aims to present a survey of Greek gem-cutting over two millennia. Most recently (1973) JGY compiled a list (Diss. 18–134) of over a thousand sealtypes from dated contexts. As part of their current collaboration JHB and JGY will publish their combined and now augmented list of stratified seals and sealings.[17]

This second method, however, though archaeologically more sound, has, no more than the first, so far produced a satisfactory chronology;

[13] The AT sealings, found in 1902, remained unpublished until 1925, though a few appeared in MonAntichi 13, 1903, 34–46.

[14] A. J. B. Wace, Chamber Tombs at Mycenae, Oxford 1932, 199–203 (= Archaeologia 82, 1932).

[15] C. W. Blegen, The Mycenaean Age, University of Cincinnati Classical Studies I: Lectures in Memory of Louise Taft Semple, First Series, Cincinnati 1961, 40.

[16] Cf. JHB, Kadmos 6, 1967, 27–28 and Atti e Memorie del Primo Congresso Internazionale di Micenologia, Rome 1967, 324–325.

[17] JHB and JGY, The Chronology of Late Bronze Age Seals: Studies in the Seals of the Aegean Bronze Age II, Bristol forthcoming.

for the date of a context is only that of the deposit, not of the seal's manufacture. It has often been noted[18] that, being small and exquisite objects of semi-precious stone or precious metal, seals travelled widely and were used for a long time. They were collected by connoisseurs like the Vapheio and Nichoria nobles, handed down through several generations like the Talismanic seals discovered in the Gypsades Cemetery, found and re-dedicated in archaic Greek sanctuaries like the Bronze Age Seals from Sounion, Perachora, or the Artemis Orthia shrine, or even re-used in comparatively modern times as galopetres.[19]

The lack of stylistic homogeneity among the sealings of the major deposits at Phaistos, Ayia Triada, Zakro, Knossos, and Pylos suggests that seals of very varied age were everywhere used for sealing. From the LM IIIAi destruction deposits at Knossos there are numerous sealings impressed by seals or rings whose exact counterparts or parallels are to be found in LM IB contexts: HMs 321 (= KSPI R37) was impressed by the same seal that was used to create HMs 40 from Kato Zakro (= KZ 105) and a sealing from Ayia Triada in the Pigorini Museum (= AT 146).

c) Grouping of seals

A coherent stylistic analysis could involve large charts showing the development of animal eyes and feet, bull tails, lion manes, and the like. All seals with bulls and all with lions might then form single lines of development, while a three-sided prism such as HM 1658[20], with a lion on one side and bull on the other, could link the separate typologies. Now, with over 4500 seal types available for study from the Late Bronze Age alone[21], the task of analysing all features is virtually impossible without the aid of a computer.

[18] E.g., M.-L. Erlenmeyer, AntKunst 4, 1961, 9: "die relative Unzerstörbarkeit der Objekte (Siegel) bringt es mit sich, daß Siegel sich über viele Generationen erhalten haben, die Kleinheit, daß sie leicht über große räumliche Bereiche durch Handel oder Raub verteilt worden sind".

[19] JGY, Kadmos 16, 1977, 141–159; J. Sakellarakis, Kretische Siegel in griechischen Heiligtümern, Neue Forschungen in griechischen Heiligtümern, Tübingen 1976, 283–308.

[20] BSA 47, 1952, 243–277, fig. 16 No. III. 22.

[21] Kenna, AA 1964, 914, estimated 6000 for the whole of the Bronze Age. For the Late Bronze Age (excluding most of the Talismanic group), we count:

CMS	I	490	CMS	IX	172
	IV	180		X	249
	V	448		XII	162

It is unlikely, in any case, that if such an analysis were to be undertaken a single line of development would result. The whole course of development would, if charted, pass through clusters of linked groups, much like royal genealogies or the stemmata of medieval manuscripts.

That some seals form clearly defined groups has long been recognised. Evans (PM I 672–4) first described the Talismanic Group, subsequently studied in detail by Kenna (SIMA 24) and Onassoglou (forthcoming). Many seals in soft serpentines and steatites have been variously called crude, schematic, and inferior, but they tend to fall into two large and generally clear categories, the Cretan Popular Group and the Mainland Popular Group.

In addition to these large groups a few scholars have also formed smaller ones. Boardman (GGFR pp. 48 and 393f.) has divided Cretan glyptic of the LM II–IIIAi period into four major stylistic groups (Fine, Common, Plain, and Cut) and Mainland glyptic (GGFR 395f.) into seven groups for rings and thirteen for sealstones. He implies that his groups may be akin to schools, workshops, or even individual artists. Indeed his text frequently refers to 'studios' and 'masters', and the juxtaposition of his illustrations strengthens this impression.

Since 1970 some scholars have sought to define smaller groups and to treat these as the products of individual artists, an approach that had been only occasionally used previously[22]. More importantly, these scholars have assigned dates to their artists, first by using seals from dated contexts to give termini ante quos, and then by modifying these dates through numerous comparisons with similar seals from other dated contexts.

Boardman himself redefined his Mycenaean group A as the output of the 'Danicourt Master' (RA 1970, 3–8); Tamvaki formed a group of haematite and lapis lacedaemonius lentoids with bulls and bull-leaping scenes (AAA 6, 1973, 308–315). JGY has defined the 'Mycenae-

CMS	VII	200	CMS	XIII	95
	VIII	100			
			AM (CS)		275
CMCG		240	AGDS		100

and we estimate in addition from HM about 1000 seals and rings and some 600 types on sealings. Given a conservativce estimate of 200 seals in unpublished private collections and a further 200 unpublished from recent excavations and in museums, this produces a total of 4711.

[22] Evans occasionally put two seals together as by the same master, e.g. the Minos and Nestor rings (PM IV 948). Kenna, Festschrift für Friedrich Matz, Mainz 1962, 4–13, and Farrago (Journal of the Cambridge University Classical Society) June 1966, 9–12, identifies, often erroneously, ten groups of seals as each by one artist.

Vapheio Lion Master' (ca. 1530–1480 B.C.) as a Minoan who may have worked in Crete before moving to Mycenae[23]; and he has also defined the large 'Island Sanctuaries Workshop', consisting of several masters, as stylistically the last major workshop of the Aegean Bronze Age, towards the end of the fourteenth century B.C.[24] Finally, JHB has assembled the works of the 'Jasper Lion Master', a member of the Cretan Popular Group working at Knossos about the same time as the Mycenae-Vapheio Lion Master was working at Mycenae[25].

The assumptions made in all these studies are:

I. The small size of seals causes the details of the motifs to be rendered in exaggerated conventions, like the drilled dots for eyes;

II. these traits and technical details as well as the general composition constitute 'style';

III. seals showing figures in the same style can be grouped together;

IV. since there are many ways of rendering features (for instance, an animal's eye is generally a dot, but it may be large or small, sunken or raised, plain or within a circle, an ellipse, or a triangle), the occurrence of several comparable traits on a number of seals suggests the same artist or school.

V. An artist or workshop, having been identified, must be dated through the termini ante quos of the seals, rings, and sealings found in dated contexts.

Given the probable length of an artist's working life, say 25–30 years, it may be possible to assign quite narrow absolute dates to a particular master or workshop. While these dates will be primarily dependent on ceramic conexts, they may eventually be accepted as more accurate than, and independent of, ceramic dates.

2. METHODOLOGY

The aim of the authors is to identify masters and workshops, to date their seals by stylistic and stratigraphic methods, and thus to produce an accurate chronology.

[23] AJA 82, 1978, 285–299; BICS 26, 1979, 119–120; TUAS 6, 1981, 67–71.

[24] JGY, Papers in Cycladic Prehistory (UCLA Institute of Archaeology vol. 14, Los Angeles 1979) 97–105; CMS Beiheft 1, pp. 263–272; and The Sealstones from the Recent Excavations at Phylakopi, Melos (forthcoming).

[25] JHB, BSA 74, 1979, 274–278.

a) Workshops and Masters

That workshops for the production of seals in both soft and hard semi-precious stones and in precious metals, as well as other artifacts in these materials, existed at palace centres is attested by a growing body of archaeological evidence. Evans (PM IV 594f.) first identified an area of the South West Basements at Knossos as a lapidary's workshop, dated recently by JGY to LM IB.[26] A MM II seal-cutter's workshop was excavated in 1957 at Mallia, producing soft-stone seals (CMS II2 86–198), mainly three-sided prisms, but containing unworked ivory and rock crystal. On the Mainland there is some evidence to suggest a workshop in the East Wing of the Palace at Mycenae (House of the Columns), perhaps early in LH III[27]. And at Thebes there is a partially excavated workshop in the New Palace, whose destruction dates to ca. 1250 B.C., containing a hoard of well over 75 finished and unfinished lapis lazuli beads and inlays; it contains no seals, but the hoard may form part of the so-called Treasure, excavated nearby, which consisted of 36 Near Eastern cylinders, dateable no later than 1300 B.C., and four Aegean sealstones (CMS V 672–5, here Fig. 3) whose style should date their manufacture to the first half of the fourteenth century[28]. Apart from these, the existence of moulds for ring bezels, jewellery and glass seals and of unfinished beads and seals from various sites implies that there were other workshops, and incidentally gives insights into the seal-engraver's craft in progress[29].

Let us suppose that each of the eleven known palace centres (Knossos, Phaistos, Mallia, Kato Zakro, and Chania in Crete; and on the Mainland, Mycenae, Tiryns, Thebes, Athens, Pylos, and Iolkos) had one major hard-stone engraver's workshop per generation (ca. 25 years) from the beginning of the Late Bronze Age until seals in semi-precious stones ceased to made; that is, from ca. 1600 to ca. 1300 B.C.

By the time all the Cretan palaces (except Knossos) were destroyed, ca. 1450, they would each have supported six generations of workshops. By the time Knossos was destroyed, ca. 1375, it would have supported three more. The total of Cretan workshops from 1600–1375 B.C. would then be 27.

[26] BSA 74, 1979, 258–268.

[27] Kh. Tsountas, ArchEPh 1897, 121, fn. 1; NMA 2521 may come from this deposit.

[28] K. T.-Symeonoglou, Kadmeia I (= SIMA 35) 63–71; GGFR 57 and 395 including further references; JGY, ArchNews 8 (2/3), 1979, 40–44.

[29] See Sakellarakis, ArchEph 1972, 234–244; JGY, Expedition 23.4, 1981, 31–38.

From Pylos, which was destroyed ca. 1220 B.C., we have five seals and at least 82 sealtypes on sealings. Of these some 70% must have been created on the Mainland or in Crete before Knossos fell, and 30% between 1375 and ca. 1300 B.C.; which supports the notion that the end of hard-stone seal engraving came no more than 75 years after the fall of Knossos[30]. We postulate, therefore, for the six palaces on the Mainland, twelve workshops each during the 300 years 1600–1300 B.C. – a total of 72. Together with the Cretan workshops, the grand total comes to 97 workshops.

Two observations may necessitate a reduction of the total:

I. of the Cretan palaces destroyed in LM IB only Kato Zakro displays the products of an undeniably local artist; the rest seem to share seals by several artists[31]. This may imply that before the LM IB destructions not every palace had a workshop: perhaps only 3 per generation before 1450.

II. if several Cretan palaces patronized a workshop in common, it is logical that the Mainland palaces did likewise and that many of these were actually Cretan workshops, whose masters travelled or exported their products. It could be that not every Mycenaean palace supported a workship, perhaps only Mycenae, and one might therefore safely halve the above Mainland total, 36 instead of 72.

Such an estimate yields altogether 57 workshops (each lasting one generation): 18 in the Cretan palaces before 1450 B.C., 3 at Knossos between 1450–1375 B.C., and 36 in the Mainland palaces for the years 1600–1300 B.C.

We must now calculate the possible output of such a single generation workshop. The surviving products of the Mallia workshop are sufficiently homogeneous to be the discards of one generation or more likely of a single year. Of the 113 published pieces, 90 are broken or unfinished while the remaining 23 are compositionally inferior to finished products found elsewhere. A failure rate of between 10% and

[30] Of those Pylos sealings so far published the following (47 in all) seem to date, on the basis of close parallels from stratified contexts giving termini ante quos, to before the fall of Knossos: CMS I 298, 299, 302–07, 309, 310, 313, 314, 316, 318, 321, 325, 326, 329–331, 340–344, 346–348, 356, 358, 359, 361, 362, 364, 366–368, 370, 372–378, 380, and 381. The following (eleven in all) seem to belong or come close to the Island Sanctuaries Workshop (towards the end of the fourteenth century): CMS I 300, 308, 317, 320, 323, 324, 353, 355, 363, 371, and 379; and others to the Mainland Popular Style of about the same period (seven in all): CMS I 296, 297, 301, 311, 351, 354, and 369; CMS I 312 may have been copied from a LH IIIAii pot (cf. FM 21. 10); the remainder (27 in all) seem too badly preserved to admit stylistic judgement.

[31] See e.g., JHB, Kadmos 6, 1967, 15–40.

20% would give a total annual output of between 565 and 1130 seals, equivalent to between 11 and 22 per week, or roughly one seal every 2 to 4 hours, given a working week of ~~48~~ 40 hours.

These figures seem not unreasonable for a workshop dealing only with soft stones and, so far as we can judge, devoted exclusively to seal production. An output of this order would account for the relatively high number of seals produced in the Late Bronze Age by the artists of the Cretan or Mainland Popular Groups who worked mainly in soft stones or by those who, though using hard stones, employed the simple and rapid techniques for the Talismanic and Cut Styles.

The weekly output of a major Late Bronze Age master, creating more complex compositions with multiple techniques on hard semi-precious stone or in metal, would probably be considerably less. If the master of each of the postulated 57 Late Bronze Age workshops produced only one seal every week, we should expect a total output of 74,100 seals.

We cannot assume, however, that each master and his workshop (consisting of at least one apprentice and one helper)[32] produced nothing but seals. The evidence of the Lapidary's Workshop at Knossos, or of the lapis lazuli workshop in the Theban Kadmeion, suggests simultaneous work in different areas of production (as does the Rekhmire fresco of a jewellery-maker's workshop).

The legend of Daidalos whose output ranged from toys to architecture, and the career of Pheidias or Benvenuto Cellini, may give a reasonable idea of such a master artist's responsibilities. If artisans spent only 10–20% of their working time on seals (i.e. one seal every five to ten weeks for 25 years), we may expect a total of 7,410–14,820 hard-stone seals to have been created in the whole of the Late Bronze Age, approximately 130–260 seals per workshop. Such an estimate would allow a reasonable hope of identifying most of the masters from the 4500+ sealtypes extant.

b) Identification of Groups

In practice, considerably more than 57 groups of seals (over 100 in fact) have been identified, because stylistic comparisons can normally only be made within a single motif. Thus we can identify a master who

[32] JGY, TUAS 6, 1981, 67–71, reconstructs the Mycenae-Vapheio Lion Workshop at Mycenae during the Shaft Grave Period as consisting of the Master and two apprentices.

depicted a certain type of bull, lion, agrimi, or the human figure, but we cannot always equate his bull with his lion.

Future work will undoubtedly combine these groups, and sometimes, even now, one can identify a single master who created several animals, as when a single sealface portrays a lion attacking a bull or agrimi. One animal on one side of a three-sided prism or of a double-faced lentoid will almost certainly be by the same artist who carved another animal on the same piece. Similarly we may assume that two or more seals cut from the same piece of stone are engraved usually by one master. Similar iconographic poses may be the speciality, though not exclusively so, of one artist, as a pair of lions running tête-bêche (when cut in hard stone) is often the work of the Jasper Lion Master, but a pair of bulls recumbent, the far one's head turned away, is a motif common to several masters. An artist may also have a preference for certain materials, like the Jasper Lion Master for red-brown jasper, Tamvaki's Master for haematite and lapis lacedaemonius, or the Island Sanctuaries Master for pale stones, especially light banded limestone; but it would be folly to assume that all carnelians or brown agates are the work of one artist.

The best guide to a sealstone artist's personality is the way he renders the anatomy of his subject. No matter how realistic the artist wished his animal or other subject to be, the tools, drill and wheel, and the small field of the seal itself, all forced him to rely on certain technical conventions not only for the general shape of his subject but also for specific details. In the case of animals the wheel could be used for the body, one thick cut for the hindquarters, two others for chest and neck, thinner ones for the legs; the result is the Cut Style. Alternatively, the large solid drill could start the shoulders and hindquarters while a smaller one moving between the two could forge the chest; the result is the 'Kamilari Goat Group' (a common type represented, e.g., by CMS VII 170, here Fig. 3, or IX 103).

Most artists, however, tended to use thin wheels for legs and horns, small solid drills for joints and general shaping, and tubular drills for rings about the eyes and the like. These smaller tools allowed greater variety in modelling and greater opportunity for obscuring the basic marks of the tools themselves. We may see therefore an artists's personality in both the general shape of his animals and the tension between his reliance on his tools and his aim for naturalism.

In summary, if a group is small and its stylistic and technical traits appear homogeneously, a master is implied and given a descriptive name; he may of course be the same as another named master of another group, though such as situation is, at present, only rarely perceived. If the

group is larger and many stylistic traits appear commonly, but several sub-groups with a few mutually exclusive traits (representing individual artists' hands) can be discerned, a workshop is implied (e.g., the Island Sanctuaries Workshop consisting of the Island Sanctuaries Master, the Rhodian Hunt Master, the Columbia Master, et al.); if the larger group seems localized but cannot be broken down by hands, the group remains only a group (e.g. the Spectacle Eye Group of Knossos or the very large Cretan and Mainland Popular Groups). If the large group cannot be localized and the stylistic traits take on the quality of a Zeitstil, we simply identify a style (e.g., the Cut Style).

In succeeding studies, seals will be grouped together because of shared stylistic and technical traits. A short identification of these traits will precede the catalogue of each group. Other seals may be appended if they share a majority of these traits, and they will be placed 'close' to the main group. Some seals may share so few traits that they are only 'related', and others may employ specific traits in an advanced form and thus be 'dependent'.

As a group is presented, the evidence for its date and possible provenience will be given; its relationships to other groups will also be discussed.

Since both the dating and the placing (provenience) of the groups involve many problems, a short general discussion of them is given here.

c) Dating

The dates for groups will be based on their members from excavated contexts, the earliest giving for each group its terminus ante quem. Such context dates must first be secure. As Niemeier has pointed out[33], the dates given in old publications may have to be revised in the light of recent research; tomb groups may be too disturbed for us to discern exactly which datable pots belong to which burial; or the dates themselves may not always reflect the pottery but may rather depend on the excavator's more subjective opinion[34].

Second, context dates should have a fairly narrow range to be meaningful; LM IA rather than LH I–II.

[33] Probleme der Datierung von Siegeln nach Kontexten, CMS Beiheft 1, pp. 91–103.

[34] E.g. Ayios Ioannis Tomb 4 dated by Hood, BSA 51, 1956, 81–99, to LM IB–II on account of the swords, daggers, cups and seals, "together with the impression made by the finds as a whole . . ."

Third, the context date is only a terminus ante quem. Objects of intrinsic or aesthetic value may have been treasured and used over long periods.

Fourth, a ceramic date implies both time and place of manufacture: whereas for seals neither style nor material unequivocally evokes a distinct place or an accepted time, since materials were exported and both artists and/or the finished seals travelled widely. A dated context for a seal or sealing only dates the time and identifies the place of the seal's latest use.

To avoid, therefore, the implication from a ceramic date of association with a culture and place, the artists, workshops, and styles will be dated to periods of years B.C. rather than to ceramic phases.

d) Provenience

Just as the seals from dated contexts point towards a date for a group, so those with known findspots can also suggest a home for it. The nature of the findspots, however, must be considered. Seals dedicated in sanctuaries may have travelled long distances with their devout owners, but seals buried in tombs or lost in the bureaucratic centres may well have been commissioned from the engravers and used for some time near their findspot. For many seals the exact findspot is not recorded, but if enough in one group are said to come from the same general region, this may also suggest a home for the workshop.

Of the Jasper Lion Master's seals, for instance, two are said to come from Knossos, one from Central Crete, four or five others from Crete, two from the Mainland (Volimidia in Messenia and a 'dependent' from Kasarma in the Argolid), and two from the Islands (Akrotiri in Thera and Ayia Irini in Keos). Many related or dependent seals of the Cretan Popular Group come from Central Crete. Such findspots make it likely that the Jasper Lion Master was a Minoan and worked in Crete, probably at Knossos. In like manner, so many of the Mycenae-Vapheio Lion Master's works come from Mycenae that it is reasonable to suppose that he worked there; seals early in his style, or close to it, and related to some aspects of the Cretan Popular Group, however, are also found to have impressed some Kato Zakro and Ayia Triada sealings, so it is quite possible that he worked first in Crete. It is likely then that he was a Minoan who emigrated to Mycenae. His early style, to be seen in Crete and in some of the seals from the Mycenae Shaft Graves, shares many traits with that of the Minoan circle of artists (of whom the Jasper Lion Master is one); but his late style, to be seen in seals and perhaps some other objects from the Mycenae Shaft Graves and the Vapheio and Rutsi tholoi, and in only one example from Knossos, is radically more formal and powerful. Since this later style seems to have originated at Mycenae and found great favour among the Mainlanders, we may think of it as the first Mycenaean style, especially when its major elements can be traced amongst the work of his pupils, whose products too found favour almost exclusively on the Mainland.

3. SUMMARY

I. The terms Minoan and Mycenaean must be applied first to the people of Crete and the Mainland and then by extension only to those artifacts that we can be sure they made. To date, only pottery can be termed Minoan or Mycenaean, on grounds of fabric and painting style.

II. Seals should be grouped according to shared stylistic traits – the technical ways in which anatomical and other features are rendered, the poses and compositions of the figures, and the shape and materials of the seals themselves.

III. Assemblages of seals with many shared traits may be called the products of certain artists or workshops; seals with relatively few shared traits may be loosely termed 'groups' or sometimes more generally 'styles'. The interrelations of these assemblages can be examined in detail by noting shared stylistic or technical traits.

IV. The seals from archaeologically dated contexts and known findspots may indicate the homes and floruits of the artists who produced them.

V. Only when we know the home of a master workshop, its stylistic relationships with other workshops whose whereabouts are also known, and the dates for them based on examples from dated contexts, will we be able to say whether a Minoan or Mycenaean made a certain seal, and when he made it.