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THE SEALING STRUCTURES OF MINOAN CRETE: MM II PHAISTOS TO THE DESTRUCTION OF THE PALACE OF KNOSSOS

PART I: THE EVIDENCE UNTIL THE LM IB DESTRUCTIONS [Part II: The Evidence from Knossos until the Destruction of the Palace]

Summary. The thousands of MM clay sealings in Room 25 of the First Palace of Phaistos testify to the importation into Crete of the Near Eastern system of storeroom administrative controls. Minoan practice then diverged from the Near Eastern model. The development of a recognizably Minoan sealing system is illustrated by the LM IB sealing deposits from Ayia Triada, Zakro and Khania (with something of its evolution traceable via Mallia and Knossos). Despite many common practices in LM IB, however, important local differences coexisted within this Minoan system, perhaps suggesting the absence of a single overriding administrative authority at this time.

This paper deals with sealings, not as carriers of glyptic art or of epigraphs (as they are usually studied) but as systematic artifacts that for long periods, on Crete at least, are almost our only evidence for palatial and villa administration. I analyse the evolution of the clay nodules themselves, their shapes, and their means of attachment to objects; this, together with the seal impressions and (occasional) scribal marks on the nodules, describes the sealing structures—i.e., the amalgamation of sealing, seal and (at some sites) scribal mark which together define the sealing system at that site. I hope that this first detailed analysis will clarify (I cannot say resolve) the evolving administrative duties of Minoan seal-owners and scribes.

THE MIDDLE MINOAN DEPOSITS

We begin at MM IIB Phaistos, already well into the First Palatial Period. This late start is in itself a surprise. The Minoans had been making seals, were being buried with seals, for something like 800 years, yet— with the single exception of one sealing from EM II Myrtos (Warren 1972, 40–41)—there is no sign that they understood that seals were to be used in a sphragistic manner.¹ There is nothing comparable in time to the sealings from the House of the Tiles at Lerna (Heath 1958, 81–121). Vassiliki, where I would certainly have expected to find sealings used to protect villa property, continues to disappoint in this respect. For the moment, at least, we must admit a blank and the uncomfortable possibility that, not

climate (with its guaranteed destruction of unbaked clay) nor the chances of excavation are alone responsible for the lack of pre-palatial sealings, but that Crete was slow in developing administrative structures.²

At Phaistos, well over 6500 clay nodules were found in Room 25 in a closed destruction deposit marking the end of the third phase of the First Palace (Fiandra 1968, 385 n. 2; pottery dating = Walberg 1981, 249). Enrica Fiandra (1968, 386) was able to make a detailed analysis of 1544 more or less intact nodules. Briefly, she discovered that:

First, with very few exceptions, the sealings sealed objects, things rather than documents or any possible written records.³

Second, these objects had been repeatedly sealed, unsealed and resealed; some objects may have been opened and closed almost every day (Fiandra 1968, 391; Ferioli *et al.* 1979, 21–23). Furthermore, it is very likely that the broken clay nodules were not immediately discarded but were retained for a time (perhaps even deliberately baked⁴) to be later checked against written authorizations of the operations (Fiandra 1968, 385; Ferioli and Fiandra 1979, 309). These two factors (constant breaking of sealings and the retention of broken nodules) account for the huge number of clay sealings in a relatively small space.⁵

Third, about 10% of the sealings had secured various kinds of identifiable goods such as jars or rush matting, while about 90% sealed either flaring wooden pommels or small wooden cylindrical pegs, both wrapped around with cords. The pommels and cylinders projected from the sides of boxes or possibly doors and were secured by the cords which fastened those boxes or doors. About 1289 such nodules repeatedly sealed a total of only 11 different wooden

objects (Fiandra 1975, 12–14).

The pommels are of a well-known Egyptian shape: Fiandra (1968, *passim*; 1975, pls. 52–54) published a number of examples from surviving Egyptian doors and chests; we find very similar profiles preserved in mud sealings from XIII Dynasty Uronarti in Nubia (Reisner 1955, 26–69, interpreted by Fiandra 1968, 392; dated by Tufnell 1975, 69, to ca. 1860–1670 BC) and in purposely-baked clay sealings from the early Hyksos period in Shechem, Palestine (Horn 1973, 289). Flaring shapes in wood and pottery are popular with the Egyptians (Der Manuelian 1981, 125–28; Middle Kingdom examples in David 1986, pls. 15, 16) and it is not impossible that such flaring pommels represent a carpentry borrowing (perhaps even imported chests)⁶ though the route need not have been direct from the Nile Valley.

What we are seeing at MM IIB Phaistos is an offshoot, and a very close one, of a widespread and ancient system of using mud or clay sealings to secure property and to control access to storerooms, a system that is found throughout the Near East (Ferioli *et al.* 1979, 19–23). Another offshoot of this system was earlier seen at Lerna but there the source, at least the direct source, is not Egypt. The diagnostic flaring pommels are absent at Lerna; the comparable Type B nodules show cylindrical and conical wooden supports, a total of three such supports sealed by 36 nodules (Heath 1958, 90–95; Heath-Wiencke 1976, 129). The development of particular shapes and types of sealings needs to be further studied in order better to trace the distribution routes of the system.⁷

The Near Eastern system is still visible in the contemporary, or possibly somewhat later, Hieroglyphic deposit from Quarter Mu at Mallia: five sealings (out of a total of

28 clay nodules) show traces of five different wooden supports, very like those now familiar to us from Phaistos (Poursat 1980, 198–99); four of the supports were wrapped with cords while, on the fifth, a leather thong is wrapped around a wooden cylinder, not an unreasonable extravagance in sheep-rearing country.

Some evolution in the sealing system has, however, already taken place. Two new sealing types are introduced in the Hieroglyphic Deposits of Mallia and of Knossos and, with them, begins the history of a truly Minoan sealing system:

First (Poursat 1980, 196–197), the crescent-shaped sealings, a short-lived variety which, nonetheless, gives rise to a whole future Minoan family of nodules.⁸ The crescents only appear in Hieroglyphic Deposits, those of Mallia and of Knossos, but they start an immensely frustrating Minoan sealing trend for they hang by cords, a string hole at either end, so there is no way we can know what the crescents actually sealed; the cords could have hung from anything. Why do the Minoans now give up pressing their clay nodules against the objects to be sealed; why do they switch over to hanging nodules instead?⁹ Whatever the reason, the change is going to be decisive.

The diagnostic crescents also appear in the contemporary Knossos Hieroglyphic Deposit (SM I pl. 4A)—if it is a true deposit at all.¹⁰ At the same time, we find the first of the flat-based nodules (the future Class IV and Class V types of LM IB: Fig. 1), fairly flat cakes of clay pressed down directly onto leather strips (SM I pl. 4 A left, 2nd from bottom). These leather strips have been interpreted as the traces of leather or parchment documents (Weingarten 1983a, 38–44, pls. 27–29; Weingarten 1983b; Pini 1983, 560–562), perhaps

strips cut like a tail from the document's margin, then wrapped around the folded document and sealed on the strip itself. One wonders if, with the introduction of these nodules, with the presumption that they sealed written documents, we are not also seeing a change of emphasis, now on sealings which authenticate, rather than sealings which prove the storeroom or container is intact.

It is interesting to note that both crescents and Class IV nodules in this deposit frequently carry more than a single seal-type impression, not simply duplicating or triplicating the same seal (as happened at Phaistos) but carrying the impressions of two or even occasionally three different seals (SM I 159–162, nos. 51, 54, 63, 73, 74).¹¹ Multiple stamping of nodules dies out later at Knossos—though we do not know how much later—but will last into LM IB at least at Zakro.

There is a tendency for the crescents to straighten out a bit, which leads directly, I believe, to the prismatic type Class VI of LM IB (Fig. 1), the most common prismatic type at LM IB Zakro. Another pointer to the future is found in the Knossos Hieroglyphic deposit: a pear-shaped prism with a single string hole at the top (SM I pl. 4 B-c); this is our Class VII of LM IB, a shape that will be most common at Ayia Triada.

Having seen Knossos, the later 'Hieroglyphic Deposit' from the Palace of Mallia—though the homogeneous character of this deposit, too, has been questioned¹²—has few surprises. Not only have we a diagnostic crescent (Chapouthier 1930, 19, fig. H-6) but we have a Class IV nodule (*ibid.* 10, fig. 7, no. 40) with its absolutely characteristic leather imprint.

Sealings from the Knossos Temple Repository are flat-based types, Class IV and V (with the presumption that they sealed

documents, not objects¹³), and at least one pear-shaped hanging prism, Class VII (Gill 1965, L 1-6, of which AM 1938.941 is Class VII, with, however, a query as to location), a shape already once seen in the local Hieroglyphic Deposit but much better known at LM IB Ayia Triada and Chania. Two Class IV nodules from the Temple Repository, now in the Ashmolean Museum (AM 1938.1440a, b = Kenna 1960, 9S), are stamped by two different gems, testifying to the continuation of multiple sealing of nodules at Knossos at least until the end of MM III.¹⁴

The sealing of objects at Knossos—as earlier at Phaistos and (to a lesser extent) Mallia—is maintained (though evidence is sketchy) throughout MM III-LM I. These practices are closely related to the evolution of a local (if later) version of the Minoan sealing system at this site so we can perhaps better postpone discussion of these sealings until Part II of this paper (The Evidence from Knossos until the Destruction of the Palace).

LM IB DESTRUCTION DEPOSITS

In LM IB, Minoan sealings are of two main types, flat-based nodules which continue to be pressed against leather strips, and prismatic nodules which hang by cords (one string hole or two) and thus continue to tell us nothing about the objects sealed. In the entire corpus of LM IB sealings, I have not yet come across a single nodule which was visibly pressed against any object (other than leather strips). There are no wooden pegs, no wickerwork, no reeds, no jars. Everything hangs by relatively fragile threads, or sits on leather strips. The switch from Phaistos, from Near Eastern sealing habits, is complete.

The shapes of LM IB nodules at Ayia

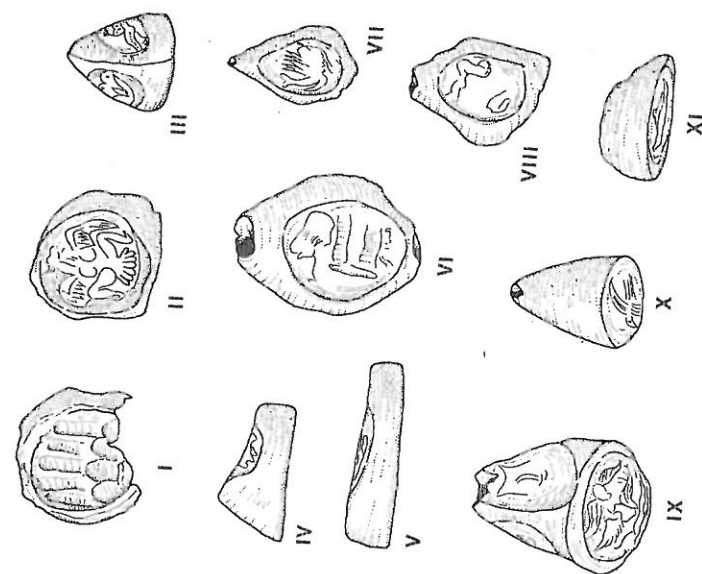


Figure 1
LM IB Sealing Shapes.

Class	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	NC*	Total
Zakro	32	156	97	74	93	40	1	1	1	1	4	25	525
	6.0	29.7	18.5	14.1	17.1	7.6	0.2	0.2	0.2	0.2	0.8	5.4	100%
Ayia Triada	—	13	—	16	47	27	524	53	252	49	56	8	1,043
	—	1.2	—	1.5	4.5	2.6	50.2	5.1	24.0	4.7	5.4	0.8	100%
Chania	—	—	—	11 ^b	44	3	19	—	—	—	2	7	86
	—	—	—	12.8	51.1	3.5	22.1	—	—	—	2.4	8.1	100%

* Nodules too damaged to be classified, or shapes belonging to no existing class.

^b Class IV at Chania has less steep sides and the profile is less triangular than the normal Class IV at Zakro and Ayia Triada.

Triada and Zakro are not arbitrary nor individual, but follow familiar and often local conventions. We can thus identify without any doubt shapes at home at either site at this time (Fig. 1). Chania, in question of shape, as in so many other sphragistic matters, falls somewhere in between practices at Zakro and Ayia Triada (Weingarten 1983a, Appendix I).

1. LM IB Ayia Triada¹⁵

Nearly all the sealings from Ayia Triada, a total of about 1050 nodules bearing nearly 150 seal-devices, were found in the North-West Portico area of the villa: about 800 in Room 11, the *stanza dei sigilli*, where they had fallen from above, and 250-300 within a gypsum chest built-in at ground level in a nearby room (Carratelli 1945, 432).¹⁶ The nodules are distinguished by the Linear A signs marked on some 70% of the sealings (*GORHΛA 2 passim*). It may be significant that Linear A signs never appear on flat-based nodules of Class IV or V. True, there is little available space on Class V nodules (though the scribes could have written a sign across the seal impression, as did later scribes at Knossos) but there was space enough on the occasional Class IV nodules though this was never used.

With the exception of 25 nodules, all carry just a single sign, the most common of which are L 29 (KA), L 98 (KU), L 22 (RO), L 57 (SI), L 88, L 16, L 100, L 74, and L 92. Of these, the first six—KA, KU, RO, SI, L 88 and L 16—account for over 92% of the signs.

One of the problems which has hindered the study of the Ayia Triada sealings, indeed sealings in general, has been the habit of giving each seal equal value, that is, a gem which impressed a single nodule, for example, is treated as the equal of one

which impressed 20, 50 or 100 nodules.

Thus, we have not been able to study the administrative structure without being distracted by the mass of sealings impressed just once or twice. What I have done is to rank the seals by frequency of appearance, isolating the sealing leaders (those whose seals are found at least 12 times in the sealing record); there are just 17 such leaders but they are responsible for an overwhelming 81.2% of all sealings at Ayia Triada. Everyone else—127 seal-owners—together accounted for 210 nodules. The seventeen seal-owners whose seals were so intensively used can justifiably be considered an administrative elite. Not all of these were equally active, however. The owner of AT 125 alone (AT numbers following Levi 1929) was responsible for 259 nodules, fully a quarter of the total. After

him, AT 13 and AT 95 stamped 124 and 97 nodules respectively (together 21.2%). This means that three seal-owners handled nearly half the business reflected in our records. Thus, the administrative structure at Ayia Triada does not resemble a bureaucratic pyramid but rather an obelisk standing on a large flat base: at the bottom are over 100 seal-owners who stamped just one or two nodules each.

The obelisk is even more pointed in the distribution of Linear A signs: five leaders have no such signs on their nodules but the remaining twelve account for 87.4% of all Linear A signs. It seemed logical to study the Linear A signs of these leaders. When we range the twelve leaders on the left axis of Table 1, and place the common Linear A signs on the right axis, a clear pattern emerges. (To bring this pattern even more

sharply into focus, I have placed those Linear A signs which appear just once within boxes.) The six signs (KA, KU, RO, SI, L 88, and L 16) cluster into two groups, each of which is determined by the seals stamped on the nodules. The first group contains the four Linear A signs, KA, KU, RO, SI, while the second group has only the two signs L 88 and L 16. With the exception of the nodules stamped by the overall leader AT 125, all seal-owners fall either into Group I or Group II, never both. The intrusion of even a single stray sign is rare. This all but absolute division suggests an underlying specialization within estate management which only AT 125 is competent to bridge.

Group II (Table 3) is the smaller—17 seal-owners—and the simpler, consisting of only the two signs L 88 and L 16 (individually, never together on a single nodule). Group II is not restricted to Ayia Triada. The same pair occurs at Khania where the owner of KH 20 (a butterfly gem) stamped two nodules impressed L 88 and six with L 16 (GORILA 3: Wa 1005–1012) and no others, exactly as at Ayia Triada. Group II has four elite members, two minor members, and 11 defective members. Obviously, as the number of nodules stamped by a seal-owner declines, the evidence recovered becomes more and more defective. This may be the reason that most defective members have lost (if they ever had) the lesser L 16.

Group I (Table 2) seems to be based on two pairs (though a set of all four signs cannot be ruled out): [KA + KU] and [RO + SI]. Given this possible dyadic structure, the group contains seven elite members (led by AT 125 who seems most at home in this group), two minor members and 14 defective members (i.e., those lacking at least one complete pair), including a defective elite member, AT 34. There is no fixed ratio

between the signs within pairs, nor between pairs (an irregularity perhaps confirmed by the patternlessness of defective members). [KA + KU] is usually, but not always, greater than [RO + SI]. It is probably more than coincidence that the total frequency of the first pair—143 and 148 nodules respectively—is roughly equal, while the totals of the second pair are equal at 87 nodules each. This might suggest a structure based on binary oppositions (e.g., in/out, to/from).

Group I and II, though involving different seal-owners (always with the exception of AT 125) do not visibly handle different jobs, that is, no group is restricted to specific nodules shapes (Table 4). True, the two Group leaders, AT 125 and AT 13, each virtually limit themselves to a single nodule shape (Class VII and Class IX respectively). But their juniors' accept no such limitation: AT 95 makes use of most nodule shapes as does his Group II counterpart AT 9. In so far as function follows form—and we suspect, but cannot prove, that it does¹⁷—the two groups may be said to be doing the same kinds of work (albeit there are significant differences within each group). One wonders if this lack of demarcation is a slight reflection of a dual administrative system?¹⁸

Be that as it may, when the Ayia Triada seal-owner impressed his seal on the nodule and the scribe made his mark upon it, the clay must still have been wet. Little time could have separated sealing from inscribing; hence geographical separation is out of the question. This does not necessarily mean that they were both resident in the villa itself. If the seal-owners were located on tributary farms or villages (as in Aravatinos 1985, 56), for example, the scribes could have been itinerant. Analysis of scribal hands—a delicate and often impos-

TABLE 1
AYIA TRIADA: DISTRIBUTION OF 9 LINEAR A SIGNS BY ELITE SEAL-TYPES

Seal-Type	L 29	L 98	L 22	L 57	L 88	L 16	L 100	L 74	L 92
AT 125	⊕	⚡	+	⚡	⚡	⚡	⚡	⚡	—
AT 95	⊕	⚡	+	⚡	⚡	—	—	—	—
AT 105	⊕	⚡	+	⚡	⚡	⚡	—	—	—
AT 79	⊕	⚡	+	⚡	⚡	—	—	—	—
AT 19	⊕	⚡	—	—	—	—	—	—	—
AT 116	⊕	⚡	—	—	—	—	—	—	—
AT 32	⊕	⚡	—	—	—	—	—	—	—
AT 34	⊕	—	⊕	—	—	—	—	—	—
AT 13	—	—	—	—	⚡	—	—	—	—
AT 45	—	—	—	—	⚡	—	—	—	—
AT 19	—	—	—	—	⚡	—	—	—	—
AT 9	—	—	—	—	⚡	—	—	—	—

Boxed signs appear just once stamped by that seal-type

TABLE 2
AYIA TRIADA: GROUP I SINGLE SIGNS

Seal-Type	KA KU RO SI										AYIA TRIADA: GROUP I SINGLE SIGNS				Total
	⊕	⊕	+	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	
	L29	L98	L22	L57	L88	L16	L100	L74	L92	L92	L92	L92	L92	L92	
*AT 125	57	42	31	49	14	7	20	11	—	—	—	—	—	—	231
*AT 95	27	31	23	15	1	—	—	—	—	—	—	—	—	—	97
*AT 105	27	8	14	3	—	1	3	—	—	—	—	—	—	—	56
*AT 79	11	5	8	12	—	—	—	—	—	—	—	—	—	—	41
*AT 19	1	37	—	—	—	—	—	—	—	—	—	—	—	—	38
*AT 116	5	11	—	—	—	—	—	—	—	—	—	—	—	—	16
*AT 32	4	4	—	5	—	—	—	—	—	—	—	—	—	—	13
*AT 122	1	2	1	1	—	—	—	—	—	—	—	—	—	—	5
*AT 8	1	2	—	—	—	—	1	—	—	—	—	—	—	—	4

*AT 34	3	—	1	—	—	—	—	—	—	—	—	—	—	—	8	12	
*AT 123	—	1	2	—	1	—	—	—	—	—	—	—	—	—	—	4	
*AT 63	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	2	
AT 65	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2	
AT 5	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
*AT 6	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	3	
*AT 27	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2	
AT 36	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	
AT 66	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
*AT 76	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2	
*AT 78	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	
AT 108	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
AT 158	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	
AT 147	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	
	143	148	87	87	16	8	24	11	13								537

Compiled from GORILA 2
* At least one example published in MonAnt 1903

TABLE 3
AYIA TRIADA: GROUP II SINGLE SIGNS

Seal-Type	AYIA TRIADA: GROUP II SINGLE SIGNS					Total
	⊕	⊕	⊕	⊕	⊕	
	L88	L16	L29	L92	L92	
*AT 13	120	13	—	—	—	136
*AT 99	20	4	—	—	—	24
AT 9	22	2	—	—	—	24
AT 45	16	7	—	—	—	23
*AT 140	4	1	—	—	—	5
*AT 73	1	1	—	—	—	2
*AT 103	1	1	—	—	—	2

AT 14	3	—	—	—	3
*AT 17	3	—	—	—	3
AT 3	4	—	—	—	4
*AT 38	5	—	—	—	5
AT 81	1	—	—	—	1
*AT 102	2	—	—	—	2
*AT 136	3	—	—	—	3
AT 68	—	1	—	—	1
AT 119	—	2	—	—	2
AT 44	—	1	2	—	3
205 33 2 3 243					

Compiled from GORILA 2
* At least one example published in MonAnt 1903

TABLE 4
AYIA TRIADA: ELITE SEALING SHAPES BY SEAL-TYPE

Seal-Type	II	IV	V	VI	VII	VIII	IX	X	XI
AT 125	--	1	--	12	244	2	--	--	--
AT 13	--	--	--	--	--	2	122	--	--
AT 95	--	--	1	3	22	1	60	10	--
AT 105	--	--	--	4	52	4	--	--	--
AT 19	--	--	--	7	33	--	--	1	--
AT 113	--	--	--	--	--	--	--	--	41
AT 79	--	--	--	--	37	--	--	--	--
AT 45	--	--	--	--	19	5	--	1	--
AT 99	--	--	--	--	18	4	--	--	--
AT 9	--	--	--	--	5	1	21	--	--
AT 106	--	--	--	--	7	6	--	--	7
AT 67	--	--	--	--	12	3	--	--	--
AT 116	1	--	--	--	1	1	10	3	--
AT 32	--	--	--	--	--	--	--	13	--
AT 12	--	--	1	--	2	8	--	--	1
AT 33	--	--	--	--	7	3	--	2	--
AT 34	--	--	--	--	6	1	--	5	--

possible task when dealing with single signs —nonetheless indicates that possibly 12 scribes¹⁹ were located at the villa along with the 57 seal-owners whose nodules were inscribed: the same hands appear on nodules stamped by several different seal owners, not neatly clustering, but in an almost random manner.

The scribes wrote their signs, not haphazardly but in the direction intended to be read, that is, for the instruction of literate men, whether themselves or others (*GORILA* 2, lxi). Literate men (by definition) knew the signs phonetically or, if

appropriate, ideographically. It seems hardly likely that the signs were arbitrarily chosen, 'just reference symbols' categorizing files or groups of accounts (Pope 1960, 203). One plausible solution is for the signs to represent commodities, either ideograms —but no commodity ideograms known from the tablets are repeated on the nodules—or as abbreviations (e.g., KU for a putative KU.NI.SU WHEAT). Pope (1960, 200) ruled out abbreviations because 'L 88, the most frequent [sign] does not begin a single surviving group in Linear A' and L 16 is the 'obvious "saw" ideogram' rather than

syllabic sign. L 88 and L 16 could, of course, be ideographic within Group II without necessarily hindering the Group I signs, KA, KU, RO and SI from being abbreviations.²⁰

Analysis of the six Linear A tablets which may have been found with the nodules in Room 11, HT 6–11,²¹ indicates that there is a probable connection between nodules and tablets (though, it must be emphasized that tablets do not respect Group demarcations). L 88 as an isolate or near-isolate sign occurs just five times on the Ayia Triada tablets as a whole, twice on tablets in Room 11 (HT 8a.3, 10a.3) and thrice elsewhere (HT 98.3, 110b.5, 115a.2); since this sign is so rare, the fact that two of the tablets are found in a room containing 221 nodules marked L 88 seems more than coincidental. Another tablet from Room 11, HT 11b2–6 reads L 35 (the 'boat' ideogram) KA followed by a series of isolate KA's (KA 40 KA 30 KA 50 KA 30 KA 30) totalling (KU.RO) 180, a reasonable approximation to the 143 nodules marked KA found in the same room, again unlikely to be mere coincidence.

The tablets give us a further bit of solid information. Scribe VI (who wrote HT 8) and scribe XII (who wrote HT 7) worked elsewhere at Ayia Triada; tablets written by them (Raison and Pope 1971, xx) are not confined to the North-West Portico area of the villa. They are servants of the villa, not of a single department. Thus, the ultimate authority in Room 11 was the same as ruled elsewhere in the villa.

2. LM IB Zakro

We now turn eastwards to contemporary Zakro, where about 525 sealings were found in House A, on the northeast hill at the very inland edge of the town. One of the most

remarkable facts about the Zakro sealings and that which strikes the eye almost immediately, is the habit of multiple stamping of nodules:

- 120 nodules are stamped by three different seals
- 240 nodules are stamped by two different seals, compared to
- 165 stamped by just a single seal.

Thus, we have 1005 seal impressions made by the often repeated use of some 214 seal devices (Weingarten 1983a, 7–24).

The nodule shapes at Zakro obviously evolved to adapt to the habit of multiple stamping. Class I, II and III may be thought of as more spacious varieties of Class IV and V—all flat-based types with identical leather imprints, all sealing the same leather objects, presumably documents. Yet it would probably be an error to assume that shape determines the number of seal impressions: Class VI, for example, is used for one (very rarely), two, or three seal impressions [while the equally spacious prismatic shapes from Ayia Triada are never used for multiple sealings]; Class IV is used for one or two seal impressions (Weingarten 1983a, 27–33).

In *The Zakro Master and his Place in Prehistory* (Weingarten 1983a, 9–15) the multiple-stamped nodules were divided into two parts depending on the constancy of the seal-type combinations:

Invariable Combinations, that is, two or three seal-types which always appear together, and

Variable Combinations, that is, two or three seal-types which shift partners, dropping one seal-type to take on another, sometimes more than once.

I was particularly interested in the relationships between the dropped partner and its replacement(s). The most provocative relationship turned out to be that

which I dubbed 'look-alikes' (Weingarten 1983a, 16–19). Two examples of this phenomenon:

Z 21 + Z 61 + Z 28 (numbers following Hogarth 1902) alter to Z 21 + Z 61 + Z 29 (Fig. 2). It is obvious that Z 28 and Z 29 are very close relations, but two variations on a single image. The two gems must have been made intentionally similar, meant to replace each other (in some sense), to alternate in combination with Z 21 + Z 61.²² Neither Z 21 nor Z 61 ever appear in any other seal combinations; they exist only in partnership with the analogues Z 28 and Z 29.

In a look-alike triad, Z 129 + Z 92 alters to Z 129 + Z 92A (not a Hogarth number) which alters, in turn, to Z 129 + Z 139 (Fig. 3). Again, Z 129 only exists to partner the analogous triad, three seals (Fig. 4) that

must have been made intentionally similar in order to assert similar authority within some closed group.

Ingo Pini (1983, 563–569) then took the next step. He showed that there were more look-alikes than I had suspected, some of them only distinguishable by the slightest, perhaps unconscious variations, a slip of the engraver's drill (if I may put it so). Here is what happened to my so-called Invariable Combination, Z 71 + Z 89, the butterfly sphinx and the two long-eared owls (as I would have them). Each seal exists in three different versions. Fortunately, the variations of the butterfly sphinx, Z 71, can be proved objectively: the number of petals in the rosettes on her right wing changes in each version—seven, eight, or eleven, alterations that cannot possibly be due to

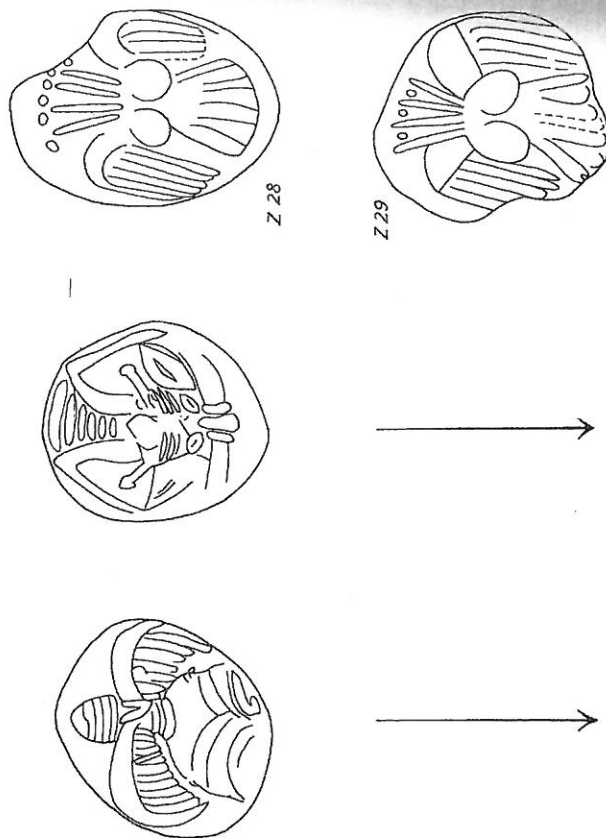


Figure 2

Zakro look-alikes: Z 21 + Z 61 + Z 28, Z 21 + Z 61 + Z 29.

any slip or carelessness impressing the seals. Once you see this difference, other differences are then so easily spotted that you wonder how you missed them in the first place.

Z 89, partner to Z 71, also exists in three versions, though, admittedly, the alterations are more subtle and might not have been noticed had we not first seen the transformations of Z 71. The three versions of Z 89 move in unison with those of Z 71: Z 71a + Z 89a, and so on. Thus, in place of one Invariable Combination (Z 71 + Z 89) based on two seal-types, we discover six

different seals (Z 71a + Z 89a, Z 71b + Z 89b, Z 71c + Z 89c) forming three Invariable Combinations. This is the rule which can now be seen to run throughout the multiple sealings of Zakro (Z 21 + Z 61 (see n. 22) also vary, depending upon Z 28 or Z 29; there are three versions of Z 129, one for each variant of its attached triad) a rule not confined to the monstrous works of the Zakro Master. The most frequent combination at Zakro, the two rings, Z 10 + Z 97, breaks down into four rings in two combinations (Pini 1983, 563–566). In

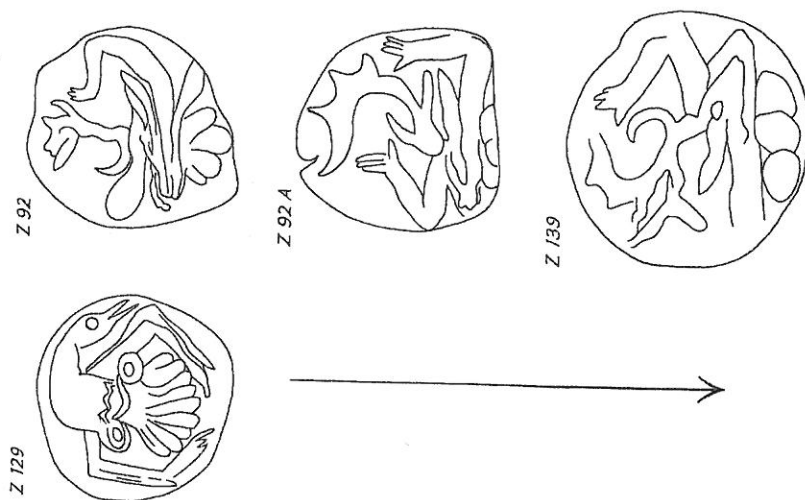


Figure 3

Zakro look-alikes: Z 129 + Z 92, Z 129 + Z 92A, Z 129 + Z 139.



Figure 4
Z 92, Z 92A, Z 139 (CMS photographs).

short, after the most meticulous restudy of the corpus, we can restate the rule: there are *no variable combinations*. There are only variations of invariable combinations.²³

I need hardly stress that this remarkable pattern raises some questions about Minoan seal use: who uses the variants and why?

However could such variants have been distinguished in practice, or would they, willy-nilly, have had to have had the same authority? Can we continue to assume that one seal equals one man, or does it represent one group of men?²⁴ Is this the same pattern, incidentally, underlying the rings

described by John Betts in his 1967 article 'New Light on Minoan Bureaucracy'? Not replica rings,²⁵ but (as I would have them) look-alike rings, with their very slight variations, undoubtedly made intentionally similar in order effectively to confer the same authority on the users. That is, they served the same purpose, neither more nor less, than the look-alikes which we have seen at Zakro. If these rings were made at Knossos, as Betts (1967, 25) believed (and I agree), that would add shared look-alikes to the shared habit of multiple stamping which we had seen at Knossos in MM IIB/MM III, and at Zakro in LM IB.

3. Some Implications of the LM IB Sealing Structures

Local sealing structures—i.e., the combinations of systematic clay artifacts, seals, and (in some cases) scribal marks—are quite different at LM IB Ayia Triada and (to a lesser extent) Khania from that at contemporary Zakro. Ayia Triada is most strikingly distinguished by the habit of single stamping of nodules allied to the frequent Linear A inscriptions which differentiate two groups of administrative officials. Zakro, on the other hand, is characterized by a complicated multiple stamping system (with no Linear A signs). Perhaps just as significant (if more difficult to interpret) are the demarcations in sealing shapes: Ayia Triada overwhelmingly uses prismatic shapes (which hang by cords), while Zakro exploits flat-based shapes (which sit on their strips). The two sites, in so far as their sealing structures reflect underlying administrative systems, are relatively autonomous.

I have suggested elsewhere (Weingarten 1983a, 45–46) that House A at Zakro was a way station, a kind of customs house, be-

tween the port and a mountain road which led to the plateau above. Goods stored there would have been in transit as it were. If so, containers normally would have continued the journey under their original seals rather than be opened and re-sealed on the spot. Nonetheless, some goods might have changed hands there, from agent to owner (or vice versa) or have been parcelled out (or grouped together). Such transactions could have been expressed in writing—whether simple receipts or more elaborate contracts—resulting in a very large number of flat-based nodules (compared with relatively few prisms which might have sealed containers).

The findspots of the sealings from Ayia Triada suggests internal storeroom administration.²⁶ Prismatic nodules hanging by strings would probably have sealed containers, whether boxes, bags, or small vases (much heavier parcels or sacks are unlikely, given the fineness of the cords fastened by the prisms). Each time a container was opened, the seal guaranteeing the integrity of the goods had to be removed and then replaced (in a system directly descended from Phaistos) to ensure that only the proper officials had access to the containers. The number of officials in the storerooms at any one time would not have been excessive. The 23 seal-owners of Group I (led, but probably not directed by AT 125) and the 17 of Group II (where AT 13 was most active) split into overlapping sub-units, ranging from eight individuals active in L 57 (SI) business to a maximum of fifteen in L 88 affairs.²⁷ We need imagine nothing like the crowds which must have attended the main storage area of the villa to the east of the North-West Portico area. Nonetheless, a large number of nodules would have fallen into the relatively small area of Room 11 if, as I have suggested, some containers were

NOTES

(An earlier draft of this paper was presented at the 12th meeting of the Oxford Aegean Archaeological Seminar in March 1986. I am grateful to the organizers, Mr Mervyn R. Popham and Miss Irene S. Lemos, for the invitation, to the Chairman of the session, Dr Susan Sherratt, and to the participants for their lively contributions to the discussions.)

1. A single seal impression stamped on a jar handle (Sackett and Popham 1965, 301, 304, fig. 18, no. 21) from an EM III/MM I level at Palaikastro, though possibly intended to identify the origin or the contents of the jar (or even the potter), can hardly be considered evidence of serious sphragistic use of seals between EM II and MM IIB.

2. There is, however, some evidence that the sealing system was not a very recent importation at the time of the Phaistos destruction. The deposit contains two probable Minoan innovations in an otherwise entirely Near Eastern system. First, the eight nodules in Flandra's Class R (1975, 15), unique parallelepiped-shaped *prove di sigillo* which, in fact, probably belong to the future Minoan category of noduli (see n. 13). (A *Handwörterbuch der Firmennamen* from Karahöyük: Alp 1968, 72). Second, her Class S, *etichette o ricevute* (not to be confused with the Hittite *Eitketten*) which, I suggest, develop into the purely Minoan roundels, probably evolving through the Hieroglyphic 'labels' or 'medallions' (Knossos = SM I P 50-P 87; Mallia Palace Archives = Chapouthier 1930, H 7-11. Note that an early roundel also appears in the latter deposit, H 5; see n. 12 below).

3. This is true of the sealings but the seven so-called shells of Class S (n. 2 above) are themselves short-written documents (each stamped with a single gem impression). See Raison and Pope 1981 for the described objects from Room 25: PH W 24, W 42-45; similar documents were also found in Rooms LI and 10. 4. Weingarten 1987a, n. 35 and 67. reviews the evidence for the suggested deliberate firing of nodules in order to preserve them as administrative documents. 5. Walberg 1981, 248 argues (*pace* Flandra 1968, 383 n. 4) that the sealings were found *in situ*.

6. Ring pegs are seen earlier on the handles of two vases from Mochlos, one of which can be dated to 21.1A (Warren 1969, p. 70, P 122; Heath-Wiencke 1929 n. 13), possibly a clue to the date of the operation of the sealing system (see n. 2 above). For example, the sealings from Karahöyük (Alp 1968, 69-72), though sharing some iconographic features with those from Phaistos, are only most

documented by the sealings, need not have been sharply divergent but expressed different transactions, the one internal, the other perhaps external. If we were to find a 'way-station' at Ayia Triada (or would it have been at Komo?) we might discover a system akin to that of Zakro, while at Zakro, I suggest, we are missing the centre for storage and distribution (as opposed to manufacture) of small-size, high-value luxury goods. This is not to deny the importance of the many administrative innovations at each site. The Zakro peculiarity of multiple stamping of nodules—a practice fundamental to their system (though perhaps shared by Knossos)—is virtually unknown at Ayia Triada and completely absent at Khania (Weingarten 1983a, Appendix I). The elaboration of geometrically-varied sealing shapes (which, I suspect, reflect a visual code allied to function) is typical of Ayia Triada. One might well consider the exploitation of roundels to be a local development at Khania. While it is true that all such variations are ultimately based on the Phaistos experience, through its evolution in the Hieroglyphic Deposits of Mallia and Knossos, they did not evolve in close harmony one with another. This variety of sealing structures argues a variety of administrative authorities. There was no one to lay down the law; evolutionary divergence is the result.

[to be continued]

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opened and resealed repeatedly, in some cases every day. This would also help explain the dearth of archaeological materials accompanying the sealings.

The small assemblage of pottery (a strainer, a high-necked amphora, alabastra and pyxides) fallen into nearby rooms might indicate the small-scale storage of perfumed oil; a serpentine mortar found in the area might have been used to grind aromatics (Watrous 1984, 127). But the amount of pottery is small and the types do not so much suggest a workshop as a storage facility. Similarly, the fine stone vases (some of which fell with the sealings) could indicate a parallel storage of valuables (*ibid.*). Only the 80 loomweights point to a workshop, perhaps with a textile storeroom near at hand.²⁸ Both oil and textiles are in keeping with the luxurious appearance of the northwest quarter of the villa. These are likely to be among the kinds of small-size, high-value goods which one would expect to find stored in an essentially residential area, where nothing noisome would be allowed and space would be limited. Such luxury goods would be parcelled out, perhaps quite frequently but in small quantities to the inhabitants and dependents of the villa, thus necessitating the constant breaking of seals and the resealing of containers. They would require the tightest bureaucratic controls and justify an elaborate system 'in which the various staff members controlled one another and were in turn under the direct control of the owner.' (Feriet *et al.* 1979, 23).²⁹

Thus, the administrative systems of Ayia Triada and of Zakro, in so far as they are

distinctly related in their sealing shapes and the objects sealed: a mere handful (Flandra 1975, n. 70) sealed wooden cylinders or pommels (none flaring).

8. The crescents are obviously direct ancestors of the LM IB prismatic Class VI nodules—and, indirectly, perhaps of Class VII and VIII as well (Fig. 1). Many crescents from Knossos, however, bear both multiple seal impressions and short inscriptions (commonly 2-4 signs) which more resemble the later roundels than simple sealing nodules.

9. Broken prisms show that the clay was (most commonly) pressed around a knot or the overlapping edges of the cords from which it hung; the nodule itself is thus the fastening as well as the guarantee of integrity. This simple system could have developed from a need to cut and detach an intact (rather than twisted off, distorted) nodule for further administrative purposes (see n. 4 above).

The Hittites (at a later date) also largely switch to hanging nodules, mostly (roughly-shaped) cones with a single string hole. Cf.: Güterbock 1940, pl. 1, 39; Güterbock 1973, no. 9, 10, 11, 29, Özgüç 1982, 116 (with LH IIB pilgrim flasks and stirrup jars). Their hanging cones may have evolved locally; compare the rough cone-shaped sealings (on objects) from Karahöyük (Alp 1968, 136/419, 141/434).

10. Gill (1965, 66): 'of those published . . . as belonging to the Hieroglyphic Deposit, it is uncertain how many came from the cupboard under the stairs and how many [were] found in adjacent magazines . . .'. 11. A mere 16 nodules at Phaistos (ca. 0.0025%) were stamped by more than a single seal-type (CMS II.5 xxii).

12. Pelon 1983, 703, where he also advances the date, from Chapouthier 1930, 7 (MM III and contemporary with the Hieroglyphic Deposit of Knossos) to the first phase of the New Palace Period, nearer the end than the beginning of MM III. Pelon (701 n. 50) questions, too, its designation as a hieroglyphic deposit since it contains many more Linear A documents than previously thought.

13. The Temple Repository also contains a number of noduli (sealings that do not seal', with neither string holes nor traces of having been pressed against any object). See Weingarten 1986, no. 4-5; Weingarten 1987b, A-12.

14. The habit of multiple sealing at Knossos extends to roundels from the Temple Repository (?) which are stamped by two or three different seals (Hallager 1987, forthcoming), a practice unknown elsewhere on Crete. 15. Weingarten 1987a analyses and interprets the Ayia Triada sealing structure in fuller detail.

16. The problems (perhaps the impossibility) of pin-

pointing the find-spots of the sealings is discussed in Weingarten 1987a, n. 1, 23 and 33.

17. Unfortunately, we can only be sure that function follows form in one wholly exceptional case, that of AT 118 (45 noduli isolated in room 27), for which see Weingarten 1987a (forthcoming).

18. While it cannot be said that Groups I and II do identical work (two pairs versus one pair), it is possible that they represent two teams performing parallel tasks. Since the sealing administration is ultimately based on an Egyptian model, one wonders if the Egyptian dual administration system had not entered Crete at the same time (Megally 1977, 267: 'La formation et les activités des deux équipes sont semblables, elles faisaient le même travail et au sein de chacune, il semble y avoir une spécialisation identique...').

19. Pope (1960, 203) estimated 6–12 scribes but did not illustrate the basis for his conclusion. In any case, six is certainly too few: I have identified nine scribal hands writing L 88 (Weingarten 1987a, Table 10) and there is certainly one, and probably at least two or three more, whose handwriting is too 'calligraphic' for individual peculiarities to be identified. I would argue for a minimum of 12 scribes working on behalf of the 57 seal-owners with inscribed nodules.

20. That Minoan administration did make use of abbreviations may be deduced from PK 1: L 57, written on the rim of the tablet, could be the file reference for the tablet's heading, L 57.06.61.78.

21. As with the nodules, the exact tablets found in Room 11 is problematic. See Weingarten 1987a, n. 37. 22. Weingarten 1983a, 14, noting that this Variable Combination contained a second pair of look-alikes (two versions of Z 61), asked '[how] did the local administration distinguish these combinations, or was there, in fact, no need to do so?'

23. Dr Ingo Pini and I are now completely restudying the Zakro sealings (to be published as a CMS Beihft). While much work remains to be done, it is already evident that the remarkable combinations at Zakro are based on this new inflexible rule.

24. If a group of men, I would argue that the look-alikes are 'office seals'. Earliest evidence for what might be such 'office seals' are the two recently-discovered *Petschaften* from the same sector of Quartier Mu, Mallia, both seals bearing the identical seal-device, a *croix pommeté* (Poursat 1987). While we cannot prove that they were office seals used by two or more different people, that does seem a likely conclusion. What is certain, however, is that the seal impressions made by the two *Petschaften*—and indeed

others with this very common seal-device—could have been separated in practice.

The situation remains the same at Zakro, but, there, it is visually complicated by the administrative need (for whatever reason, and as earlier at Knossos) stamp most nodules multiply. Perhaps, at Zakro, newly-appointed officials would receive a set of two or three seals. It would then naturally happen that two officials appointed at much the same time (or even simultaneously) would have close look-alike sets. If more time intervened, more changes would occur in all seals in the set (some sets do look as if they were the work of a second engraver).

Aegean glyptic scholars have perhaps relied too much on 'classic' Near Eastern seal evidence: the supposedly intimate and inalienable bond between a man and his seal may now be called into question even in the Near East. In Middle Kingdom Egypt, for example, named scarabs with funerary titles were used for sealings by people who could not possibly be those who were named. Tomb robberies seem to have spread them about; the death, burial and pillage of the true owner did not seem to bother those who later used them. Clearly, these scarabs are not used as authentication; they merely secured the package or letter and ensured that they arrived intact (Williams 1977, 138). There is some equally ambivalent evidence from the Old Assyrian colony in Anatolia: approximately half of the named seals (of course, only a small proportion of all cylinder seals) were used by persons with different names, and it is impossible to establish any relationship between the name on the seal and the name of the user. One would think that seals impressed on tablets would be meant as signatures, but it is also quite common to find the same seal used on different tablets without the name of a single person recurring (Larsen 1977, 89–99).

25. Betts's argument for replica rings is based, above all, on the *taurokaphupia* ring (with a nick in its baseline) which undoubtedly sealed nodules found at Gournia (HM 101), Ayia Triada (AT 54 = three nodules) and Sklavokampo (SK 2 = 2 nodules). Even claimed that the clay used for each nodule was sealed therefore each nodule must have been stamped on the spot. He postulated travelling Knossian bureaucrats armed with replica rings to account for this and other look-alike sealings at different sites (Betts 1967, 2–26). My own observations on the three Ayia Triada nodules, however, do not confirm that the clay is sealed on the contrary, the clay looks distinctly foreign (see 123). Since all three examples of this *taurokaphupia*

AT 54, are on Class V nodules, I suggest that a single ring (at Knossos?) stamped documents (?) which were sent to Ayia Triada (and the other sites). That is, the nodules travelled, not central bureaucrats, an argument for trade or communication, not dominion. That the *taurokaphupia* ring was an 'office seal' (n. 24 above) is strongly suggested by another sealing from Gournia which Boyd Hawes (1908, fig. 30.4) published as a duplicate of HM 101. Betts (1967, 16–17) rightly noted subtle but real differences between the two. They are only close look-alikes.

26. The rooms above Room 11 may have been the actual storerooms, possibly containing oils, textiles, and leather products. See Weingarten 1987a.

27. Overlapping officialdom (whether of the same or different administrative levels, doing similar or even the same work) is a characteristic of storeroom administration at much-studied Mari. See Weingarten 1987a, n. 68 for references.

28. At Pylos, textile weaving was attached to the storage of perfumed oils—perhaps for the purpose of storing cloths (Shelmerdine 1984, 92).

29. It is extraordinary how few—if any—LM IB nodules were found *in situ* in magazines where the bulk pods (on which the villas depended) were stored. It is as if bureaucrats were content with recording receipts and deliveries of basic commodities on tablets. Metabolous controls (based on sealing, unsealing, re-sealing) may have been reserved for high-value goods and in other special circumstances.

ABBREVIATIONS

CMS *Corpus der Minoischen und Mykenischen Siegel* (Berlin 1965–)
GORILA 2 Godart, L. and Olivier, J.-P., *Recueil des inscriptions en linéaire A II* (Paris 1979)
GORILA 3 Ditto III (Paris 1976)
MINE Gibson, McG. and Biggs, R.D. (eds.), *Seals and Sealing in the Ancient Near East* (Malibu 1977)
PCA Shelmerdine, C. and Palaima, T. (eds.), *Pylos Comes Alive* (New York 1984)
WE Evans, A.J., *Scripta Minoa I* (Oxford 1909)

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THE OLIVE IN THE PREHISTORIC AEGEAN: THE EVIDENCE FOR DOMESTICATION IN THE EARLY BRONZE AGE

Summary. In 1972 Colin Renfrew suggested that the rise of Mycenaean civilization may have been made possible by the development of a polycultural triad of wheat, vine and olive in the Early Bronze Age. A careful examination of the botanical and archaeological evidence for the domestication of the olive lends little support to this aspect of the thesis. The palynological evidence from various points in Greece is inconclusive, but for most areas it would seem to suggest that the intensive cultivation of olive began in the Late Bronze Age or even later.

No conclusive archaeological evidence for processing or storage of olive oil exists for any period in the Bronze Age. The question of when olive domestication took place must remain unanswered until more data are available from Early and Middle Bronze Age contexts and more conclusive botanical data have been collected.

In this paper we shall address ourselves to the problem of identifying the archaeological evidence for the domesticated olive in the Aegean with specific reference to Crete, the Cycladic islands, and mainland Greece. Our interest in this subject has been stimulated by Colin Renfrew's influential thesis (1972) that the Early Bronze Age (EBA) settlement of southern Greece was in part made possible by the introduction of the domesticated olive tree and the grape vine. The supposition that these were new cultivars at the beginning of the third millennium is a crucial part of Renfrew's thesis. Cultivated for oil and wine, these plants were part of the Mediterranean polycultural triad of wheat, oil, and wine, which together permitted an increase in population and settlement by allowing new

and more marginal land to be brought under cultivation.

We (Runnels 1985) have already drawn attention to other factors for the cultural expansion witnessed in the EBA, such as the introduction of metallurgy and the longship, or the existence of good harbours in Central and Southern Greece. We have also (Hansen 1984) drawn attention to the difficulties encountered in the attempt positively to identify the presence of domesticated olives in the archaeological record in Cyprus. It is useful, therefore, to turn our attention to the Aegean and mainland Greece, to focus upon the olive, and to offer a critical evaluation of the evidence for its use and domestication. This problem has two parts: first we must determine where and at what time it was first known in