CRETAN HIEROGLYPHIC

Nearly 4,000 years ago a hieroglyphic script was used on Crete which predates Linear A and Linear B, indeed any other writing in Europe, but remains undeciphered since its discovery at the beginning of the twentieth century. This is the first comprehensive account of this script, which is analysed by leading experts through an array of lenses, including archaeology, philology, palaeography, cognitive studies and decipherment theory, in order to showcase its importance in the history of writing. The book takes a broad approach to writing, understanding it not solely or even mainly as a visual tool to convey language, but primarily as a social and cultural phenomenon rooted in agency, materiality and semiotics. The volume will provide an invaluable tool for scholars and will facilitate further research. This title is also available as Open Access on Cambridge Core.

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PREFACE

THE CRETAN HIEROGLYPHIC SCRIPT AND PROBLEMS OF DECIPHERMENT

Louis Godart

Cretan Hieroglyphic Script and Linear A

Three clearly related scripts were used in ancient Crete during the Bronze Age: Cretan Hieroglyphic, Linear A and Linear B. The earliest written testimonies date back to the third millennium BC. A few seals, presenting some fifteen different signs in all, have been found at three sites on the island: Archanes, not far from Knossos, Odigitria Monastery on the Messara plain and Pankalochori outside Rethymnon. They date from Early Minoan III or, at the latest, Middle Minoan IA levels (Table 0.1, cf. Civitillo, Ferrara and Meissner, this volume). The five signs incised on these seals, most of which are made of bone, seem to be precursors both of Cretan Hieroglyphic and Linear A signs and are known, as a whole, as the 'Archanes formula' (Valério, Civitillo, Jasink and Weingarten, this volume). The 'formula' we can read on these seals is more or less the same as we have on many Linear A inscriptions on libation tables from the Late Minoan period: if we apply the phonetic values of the correspondent Linear B signs to these inscriptions, the 'Archanes formula' will read A-SA-SA-RA-NE and on the Linear A libations tables A-SA-SA-RA-ME.

Two scripts are attested for the Protopalatial period: Cretan Hieroglyphic and Linear A. The former, though certainly of Cretan origin, owes its name to Arthur Evans who assumed a vague resemblance of its signs to the characters of Egyptian hieroglyphic script. The second was named Linear A because its texts are written in horizontal lines and because it predates another Cretan script which displays most of the same traits: Linear B. Until a few decades ago, all the Linear A texts of the Protopalatial period solely came from the ruins of the First Palace at Phaistos excavated by Doro Levi, Luigi Pernier's successor. In 1953, in a Middle Minoan II horizon, he was astonished to bring to light several dozen clay tablets which had been burnt by chance in the fire that left the royal residence deserted around 1700 BC. Recently, a Linear A tablet was discovered in a Protopalatial context at

Knossos.[1] At the time of the First Palaces, while the scribes of Linear A were keeping accounts, other literate Minoans continued the tradition evidently in use in Middle Minoan I and used the Cretan Hieroglyphic script for inscriptions on seals. Even so, because it is difficult to limit the scope of a script, once invented, the Minoans extended the use of Cretan Hieroglyphic to clay vases, offering tables and other objects made of clay (tablets, tokens, etc.).

It may seem strange that during their history the Minoans invented two writing systems, Cretan Hieroglyphic and Linear A. However, they were not alone in this. The Hittites, for example, also used two scripts: the cuneiform script which they inherited from the Assyrian merchants, and the so-called Anatolian Hieroglyphic script. The Hittites adopted the cuneiform script probably some time around the middle of the eighteenth century BC. This script was used for several centuries in the scribal school at Ḫattuša, the capital of the Hittite empire. Hittite cuneiform was the official script. The scribes used it to compile texts in the various languages of the empire. In order to write one of the languages of the empire, Luwian, the Hittites used from the fifteenth century BC, alongside the cuneiform script, the Anatolian Hieroglyphic writing system. This is based on signs representing, always in profile, certain animals, parts of the human body, domestic objects and numerous religious symbols. The documents in Anatolian Hieroglyphic include rock-carvings, commemorative steles, domestic objects and, in particular, a rich collection of personal seals and cylinder seals. The coexistence of two different scripts, whether in the Minoan or the Hittite world, was possibly connected with the differentiation of the messages to be transmitted. Since more than 98 per cent of the Minoan seals are written in the Cretan Hieroglyphic script, I do believe that at the beginning this sort of writing was first used to write messages on this sort of support, while Linear A was restricted to tally records as in the Protopalatial archives from Phaistos.

It is undeniable that new research on Cretan Hieroglyphic writing is very promising.[2] For instance, my last study of the scribes of the hieroglyphic documents discovered in the 'Deposits of the palaces of Malia and Knossos' can demonstrate four points: 1) the same scribe is the author of documents discovered in the palace of Malia and of Chamaizi vases unearthed in the *Quartier Mu*; 2) since the date of the *Quartier Mu* is certain (Middle Minoan IIB), it is obvious that the 'Hieroglyphic Deposit' found in the palace also dates from Middle

[1] Schoep 2007: 132–3. [2] Godart 2023.

Minoan IIB, which confirms the dating proposed by F. Chapouthier;[3] 3) there was coexistence between Hieroglyphic and Linear A in the 'Hieroglyphic Deposit of Knossos' as well as in that of Malia, because document KN #019 is written in a form of Linear A identical to that attested in the Phaistos tablet PH 7, document KN #048 presents logograms (*164 or *165) identical to logograms *AB* 180 attested in the inscriptions in Linear A MA 4 and MA 6 of the palace of Malia and to logogram *180 of Linear B present in tablet KN U 172 and, finally, tablet #068 published in *Scripta Minoa I* (P 120)[4] is in Linear A and not in Cretan Hieroglyphic; 4) finally, in order to note the hundreds, the same scribes responsible for the Hieroglyphic texts discovered in the palaces of Malia and Knossos could use either oblique strokes, or, as in Linear A, circles. This last point is due, obviously, to contact within the same archive rooms, between scribes using Linear A and scribes writing in Cretan Hieroglyphic.

The Decipherment of Cretan Hieroglyphic Texts

There are four basic, essential conditions for every decipherment:

(1) First, we need to have a sufficiently clear idea of the content of the texts.
(2) Next, it is essential that we have a specific idea of the system of writing used.
(3) Third, we must possess a starting point in order to propose a first working hypothesis.
(4) And finally, we should possess a large number of signs and sign groups so that we have the possibility to try out, on a large scale, the proposed hypotheses of decipherment.

We must remember that Michael Ventris, when he deciphered Linear B, had at his disposal all these preconditions. He knew that the Linear B tablets were economic texts, that the script was syllabic and, thanks to Evans' preliminary work, that some correspondences between some signs of the Classical Cypriot Syllabary and some signs of Linear B had already been established. Finally, he had the possibility to experiment with his decipherment method, by relying on a Linear B corpus of more than 25,000 individual signs.

Let us now assess which of these preliminary conditions are essential for the decipherment of the Cretan Hieroglyphic documents we possess.

[3] Chapouthier, Gallet de Santerre and Martin 1947: 405–7. [4] *SM* I: 148, 179 and Table X.

(1) We know that the message on the seals and the sealings is not merely administrative. The group of signs on this type of documents are probably either men's names, titles or the so-called 'formulae' (Civitillo, this volume). We also know that the tablets, clay labels, etc. are economic documents with logograms and that numbers were expressed in a decimal system. Finally, it is probable that the inscription on the libation table from Malia was a religious text. The first condition is thus fulfilled.

(2) We have a specific idea regarding the system of writing used. Broadly speaking, three graphic systems are encountered in all scripts. The first is known as logographic and each sign is called a *logotype* or *logogram* rendering an uttered lexeme and morphemes. The number of signs used in a logographic script such as Chinese increases excessively not only because the objects rendered are many, but also on account of the abstract concepts associated with them, if sentences including verbs, adverbs, adjectives and so on are to be expressed in writing. Every educated Chinese must be able to read and therefore write several thousand characters, all written in a different way. Thus, it is hardly surprising that Chinese dictionaries can encompass 50,000 different logograms. Other writing systems are *phonetic*, i.e. have as their base the phonological make-up of the word. Functionally these cover a broad spectrum. Particularly common are the *syllabic* and the *alphabetic* type. The difference between the syllabic and the alphabetic system lies in the fact that the phonetic element rendered by each sign can be, for the syllabic system, a whole syllable as it is pronounced, and for the alphabetic the phonetic realisation of a single phoneme, an abstract entity that cannot be pronounced as such. The syllabic system separates the words into syllables. For example, the word 'napoletano' in a syllabic system of writing would be rendered graphically by five signs, na-po-le-ta-no. The total of signs essential for a syllabic script is evidently much smaller than that for a logographic one. A language such as Japanese, which is rendered in a syllabic script and which consists, like Italian, almost entirely of open syllables – that is of syllables ending with a vowel – can quite easily be transliterated with a syllabic system, the *kana*, which comprises forty-eight signs and two auxiliary diacritic signs. The alphabetic system was created in the Levantine area and developed by the Greeks; it constitutes the system that has enjoyed the greatest success for it has been adopted all over the world. This success is due to historical reasons and not only to the ease of use and the small number of signs required: the English alphabet has twenty-six

letters, the Italian twenty-one and modern Russian, though arguably more complicated, still has no more than thirty-two letters. Cretan Hieroglyphic has fewer than 100 syllabograms.[5] Thus, we can be sure it is a syllabic writing system. The second condition is also fulfilled.

(3) We do not have even one group of signs common to Cretan Hieroglyphic and to a deciphered writing such as Linear B, to offer a starting point for a possible hypothesis of decipherment. The third condition is missing.

(4) Finally, the total corpus of Hieroglyphic consists only of fewer than 2,000 signs. We are a long way from the more than 25,000 signs Michael Ventris had at his disposal to achieve the decipherment of Linear B in 1952.

Along with its fascination, Cretan Hieroglyphic is condemned for the present to jealously guard its secret, but I have no doubt that new excavations and new discoveries in the near future will enhance our knowledge of this script developed by the first European communities. And this is also the aim of the present book. But I would not like to close on such a pessimistic note. Fortunately, new discoveries are enriching the corpus of the Cretan Hieroglyphic script. The *CHIC* edition completed by the late Olivier and myself in 1996 now requires a Supplement. It is necessary to collect in a new publication the texts that have come to light after the publication of *CHIC* and to update the index of words, logograms and fractions attested in the hieroglyphic writing system. Alongside the present volume, a *CHIC* Supplement, to be published in due course, will provide such a reference point, on which new paths of research in Cretan Hieroglyphic can be based.

[5] *CHIC*: 19.

INTRODUCTION

THE EARLIEST SCRIPT ON CRETE: SEMIOTICS, LINGUISTICS, ARCHAEOLOGY AND PALAEOGRAPHY

Matilde Civitillo, Silvia Ferrara, Torsten Meissner

Cretan Hieroglyphic: Purpose of This Volume

Notable progress has been made in recent years in our understanding of Cretan Hieroglyphic, a highly 'iconic' (image-based) script created and used on the island of Crete some 4,000 years ago. This is the earliest certain attestation of writing in Europe, and the earliest in the broad Aegean script family comprising Linear A, Cypro-Minoan and Linear B. Except for the latter, all these scripts are as yet undeciphered in the sense that the underlying language or languages is/are unknown – although a considerable number of Linear A signs are 'readable' with respect to their individual sound value.[1] Within this family, Cretan Hieroglyphic is the least well understood. This situation is due both to the small number of documents attested, and to the prevailing attestation of this writing system on seals, which has caused great difficulties in the understanding of its functioning and has even favoured its definition as 'decorative writing'.

However, as will become apparent, research has advanced in many respects. In the first place, a broader approach to the concept of 'writing' and proper appreciation of its social dimension has helped contextualise and understand Cretan Hieroglyphic much better, even if the linguistic message of the inscriptions still eludes us.[2] Secondly, a broad consensus as to the general nature of the script, or at least as far as its use for rendering elements of speech in a systematic way is concerned, has emerged. And thirdly, owing to the work done by Younger, Davis and others, considerable progress has been made in our understanding of the most immediate relative of Cretan Hieroglyphic, Linear A, so that many more links, but also differences, can be seen much more clearly than was possible even a generation ago. This partly concerns

[1] For a recent discussion, Steele and Meissner 2017.
[2] Civitillo 2016a and 2021b; Decorte 2017 and 2018a; Ferrara 2015 and 2021; Ferrara, Montecchi and Valério 2021a–c.

the language, but much more importantly, the development of the script, its uses and its limitations, and its relation to Linear B as well as to Cretan Hieroglyphic.

This has prompted the creation of this book, to unify all the different strands of research into the complex phenomenon that is Cretan Hieroglyphic writing, and to make available to the reader, for the first time and in a single volume, an up-to-date overview of all aspects of this script. While some of the aspects covered here can now be said to be well established and accepted, others are still very much in flux. It is with the intention of covering these grey areas that this book was conceived, and this updated perspective also gives us the opportunity to sketch out potential future paths of investigation.

Chronology and Contexts

The Cretan Hieroglyphic material edited in the *Corpus Hieroglyphicarum Inscriptionum Cretae* (*CHIC*) comprises around 200 incised and/or stamped clay documents, 136 seals and 16 miscellaneous items (incised and painted pots and an incised stone libation table), distributed across central and north-eastern Crete and produced between MM IA and MM III (2000/1900–1700/1600 BC, Table 0.1), with only few recovered outside the island.[3] Clay documents come from magazines, workshops and 'deposits' inside or connected with the palaces at Knossos, Malia and Phaistos. In addition, there are concentrations of documents from a building of 'palatial' character at Petras and from an important building, probably connected to the palace, at *Quartier Mu* at Malia.

Newly discovered inscriptions come from Petras, comprising a dozen clay documents, five seal impressions[4] and six seals,[5] a fragmentary amphora handle and a vase from Malia,[6] a vase handle from Pyrgos,[7] a potter's wheel from Gournia,[8] a fragmentary Chamaizi vase from Katalimata,[9] a 4-sided prism from Vrysinas,[10] an irregular cushion seal from Knossos[11] and an impression from Mikro Vouni.[12] Moreover,

[3] For the two seal impressions found on Samothrace and the seal from Kythera, Matsas 1991; *CHIC*: 20–2, #267.
[4] Tsipopoulou and Hallager 1996a; 1996b; 2010. [5] Krzyszkowska 2012; 2017.
[6] Schoep 1995; Olivier 1999: 420; 2009: 188; Pomadère 2009; Del Freo 2012: 5–6; 2017: 6.
[7] *CMS* II 6, 230; Del Freo 2008: 200. [8] Del Freo 2017: 4. [9] Ibid.: 6.
[10] Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5.
[11] Kanta 2018 cat. 305; Kanta, Palaima and Perna 2023.
[12] *CMS* V Suppl. 3, 343; Olivier 2010: 290, n. 13; Del Freo 2008: 201.

a clay lame from a MM IIB context at the extra-urban regional shrine at Kato Syme[13] points to the presence of literacy in sanctuary contexts as well. The use of the script at sanctuaries is confirmed by a possible inscription on a libation table from Malia (*CHIC* #328) and by the above-mentioned 4-sided prism from the Minoan peak sanctuary at Vrysinas and is now further supported by the recent find of the already-mentioned seal with the so-called 'Archanes formula' at a sanctuary near Knossos (KN S (4/4) 01). Seals come from the same contexts as clay documents but were also found deposited in graves. Unfortunately, as is expected, the precise find-spot of many of the inscribed seals is not known as many come from the antiquities market.[14]

The fact that seals were found in residential quarters at Malia suggests the possibility of a wider use of Cretan Hieroglyphic outside palatial centres,[15] perhaps connected to heterarchical power structures, such as factions or corporate groups.[16] This shows that writing was not confined to palaces and their economic workings only. Indeed, we have evidence of inscribed pots that were used in ritual and domestic contexts. Moreover, an incomplete inscription incised before firing has recently been identified along the rim of the fragmentary potter's wheel from Gournia mentioned above.[17] This is a very important find as it demonstrates familiarity with the script among pottery manufacturers, pointing in the direction of a relatively widespread literacy across Minoan artisanal society.

The use of the script over the first two or three centuries of the second millennium shows that the development of a local, autonomous writing tradition was well rooted in different cultural settings. The Cretan Hieroglyphic script co-existed with Linear A for part of its life, and this is a problematic aspect that implies a complex interplay between two intertwined traditions. Epigraphic preferences may have been responsible for the eventual obsolescence of Cretan Hieroglyphic, which was perhaps sidelined by the more flexible and easier to use clay documents rather than the labour-intensive, specialised manufacture of seals. Considerations of a different nature too (linguistic, administrative) will receive attention in this volume (Civitillo, Steele, Jasink and Weingarten, Meissner and Salgarella, Davis, and Bennet and Petrakis).

[13] Lebessi *et al.* 1995: 63–77.
[14] For a list of the sites in which hieroglyphic seals were found, see *CHIC*: 21; Karnava 2000: 11, tab. 2.
[15] Schoep 2002b: 19–21; Flouda 2013: 145. [16] Schoep 2002c: 117. [17] Del Freo 2017: 4.

Problems of Definition

The very definition of this writing system was a matter of debate until the 1980s. 'Hieroglyphic' as a term (used alongside 'conventionalised pictographs') dates to Arthur John Evans, who was convinced that it was possible to identify some points of contact in the graphic appearance with Egyptian hieroglyphic writing. In 1967, Maurice Pope proposed the definition 'writing of the First Cretan Palaces', because, in his opinion, 'to call the script "hieroglyphic" suggests a dubious analogy with Egyptian; to call it "pictographic" may be misleading and is certainly question-begging'.[18] Pope's proposal never gained track in Aegean studies. Jean-Pierre Olivier[19] later proposed to continue to use Evans' definition, with the caveat that the Cretan Hieroglyphic script should be considered a phonetic, logo-syllabic writing with no connection to Egyptian hieroglyphic writing[20] (Valério, Flouda, this volume).

Whatever designation scholars chose to refer to the script, its nature has been highly debated all along (Ferrara; Meissner and Salgarella, this volume). Ever since Evans pointed out that understanding the signs entailed a complex decoding process it has become clear that many of the signs engraved on seal faces might have been used as 'word-signs', to be interpreted according to a sort of 'free association play'.[21] Also, some of these signs tend to be repeated in identical sequences – sequences which Evans named 'formulae'[22] –, surrounded by ornamental motives which 'only bring out more clearly the fact that the signs themselves are introduced with a definite meaning, and are in fact a form of script'.[23]

Along with the 'formulae', some other signs, attested in isolation (for which different interpretations have been proposed; see *passim* in this volume), were famously interpreted by Evans as 'chanting badges' expressing *cognomina* or the lineage of Minoan princes that would have then been added to these titles. Examples for these, according to Evans, are the lion head with a lily on the head (now recognised as a variant of the cat mask), the sitting cat,[24] the wolf/dog with its tongue sticking out, the fish, the dove, the spider and other zoomorphic signs. Evans assumed that these signs were not intended to be rendered phonetically – at least not necessarily or consistently – but might have expressed *cognomina* such as 'Leo', 'Wolf', 'Cat', or have been used as elements of compound names.[25] This interpretation is reflected in the standard

[18] Pope 1968: 461. [19] Olivier 1989: 40. [20] *SM* I: 241–3. [21] Karnava 2021: 241.
[22] *SM* I: 260. [23] Ibid.: 245–50.
[24] Probably a *pars pro toto* (face- or head-only) variant of the former: Younger 1996–7 [1998]: 387; Jasink 2009: 140; Civitillo 2018. For similar cases, see Valério, this volume.
[25] *SM* I: 264.

corpus, which excludes these signs from the sign list, as they are not attested on clay documents and appear to be intrusions in the formulaic patterns on the seals. Although recent years have seen a process of deconstruction of such formulae,[26] it seems clear that these signs *add* something to the sequences they accompany, as a logogram[27] or, conceivably, as a syllabic abbreviation or complement.[28] But this problem is far from resolved.

And even if these were the basic rules for 'reading' Cretan Hieroglyphic signs on seals, where a combined use of ideograms and logograms along with possible determinatives and decorative motives was to be assumed, the existence of another typology of Cretan Hieroglyphic documents on clay favoured the hypothesis that 'the phonographic element was also well represented by the Cretan hieroglyphs',[29] a conclusion to which Evans was also led by the observation that 135 different signs were too few for an ideographic system. Moreover, the view that 'a syllabic phonetic element, together with an ideographic one, had entered the Minoan hieroglyphic system'[30] was also warranted by two other observations: that on some sign groups (attested on seals and on clay documents) it was not possible to recognise a 'cumulative ideographic value' because of the disparate character of their 'content'.[31] And secondly, that the 'linearisation' of some signs, so advanced that their iconic referent was no longer recognisable, could only be understood as evidence for a change of their use from a pictographic to a phonetic one.

Despite Evans' efforts, the persistent difficulties in understanding the sign composition on seals led Maurice Pope[32] to argue in the 1960s that they were expressions, as a whole, of a 'dubious writing', concluding that 'we cannot tell whether the seal inscriptions communicated awe, prestige, or pleasure, but they are unlikely to have conveyed serious information.' Equally sceptical at first was Jean-Claude Poursat: '*mais est-ce bien de l'écriture?*'[33] One of the scholars who devoted some of his most important studies to this subject was, as is well known, Jean-Pierre Olivier. In 1978, he too stressed that the inscriptions engraved on seals were to be interpreted as purely decorative ('*nous n'avons sans doute pas affaire à une écriture stricto sensu, mais à une écriture ornementale*'). For this reason, Olivier was wondering if texts on seals were evidence of '"écritures ornementales" *ou* "*décoratives*" *plutôt que de l'histoire des écritures stricto sensu*'.[34]

[26] Jasink 2009, *passim*; Ferrara 2015 and 2018; Ferrara and Cristiani 2016; Decorte 2017; 2018a; 2018b; Ferrara, Montecchi and Valério 2021b; Ferrara and Weingarten 2022.
[27] Ibid. [28] Civitillo 2023a. [29] *SM* I: 247. [30] Ibid.: 148. [31] Ibid.: 248.
[32] Pope 1968: 461. [33] Poursat 1978: 3. [34] Olivier 1981: 113–14.

Leaving aside the notion of 'decorative writing', a more nuanced interpretation can be garnered since some sign groups found on clay documents also occur on seals. Therefore, from the 1990s onward, Olivier conceded that the signs engraved on seals could express 'true' writing, to be 'read' according to common sense. This is maintained in *CHIC*, which offers scholars a standardised 'guide' to reading Cretan Hieroglyphic on seals, distinguishing between writing signs and decorations (for a detailed account, Ferrara and the Appendix, this volume). However, this is where the consensus ends, and new interpretations have thrown light on some specific aspects of this writing system.[35] Indeed, the nature of the script on seals is still a topic of discussion and this book aims to offer current perspectives on this complex issue.

Epigraphic Supports and Their Relations

Even if the writing system used on these different media was the same, the constraints of the graphic support may have influenced its specific use on seals, which brings about the choice of medium-specific preferences for writing. Among these uses, we can count some possible expedients due to the need to write texts on small surfaces, such as abbreviations;[36] the possible use of 'diagrammatical signs'[37] or 'diacritic markers';[38] the presence of an iconic or symbolic apparatus;[39] and the insertion, in the same space, of decorative motives.

Until recently, the influence of the medium, beyond its formatting, and the combined use of signs with different semantic values had not received adequate attention. Post-Evans, the issue of reading hieroglyphic inscriptions on seals was always tied to a narrow 'linguistic reading', equating writing with the graphic representation of speech. But before MM II, writing media were probably not conceived as mere bureaucratic tools, but as artefacts of prestige for the owner, with great symbolic value,[40] enhanced by the choice of materials and engraving techniques. On these, the non-linguistic message was probably as important as the linguistic one. This is evident in graphic combinations that mix writing and icons, symbols and abbreviations, as found on coins today, for instance.

For this reason, the framework we need to use should not be any less than an integrated interplay of different communicative devices, which can be interpreted as *meaningful* (though non-phonetic) in the context

[35] Jasink 2009; Karnava 1997; Ferrara 2015; Civitillo 2016a; Decorte 2017 and 2018b.
[36] E.g. Decorte 2018b; Civitillo 2023a. [37] Ferrara 2015: 32; Ferrara and Cristiani 2016.
[38] Decorte 2017; Ferrara 2018. [39] Civitillo 2016a. [40] Ferrara and Jasink 2017.

in which they are used. All these elements can be combined with other forms of communication such as size, shape, colour, execution technique and configuration in general (Flouda, this volume). This is of particular importance for a more in-depth understanding of writing on seals, where different choices (apart from the linguistic codification of texts) from those found on accounting texts on clay documents must have come into play.

Differently from any ephemeral accounting document, seal inscriptions were meant not only to be read, but also to be *seen*,[41] thus the harmony and consistency of the graphic composition was a very important concern. Different supports also imply different expected durability of the messages they conveyed, in accordance with the perceived value and significance that were attached to them. Indeed, the material used required specific artisanal skills, and may have had varying degrees of aesthetic resonance and prestige. Moreover, seals and inscribed vessels of ritual character (the Chamaizi vases, for instance) could be displayed publicly, as was the case for the monumental inscription on the Malia libation table, and might have been buried with their owners. By way of contrast, clay documents were, essentially, palimpsests, erased and rewritten, and repurposed multiple times.

New Approaches to Cretan Hieroglyphic

Over the last few years, multi-dimensional approaches have been proposed to frame the Cretan Hieroglyphic documentation within factors beyond seeing the inscriptions as linguistic records, such as the support materials, the tools used and the visual presentation of texts.[42] These elements are as important as the texts because they constitute the 'prior knowledge'[43] required to correctly understand the written information, guiding the reader's perception even *before* reading the inscriptions closely; as such, they go hand in hand with the contents of the texts (Valério, Flouda, Civitillo and Steele, this volume). With regard to seals, for example, it is possible to identify a complex network of relationships between form and contents, i.e. seal typologies and sign sequences attested, that allow us to postulate different uses for *Petschafte* and prismatic seals respectively (Valério and Civitillo, this volume).

In the same vein, an adequate appreciation of the archaeological contexts from which the Cretan Hieroglyphic texts come is essential for a deeper understanding of the texts themselves and their intended uses.

[41] Civitillo 2016a. [42] Flouda 2013; Finlayson 2013; Civitillo 2021b. [43] Smith 2012: 73.

We have already seen how the find context of some seals and Chamaizi juglets from burials is crucial to the understanding of their function. No less important is the recent discovery of a seal bearing the so-called 'Archanes formula' from a sanctuary context at Knossos (KN S (4/4) 01).[44] This confirms the religious environment and use of this 'formula' that has frequently been suggested.[45]

These finds invite a more in-depth consideration of the use of Cretan Hieroglyphic. Coming back to the second part of *CHIC*'s definition of writing (and reading) signs on seals, Olivier and Godart state: '*quand elle* [Cretan Hieroglyphic writing] *y figure, elle pouvait y être lue, mais à deux conditions distinctes l'une de l'autre, subordonnée l'une au support, l'autre aux utilisateurs : qu'il y ait bien eu message écrit (et non pas utilisation d'un ou de plusieurs signes de l'écriture à des fins décoratives)* […] ; *que 'les utilisateurs' (possesseur du sceau ou destinataire de l'empreinte) aient su lire (par contre, il n'est pas indispensable que le graveur de sceaux ait su lire : il pouvait exécuter un modèle ou varier plus ou moins librement sur un thème), sinon le sceau porte bien un message, mais un message d'identification et/ou de protection de la chose scellée, pas un message écrit*.'[46]

Indeed, a distinction should be made between the reading of texts, restricted to fully literate readers (as scribes/administrators) and the 'perception' of written texts, i.e. the capacity of identifying signs of writing and attribute to them a special role even without the ability to read them properly (i.e. linguistically). This 'iconic literacy' may also have existed within the palatial social pyramid. For example, because of the repetitive nature of the 'formulae' engraved on seals, the owners and perceivers of these objects could have understood their significance without being fully literate. As for the engravers of seals, even if they are generally assumed not to be literate writers[47] but rather specialised craftsmen who produced non-hieroglyphic seals as well, they may have had special training in carving signs in a recognisable and consistent way,[48] with a good level of competence in handling the writing system.

Moreover, it seems safe to suppose that an inscription, being regarded as a prestige commodity (Jasink and Weingarten, this volume),[49] even if not closely readable, could have been perceived by a non-literate person as an indicator of status or as a sort of ceremonial or ideological 'marker'

[44] Kanta 2018: 251–63, cat. no. 305; Kanta, Palaima and Perna 2023.
[45] Civitillo 2016b with previous bibliography; 2020; Karnava 2016b; Weingarten 2022.
[46] *CHIC*: 12–13. [47] But *contra*, Schoep 2010: 76.
[48] Younger 1990: 88–92; Karnava 2000: 229–31; Boulotis 2008: 78; Flouda 2013: 155.
[49] Schoep 2007: 56; Ferrara and Jasink 2017: 41–53.

on other inscribed objects, such as the Chamaizi juglets and the libation table from Malia. Thus, we can assume that different levels of reading skills and different degrees of specialised literacy may have co-existed in Protopalatial Crete.

Structure of the Volume

Our intention is to present, in this book, the debate on unresolved questions about Cretan Hieroglyphic, and the authors of individual chapters may not agree on a given issue. In such cases, different positions are expounded with due attention. Indeed, in our opinion, in a field where so little is clear and agreed, it is of unquestionable value to give space to different opinions in a constructive, dynamic conversation. This is the case, for instance, of the still ongoing understanding of the so-called 'Archanes script', thus named after its identification on six seals found in the necropolis of Archanes/Phourni and dating to ca. 2000–1900 BC. The definition goes back to Yule[50] and is used by scholars as referring, on the one hand, to the two sequences of Cretan Hieroglyphic signs it comprises (0042-019 and 019-095-052,  and  , A-SA SA-RA-NE, by applying the phonetic values we have for the homomorphic Linear A/B signs) and, on the other hand, to the complex of motifs that occur intricately associated with them. After the publication of *CHIC*, however, the definition 'Archanes script' became restricted only to the five signs mentioned, which have ever since been known as constituting the so called 'Archanes formula' or 'inscription'.[51] While according to Olivier and Godart[52] and the bulk of the literature on this much-debated topic the seals bearing this 'formula' are considered as the first testimonies of the inception of Cretan Hieroglyphic script,[53] this interpretation is not unanimous. For other scholars, in fact, they are or may be written in an independent script, though related in some way to both Cretan Hieroglyphic and Linear A.[54] Both positions are fully investigated throughout this book (Valério, Flouda, Jasink and Weingarten, Meissner and Salgarella, and Bennet and Petrakis, this volume). With this collective effort we aim to show not so much the consensus, but the current state of knowledge on Cretan Hieroglyphic and the prospects for future progress in understanding debated issues.

[50] Yule 1980: 171–2.
[51] Karnava 2021: 246.
[52] *CHIC*: 18, n. 59.
[53] See, for example, Grumach 1963–4; Grumach and Sakellarakis 1966; Sbonias 1995: 108; Younger 1996–7 [1998]: 380–1; Perna 2014; Flouda 2015b: 65; Karnava 2016a: 81; Ferrara, Montecchi and Valério 2021b; Valério and Flouda, this volume.
[54] Decorte 2018b; Schoep 2020; Jasink and Weingarten, and Bennet and Petrakis, this volume.

The volume is organised into three broadly defined thematic parts, each articulated into three chapters. The first three chapters focus on the sign inventories of the script, the harnessing of icons and their interplay with iconography. Attention is paid to the iconicity of the script and the icons selected to form the repertoire of the script. This is an important feature that can be compared to other image-derived writing systems (for instance Egyptian hieroglyphs) to gain a proper understanding of how the script was created, *vis-à-vis*, for instance, seals deemed to be purely decorative. A full iconological analysis is yet to be produced and this would be a major step in that direction, together with recent contributions on this topic.[55] The controversial issue of 'ornamental writing', i.e. the possibility that seals do not bear phonographic notation, is reassessed in light of new methodologies in 'reading' the signs, their visual configurations and combinations and iterations.

The bulk of the Hieroglyphic inscriptions comprises seals and clay documents, which differ in function, layout and word-sequences. These are discussed in detail in chapters 4–6. Also, the correspondences between the visual presentation of the seals (in terms of shapes and materials) and the sign sequences incised on their surface is investigated. Moreover, the patterns according to which the texts were arranged and the graphic norms adopted by seal engravers are discussed. Syntax, genres schemes, sign alignment and directionality along with the scribal conventions are part of the analysis. Furthermore, uses and social practices connected to Hieroglyphic texts are analysed, and attention is paid to the use of the script and its broader cultural and ideological significance.

The last three chapters (7–9) address the relationship between Cretan Hieroglyphic and Linear A, between writing and languages, and set the agenda for future research on Cretan scripts. The four-generation problematic overlap between Cretan Hieroglyphic and Linear A has not been explored to its full potential. Why would socio-cultural groups develop two parallel writing systems on the island? Are they created to mark a linguistic differentiation, or to designate two different epigraphic traditions, tied to social or ethnic differences? To what extent are the scripts graphically related? These questions are clearly deserving of in-depth exploration.

Our overarching aim with this volume, then, is not only to present a comprehensive introduction to Cretan Hieroglyphic, and the latest research focused on it, but also to show how this writing system, throughout its life, manifests itself as a flexible, articulated cultural

[55] Jasink 2009; Ferrara 2015; Civitillo 2016a; Decorte 2017 and 2018b and c.

Table 0.1 *Aegean chronology (in light grey, periods susceptible to high chronology). Adapted from D'Agata and Girella 2023, p. 22, tab. 1*

Absolute dating (BC)	Crete		Cyclades		Mainland Greece		High chronology	
							Crete	Mainland Greece
3100	Prepalatial	EM I	Grotta-Pelos	EC I	EH I			
3000								
2900								
2800			Kampos					
2700								
2600		EM IIA	Keros-Siros	EC II	EH IIA			
2500								
2400		EM IIB	Kastri group		EH IIB			
2300								
2200								
2100		EM III	Phylakopi I	EC III	EH III			
2000								
1900		MM IA	MC I		MH I			
1800	Protopalatial	MM IB	MC II		MH II			
		MM IIA					MM III	MH III
1700		MM IIB						
	Neopalatial	MM IIIA	MC III		Shaft greaves	MH III	LM IA	LH I
1600		MM IIIB					LM IB	LH IIA
		LM IA	LC I Akrotiri's destruction			LH I		
1500		LM IB	LC II		LH IIA			
	Monopalatial	LM II			LHIIB		LM II	LH IIB
1400		LM IIIA1			LH IIIA1		LM IIIA1	LH IIIA1
		LM IIIA2	LC III		LH IIIA2			
1300	Postpalatial	LM IIIB			LH IIIB			
1200		LM IIIC			LH IIIC			
1100	Subminoan				Submycenaean			
1000								

phenomenon, not just a mere instrument of the bureaucratic machinery. In so doing, we challenge traditional discipline boundaries, with an inclusive approach that bridges archaeology, linguistics, epigraphy and semiotics. And while the focus is on Cretan Hieroglyphic, we hope that the same approach may be extended to other ill-understood writing systems and to the study of writing as a phenomenon in general. Emphasis on the articulation of cultural dynamics, interplays and symbolic expressions that underpin scripts and their creation is, we believe, an innovative and fruitful avenue of investigation, especially if the scripts in question are characterised by a pronounced relationship to images. It is in this spirit that we approach writing and its many facets, treating it as a filter to understand how, as human beings, we approach visual communication, to ultimately understand how we conceive, perceive, relate to the things we choose to write down for permanency and posterity.

Postscript, March 2024

We learn with great regret that the University of Kansas no longer hosts John Younger's seminal Cretan Hieroglyphic and Linear A websites, frequently referenced in this volume. Some of the content of the original websites has now been put in a different format and moved to John Younger's Academia page at https://kansas.academia.edu/JYounger?nbs=user and the reader may wish to consult this for the time being. However, as it is hoped that the websites can eventually be reinstated at their original address, we have taken the decision to leave the references in this book unaltered.

CHAPTER 1

CRETAN HIEROGLYPHIC SIGN REPERTOIRES: YESTERDAY, TODAY AND TOMORROW

Silvia Ferrara

1.1 Introduction

Script and writing system are not, strictly speaking, interchangeable terms. To ascertain whether a script can be defined as a *bona fide* 'system', it needs to have a normalised set of signs. These signs constitute a standardised inventory, or better, a sign list. This is an essential first step in understanding a script, as it provides the essential *abc*, as it were, or foundation upon which correspondences can be built between individual signs and their potential sounds. Therefore, in this chapter, the terms 'repertoire' and 'sign list' are, again, disambiguated at the outset and taken as two separate entities, the one comprising the collected, 'undigested' occurrences of signs, the other containing a rationalised, 'digested', definitive list.

There are typological implications too, as writing systems could have alphabetic, syllabic or logo-syllabic (the latter with a series of signs for 'words' or morphemes, known as logograms) structures. As is well known, typology depends on the definitive number of signs in the normalised repertoire – the more numerous the signs, the more likely that the script is predominantly logographic. Alphabets range around a maximum of thirty signs, syllabaries can reach many hundreds. The standard cuneiform script, for instance, totals about 660, with the logographic series included. The syllabary with fewest signs is the Canadian Aboriginal script Cree (45), followed by the Classical Cypriot Syllabary (56).

As straightforward as this premise may be, several scripts of the ancient world still are lacking a standard sign list. The Rongorongo of Easter Island, the Cypro-Minoan script and, indeed, the Cretan Hieroglyphic are just a few cases in point. The nature of the problem for this situation varies in each case. For Rongorongo many signs appear extremely similar, thus creating a difficulty in assessing whether they are allographs (signs representing the same sound albeit with minuscule graphic variations in their shapes) or signs with a different sound. For Cypro-Minoan, the difficulty is the high level of epigraphic variation, as the script is attested on different supports, from small clay balls and tablets (with differing degrees of

hardness of the clay) to metal objects, ivory, stone and other materials, with the signs rendered in different hands, *ductus* and general shape.

1.2 The Cretan Hieroglyphic Inventory: Problems

Where Cretan Hieroglyphic is concerned, this state of affairs is, to be sure, intimately tied also to the paucity of inscribed texts, which cannot guarantee a substantial frequency of all the signs attested. Today the corpus amounts to fewer than 150 inscriptions on clay, with about 200 carved on the seals (mainly stone, but bone and metal specimens are attested too), several impressions on clay lumps and painted signs on vessels, lids and potters' wheels (Flouda, this volume).

Beside this, there is an even more fundamental problem that lies in the highly figurative graphic appearance of the signs. On seals and seal impressions, especially, the sign shapes are iconic for the most part. Also, the cohabitation of *bona fide* signs with decorative elements complicates the matter even further, raising the issues of grey areas between 'art' versus 'proper writing' and the boundaries between these two realms in the same close association.[1] Thus, disambiguating between drawings and signs, between ornaments and written language is particularly complicated, as figurative symbols can be *prima facie* confused with decoration.

It needs to be added that the problem of iconicity is one that has historically proven to be a confounding factor for all image-based scripts that underwent ultimately successful decipherment attempts. It applied to the Egyptian hieroglyphs and the Rosetta stone, for instance. Indeed, prior to the decipherment, the reigning view was that the Egyptian hieroglyphs were 'sematographic', they essentially recorded ideas, not sounds. The script's iconicity thus was the very obstacle to its decipherment, its own hidden trap, before the decipherer, Jean François Champollion, admitted to himself that the script could be phonetic.[2] The same hurdle was faced by the early scholars of Maya and a long delay was to be endured for its decipherment.[3] The study of the Indus Valley script is, arguably, tainted by the same bias.[4]

These two aspects, namely a marked interface with iconography and the few attested inscriptions, contribute to the still tentative nature of the sign list. As will become apparent in the following sections, the past of the Cretan Hieroglyphic sign list has been tortuous, and its status today is still a topic of discussion.

[1] Olivier 1981. [2] Champollion 1824. [3] Coe 2012. [4] Sproat 2014.

1.3 The Earliest Repertoire of Cretan Hieroglyphic Signs

The earliest appraisal of the repertoire of Cretan Hieroglyphic, functional to a coherent classification of its signs, was introduced by Arthur Evans in his monumental introduction to the Aegean scripts, *Scripta Minoa*. His list is designated here as *SM* before each individual sign attestation.[5] For the Cretan Hieroglyphic script, Evans used the specific definition of 'conventionalized pictographs' and 'conventionalized Hieroglyphs' to stress its iconic nature. Evans also assumed that the lifespan of Cretan Hieroglyphic consisted of three consecutive phases. These phases are rooted in an evolutionary trajectory, whereby figurative signs necessarily develop into more stylised, streamlined shapes. The implications of this framework go beyond shape configurations, as they involve their function, following a typological trajectory from 'pictographic' to 'phonographic'.

In Evans' frame, first and oldest are several 'early pictographic' seals, with an extremely long time span, ranging from Early Minoan (EM) II until the MM I period (the chronology will prove erroneous: Civitillo, Ferrara and Meissner, this volume). This class is represented by a number of seals bearing motifs either in narrative scenes or in isolation. Second, he classified the 'Hieroglyphic Class A'. This class groups together almost all hieroglyphic seals fashioned from soft stones and commonly showing small and repetitive formulae. Third is the group named 'Hieroglyphic Class B', composed of seals with a more elaborate iconography, a more dexterous engraving and a wider range of signs, with the later MM III as their *floruit*.

Despite this now-superseded diachronic classification, the sign list Evans proposed is an all-encompassing catalogue of all the attestations of individual graphs,[6] as found engraved on seals, inscribed on clay documents or impressed on sealings. This is already taken to be a consistent whole.[7] In this catalogue we find a total of 135 *SM* signs (Figure 1.1), organised into different classes whose physical referents are clearly recognisable or less so, but in any case, interpreted subjectively (human figures and their parts; arms, implements and instruments; cult objects and religious symbols; houses and enclosures; utensils, stores and treasure; ships and marine objects; animals and their parts; insects; plants and trees; sky and earth). Only a few are classed as unknown, and these are either too schematic or represent wholly unrecognisable objects. To

[5] *SM* I: 181–231.

[6] Graph is an important technical term in this respect, as it refers to any graphic symbol, regardless of its function as a decorative motif, emblem (which is intended as a synonym for semasiograph, to indicate a language-independent graphic symbol of limited use) or writing.

[7] *SM* I: 235.

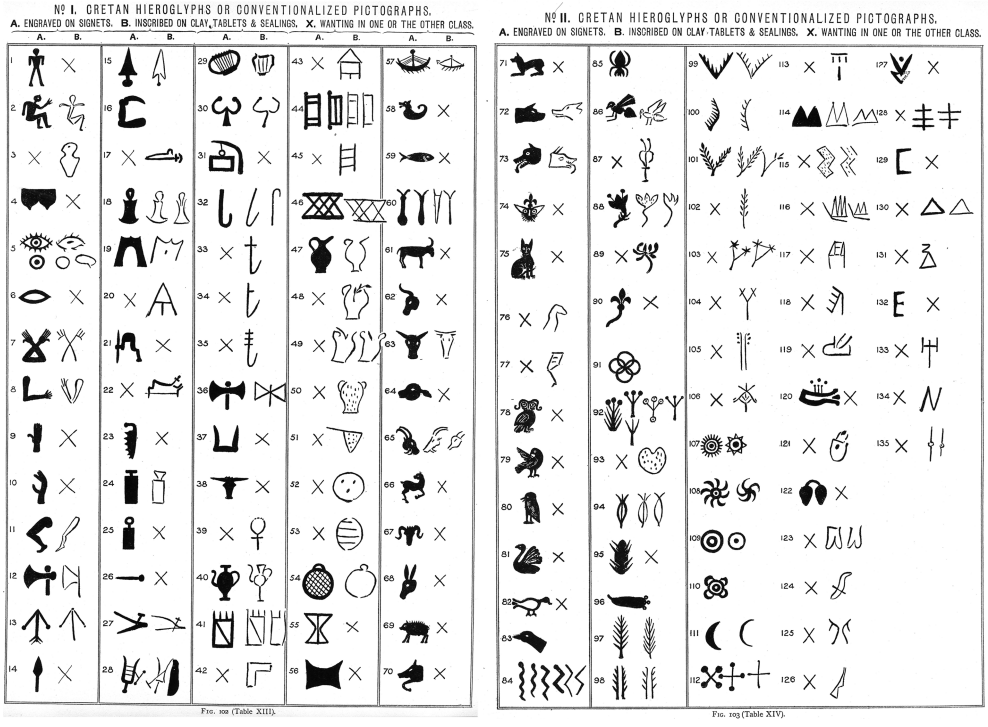


Figure 1.1 Sign list as presented by A. Evans (*SM* I: 232–3)

this list of signs, Evans added a limited number of decorative elements, signposted with an asterisk (*SM* 136*–139*). These are found only on the seals (defined as 'signets').[8]

More generally, Evans noted a crucial aspect, namely that some signs are confined to the seal repertoire, and that some other signs are only attested on the clay documents. Also, on the seals, certain sign groups tended to occur in a formulaic and repeated fashion, in association with what Evans classed as decorative symbols, or isolated. These sign groups have been coined 'formulae' since then and occupy almost half of the material on seals, but they also occur, if rarely, on clay documents.[9] The most frequent are the so-called trowel- and trowel-arrow combinations (for a reassessment of 'trowel');[10] others are also attested. In Evans' view these formulae are to be interpreted as 'canting badges', tied to the official role of the individuals that owned them.

Evans is also sensitive to the paucity of frequencies, claiming that 'the majority of the signs at present only known in their graffito form [that

[8] Ibid.: 229. [9] Decorte 2017. [10] Ferrara and Cristiani 2016.

is, on clay] have corresponding glyptic types [that is, on seals]'.[11] Also clear is the epigraphic relation between stone seals and clay inscriptions: 'the main characteristics of the script are essentially glyptic in origin'.[12] The gradual process of schematisation from picture-writing to progressively more linear shapes is very clearly showcased and has, to this day, stood the test of time.

The sign list published by Evans is a maximalist collection of the attestations of Cretan Hieroglyphic graphs known at his time. With all due caution, and a minimal number of inscriptions at his disposal, Evans did not attempt to define, assess or contextualise the occurrences of the graphs. Nor did he propose to rationalise with an eye to formally reducing the repertoire. It can be claimed that his was a balanced and neutral description of the evidence, without any subjective interpretation or bias in selecting or excluding graphs.

1.4 The Corpus Sign List

The first proposal of a rationalisation of the Cretan Hieroglyphic repertoire was published in 1996, within the corpus of inscriptions known as *CHIC*. The corpus collected for the first time, with transcriptions and photographs, 331 engraved and inscribed objects, comprising the inscriptions found at Malia and *Quartier Mu*, which Evans had not seen.

Crucially the authors divided the inscriptions between seals and all other clay documents. This generates a differentiated sign list. This list has ever since become the standard reference point for all scholars working on Cretan Hieroglyphic. It contains 144 signs divided into five classes: syllabograms (nos 001–96); logograms (nos *151–*182 and *159*bis*); klasmatograms, that is fractions (nos 301–9); arithmograms, that is whole numbers (units, tens, hundreds and thousands); and stiktograms, that is punctuation signs (X and |) (Figure 1.2). It must be noted that since *CHIC*, a number of inscriptions have been uncovered, from Petras, Simi and other sites on Crete, but these do not fundamentally change the repertoire of graphs.

Some methodological guidelines adopted by *CHIC* to define the sign list need to be considered. Although the authors are terse in their commentary with regard to the principles they adopted in inventorying items, the overarching line is their definition of 'inscription'. An inscription can only be represented by at least three consecutive signs, in close and coherent association with each other, specifically attested on the clay documents (see below). From this line of reasoning, three distinct categories of graphs, that are crucially found only on the seals, emerge.

[11] *SM* I: 235. [12] Ibid.

TABLEAU DES SIGNES STANDARDISÉS (MAIGRES ET GRAS) DE L'HIÉROGLYPHIQUE CRÉTOIS

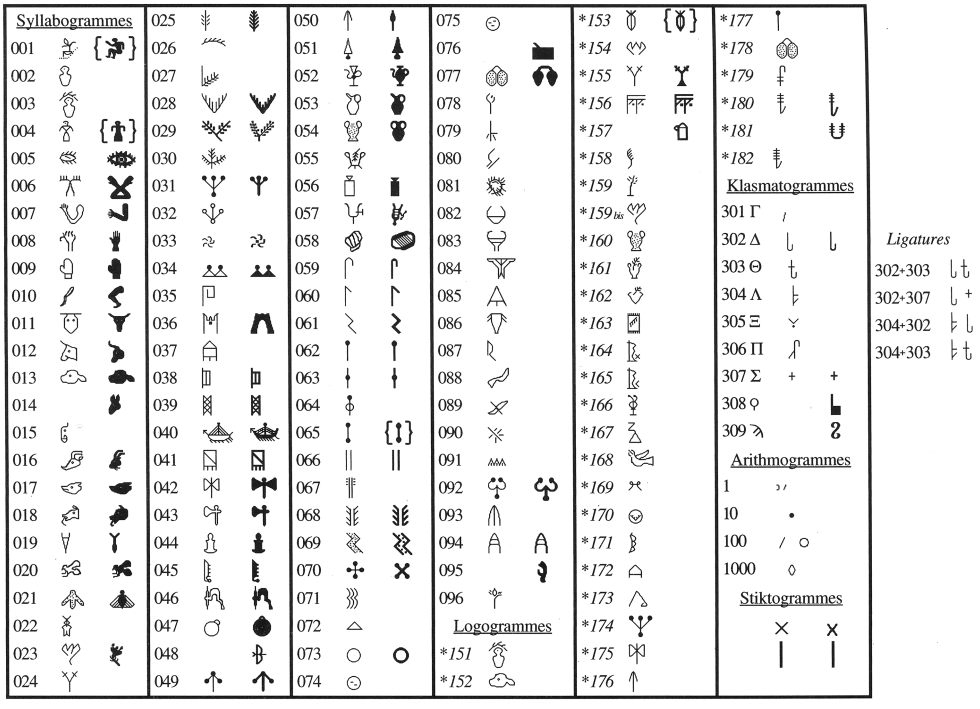


Figure 1.2 Sign list as presented by *CHIC* (17)

These are graphs that should not, in the authors' view, be included in the definitive sign list:[13]

(1) Clear decorations without symbolic value ('*décoration non signifiante évidente*')
(2) Clear decorations with possible symbolic value ('*décoration éventuellement signifiante évidente*')
(3) Unclear decorations with possible symbolic value ('*décoration éventuellement signifiante non évidente*').

The first group includes graphs already listed as decorations by Evans,[14] namely *SM* signs 136*–139*, and other elements interpreted as fillers (small geometric inclusions used for *remplissage*). These graphs are geometric motifs, a spiral and a scroll. It must be noted that they are attested already as Prepalatial seal decorations, so they belong to a long-standing tradition of local iconography. These graphs are ignored in the normalised transcriptions in the corpus.

[13] *CHIC*: 13–14. [14] *SM* I: 229–31.

The second group is equally not transcribed in the corpus. It comprises graphs that are included in Evans' original sign list (these are *SM* 66, 69, 75, 84a, 85, 90), and are not included in *CHIC* because they are not attested on the clay documents or may show dimensions that are not consistent with, or diverge too significantly from, *bona fide* Cretan Hieroglyphic signs.

The third group comprises instances of signs that are included in the *CHIC* sign list (CH 031 ), but also signs from Evans' list (*SM* 59c  , 74  and 82 ). As we will see, later lists add other signs to this group. For instance, a possible 'fish(?)' and a 'two-handled vessel'  are treated in Jasink.[15] In *CHIC*, only graphs from this third group are transcribed and rendered between scroll brackets {} if they are included in the sign list, or with exclamation {!} if they are not. These may be ideographic or logographic in nature, but the authors do not venture into strengthening this hypothesis, justifying it contextually.

The result is that *CHIC* includes in its final list only signs 014  , 0048  , 076  , 095  , 157  , 181  , 309/  . This leaves out many graphs that conceivably may be considered *bona fide* signs worthy of being included in a definitive sign list.

Notably, graphs deemed to be 'ornamental' or 'symbolic' (cit.) can, on the seals, be found inserted in varying positions among well-known repeated sign groups, the 'formulae' mentioned above. These graphs can be found interposed in between formula signs or placed before or after them. The result is that in a way they appear to disrupt the harmony of the 'formulae'. For some of these 'intruders', *CHIC* borrows the notion of 'badge', already introduced by Evans, to refer to a meta-linguistic 'heraldic' connotation, which one can assume refers to iconic semasiography, that may qualify groups or titles (Valério, this book).[16]

A general comment needs to be made about the parameters adopted by *CHIC* in relation to inclusion or exclusion of graphs in their list. Olivier and Godart used the attestation on clay documents as a guiding principle for inclusion, because only on these supports, which are created specially to bear text, can we ultimately find the *raison d'être* for glottographic representation,[17] or, as Palaima first commented, only when they are 'part of a phonetic/logographic textual syntax'.[18]

This implies that graphs on seals ought to behave differently, as they straddle boundaries between artistic display and writing *stricto sensu*,

[15] Jasink 2009: 190 and 49–50 respectively. [16] Also Civitillo 2016a.

[17] Despite this general rule, CH signs 14, 76 and 95 are included in the sign list, even though they do not appear on clay documents. This choice seems to be tied to the fact that these signs are not found close to frequently repeated groups of signs (defined as 'formulae').

[18] Palaima 1998: 435.

with the general implication that choices need to be made as to what constitutes writing and what does not. If a graph is attested only on seals, the likelihood of it not being a sign is deemed to be higher. This belief was, to be sure, already entrenched in the spirit of the scholarship concerned with Cretan Hieroglyphic graphs on seals, where decoration was implied to be virtually meaningless, or hardly 'serious'.[19]

Scepticism over this principle of division was raised in recent times (even before the publication of the corpus by Palaima;[20] also, soon after publication by Karnava)[21] with an eye to a more open-ended and systematic approach to Cretan Hieroglyphic. In any case, and beside the nature of the script on seals, a note of warning is necessary. The graphs on Cretan Hieroglyphic, be they partly decorative, wholly decorative or wholly glottographic, show perilously low frequencies of attestations, and this inevitably hinders a comprehensive analysis in terms of their individual and overall distribution patterns. Quite simply, it is impossible to chart the behaviour of a high number of graphs in the repertoire.

1.5 Recent Reassessments of the Sign List

The past two decades or so, since the publication of *CHIC*, have stimulated the interest of several scholars who have been drawn to the reassessment of the list as established by Olivier and Godart. This spark of interest was generated, in the first place, by the principles employed to exclude signs, specifically those found on seal or seal impressions.[22] Signs previously recognised by Arthur Evans were, as a result, reconsidered contextually, and in their individual arrangement and distribution.

Also, many a reassessment of the sign list has benefited from drawing typological evidence from other early writing systems. This has proved instructive in light of the problematic identification of signs in a fluid, image-based script. Indeed, these re-evaluations show that some graphs may have been excluded from the *CHIC* list prematurely and should rightly be considered as Cretan Hieroglyphic signs. We will treat individual contributions to the reassessment of the list in chronological order.

Younger was the first to raise suspicion that certain graphs may need to be reinstated. Crucially, the identification of the so-called cat mask

[19] *Verbatim* Pope 1968: 446; but see, *contra*, Reich 1968; Poursat 1978; Olivier 1981.
[20] Palaima 1990: 21; 1998: 435. [21] Karnava 1997; 2000.
[22] Younger 1996–7 [1998]; Karnava 2000; Jasink 2009; Civitillo 2016a; Decorte 2017; Ferrara 2018: 91; Ferrara, Montecchi and Valério 2021c; Ferrara and Weingarten 2022.

graph (*SM* 74 ), with the later syllabogram found in Linear A and in Linear B as sign AB 80, which corresponds to the syllable /*ma*/ was flagged.[23] This is a graph frequently found on the seals, which warrants by distribution and contextual association a rightful inclusion in the list, a possibility that the authors of *CHIC* foresaw but never implemented. Palaima and Karnava in their reviews of the corpus[24] draw attention to similar methodological issues concerning the exclusion of graphs.

But it is Jasink who takes this further, with the first systematic reassessment of the dataset, graph by graph.[25] While she does not disrupt the state of the art laid out in *CHIC* and claims to follow its criteria closely, her conclusions point in the direction of a general restoration of more than thirty graphs into the formal list (Figure 1.3), harking back all the way to Evans' list.

Crucial inclusions are, for instance, the full-bodied cat *SM* 75  and the cat-mask *SM* 74 , already reinstated by Younger, and various animals and plants and other classes of graphs that *CHIC* did not transcribe. Her approach stimulated a number of scholars to reopen the debate and many other questions concerning the nature of the script, especially as it appears on seals. For instance, Jasink introduces the possibility, already postulated in the 1960s,[26] that some restored graphs may have had a logographic or a determinative value, given their contextual position within sign sequences or by means of emphatic signposting. This would naturally change their function beyond that of purely decorative devices.

An even more groundbreaking methodological approach was embraced by Decorte. His main contribution is not so much to propose a revised sign list, but to reframe the theoretical standpoint from which we should view each individual Cretan Hieroglyphic graph by conceiving it as an integral part of the script and the seal decoration.[27] A much closer attention to the detail on the engravings is encouraged, geared towards considering every single element on the seal face as meaningful. This implies not disregarding or dismissing any mark, be it the so-called small fillers, dots, cross hatchings, crescents, crosses (the frequent x-shaped stiktogram), which encircle, and at times separate, graphs and signs. Rather than representing background noise or a form of *remplissage* particular to a Minoan *horror vacui*, each of these devices is deemed to be part of an integrated Cretan Hieroglyphic syntax.

More recent approaches sought a revision that is based on statistical methods. Also, it must be stressed that previous work devoted to the

[23] Younger 1996–7 [1998]: 387. [24] Palaima 1998; Karnava 1997. [25] Jasink 2009.
[26] Grumach 1963a; 1963b. [27] Decorte 2017.

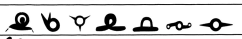
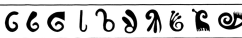
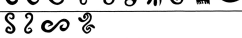
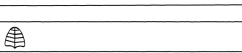
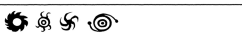
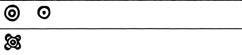
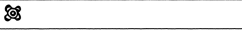
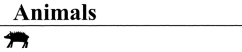
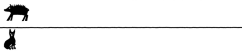
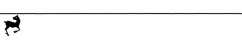
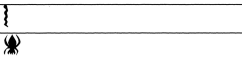
Geometric motifs		
circle with outgoing elements		
coil		*SM* 138*[2]
dot with outgoing elements		
interlaced circles		*SM* 91
scroll		*SM* 137*
spiral		*SM* 136*
semicircular composed symbol		
"Vegetal" and floral motifs		
bifoliate figure		*SM* 139*
two-forked branch		
three-forked branch		
ear of barley		*SM* 95
lily		*SM* 90
palmette		
petaloid loop		
"Astral" motifs		
star or rayed solar symbol / centrally radiating motif		*SM* 107
crescent moon		*SM* 111
day-star / sun with revolving rays		*SM* 108
solar disk without rays		*SM* 109
sun and four moons		*SM* 110
Animals		
(wild) boar		*SM* 69
cat		*SM* 75
cat-mask		*SM* 74
dog		*SM* 72
duck		*SM* 82
fish		*SM* 59
ibex (kid)		*SM* 66
snake		*SM* 84
spider		*SM* 85
waterbird		
sea-snail(?) / bird's head and neck(?)		
fish(?)		
Vessels		
two handled globular vessel(?)		
Tools		
plough		*SM* 27
Cult symbols		
horns of consecration		*SM* 37

Figure 1.3 Graphs reinstated by Jasink 2009 (Appendix B, 189–90) after Civitillo 2016a: 205

reassessment of the Cretan Hieroglyphic repertoire generally has involved a case-by-case study, rather than a systematic method, even when the corpus was exhaustively surveyed. The INSCRIBE ERC team, active from 2018 to 2023, attempted further progress to rationalise the sign list[28] by addressing distribution, sign associations with other signs and specific layout configurations. The team presents evidence emerging from several inconsistencies in the graphic behaviour of signs, especially those of single (*hapax*) or low frequency. They also propose mergers of signs, attempt to reassign a function to specific signs and try to settle uncertain cases that can be read as Linear A instead of Cretan Hieroglyphic. The resulting sign list aims to be a systematic and contextual approach to the dataset, rather than a proposal for a definitive list (Figure 1.4).

1.6 Future Prospects

Contributions in the last few decades have shown that progress can be made, despite the uneven evidence (paucity, shortness and limited variety of inscriptions) and the nature of the texts. Highly formulaic syntagms, which include frequently attested signs and sign groups, and many one-time attestations (*hapax*) represent two fundamental factors that limit the appreciation of meaningful patterns of distribution. Despite this, a few considerations can be made. The standard sign list published in 1996, while without a doubt a seminal reference point that enabled decades of in-depth research, today can be reassessed and integrated with several graphs that Evans first identified. The number of individual items in the sign list, while not definitive until the scholarship reaches a unanimous consensus, will be pending until further evidence comes to light.

However, it is worth noting that, as also apparent (Valério, Bennet and Petrakis, this volume), several scholars converge over the possibility that logographic notations or semantic determinatives can be postulated, alongside purely syllabic sequences.[29] Semantic classes are impossible to gauge with certainty within an undeciphered script, but any script at its earliest stages tends to show a flexible behaviour and initial multi-valence. This 'functional plasticity' cannot and should not be excluded as a possible avenue to explore further. It is with the same flexibility of mind that we should look at Cretan Hieroglyphic and its signs, however many they were and whatever normalised sign list we choose to adopt.

[28] Ferrara, Montecchi and Valério 2021c; 2023.

[29] Jasink 2009; Ferrara and Cristiani 2016; Civitillo 2016a; Decorte 2017; Ferrara and Weingarten 2022.

Figure 1.4 The INSCRIBE sign list (Ferrara, Montecchi and Valério 2021c)

Acknowledgements. I am deeply grateful, in reverse alphabetical order, to Judith Weingarten, Miguel Valério, Barbara Montecchi, Torsten Meissner and Matilde Civitillo for all their suggestions and lively discussions on the topic of this chapter over the years. May Cretan Hieroglyphic join future scholars in friendship as it joined me to these wonderful scholars.

CHAPTER 2

ORIGINS AND INTERFACE WITH ICONOGRAPHY

Miguel Valério*

Recent scholarship assumes that Cretan Hieroglyphic was an original creation and the first writing system in the Aegean, though this view is not unanimous. Research and debate centre on the earliest attestations of writing on Crete, in the form of seals bearing the so-called 'Archanes formula' from ca. 2000–1900 BC, and how they relate to later epigraphic material, as well as earlier and coetaneous iconography. The interfaces of Cretan 'hieroglyphs' with imagery have become crucial. The old idea that the script was influenced by Egyptian hieroglyphic has receded, paving the way for a new paradigm whereby local icons, especially as found on seals, should represent the forerunners of its set of signs. The question of how Cretan Hieroglyphic came about then intertwines with issues of typology (what type of signs did it comprise and how phonetic was it?), use (what did the inscriptions convey and in what social settings?) and decipherment. In addressing origins, this chapter echoes recent calls to comparative approaches that consider the trajectories and typology of invented, image-based writing elsewhere in the world, as well as the relationship between seals and writing in the Eastern Mediterranean. It also proposes an agenda to conciliate such approaches with 'internal' analyses of Cretan Hieroglyphic inscriptions that might shed light on the origins and function of its signs.

* I would like to thank the editors of the volume for the invitation to write this chapter. The latter is the output of the ERC Project 'INSCRIBE. Invention of Scripts and Their Beginnings'. The project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (Grant Agreement No. 771127). The chapter was written in the environment of collective research of INSCRIBE and owes a great deal to the exchanges with my colleagues; my gratitude goes especially to Silvia Ferrara, the Principal Investigator, and Barbara Montecchi. I would also like to thank José Lull and Judith Weingarten for valuable comments and bibliographic references, and the staff of the Cleveland Art Museum for the information provided on Egyptian design seals housed at their institution. Michele Corazza assisted with technical aspects in the preparation of some of the illustrations. As usual, I am solely responsible for any shortcomings.

2.1 Defining Writing and Tracing Its Origins

'First' writing systems – in the double sense of early and invented – are difficult to investigate, not least at their beginnings. Often the problem lies in the limited material available for the early stages of a script or its undeciphered status, but there is another fundamental issue. In the pre-modern world, invented scripts were all 'iconic' or image-based (i.e. their signs mostly depicted real or fictitious objects and beings) and so could be, to an extent, scripts derived from them. We can include in this group Sumerian cuneiform, Egyptian Hieroglyphic, Anatolian Hieroglyphic, Bronze-Age Chinese, Maya, Nahuatl (Aztec) and most probably also the Indus Valley script, the Rongorongo of Rapa Nui (Easter Island) and Cretan Hieroglyphic itself. At least some of these scripts began their existence in close association with pictures, 'iconography' or 'art' (there is not positive evidence in every case). Their signs can appear as captions to figurative scenes; feature in media which around the time of the invention were also populated by images; or simply look identical to pictorial elements that are not language notation ('decorations', 'iconographic motifs', etc.). Thus, the more we look back to any such script, the more it blurs in its attestations, distinctiveness and decipherability.[1]

Because of these blurred lines, the basic question *what constitutes writing* remains much debated apropos of the origins of early image-based scripts. The literature often engages in discussions of terminology and definitions.[2] Yet, regardless of the terms we use, we should recognise two different manifestations. One takes the form of graphic codes that only convey meaning independently from language and are not strictly speaking 'read'. Modern examples include traffic signs, musical notation and flags. The other manifestation comprises systems of graphic signs, some of which can represent speech sounds and hence transcribe *a particular* language. Systems of this second type can notate not just lexical words (like nouns, adjectives and verbs), but also grammatical words. Thus, what makes this type different is *phonetic notation*, which historically is a more recent human creation, appearing in the archaeological record for the first time only in the late fourth millennium BC, in Egypt[3] and possibly slightly later in Mesopotamia.[4]

[1] Ferrara 2017: 14, 17.
[2] E.g. DeFrancis 1989; Boone 2004: 313; Whittaker 2011; Morenz 2020: 48–9.
[3] Kahl 2001: 119. [4] Woods 2021: 41.

Some authors use a broad definition of writing that encompasses both types of code, phonetic and not necessarily phonetic.[5] To be sure, expressions such as 'phonetic writing', 'full writing' or 'glottography' can then be evoked for specificity. Yet this choice carries the analytical risk of dimming the presence of the very phenomenon whose origins we try to trace,[6] as it is the *communis opinio* that Cretan Hieroglyphic comprises phonetic signs (Civitillo, Ferrara and Meissner, and Ferrara, this volume). This is largely inferred by analogy with the Linear A and Linear B scripts, rather than demonstrated by decipherment, but we are nonetheless searching for the beginnings of phonetic notation on Crete.

Thus, in this chapter I use 'writing' in the narrow sense to refer to a graphic code that has (or is believed to have) a phonetic component and 'semasiography' to mean graphic signs that do not notate a particular language but carry a coded meaning. Any graphic sign, regardless of what kind of recording it belongs to (iconography, semasiography, writing), I call a graph. However, we should note that a *semasio*graph is any graph that conveys meaning, potentially translatable as a word, without being bound to any language. Thus, semasiographs are also part of early writing systems, in the form of semantic determinatives (also called classifiers) and logograms. Crucially, they often dwell in the nebulous settings where image and writing overlap.

2.2 The 'Archanes Formula' and the Primacy of Cretan Hieroglyphic

The earliest inscriptions in the corpus of Cretan Hieroglyphic are six seals containing the so-called 'Archanes formula' (Godart, Jasink and Weingarten, this volume) (Table 2.1), thus named after the necropolis of Archanes/Phourni, where four of them were found.[7] Two groups of signs, transcribed respectively as 042-019  and 019-095-052  (*CHIC*), make up the 'formula'. The other two seals came from Knossos and the necropolis of Moni Odigitria, in south-central Crete. Three of the four objects from the cemetery of Archanes come from the same context, the Ossuary of Burial Building 6.

[5] See e.g. Schoep 2020. [6] Trigger 2004: 44.

[7] Originally Yule 1980: 170, who called it 'Archanes script'. I follow the conventional use of 'formula' in the broad sense of established form of words or symbols in a ceremony or any procedure, including an inscription.

Table 2.1 *Late Prepalatial/early Protopalatial (MM I) inscribed seals (adapted from* CMS *II.1,* CMS *VI,* CHIC *and Sbonias 2010, after Ferrara, Montecchi and Valério 2021b)*

CHIC no.	*CMS* no.	Provenance	Seal type and material	Graphs
#202	II.1 394	Archanes/Phourni	Bone disc	α. 042-019 β. 019-095-052
#203	VI 13	Knossos	Steatite discoid	α. 042-019 β. 019-095-052
#251	VI 14	Archanes/Phourni	Steatite 3-sided prism	α. 019-095-052 β. 042-019 γ. 094-038
#252	II.1 393	Archanes/Phourni	Bone 3-sided prism	α. 019-095-052 β. 042-019 γ. 062-●-●-●
#313	-	Moni Odigitria	Bone cube	α. 042-019 + Flower? β. 019-095-052 γ. Quadruped δ. Human figure with a fish?
#315	II.1 391	Archanes/Phourni	4-sided bone bar (*baton*)	A. Caprid? B. Equid 1 C. Equid 2 D. CH *181? E. Bovine? F. Basket G. Damaged signs H. 019-095-052 I. 042-019 J. Hand/CH 008? K. Human figure with a basket L. Leg/CH 010? M. Floral N. Antelope?

The three inscribed seals from the Ossuary at Burial Building 6 of Archanes/Phourni (*CMS* II.1, 391, 393–4) come from secondary burial deposits in rooms I and III. These spaces yielded 196 human skulls and, among other items, another twelve seals (*CMS* II.1, 379–90, 392, 395). The context was dated by the excavator to between late EM II and early MM IA,[8] or more specifically to MM IA.[9] It has been reported

[8] Grumach and Sakellarakis 1966: 109, 111–12.
[9] Sakellarakis and Sapouna-Sakellaraki 1997: 326–30, 674, 680–1.

that excavation was carried out under difficult weather conditions that complicated its interpretation.[10] Moreover, Burial Building 6 covers a long time span from EM III to MM I like the Mesara tholos tombs. Sbonias[11] has argued that these seals – as part of a stylistic 'Archanes-Script Group' – date to the late MM IA-IB.[12] He also assigns to the late Prepalatial the Moni Odigitria seal (MO S35 = *CHIC* #313), which was found in a funerary pit ('Ossuary') described as an 'undisturbed closed deposit'.[13] An MM I date (ca. 2100/2050–1875/1850 BC) aligns well with the stylistic attribution of an imported scarab found in the Ossuary at Burial Building 6 of Phourni (*CMS* II.1, 395) to the 11th Dynasty of Egypt, i.e. ca. 2080–1956/1940 BC.[14] The issue remains whether these six crucial seals are from before or after the beginning of the Protopalatial,[15] towards ca. 1925/1900 BC. In any case, their more general dating to MM I has one advantage. It reduces the temporal gap between a few early attestations of writing and the bulk of Cretan Hieroglyphic and early Linear A inscriptions from MM II (ca. 1875/1850–1750/1700 BC).

While Olivier and Godart[16] included the MM I inscriptions with the 'Archanes formula' in their Cretan Hieroglyphic corpus as '*la plus ancienne manifestation connue de l'hiéroglyphique crétois*', this classification is not unanimous. Several authors have shown agreement, before or after the publication of the corpus,[17] but it has also been argued that these inscriptions could represent an initial stage of Linear A.[18] For others still, they are or may be written in an independent script, though related in some way to both Cretan Hieroglyphic and Linear A.[19]

The scenario of a third, poorly attested and earlier script on Crete would naturally have negative implications for the view of Cretan Hieroglyphic as original. Therefore, the debate centres on whether the epigraphic evidence at hand requires us to theorise its existence. Three of the four signs in the 'Archanes formula', CH 019  , 042  and 052  , occur also in other Cretan Hieroglyphic inscriptions. Only sign CH 095 is so far restricted to it, but in a corpus of only over ca. 360 (mostly short) inscriptions, written in a script with many rare signs, this is hardly surprising.[20] The formula occurs also on Protopalatial seals, one of which (*CHIC* #292

[10] Weingarten 2007: 137, n. 51. [11] Sbonias 1995: 58–9, 107–8.
[12] See also Watrous 1994: 727, n. 241; Weingarten 2007: 137; Decorte 2018a: 363–4.
[13] Sbonias 2010: 218.
[14] Absolute dates for Egyptian periods are given after Hornung *et al.* (2006) and those for the Aegean chronology follow Manning (2012: 22, tab. 2.2).
[15] Weingarten 2007: 137, n. 51. [16] *CHIC*: 18, n. 59.
[17] Grumach 1963–4; Grumach and Sakellarakis 1966; Sbonias 1995, 108; Younger 1996–7 [1998]: 380–1; Perna 2014; Karnava 2016a: 81.
[18] Godart 1999; Anastasiadou 2016a. [19] Decorte 2018b; Schoep 2020.
[20] Ferrara, Montecchi and Valério 2021b.

= *CMS* VI, 217) bears the Cretan Hieroglyphic fraction signs *302/Δ 𐄳, *307/Σ 𐄷, *308/Ϙ 𐄴 and *309/ϡ 𐄵.[21] Another MM II seal with the formula (*CHIC* #206 = *CMS* III, 149) even features three stiktograms X, one on each side of sign 042 and another next to 052.[22] This X marker is diagnostic of the Cretan Hieroglyphic script.

When we consider all graphs engraved on these six MM I inscriptions, the matches with Cretan Hieroglyphic are not limited to the signs of the 'Archanes formula'. In the badly eroded linear sequence on *CHIC* #252.γ (= *CMS* II.1, 393b) we recognise a possible instance of CH 062 (*CHIC*: 252–3), if not the spear-shaped CH 050. The comparanda extend also to self-standing elements on 'iconographic' faces of the *baton* (*CHIC* #315 = *CMS* II.1, 391, faces J, L and D and 392a, respectively; Figure 2.2): hand = CH 008 𐄁; straight leg = CH 010 𐄂; and an obscure U-shaped graph = CH *181 𐄃.[23]

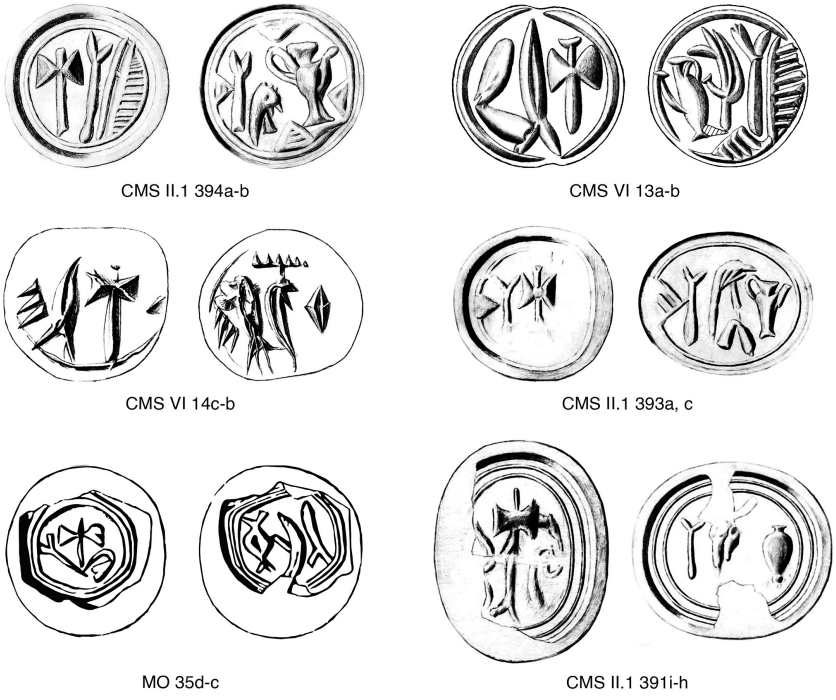


Figure 2.1 Faces of MM I seals that bear the 'Archanes formula'. *CMS* Images are courtesy of *CMS* Heidelberg; MO 35 was redrawn after Sbonias 2010: Pl. 61, nos 35c–d). Presented in the same order as Table 2.1 (from left to right and down to bottom). Not to scale

[21] *CHIC*: 274–5. [22] Decorte 2018a: 368. [23] Flouda 2013: 150.

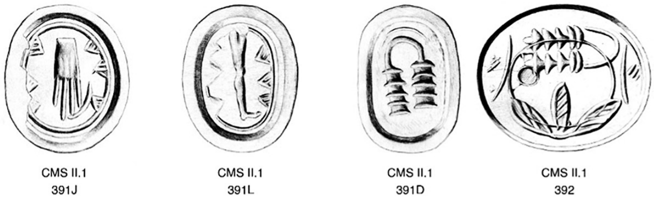


Figure 2.2 From left to right: graphs comparable to signs CH 008, 010 and *181 on seals *CMS* II.1, 391 (= *CHIC* #315) and 392 (Images courtesy of *CMS*; adapted and not to scale)

Even the 'C-spirals' , 'S-spirals' (= Evans' no. *SM* 136) and possible double coils (= *SM* 137a–b) (on faces A, C and I, respectively) continue to appear on Cretan Hieroglyphic seal inscriptions in the MM II period.

There is more evidence pointing in the same direction. The 'Archanes formula' occurs only on seals, which is a typical medium for Cretan Hieroglyphic, but not for Linear A.[24] The shapes of its four signs are also characteristic of Cretan Hieroglyphic rather than Linear A. CH 052 is simplified in some instances, but when it is so it is actually the least comparable to its counterpart in Linear A, sign 24/ne .[25] It has long been assumed that the Linear A sign sequence 08-31-31-60-13/A-SA-SA-RA-ME, found mainly on stone libation vessels, continues the two sign groups of the 'Archanes formula'.[26] However, Ferrara, Montecchi and Valério (2021b) argue not only that CH 052 matches LA 24/ne rather than 13/me, but also that CH 095 is more closely comparable to LA 10/u than to 60/ra . Hence, two of three signs in the second group of the formula do not match with the final part of Linear A A-SA-SA-RA-ME.

To sum up, multiple lines of evidence converge to support the view that the early 'Archanes formula' group of seals is part of the tradition of writing in Cretan Hieroglyphic, not Linear A nor a third, otherwise unattested script.

[24] Powell 2009: 129. Perna (2014: 253, 256–8) mentions four possible exceptions of seals inscribed in Linear A: ARM Zg 1 (= *CMS* VS1B 310), CR(?) Zg 3 (= *CMS* XI 311), CR(?) Zg 4 (= *CMS* XII 96) and KN Zg 55 (see also Del Freo and Zurbach 2011: 86–9). Yet he considers 'definitely a Linear A document' only CR(?) Zg 4.

[25] Decorte (2018a: 355) correctly notes that the sign in the position of CH 052 (AS004 in his numeration) is also attested without handle or spout, and sometimes is even like a simple lozenge (see also Ferrara, Montecchi and Valério 2021b). The author interprets those instances as a different sign, not represented in the repertoire of Cretan Hieroglyphic, whereas most scholars treat it as a mere graphic variant of CH 052.

[26] E.g. Bossert 1931: 318–20; Brice *apud* Brice and Henle 1965: 56–68; Grumach 1968; Weingarten 1995: 303–4, n. 23; Schoep 2006: 46, n. 74; Perna 2014: 253; Anastasiadou 2016a; Karnava 2016a: 352–3.

2.3 Invented or Borrowed?

In his first comprehensive presentation of Cretan Hieroglyphic after his excavations at Knossos, Evans offered a somewhat intricate view of its origins.[27] He spoke both of a 'general formative influence' of Egyptian hieroglyphic and 'a more direct indebtedness' of Cretan Hieroglyphic to it. Then he suggested also links with the Anatolian Hieroglyphic script used at a later period in the Hittite kingdom. Yet, finally, Evans concluded that 'on the whole the Minoan hieroglyphic system is essentially of home growth'.

That Cretan Hieroglyphic is mainly an autonomous development is the theory that gradually settled in. Although scholars diverge on the details, it has been widely endorsed in recent decades.[28] The only other image-based writing system in the Eastern Mediterranean around 2000 BC was Egyptian Hieroglyphic.[29] Yet, there are no systematic matches between the Cretan and the Egyptian signs, nor structural evidence, to sustain the idea of adaptation.[30] Graphemes of the two scripts depict similar things, such as body parts (a hand, a leg and so on), insects (bee, fly), boats, tools, buildings, etc., as first shown by Evans[31] and as is common for early original scripts. However, the conventions for representation and choices of design often differ.

For example, sign CH 057 𓌳 looks like a plough,[32] with handles drawn like a V or U as well as a T-shaped feature that represents the yoke and beam.[33] On three occasions (*CHIC* #243.β, #243.γ and #295.γ), vertical strokes imply braces connecting the handles. This yields a depiction of a plough in frontal or isometric view.[34] Conversely, the handles of the Egyptian plough hieroglyph (𓌳 *hb*) are depicted with two short parallel strokes and the yoke and beam are drawn as a circle at the edge of a long oblique stroke. In Egypt, it is the beam and the share that are V-shaped, not the handles, and those parts are connected by a stroke that represents the strap of the plough.[35] Moreover, the plough is shown

[27] *SM* I: 241–3.
[28] See, among others, Olivier 1986: 378; 1989: 41; 1996a: 102–4; Powell 2009: 109; Perna 2014: 252; Ferrara 2015: 16; Karnava 2015: 141; 2016a: 64; Decorte 2018b; Ferrara, Montecchi and Valério 2021a.
[29] This excludes the Phaistos Disk, as it is a *unicum* and the status of its signs as writing is not demonstrated beyond doubt (see, however, Meissner and Salgarella, and Davis, this volume).
[30] Olivier 1996a: 102–4; Powell 2009: 130; Ferrara, Montecchi and Valério 2021a.
[31] Evans 1895: 302ff. *SM* I: 181ff. [32] *SM* I: 190–1.
[33] Notice, however, that Evans imagined a plough seen from a different perspective.
[34] Ferrara, Montecchi and Valério 2021a: 13–15. [35] Gardiner 1957: 517.

in profile.[36] Thus, even if the Cretans saw Egyptian objects inscribed with the plough hieroglyph and were inspired by them to devise their own plough sign, the latter still conformed to different conventions. The same conclusion applies to several other Cretan Hieroglyphic signs.

Similarly, Karnava[37] compares votive clay human body parts with CH signs 007, 008, 009 and 010 and clay figurines with triangular lower bodies with CH 002 and 003. She concludes that votive figurines and miniature limbs could have served as models for these CH signs. Whatever the direction of inspiration, the match suggests that these signs were linked to local representational conventions in MM II (though see below on the origins of the hand as imagery).

By contrast, CH *156 is the only Cretan Hieroglyphic sign – out of a repertoire of over 100 signs – whose shape indicates a direct borrowing from Egypt. This grapheme is the forerunner of the Linear A and Linear B logogram for 'wine' (cf. AB 131a VIN in Linear A), and it most probably had an identical meaning in Cretan Hieroglyphic. The sign is comparable to the Egyptian 'vine' hieroglyph M43, which also spelled *ỉrp* 'wine' in the Middle Kingdom.[38] Both the Cretan and the Egyptian signs depict a vine on trellises with beams, with either dots or circles depicting grapes.[39]

Cretan Hieroglyphic is considered a 'syllabary',[40] with signs representing open syllables of the types V (vowel) and CV (consonant + vowel). Implicitly or explicitly, it is presumed that every sign in a Cretan Hieroglyphic sign group is phonetic and syllabic (except, of course, for punctuation marks). This follows an analogy with, and backwards extrapolation from, Linear A and Linear B. In the so-called 'linear' scripts, sign sequences are fully phonetic spellings of words, while logograms are mainly used outside sequences to denote commodities (although it is possible that even Linear A did not function exactly like Linear B in this regard, at least not always).[41] Thus, the list of Cretan Hieroglyphic signs in *CHIC* distinguishes two sub-sets: ninety-six 'syllabograms' (nos 1–96) and thirty-three 'logograms' (nos *151–*182). All 'logograms' are taken to stand for commodities when they are not part of sign groups. Some are assumed to play both roles, syllabic and logographic, so they are duplicated and have two separate entries (thus

[36] The Egyptian plough hieroglyph has this appearance in variants engraved on contemporary scarab seals. See e.g. the Middle Kingdom example in Wegner 2018: 240, fig. 13.5.

[37] Karnava 2015. [38] Gardiner 1957: 484. [39] Ferrara, Montecchi and Valério 2021a: 7–9.

[40] E.g. Olivier 1986: 378; Davis 2014: 151–2; Karnava 2016a: 79.

[41] Cf., for instance, the Linear A sequence 100/102-28 à VIR-I on tablet HT 11a.4 (*GORILA* I: 22–3), which *in theory* could be the logo-phonetic spelling of a designation of people.

CH 013 and *152, for instance, are the same sign). Sometimes the term 'logo-syllabary' is used to describe Cretan Hieroglyphic and Linear A,[42] but this only refers to the use of commodity logograms beyond sign groups. As the structure of inscriptions in Cretan Hieroglyphic and Linear A is very different,[43] there is no reason *a priori* to expect these writing systems to have functioned in the same way.

All assumptions about the nature of the Cretan Hieroglyphic script have ramifications for decipherment, and some may even clash with the view that it was invented. This is also the case with the notion that Cretan Hieroglyphic was 'logo-syllabic' (and hence logo-phonetic) only in the sense that it had logograms used in isolation to denote goods. From the perspective of typology, the 'logo-' affix in 'logo-phonetic' does not indicate the mere presence of logograms in a script. That would not tell us much, as all or almost all scripts have logographs of some kind (even our modern alphabetic script combines with signs that stand for whole words, such as the numbers, &, €, etc.). Rather, 'logo-phonetic' describes a more significant feature, common to all original writing systems that are image-based like Cretan Hieroglyphic (Egyptian, Sumerian cuneiform, early Chinese) and even original creations in regions where writing was already known (Anatolian Hieroglyphic, Nahuatl). While the specifics varied in each case, all these scripts spelled at least some words with *combinations* of semantic and phonetic signs. For instance, Anatolian Hieroglyphic FEMINA-*na*-*ti* combines the logogram FEMINA with syllabograms to spell the Luwian word */wanatt(i)-/ 'woman'.[44]

Thus, if Cretan Hieroglyphic was an autonomous creation, then it is very probable that at least some of its sign groups are combinations of semantic signs (either logograms or determinatives) and phonetic signs. It is unlikely that word-signs are only those that appear in isolation on incised clay documents to stand for the names of agricultural products, domestic animals and other goods. Despite recent attention to comparative and typological data,[45] this notion is yet to be fully integrated into the investigation of Cretan Hieroglyphic. In addition, it is even possible that phoneticism in Cretan Hieroglyphic was very limited,[46] as was also the case with the initial stages of some invented scripts, such as proto- and early cuneiform and Anatolian Hieroglyphic. It is perhaps useful to review the comparative evidence that points in that direction.

[42] E.g. Bennet 2008: 5; Karnava 2021: 253–4. [43] Ferrara, Montecchi and Valério 2022.
[44] Hawkins 2000: 632. [45] Ferrara 2015; 2017; Decorte 2017.
[46] Cf. already Grumach 1963–4: 375.

2.4 Seals, Graphic Codes and Writing: Cretan Hieroglyphic in Its Macro-Regional Context

Cretan Hieroglyphic is first seen on seals and this medium remained important throughout the life of the script. From a historical perspective, seals as a technology had a close relationship with the emergence of writing in the geographical area between the Eastern Mediterranean and the Indus Valley.[47] Everywhere in this macro-region, sigillary devices came first: stamps (not necessarily administrative) appear in the archaeological record of northern Syria in the second half of the eighth millennium BC, stamp seals as part of 'control systems' are documented about a thousand years later[48] and the first writing systems were devised only towards the end of the fourth millennium BC, in Egypt and Mesopotamia, before spreading to surrounding areas. Crete is no exception to this tendency,[49] as the first seals found on the island date to EM II, ca. 2500–2200 BC.[50]

Sealing in the sphragistic sense was the placing of a portion of wet clay over the mouth or stopper of a vessel, or the door of a storeroom, and impressing it with a carved seal. This left a recognisable mark that traced the origin of stored goods to a particular individual or social group/institution, or indicated tampering.[51] As mechanisms of control, seals in early Eurafrasia are associated with growing social 'complexity' and the emergence of 'proto-states' or 'states'.[52] But where does the link to writing lie? The shapes of seals, varied as they were, afforded surfaces that could be engraved, eventually with figurative elements and, later, writing *stricto sensu*. In at least two societies, seal imagery was either related to or the trigger for the emergence of writing. Thus, several icons of standards, buildings, vessels and animals on protoliterate Mesopotamian cylinder seals match the non-numerical signs of early cuneiform[53] and may have inspired them, while the Anatolian Hieroglyphic script of the Hittites first appears in the form of emblem graphs and auspicious symbols on stamp seals.[54] Moreover, no matter how their writing originated, different Bronze-Age societies inscribed seals with the names, titles or affiliations of their owners.[55]

Functionally, seals could also be amulets. They might carry not just the *figurations*, *marks*, *emblems*, or *written designations* of the persons who owned them, or the institutions on whose behalf they acted (including tutelary deities), but also auspicious or protective symbols.[56]

[47] Already Childe 1951: 93–4. [48] Duistermaat 2012. [49] Ferrara 2017: 15.
[50] Krzyszkowska 2005: 36. [51] Wengrow 2010: 62; Duistermaat 2012. [52] Rahmstorf 2012.
[53] E.g. Pittman 1994. [54] Yakubovich 2008: 10–12. [55] Ameri *et al.* 2018.
[56] Cf. Childe 1951: 93.

There could be also rules and conventions in the society that established who could bear what signs on what types of seal. The social role of seal-amulets could extend beyond the sphere of administration, making them something worth carrying in daily life and being buried with. Thus, to inquire into whether a seal was an amulet, a marker of social status or a bureaucratic device might be a misplaced question. It could have been all these things simultaneously.[57]

The seal practices of Egypt around the time writing was emerging on Crete might inform our approaches to Cretan Hieroglyphic. Cylinder seals had been dominant in the Egyptian land until the First Intermediate Period (ca. 2118–1980/1955 BC), but then they were largely replaced by button stamps, also called 'design amulets'. These button seals were decorated with deeply cut designs: geometric patterns; depictions of humans, often squatting or seated; animals (including the lion and the ibex) and plants; and auspicious signs, such as  *ʾnḫ* 'life' or  'protection'.[58] Indeed, hieroglyphs on Egyptian seals (whether phonograms, logograms or determinatives) could *also* be used to convey a general notion, independently from language, i.e. as semasiographs. In this role, they can appear in iterations and very elaborate forms, often described as decorative, which nonetheless coexisted with their use as script-signs.[59]

Towards 2000 BC, Egyptian button seals were replaced by an array of 'amulet-seals' with three-dimensional figurations modelled on the back of a flat decorated base that could be used for sealing.[60] Both buttons and zoomorphic seals are types attested in Prepalatial Crete as well,[61] showing that objects and ideas travelled.[62] In the First Intermediate Period Egypt, amulet-seals had been mainly associated with women,[63] but funerary evidence points to an increase in adult male ownership of seals by the beginning of the Middle Kingdom (ca. 1980/1964 BC–1760 BC), which has been tied to changes in administrative practices. Scarabs symbolising the regenerative power of the beetle deity *Ḫpry* had emerged shortly before as the main funerary

[57] Ferrara 2015: 9; Ferrara and Jasink 2017: 42.
[58] Hayes 1978: 141–2, fig. 85; Wiese 1996; Wegner 2018: 237.
[59] Schulz (2021: 374) makes the following remark about writing on Egyptian seals: 'The transition between script, icons, and pattern is fluid, the ascertainment of which is not always definite (e.g. whether a *nb*-basket hieroglyphic sign on the top and bottom of an oval sealing-surface should be translated as 'all' or 'master', interpreted as a symbol of control and kingship, or just regarded as a 'fill' element), and the connotation is often multi-layered.'
[60] Wegner 2018: 237.
[61] Yule 1980: 38, 92–3; Krzyszkowska 2005: 64, 72.
[62] Multi-sided prisms (*mehrseitige prismatische Siegel*) have also been documented for the Old Kingdom and First Intermediate Period (see Wiese 1996: 45–6, nos 35, 391–2, 1168, 1170, 1172, 1174–6; Anastasiadou 2011: 23–4).
[63] Schulz 2021: 377.

amulet type in Egypt, and by the early Middle Kingdom they had moreover become the primary type for sealing practices.[64] New decorative schemes emerged which included cord designs, interlocking scroll patterns and 'amuletic' or auspicious hieroglyphs such as *nfr* 'goodness, beauty' () and *ʾnḫ* 'life' (). Scholars still debate whether cord and scroll motifs evolved in Egypt and were then borrowed into the Aegean or vice versa.[65]

Throughout the Middle Kingdom, administrative seals were inscribed with royal names, anthroponyms and titles of non-royal individuals and the names of institutions and departments.[66] Ten Egyptian occupational titles of this period, attested on seals as well as other media, contain the words *ḫtmtj* 'sealer', *ḫtmw* 'seal-bearer' and *ḫtm* 'seal', all written with the seal hieroglyph  .[67] By far the most common is 'seal-bearer of the *bjtj* king', a 'courtly rank'[68] with 195 attestations. Later in Anatolia, the hieroglyphic sign L327  SIGILLUM also indicated ownership ('seal of…') on various Hittite sigillary inscriptions.[69]

Indeed, the trajectory of Hittite Anatolia is just as insightful.[70] In the Old Hittite period (ca. 1650–1400 BC) stamp seals – the prevailing type in the region – feature a reduced number of graphs, completely excised from any complex representational scenes. At first, these functioned only as semasiographs and were not language dependent. Figure 2.3 shows the example of a seal impression with the pair of amuletic signs BONUS 'good, well-being'  and VITA 'life' (reminiscent of the Egyptian hieroglyphic phrase *dj ʾnḫ* 'given life');[71] divine emblems like the thunder (TONITRUS) as a metonym for the Anatolian Storm-god Tarhunt; and socio-political titles such as REX 'king' and SCRIBA 'scribe, official' .[72] By the fourteenth century BC, an incipient writing system was in place which included phonetic signs in addition to logograms and semantic determinatives, and Luwian emerged as the language behind it. The Hittite kings and officials began to record their names and titles with this script and soon it 'leaped' to large stone monuments and was carved in long inscriptions.[73] Nevertheless, formulaic *complexes of logograms* that lacked phonetic complements, such as MAGNUS.REX, 'Great King', remained in use from the early stages of the script down to its decline in the Iron Age.

[64] Wegner 2018: 237–8. [65] Ben-Tor 2007: 12; Wegner 2018: 238. [66] Ibid.: 237–8.
[67] *Persons and Names of the Middle Kingdom* – Online database: https://pnm.uni-mainz.de/3/info
[68] Cf. Schulz 2021: 369. [69] Gelb 1949; Hawkins 2000: 581. [70] Ferrara 2017.
[71] I thank Ignasi Adiego (pers. comm.) for pointing me to this comparandum.
[72] Yakubovich 2008: 11; Weeden 2018: 59. [73] Yakubovich 2008: 12.

Figure 2.3 Old Hittite bulla from Tarsus, with impression of seal with Anatolian Hieroglyphic inscription: within the circle of dots, we observe signs TONITRUS, REX and SCRIBA (on the left), and BONUS and VITA (on the right) (Boehmer and Güterbock 1987: Taf. XI, no. 111)

2.5 Developed from Images … or Alongside Them?

A current idea is that Cretan Hieroglyphic – not unlike other invented writing systems – developed in close connection to local iconography, especially as produced on early seals.[74] However, it is difficult to trace the precise trajectory and timeline of the development.

To date, the four signs of the 'Archanes formula' (CH 019, 042, 052, 095) appear to emerge in MM I without iconographic antecedents. CH 042 depicts a double axe, which is a characteristic Cretan object. As a self-standing image (and thus an emblem?) it appears only on Protopalatial seals,[75] so the sign may have been directly inspired by physical double axes (not depictions thereof), which have been found in Prepalatial *tholoi* burials.[76] When compared with animals depicted on Protopalatial seals, CH 019 resembles a tunny fish (*Scombridae*), as first suggested by Evans for one of its instances,[77] rather than a sepia (as also proposed by Evans for most other attestations). If it is a fish, the sign depicts only the contour, being more schematic than aquatic animals engraved on late Prepalatial seals (cf. *CMS* II.1, 287b in Figure 2.5). CH 052 has no close counterparts in the glyptic iconography of the MM II period or earlier. Rather, it seems directly inspired by

[74] Sbonias 2010: 218; Flouda 2013: 148–55; Ferrara 2015: 31–2; 2017: 15; 2018; Decorte 2018b: 39–42.

[75] Yule 1980: 168, Pl. 29. The double axe is attested on sealings from the MM IIB deposit of Room 25 at the Palace of Phaistos (*CMS* II.5 231–3, 235) and the 'Hieroglyphic Deposit' at Knossos (*CMS* II.8, 55), as well as on two seals from the MM IIB Workshops Γ and Δ of Malia's *Quartier Mu* (*CMS* II. 2 129 and 155c). It is also engraved on the side of one MM II seal (*CMS* XII D007).

[76] Flouda 2015a: 44a, n. 4.

[77] *SM* I: 204–5.

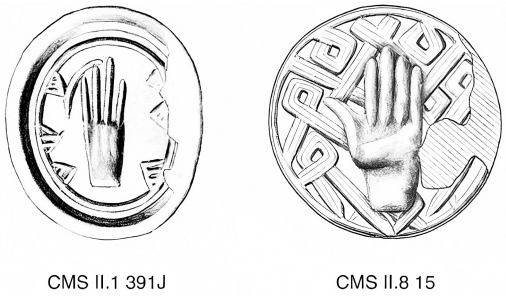


Figure 2.4 Hand graphs on seals *CMS* II.1, 391J and II.8, 15. *CMS* Images are courtesy of *CMS* Heidelberg. Not to scale

the footed 'teapot', a ceramic vessel shape attested in the Protopalatial period and possibly influenced by similar Eastern Mediterranean metal vessels found, e.g. in tombs at Byblos dated to the Middle Bronze Age. CH 095 is comparable to the 'headless waterfowl' motif of Protopalatial seals and, again, it seems earlier.[78] Thus, none of the signs of the formula is closely paralleled by iconographic manifestations on late Prepalatial seals.

The same is true of other graphs from the same group of seals which resemble Cretan Hieroglyphic signs. The hand and the leg (attested on *CMS* II.1, 391J, L and *CMS* II.8, 15; cf. Figures 2.2 and 2.4) have no other precedents on Crete. We might then turn to comparisons with the Egyptian hieroglyphs 𓂝 and 𓃀, but hand and leg signs were devised independently in several primary scripts, so they are comparable only insofar as they depict the same parts of the human body. Below, I shall suggest another stimulus for the development of the hand-shaped sign. In the meantime, CH *181 𐄁, as found in MM II inscriptions, is classed as a commodity logogram (*CHIC*), and it has also been compared to the Linear B commodity logogram *134 = *190 𐄪.[79] However, its referent remains elusive.[80]

In theory, Cretan Hieroglyphic signs attested only in MM II have more chance of having precursors in late Prepalatial iconography, but in practice few appear to do so (Figure 2.5). CH 001 𐄀 echoes

[78] Ferrara, Montecchi and Valério 2021b. [79] Younger 2000–2021.

[80] CH *181 has been tentatively compared to an Egyptian sistrum (Flouda 2013: 155), but the frames of sistra are not open and U-shaped. In addition, a musical instrument would be a surprising referent for a commodity logogram. Despite all doubts, what seems certain is that the shape of CH *181 was not borrowed from the Egyptian 'sistrum' hieroglyph 𓉐 (cf. Ferrara, Montecchi and Valério 2021a: 17–19).

Figure 2.5 Prepalatial seal faces and seal impressions with possible forerunners of Cretan Hieroglyphic signs. *CMS* Images are courtesy of *CMS* Heidelberg; MO 35 was redrawn after Sbonias 2010: Pl. 61, no. 35a. Not to scale

representations of seated or squatting humans, in isolation (*CMS* II.1, 477a from Mochlos, grave XVIII), in compositions (*CMS* II.1, 222 from a tholos at Mavrospelio) or in circular iterations (*CMS* II.1, 310a, from Platanos, Tholos B and 385a from Phourni, Burial Building 6). Two bees or wasps in *tête-bêche* arrangement on *CMS* II.1, 159 (from Koumasa, Tholos B) are comparable to CH 020.[81] The sun, star or whirl on *CMS* II.1 308 (Platanos, Tholos B) is similar to CH 033. A boat on *CMS* II.1, 287b (also from Platanos, Tholos B) is comparable to sign CH 040, even though it is part of a more complex scene also showing two fish or dolphins. The graph at the centre of *CMS* II.1, 64a (Ayia Triada, Tholos A) is a depiction of cloth on a loom with three hanging loom weights[82] and is the possible forerunner of CH 041 (which is in turn the counterpart to Linear A sign 54 TELA / *wa*).

[81] Ferrara, Montecchi and Valério 2021a: 12. [82] Ulanowska 2016.

Certain quadrupeds found on Prepalatial seals, namely the Cretan goat, the boar and possible equids, might relate to signs CH 016 , 017 and 014 respectively (Figure 2.6).[83] They are full-length depictions of the animals whose heads constitute signs in the standard repertoire of *CHIC*. Nevertheless, the swine on *CMS* II.1, 64d does compare well with the full-length boar that appears alongside CH 038 on *CHIC* #256.α. On the same inscribed seal, face #256.β features sign CH 043 and a hornless quadruped that is reminiscent (though not identical in its movement) of two quadrupeds seen on seals from Burial Building 6 of Archanes/Phourni (*CMS* II.1, 391N, i.e. the *baton*, and 392b) and another on *CMS* II.1, 64c (Figure 2.6). These comparanda suggest that certain CH signs may have had both full-length and *pars pro toto* (face- or head-only) variants. However, the full-body types have not been catalogued as script-signs in *CHIC*, because they do not occur on incised clay documents. The same range of variation has long been implied, for example, with regard to the graphs cat (*SM* No. 75) *vis-à-vis* the cat face (*SM* No. 74).[84]

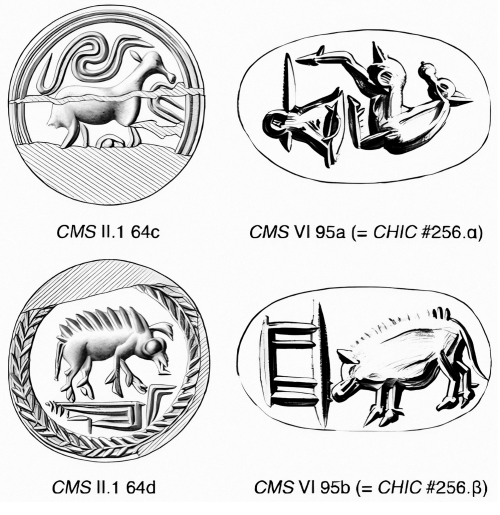


Figure 2.6 Parallel depictions of full-body quadruped animals on early seal *CMS* II.1, 64 and inscribed *CMS* VI 95 (= *CHIC* #256). Images courtesy of *CMS* Heidelberg. Not to scale

[83] The composition on *CMS* II.1 64b, where a caprid (or antelope?) is depicted along with branches of plants, is reminiscent of figurations of antelopes on Egyptianising scarabs from Canaan, dated to the Second Intermediate Period (ca. 1759–1539 BC) and found at Tell el-Far'ah, Gezer and Lachish (Ben-Tor 2007: 175, Pl. 96, nos 14–15, 17–20, 22, 24–6). In this case, the Cretan *comparandum* is earlier in date.

[84] Younger 1996–7 [1998]: 387; Jasink 2009: 140.

Other comparisons are also possible, but more problematic.[85] Writing or not, most of these few potential forerunners of script-signs form self-standing units, excised from any narrative scene, sometimes with an extra spiral, coil or plant-shaped element. Beyond the squatting human on *CMS* II.1, 222 and the boat on *CMS* II.1, 287b, there are few exceptions. On face γ of the Moni Odigitria seal (= *CHIC* #313, but see MO 35 in Figure 2.5) a man holds something that looks like sign CH 019 as engraved on face α. This could represent a staff, but it also echoes the figure of a human holding a fish by its tail on a Protopalatial seal (*CMS* II.2, 174a).[86] On the Archanes *baton* (*CMS* II.1, 391), face K displays a man holding a basket or vessel of some sort, whereas face F shows the same container on its own (). However, the latter does not match closely any Cretan Hieroglyphic sign.[87]

We have seen that Egyptian hieroglyphs were not copied wholesale on Crete, and that we have strong evidence only for the borrowing of one Egyptian sign ('wine') into Cretan Hieroglyphic. Still, we need to consider the possibility of vaguer inputs from Egypt in the formative stages of the Cretan script, in the guise of meaningful seal decorations (semasiographs). This is like the case of the Anatolian hieroglyphic sign VITA (‘life’), if it originated with the Egyptian hieroglyph as used on seals imported to Anatolia. Flouda suggests that the early 'Archanes formula' seals emulated imported Egyptian scarabs,[88] triggering the adoption of more and more sigillary designs at the end of the Prepalatial period. Imported scarabs deposited in tholos tombs incorporate Egyptian hieroglyphs without obvious comparanda in Cretan Hieroglyphic, but also C- or S-spirals (,) that recall similar elements used, for example, on the Archanes *baton*. Moreover, these scarabs often have hatched designs and elliptical frames that are consistent with the designs on the Border/Leaf seals of the late Prepalatial phase (Figure 2.7). Yet, we have seen that the geographical source of some of these decorations is debated. As for the rare Egyptian hieroglyphs

[85] Four insects on *CMS* II.1 474 (reportedly from an EM III deposit at the settlement of Mochlos) resemble the more iconic variants of CH 068 . Yet they might be crudely engraved spiders as well (cf. *CMS* II.1 248a from Platanos, Tholos A), hence corresponding to Evans' *SM* 85 . If the latter were a script sign (cf. its use within an inscription in *CHIC* #310.γ), then it would be the likely counterpart of Linear A sign AB 44 *ke* (cf. Ferrara, Montecchi and Valério 2022, with references). Likewise, if Evans' no. *SM* 137c (variant of 'coil' with tassels) is a Cretan Hieroglyphic sign (cf. also Jasink 2009), then its potential precursor appears on *CMS* VI 7 (dated stylistically to EM III–MM IA).

[86] See Ferrara, Montecchi and Valério 2021b.

[87] The same container is a self-standing graph on another late Prepalatial seal, *CMS* IV 66. The only sign remotely comparable is CH 047 , but its shape is not angular like the graph in question.

[88] Flouda 2013: 152–5.

attested on imported scarabs, they are all 'augural' or 'amuletic', conveying positive notions as semasiographs rather than writing *stricto sensu*:[89] *nfr* 'goodness, beauty' (𓄤), *ʔnḫ* 'life' (𓋹) and the papyrus clump (𓇋). This is not to say it is impossible that early Cretans saw actual Egyptian writing on materials that have not survived to us. Yet, so far, other than the 'wine' sign, we have no evidence of direct borrowings. Thus, the only one of these auspicious hieroglyphs comparable to a Cretan Hieroglyphic sign is the clump of papyrus, which might have influenced CH 032 𓇋.[90]

Based on style, the earliest imported scarabs on Crete date to the 11th Dynasty of Egypt (ca. 2080–1956/1940 BC). They are *CMS* II.1, 201, 204, 238 and 395, according to the online catalogue of *CMS* (the first two are shown in Figure 2.7). This is also the period in which scarabs had just begun to flourish in Egypt,[91] and the last of these four specimens comes from Burial Building 6 of Archanes/Phourni. Therefore, this type of seal may have arrived only around or after the time writing was invented on Crete, perhaps too late to play a role in the genesis of Cretan Hieroglyphic.

Conversely, closer parallels for Cretan Hieroglyphic signs emerge when we look to earlier Egyptian button or design seals from the late Old Kingdom and First Intermediate Period (ca. 2200–1980/1955 BC), already mentioned above. CH 020 is a case in point. It has been tentatively suggested that the sign was not copied directly from the Egyptian bee hieroglyph (𓆇), but rather began as an ornamental symbol before entering the repertoire of Cretan Hieroglyphic signs.[92] Now, the potential forerunners of CH 020, depicted in profile and in *tête-bêche* on a late Prepalatial seal (see *CMS* II.1, 159 in Figure 2.5), are very similar to

Figure 2.7 Faces of Egyptian scarabs from Lendas. From left to right: *CMS* II.1, 201 (Tholos II, 11th Dynasty), *CMS* II.1, 204 (Tholos IIa; 11th Dynasty) and *CMS* II.1, 180 (Tholos I; 12th Dynasty). Images courtesy of *CMS* Heidelberg. Not to scale

[89] Schulz 2021: 375, 392.
[90] As part of inscriptions, CH 032 is attested only on incised clay documents, not seals (*CHIC*: 397), but we may note the occurrence of its shape as the only motif on the seal impression *CMS* II.5 41 (stylistically MM II).
[91] Wegner 2018: 237. [92] Ferrara, Montecchi and Valério 2021a: 11–13.

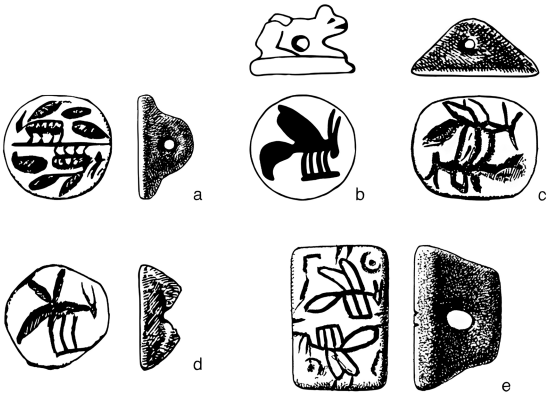


Figure 2.8 Egyptian button seals with depictions of bees dated to: 6th Dynasty, ca. 2200–2150 BC (a); 7th/8th Dynasty, ca. 2150–2118 BC (b, c); and early First Intermediate period/9th Dynasty, ca. 2118 BC (d, e). Redrawn after Wiese (1996: nos 804, 794, 806, 782 and 807, respectively). Not to scale

tête-bêche bee decorations on Egyptian button seals from the late third millennium BC (Figure 2.8). Details differ, such as the number of legs, the size of the wings and the thickness of the waist, but this is barely a hindrance. The shapes of bees on Egyptian seals vary as much as the palaeography of CH 020. Thus, even if the Cretans took creative licence, it now seems very likely that they drew inspiration from Egyptian designs.

In a similar fashion, decorated seals like the ones shown in Figure 2.9 and Figure 2.10.d, arriving to Crete from Egypt or elsewhere, may have contributed to the late Prepalatial *Leitmotif* of humans in squatting or sitting positions (Figure 2.5), which later crystallised in sign CH 001 𓀠.[93] At the same time, Egyptian seal-amulets with isolated hand motifs, including examples with bent thumbs (Figure 2.10), may have influenced the adoption of a similar symbol on Crete, as found on *CMS* II.1, 391J and *CMS* II.8, 15 (see above), before it developed into sign CH 008 𓂝.

The scarcity of potential forerunners of Cretan Hieroglyphic signs in the late Prepalatial correlates with the smaller proportion of figurative seals in this early period. It is unlikely to be only the consequence of the limited glyptic material available to us from that period. As evidence stands, both iconography and writing would appear to have flourished in the Protopalatial phase. This casts doubt on the idea that Cretan Hieroglyphic developed exclusively from an iconographic 'substratum'

[93] The Egyptian motifs echo hieroglyphs of humans in sitting postures, with arms raised, or both, which functioned as determinatives for vocabulary of youth, joy, praise, or worship (Gardiner 1957: 443–4). Thus, they may have had auspicious connotations, but it is unclear whether they were deliberately emulated as such on Crete.

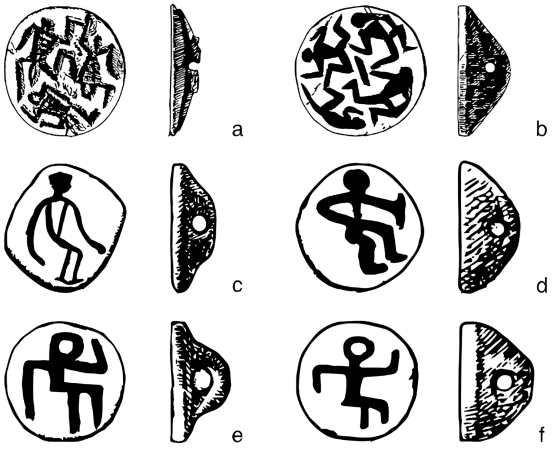


Figure 2.9 Egyptian button seals with squatting or seated humans dated to: 6th Dynasty, i.e. ca. 2200–2150 BC (a), the 7th/8th Dynasty, i.e. ca. 2150–2118 BC (b), and the early First Intermediate period/9th Dynasty, i.e. ca. 2118 BC (c–f). Redrawn after Wiese (1996: nos 145–6, 326–7, 329–30, respectively) and adapted. Not to scale

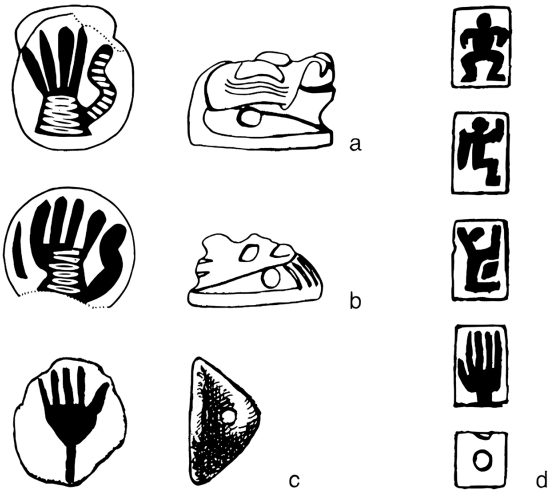


Figure 2.10 Egyptian button seals decorated with hand motifs, dated to: Old Kingdom/late 6th Dynasty, ca. 2200–2150 BC (a–b) and the early First Intermediate period/9th Dynasty, ca. 2118 BC (c). Late First Intermediate Period, 10/11th Dynasty, ca. 2100–1940 (d). Redrawn after Wiese (1996: nos 382–4, 391, respectively) and adapted. Not to scale

and reinforces the scenario in which designs on seals developed in parallel with glyptic imagery.[94]

2.6 Writing and Images in MM II

Thus, in MM II we find the Cretan Hieroglyphic system of signs fully formed and it is hard to discern any developmental stages. Script-signs and iconography or 'decorations' continued to share space on seal faces, but the significance of these combinations is poorly understood.[95] If Cretan Hieroglyphic was formed in a short span of time,[96] in the transition to the early Protopalatial, then its close relationship with glyptic iconography in this phase can suggest ways in which script-signs developed. The seminal study of Poursat (2000) has argued that the combinations of repeated Cretan Hieroglyphic sign groups on 3- and 4-sided prisms imply hierarchical levels within MM II society. The distribution of glyptic 'motifs' (non-script graphs) also reveals combinatorial patterns. Some groups of 3-faced prisms repeat similar groupings of motifs on separate seal faces, which then allow us to detect variations, as seen in the examples in Figures 2.11–13.

These groups show strategies of representation more typical of iconography (though not without parallels in writing systems), such as multiplication of icons,[97] as if to suggest plurality, collectiveness or emphasis. Thus, the alternation between one ceramic container, multiple vessels and one or two people handling a vessel (Figure 2.12) is suggestive of 'pottery' or 'potter(s)'. Duplication of signs is also attested in at least three Cretan Hieroglyphic sign groups: cf. 036-092-092-031 instead of the more common 036-092-031 in #262.α, 010-010-031-038 instead of 038-010-031 in #262.β and 013-044-049-049 in the place of the more common 044-049 in #264.β.

Some depictions are suggestive of occupational groups or departments. In addition to possible potters, we find human figures holding spears or bows alternating with one or two daggers, and a person holding a pole with hanging vessels instead of only the stick and the vessels, as if representing a water carrier (Figures 2.11, 4).[98] And there are more cases worth considering.[99] Such figurations may stand for productive

[94] Ferrara, Montecchi and Valério 2021b. [95] Krzyszkowska 2005: 72.
[96] As pondered by Ferrara 2015: 17. [97] Ferrara 2018: 92.
[98] Burke (1997, 418–19, followed by Nosch and Ulanowska 2021, especially 80) has argued that the 'pole slung with string vessels' motif (as correctly identified by Anastasiadou 2011: 350, 371–2) represents loom weights, in connection to 'the administration of textile industry'. However, our third group of prisms (Figure 2.13) shows that it alternates with a person carrying the pole on their shoulders. This is consistent with the depiction of a water carrier.
[99] Cf. Yule 1980: 119–20; Ferrara 2018: 93.

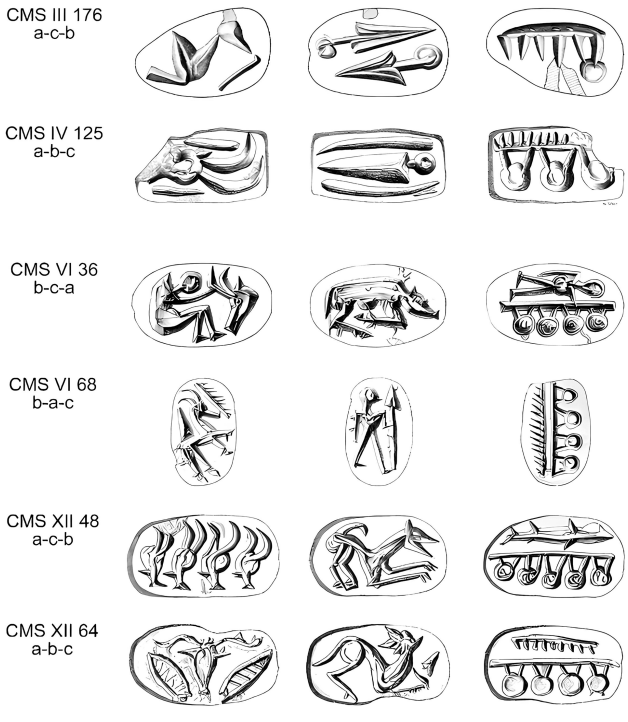


Figure 2.11 Protopalatial 3-sided prisms showing variations of the combination caprid(s) + weapon(s)/warrior/animal + vessels hung on a pole. Images collected by Miguel Valério, courtesy of *CMS* Heidelberg. Not to scale

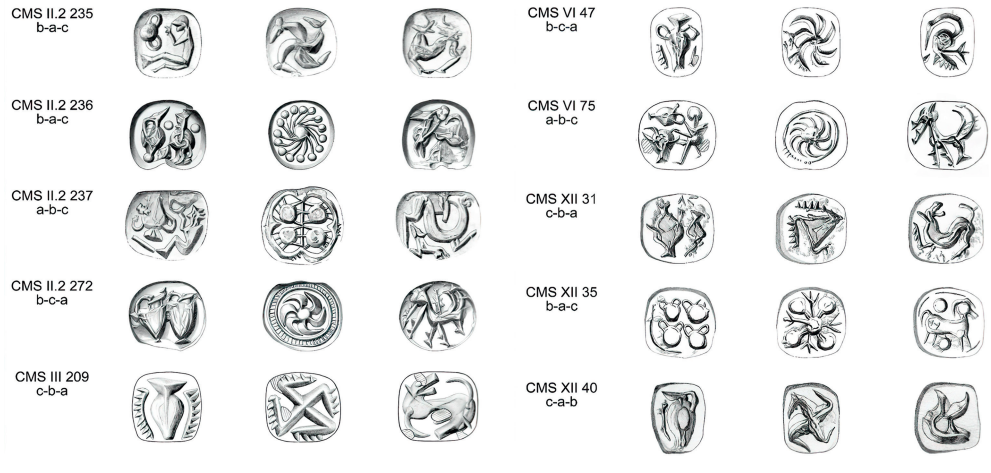


Figure 2.12 Protopalatial 3-sided prisms showing similar combinations of graphs: pots or potters/whirling motif/creature. Images courtesy of *CMS* Heidelberg. Not to scale

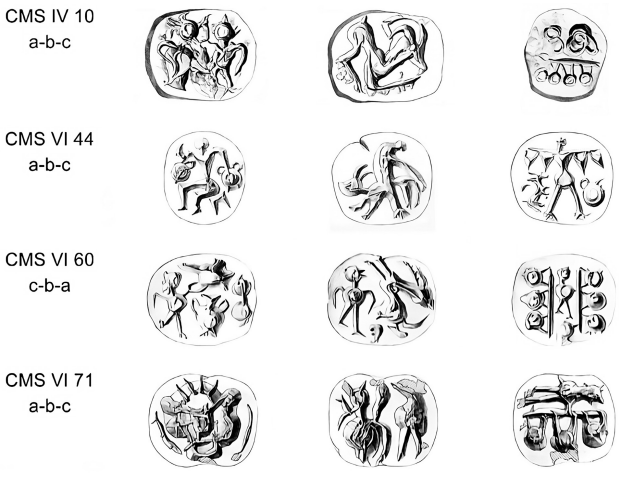


Figure 2.13 Protopalatial 3-sided prisms showing similar combinations of graphs: pots or potters + caprid or person with caprid, perhaps a shepherd (with one exception) + vessels hung on pole/water carrier. Images courtesy of *CMS* Heidelberg. Not to scale

sectors dealt with by seal bearers in the Protopalatial administration – as often happens, the idea goes back to Evans.[100] A metonymic principle may have operated, whereby an object could indicate a sphere of activity or occupation.[101] This principle is widely observed in the values of signs of original image-based scripts, and it may have applied also to Cretan Hieroglyphic. Unlike Egyptian hieroglyphs, the Cretan script is scarce in signs that depict humans holding objects, another common way of denoting spheres of activity. Thus, the values of some of the Cretan Hieroglyphic signs that depict vessels, weapons and implements might refer not to the name of the objects themselves (or not exclusively), but to the occupation associated with them. For example, the holders of three of the seals shown in Figure 2.13 might 'oversee' potters, shepherds and water carriers. Against the case for an iconography of human occupations, it has been objected that many other images on prisms lack human depictions.[102] Yet not all iconic graphs need to have the same function. Some might be, for instance, auspicious symbols or emblems of over-arching entities, such as institutions or tutelary supernaturals. This is worth considering (if difficult to ascertain) especially for animal icons like the beast with protruding tongue, the spider, the waterfowl, etc. In any event, we should be cautious about taking alternating images as fully equivalent among themselves or with Cretan

[100] *SM* I, 131–4. [101] Anastasiadou 2011: 354. [102] Ibid. 2011: 349, n. 2100.

Hieroglyphic signs, as some interchanging pairs resemble script-signs that are clearly distinct: e.g. CH 053 and 054 , or CH 050 and 051 (see Figures 2.11 and 2.12).

Among these iconographic combinations on multi-facial prisms, we also see permutations between full-length and the head-only depictions of an animal. These substitutions follow a *pars pro toto* convention that we also see at work in Cretan Hieroglyphic and other writing systems. Thus, the heads of caprids in these groups (cf. *CMS* IV, 125; VI, 36; XII, 48) are not very different from sign CH 016 , especially as inscribed on *CHIC* #148 and #290.δ. This is indirect evidence that CH 016 is related to full-body caprids already found on Prepalatial seals. However, we need not always assume reduction in the course of time, whereby the full-body animal came first, and then its head was just excised. The two kinds of depiction might be coetaneous. Moreover, Krzyszkowska (2015) argues that the famous cat face (Evans' *SM* 74, known in the literature as 'cat-mask') may have been the original graph from which the rarer full-body depictions (Evans' *SM* 75) derived. The latter show the body in profile but the face also in frontal view.

Because at times script and iconography are combined on the same seal, certain images may have fulfilled the same role as an inscription, thereby substituting for one another on different seals. For example, the set in Figure 2.14 implies that: sign group 011-009-068 may have substituted for the frontal head of a long-horned mammal comparable to CH 011, as main element; and 044-049 could take the place of the interlaced circles motif. Another telling case of permutation between image and script involves the pair of seals *CHIC* #207b = *CMS* II.1, 420b and *CHIC* #274a = *CMS* XII, 105a (Figure 2.15): the former combines

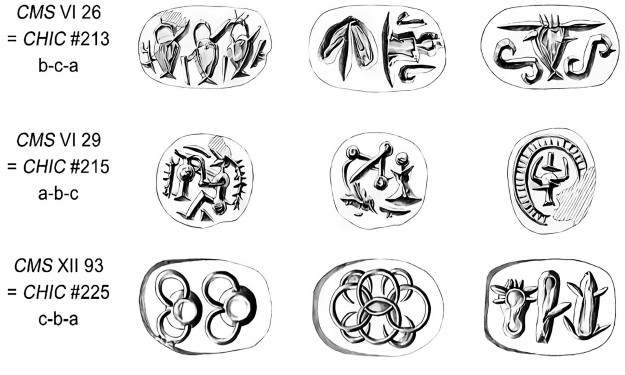


Figure 2.14 3-faced prisms engraved with: pots/potter + 044-049 or interlaced circles + frontal head of long-horned mammal or 011-009-068. Images courtesy of *CMS* Heidelberg. Not to scale

Figure 2.15 Seals *CHIC* #207b = *CMS* II.1, 420b (left) and *CHIC* #274a = *CMS* XII, 105a (right). Images courtesy of *CMS* Heidelberg. Not to scale

the inscription X 044-049 with the elaborate scene of a human stomping grapes next to a larger container; the latter is inscribed with *156-044-X-049, where *156 𐄷 is the sign for 'wine'.[103] Further structural analyses of script and iconography on multi-faced prisms and other seals could yet throw much light on the function of Cretan Hieroglyphic signs.

2.7 In Search of a Model for the Inception of Cretan Hieroglyphic

Most inscribed Cretan seals from the period around the emergence of writing were recovered from mortuary contexts, so the ritual side of these objects is emphasised by archaeologists. Conversely, evidence for sphragistic practices in non-funerary contexts in the same period is scant. Thus, the notion that MM I seals and their writing had an 'economic' or administrative function has been called into question,[104] but the historical trajectories of other regions warn us that burials may have been just their 'last stop'. We do not know a lot about the life of these objects and their owners at the settlement of Archanes/Tourkogeitonia, located one kilometre to the southeast of Phourni, nor what exact sort of structures of power existed there.

We have, however, several indications that inscribed seals, and potentially their inscriptions, did play a role in early Cretan administration. Weingarten[105] has stressed that in the Protopalatial period 'almost half of the seals impressed at Knossos and *Quartier Mu* were engraved with hieroglyphic inscriptions'. During this period, most hieroglyphic seals are 3-faced or 4-faced prisms. These are types closely associated with the use of writing, and which on statistical evidence appear to combine sign groups according to specific rules.[106]

[103] Decorte 2017: 54. [104] Schoep 2006: 47. [105] Weingarten 1995: 287.
[106] See especially Poursat 2000.

Crucially, multi-facial seals as conveyers of meaning through 'series of images' have roots in the late Prepalatial.[107] Among the six seals containing the 'Archanes formula' from MM I, the following morphological types are represented: discs or discoids, 'gables' (3-sided seals), one cube and one *baton* (*CMS* II.1, 391), which Weingarten[108] rightly described as (three) stacked cubes. All four shapes are also attested within the Ossuary of Burial Building 6 at Phourni. These seal types are based on geometric shapes that yield multiple flat faces and have circular fields for engraving (though not necessarily on all faces). The fields bear figurative contents, be they script-signs (CH 019, 042, 052, 095), isolated graphs that resemble Cretan Hieroglyphic signs (CH 008, 010 and *181) or more complex compositions. The main difference lies in the number of sides: two (discs), three (gables) and six (cubes); the *baton* triples the cube and has thirteen faces (not eighteen) because of the stacking and the handle. Their frequency from EM II through MM I in the online catalogue of *CMS*, even if approximative because the database does not contain all extant seals, indicates the following: the *baton* is a *hapax*; and there are six seals of cubic type (*Kubus*), ten 3-sided gables (*Giebelprisma*), and twenty-two examples of discs (*Diskus*). This distribution shows a reverse proportion: the higher the number of sides, the rarer the shape. This suggests social rules that restricted the use of seals with more engraved faces, and this logic may have paved the way for the situation in the Protopalatial. The gables foreshadow the 3-sided prisms that later characterise MM II.[109] The cubes as such disappear from the archaeological record in the transition to the Protopalatial phase, but it is as if they were replaced by the parallelepipedal 4-sided prisms.

By virtue of their flat faces, the geometric seal types that bore Cretan Hieroglyphic signs (or their forerunners) made for ideal sigillary devices and there is indirect evidence that they were. The sealing from Knossos *CMS* II.8, 15, showing a hand comparable to CH 008 as central motif, compares well with the cubic seal *CMS* II.1, 64a (cf. Figures 2.4 and 2.5) and is most probably from this family of shapes.[110] There is also evidence connecting the 'Archanes formula' and sphragistic practices. Seals with the formula were for sure used sphragistically in MM II. We have impressions of its first sign group (*CMS* V.S1B, 326 and 327; V.S3, 343 = *CHIC* #135–7, 137*bis*) on clay objects and possibly one with the two groups (*CMS* II.8, 29 = *CHIC* #179). Some of these come

[107] Krzyszkowska 2005: 71–2. [108] Weingarten 2007: 137.
[109] Poursat 1995; Anastasiadou 2011: 23–30.
[110] Weingarten 2007: 137. *CMS* II.8, 15 is reported as coming 'from a secure MM IIA context', but, as underlined ibid., this dates the sealing and not necessarily the seal.

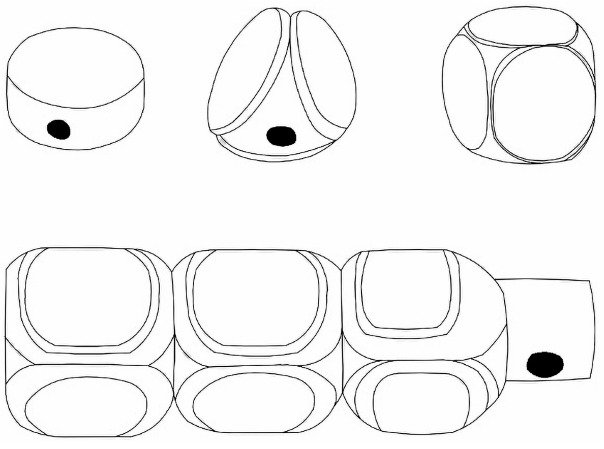


Figure 2.16 Geometric seal shapes associated with incipient writing on Crete (from top left to bottom): disc, gable, cube and stacked-cube bar (*baton*) (shapes redrawn and schematised after Yule 1980: 27–30)

from Mikro Vouni in Samothrace, suggesting a link to long-distance exchanges. *CMS* VII, 31, a seal engraved with the first sign group of the formula,[111] is a *Petschaft*, the typical Protopalatial stamp. Another MM II seal, a flattened onyx cylinder (*CMS* VII, 35 = *CHIC* #205), features the sign groups of the formula separated in two sections of the same face. In turn, this seal is comparable in shape, material and measurements to *CMS* III, 149 = *CHIC* #206, which also has signs inscribed on separate encasements. Remarkably, one of the two sides of #206 features signs that stand for commodities, CH *155 = 024 𐄁 (figs) and *156 𐄐 (wine), while the other side has signs for fractions, CH *302/Δ, *307/Σ, *308/Q and *309/𐆙 (*CHIC*: 228–9, 429–31).[112] The comparison comes full circle with the seal *CHIC* #292 = *CMS* VI, 217.[113] It has a different morphology, but as far as the inscriptions across its four faces go, it combines in one object the fraction signs of #206 (302/Δ, 307/Σ, 308/Q, 309/𐆙) and the 'Archanes formula' as seen on #205. The point is that the formula was applied on seals alongside signs related to the sphere of economy. And while this evidence stems from Protopalatial objects, Flouda[114] notes that the 3-sided steatite seal *CMS* VI, 14b (= *CHIC* #251b), dated to MM I, shows traces of 'intensive use' on the face inscribed with 019-095-052.

[111] Perna 2016.
[112] See Jasink (2005) for the different interpretation of the instances of 302/Δ, 307/Σ, 308/Q, 309/𐆙 on seals as logograms or even syllabograms.
[113] MM IB-II according to Yule 1980: 102. [114] Flouda 2013: 155.

In the Protopalatial phase, the most frequent Cretan Hieroglyphic signs by far are CH 044 and 049 , which are attested 132 and 134 times, respectively. Furthermore, CH 044 is part of the two most frequent sign groups occurring on 3- and 4-sided prisms, 044-049 and 044-005 .[115] Because seal faces containing these 'formulae' were used for sealing, CH 044 surely played a key role in Protopalatial administration, regardless of its category (determinative, logographic, phonetic) and precise meaning. But what exactly might the sign indicate?

For a long time since Evans (1909), CH 044 has been interpreted (or at least described) as a trowel and, to be sure, metal tools showing a resemblance to it but defined as 'cutters' are attested in Prepalatial burials.[116] Recently, however, Ferrara and Cristiani (2016) equated the shape of the sign with stamping signet seals of the *Petschaft* type. The Cretan *Petschafte* have parallels in Anatolia and evolved from simpler signet seal shapes during MM IB.[117] Both cutters and signet seals have profiles like the contour of CH 044, but the signets account for the sign's variation (Figure 2.17) and make for a superior hypothesis for another

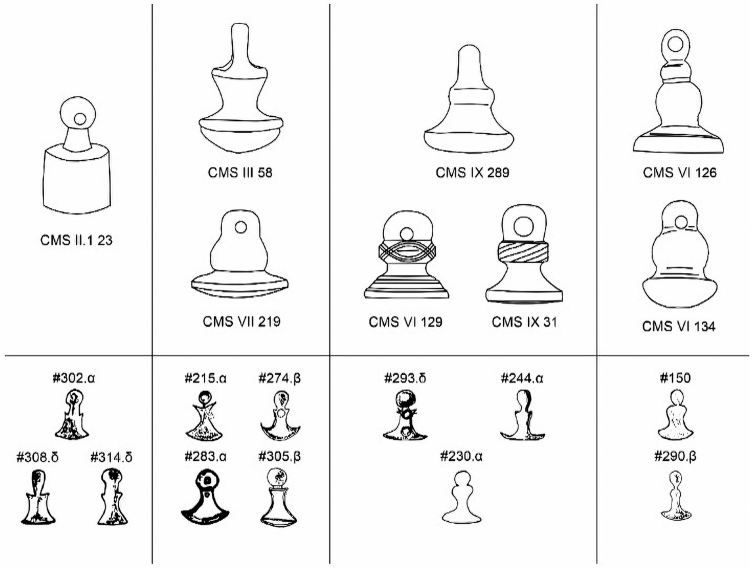


Figure 2.17 Comparison of Minoan signet seal shapes, mostly of the type defined as *Petschaft* (contours of shapes redrawn after Yule 1980: 82, 86–7 and *CMS*), and selected palaeographical variants of CH 044 (after *CHIC*: 403–5). *CMS* II.1, 23 is a hammer-head type dated stylistically to EM II–III

[115] Poursat 2000. [116] E.g. Xanthudídes 1924: Pl. LVI, no. 1944.
[117] Ferrara and Jasink 2017: 43–4, 47; cf. also Yule 1980: 86.

reason: an iconic sign that pervades seal inscriptions is less likely to depict a mason’s tool (as originally proposed by Evans) than a seal.[118]

Evans (1909: 265ff.) famously suggested that some of the repeating Cretan Hieroglyphic formulae (038-010-031, 044-005, 044-049) represented titles of high-ranking Minoans. His main argument derived from the iconicity of the signs, which he interpreted as metonymic logographs: the gate or door (CH 038) should stand for ‘keeper, guardian’, the leg (CH 010) for ‘a leader’ and the eye (CH 005) for ‘overseer’.[119] This may seem too superficial, but typologically speaking there is nothing uncommon about metonymic values in script systems. Rather, the problem is that such interpretations are difficult to falsify. Olivier and Weingarten have also interpreted 044-049 and 044-005 as titles of influential entities in the realm of Minoan administration, but their argument draws mainly on the distribution of the sign groups. Olivier[120] suggested very tentatively that they could mean something like ‘temple’ and ‘palace’. Weingarten proposed, also tentatively, that they stood for ‘the royal estate’ and ‘a department of bureaucracy (such as the Treasury or Central Storehouse)’.[121] Ferrara and Cristiani (2016) interpreted CH 044 as the image of a *Petschaft* whose meaning as a logograph was ‘(basic) administrative act’ or a ‘synecdoche for administration’, in other words, ‘seal(ing)’. We could add that in the case of inscriptions #207b and #274a, as mentioned above, 044-049 might represent an official or department that oversaw the production of wine. Thus, the hypothesis of Ferrara and Cristiani has the advantage of aligning the iconicity and distribution of CH 044. It also echoes the connection of emergent writing with seals observed in other regions during the Bronze Age, and the ubiquitous tendency of seal inscriptions to contain names of persons and institutions.

While the language(s) behind Cretan Hieroglyphic and its users remain(s) largely inaccessible (Davis, this volume), the context, distribution and iconicity of some signs may have already advanced us somewhat towards their origin and function. The essence of Evans’ old idea

[118] By way of comparison, in Egypt words related to sealing occur in Middle Kingdom titles more than 200 times, whereas forms of the word *qd* ‘builder, mason’ (the sense which *SM* I: 187, 241, 246 associated with CH 044) are attested only fifteen times in designations of people (*Persons and Names of the Middle Kingdom*, with refs.).

[119] Analogies with Egyptian writing also played a role. Evans interpreted as a collective designation for a ‘mason’ the combination of his ‘trowel’ (CH 044) and the sign he thought resembled the Egyptian hieroglyph for ‘adze’ (CH 046). However, according to Faulkner (1962), neither *qd* (or *ḳd*) ‘builder’ nor *ẖrtj-nṯr* ‘stone mason’ are spelled with the combination of ‘adze’ and ‘saw’ hieroglyphs in Middle Egyptian.

[120] Olivier 1990: 18.

[121] Weingarten 1995: 303, n. 23. Weingarten preferred to see the ‘temple’ in the first sign group of the Archanes formula (042-019).

of titles conveyed by combinations of semantic signs, i.e. logograms and semantic determinatives (though Evans used a different, at times confusing, terminology), is not at odds with the history of writing systems. We saw that logographic complexes that conveyed titles, tutelage and auspicious notions were predominant in early Anatolian Hieroglyphic writing on seals, before phonetic notation expanded. Likewise, proto-cuneiform was a very productive notation in early Mesopotamia, mainly tied to accounting clay records – also typical of Cretan Hieroglyphic – and yet phoneticism, if present, was minimal at this stage of cuneiform writing.[122] Future research into the origins and development of Cretan Hieroglyphic might well benefit from an approach that balances internal, iconographic and comparative-typological data.

[122] Woods 2021: 41.

CHAPTER 3

CRETAN HIEROGLYPHIC WRITING AS A SYSTEM OF VISUAL ENCODING: ICONICITY AND GRAPHIC COMMUNICATION

Georgia Flouda

3.1 Universal Features of Early Writing Systems as Forms of Visual Encoding

Every script is based on a visual code, whereby speech sounds are represented by convention and communicated through individual graphic signs. The basic criterion for identifying any notation system as a script is that its constituting signs jointly represent sound and meaning, namely phonetic and semantic content. With regard to phonetic content, the size of the speech unit that the writing signs represent is simply a matter of choice by convention and has to be taught.[1] Beyond these linguistic or glottographic systems of writing which are based on phoneticisation,[2] non-glottographic or semasiographic systems convey concepts or ideas not through linguistic codification but through different means of symbolic representation; but they also require verbal communication because these are arbitrary and conventional.[3]

A cognitive-based approach to early graphic systems has recently provided insights into what may universally underlie the genesis of writing and also into the human ability to acquire writing and use it as a communication tool. According to the neuronal recycling hypothesis, it is 'a cerebral network that links visual and language areas and is plastic enough to recycle itself and recognize the shapes of letters'.[4] This hypothesis is based on the visual cortex that functions as a text-comprehension device. Despite the diversity of existing writing systems, universal features of different scripts reflect how visual information is encoded in the visual cortex.[5] It is argued that a small inventory of basic

[1] This speech unit ranges from whole words in ideographic scripts, such as Chinese, to syllables in the case of the syllabic scripts, phonemes in alphabetic writing systems, or even isolated phonetic features.

[2] In writing systems based on phoneticisation, written signs are given phonetic interpretation (Coulmas 2003: 15). Sampson 1985; Hyman 2006.

[3] Boone 1994; Iannàccaro 2013: 153; Ferrara 2015: 28–30.

[4] Dehaene 2009: 172–4, fig. 4.1. [5] Ibid.: 174–9.

shapes seems to lie at the core of all writing systems,[6] through the hierarchical combinations of which graphemes, namely phonemic components, are generated. Visual neurons then use a combinatorial principle to encode units of increasing size and invariance. Based on these two premises that draw from cognitive science, it has been suggested that cross-culturally the first 'scribes' settled on graphic signs, whose shapes resemble those found in the environment and are, thus, easily represented by our brains; the most plausible explanation may be that learning these signs requires minimal cortical change and, hence, that they are the easiest to read.[7] Another principle that applies to different sorts of early writing, which are employed as systems of written communication, is that all these systems impose a specific orientation to writing and, thus, reading, since these actions are integrated and linked by 'reciprocal presupposition' following the theory of integrational semiology.[8] As Gombrich has stressed, 'in the development of the scripts it is the device of the line which universally serves as a guide to the eye';[9] this may also be explained through brain physiology, since it is argued that our visual neurons only tolerate about 40 degrees of rotation.[10]

While these cross-cultural notions on early graphic signs and human cognition may prove to hold some truth, we should not overlook the distinct pathways by which writing came into being in different places. It is worthwhile to consider as a significant fact for writing and its development the notion of 'communities of practice', developed for technological change on the basis of ethnographic data; as technological changes are mostly the outcome of social processes,[11] it is possible to suggest that the development and learning of writing takes place and is connected to specific social settings. This probably underlies the variation of writing systems, which are basically distinguished by differences due to the diverse structural principles on which they are based.[12] For instance, although the sign repertoires of most (if not all) scripts that are recognised as new inventions are iconic,[13] they also feature abstract or geometric shapes.[14] Thus, it is worthwhile to test the aforementioned cognitive hypothesis against archaeological findings on ancient scripts whose signaries still defy understanding. Accordingly,

[6] Changizi and Shimojo 2005; Changizi, Zhang, Ye and Shimojo 2006. [7] Dehaene 2009: 178–9.
[8] Harris 1995: 6. [9] Gombrich 1984: 235.
[10] Dehaene (2009: 176) remarks that 'because our visual neurons only tolerate about 40 degrees of rotation, we could never learn to read efficiently in all orientations without first assigning a prohibitively large number of additional neurons to each viewing angle beyond 40 degrees'.
[11] Gosselain 2000; Knappett and Van der Leeuw 2014: 69.
[12] Coulmas 2003: 17. [13] Houston 2004a. [14] Ferrara, Montecchi and Valério 2021a: 1.

this paper will focus on Cretan Hieroglyphic, a logo-syllabic script[15] used on Crete concurrently with Linear A from MM II to MM III at least (about 1800–1600 BC). Cretan Hieroglyphic has been recognised as an indigenous invention of the early second millennium BC.[16] A recent analysis of its signary supports that 'the birth of the Cretan Hieroglyphic script can thus be seen as a cumulative, gradual, and multimodal outcome' (discussion in Valério, this volume).[17] The script is mainly attested not only on a large number of seal stones and a variety of specialised clay inscribed documents, but also on a fragmentary stone votive object, on twenty-eight inscribed clay pots and a number of pottery fragments impressed with Hieroglyphic seal stones.[18] It was mostly used for recording/labelling and validating administrative transactions, although the inscriptions on the miniature clay 'Chamaizi pots' probably had ritual associations.[19]

Cretan Hieroglyphic represents a combination of phonetic and semantic codification, as it mixes two systems of signs: one primarily based on sound and consisting of the syllabograms, and another based on meaning and consisting of the logograms. The latter represents a system of notation which does not depend on phonetic content. The greatest challenges for the study of the script lie in the pure understanding of its structure and morphology[20] as well as in the difficulty of inferring its genetic relationship with Linear A and in standardising its overall repertoire of signs.[21] Since the character of many Cretan Hieroglyphic signs is still debated[22] and a new classification of signs has also been proposed,[23] this paper shall discuss aspects of the written form of inscriptions, namely the signifier or representamen,[24] drawing upon cognitive linguistics, semiotic studies and archaeology. In particular, I shall address the pictorial quality of Cretan Hieroglyphic and explore nuances of its development as a system of visual encoding,

[15] *CHIC*: 17. [16] Olivier 1989: 41; Ferrara 2015; 2017.
[17] Ferrara, Montecchi and Valério 2021a: 18.
[18] *CHIC*; Del Freo 2008; 2012; 2017; Ferrara, Weingarten and Cadogan 2016: 82, 85–7, figs. 4–6; Montecchi 2020: 49, 52–4. The five most common inscribed artefacts are seals, medallions, crescents, bars and incised vases (Decorte 2018b: 31). Alongside the published vase fragments with impressions of Hieroglyphic seal stones already discussed by Montecchi (2020), there is also a recently recovered unpublished piece from the settlement at Agriana that was presented at the 13th International Congress of Cretan Studies (Christakis, Galanaki and Apostolaki, forthcoming). The Hieroglyphic archive at Petras has also produced a direct clay stopper impressed by a 3-sided Hieroglyphic prism as well as seal impressions with Hieroglyphic inscriptions (Tsipopoulou and Hallager 2010: 115, 166–8, fig. 70).
[19] Montecchi 2020: 53–4. [20] Consani 2008 [2010]: 344, 394–5.
[21] Salgarella 2021: 1, *passim*, with new suggestions; Ferrara, Montecchi and Valério 2021c; also, Meissner and Salgarella, this volume.
[22] For the standardised list of signs, see *CHIC*: 17. [23] Jasink 2009. [24] Chandler 2007: 30.

building on my earlier study that addressed its perception and materiality.[25] Central to my theme is the high level of iconicity characterising the Cretan Hieroglyphic. Its signs are often characterised either as 'pictographic', namely visually representing real-world referents[26] although not denoting them semantically,[27] or of a highly naturalistic character.[28] Thus, the relationship between the graphic signs and their form/design is the point of departure of the analysis; the great challenge is how to differentiate semantic from decorative/iconographic functions through context.

In this framework, I aim to reframe current perspectives on how pre-existing Early Minoan emblematic objects may have turned into proper writing. A short introduction to forms of visual communication in the sign inventories of the Egyptian hieroglyphs will provide the necessary background for the discussion. Although it is not assumed that there was a direct emulation of Egyptian hieroglyphs and the inception of Cretan Hieroglyphic is considered as an autonomous development,[29] it is certainly worthwhile to explore possible analogies in the cognitive steps that led to the invention of the two scripts (on these points, see also Valério, this volume). A secondary goal is to offer insights into how semantic content was rendered by Cretan Hieroglyphic through both functions of the script, administrative and non-administrative. In this case, the significance of graphic composition and visual display will also be considered through the inscription-supports. Directionality and alignment affecting the arrangement of the signs in the 'graphic space'[30] will be examined, because these parameters always constitute a visual logic that guides the perception of writing.

3.2 Prototypes and Visual Communication: the Conceptual Origins of Egyptian Hieroglyphs and Cretan Hieroglyphic

A cognitive mechanism involved in the conception of the Egyptian writing signs, which generally retained a pronounced iconicity,[31] was probably archetypal meaning; easily recognisable and significant themes, which could be singled out as prototypes, were chosen as signs.[32] Developed Egyptian hieroglyphs visually represent the following semantic categories: astronomical entities, animals, objects and tools, body parts, body postures/gestures and simple geometric

[25] Flouda 2013. [26] Evans 1894b: 302–16; Facchetti 2012: 17–18. [27] Salgarella 2021: 2–3, fig. 1.
[28] Ferrara 2015: 31.
[29] E.g. Ferrara 2015; Karnava 2015: 141; Ferrara, Montecchi and Valério 2021a.
[30] Harris 1995: 121. [31] Assmann 2002: 35–45. [32] Hornung 1986: 403–38.

shapes.[33] Moreover, Egyptian logograms remarkably borrow traditional features of the relevant pictorial representations.[34] With regard to its origins, it is now commonly held that certain forms of Egyptian visual communication, some of them three-dimensional, others bi-dimensional, transformed into standardised icons, namely visually codified messages that could be understood by any observer.[35] Here we should recall that the human cognitive capacity to reproduce three-dimensional shapes in two dimensions also underlies the creation of the oldest cave paintings produced by *Homo sapiens*. According to Leroi-Gourhan[36] this sort of figurative art was a 'symbolic transposition'.

The process involved in the invention of Egyptian hieroglyphs was probably not a linear one and is not fully understood yet. Morenz[37] has argued that the phoneticisation of the image led to the invention of Egyptian hieroglyphs through various metaphorical transpositions; a similar process may also have affected Sumerian cuneiform script.[38] Thus, the inception of Egyptian writing depended on the development of a critical mass of artistic expression during the sixth–fourth millennia BC, including Naqada I period female figurines in the round and the stereotypical images adopted in the framework of burial rites.[39] Later on, some of the icons appearing on Naqada II art which were used in a symbolic way, such as ships, birds, female dancers, mountains, trees, entered the sign repertoire of the script, to be used mostly as determinatives.[40] These icons gradually acquired linguistic meaning, thus conveying the words and sounds of Egyptian language and becoming writing signs.[41] Nevertheless, the pictorial content of the early Egyptian pictographic signs gradually withered, as logographic signs were filtered out and the script evolved over time.[42]

The royal tomb U-j at Umm el-Qa'ab/Abydos (ca. 3250 BC) has provided the earliest evidence of phonetic writing in Egypt in the form of miniature signs incised onto small, perforated ivory, bone or ebony labels, larger signs painted on ceramic vessels and seal impressions probably attached to bags.[43] All these short inscriptions and similar examples from the other Predynastic elite cemetery at

[33] Vernus 2016: 1–3; Polis 2018: 298–9 figs. 4–6. According to neuroscientists these categories could activate the ventral cortical regions (Dehaene 2009: 183–4), but this fact does not sufficiently explain their invention, especially when juxtaposed with the Proto-cuneiform evidence from Mesopotamia.

[34] Polis 2018: figs. 4–6. [35] Goldwasser 1995: 1–17.

[36] Leroi-Gourhan 1993: 190–1; also, Ingold 2004. [37] Morenz 2002. [38] Green 1981: 346.

[39] Morenz 2004: 14–15; Graff 2017: 225. [40] Ibid.: 227–8.

[41] Jiménez-Serrano 2016: 22; Graff and Jiménez-Serrano 2016b: 166.

[42] Goldwasser 1995: 1–17; Regulski 2016, citing Kahl 1994: 421–905. [43] Dreyer 1998.

Saqqara were used for monitoring the flow of goods and commodities during the royal funeral rituals.[44] In any case, only the ivory labels from tomb U-j represent the formative phase of hieroglyphic writing. These attestations of writing did not represent continuous spoken discourse,[45] but possibly denoted logograms and phonograms.[46] What is most interesting, though, in the framework of this discussion, is that the inscriptional material from tomb U-j demonstrates the coexistence of distinct but compatible modes of written communication during the early Naqada III period.[47] These are represented by notational systems that employed seals and painted and incised potmarks; these systems were used in major Predynastic settlements for protecting and validating transactions, accounts and stored goods. Their geographic spread across Egypt and beyond its borders testifies to intensive regional and foreign exchange from the Naqada II period onward.

This discussion provides a basis for examining the conceptual machinery that led to the earliest attestations of proper writing on Crete. As language and writing are cultural cognitive structures, namely mental models, their investigation should be enhanced 'by a thorough understanding of the context (physical and human, i.e. cultural) in which they are acquired and realized'.[48] What may possibly be regarded as the formative phase of Cretan Hieroglyphic, namely the so-called 'Archanes script' (for a discussion, see Meissner and Salgarella, and Bennet and Petrakis, this volume),[49] represents a group of seals engraved with signs of a strong iconic character, either solitary or in sign groups (Valério, this volume). The longest existing sequence consists of five signs arranged in two sign groups, which recur in the later scripts as a unified sign sequence with a syllabic value.[50] It is, therefore, considered as a standardised 'formula' that semantically conveyed phonetic values,[51] although, like the Abydos writing, it probably did not convey

[44] The inscriptions consist of two basic categories of signs, namely numeric signs and signs appearing to be the first hieroglyphs, whose character is still debated. The latter may denote private names, goods, or most probably toponyms, such as the names of towns which had contributed their gifts or tributes to the royal tomb (Graff 2017: 221–2 with bibliography).

[45] Regulski 2008. [46] Jiménez-Serrano 2016: 24.

[47] Regulski 2016; Graff 2017: 223–4; see Jiménez-Serrano 2016: 23, for a contrasting view.

[48] Bernardo and Kronenfeld 2011: 93–4.

[49] Grumach 1963–1964; 1968; Grumach and Sakellarakis 1966; Yule 1980: 209–10; Karnava 2000: 197–8; Jasink and Weingarten, and Valério, this volume. This issue is still debated though. For a recent summary of alternative views, see Ferrara, Montecchi and Valério 2021b: 2.

[50] Here the term 'Archanes script' is followed simply for reasons of convention; 'Archanes Formula' indeed corresponds more closely to the two sign groups, since they do not represent a complete writing system (Ferrara, Montecchi and Valério 2021b: 2).

[51] Schoep 2010: 71; Decorte 2018a: 367–8; 2018b: 34, nn. 53, 35.

continuous discourse.[52] On some of its early examples, the 'Archanes script' is also intricately associated with pictorial images, which are variably interpreted either as decorative themes or as symbolic signs constituting a visual code[53] and as 'semasiographic codes without any phonetic value, but functioning as mnemonic aids'.[54] These images may be considered as the outcome of a preliterate rise in symbolic awareness,[55] manifested by the transition from EM II–III[56] seals with linear or geometric motifs to the first iconic representations on the EM III–MM IA hippopotamus ivory seal groups, including the 'Parading Lions/Spiral Group'.[57]

The EM III–MM IA seals with iconic representations were adopted as group emblems for signifying emergent social groups and for establishing the physical/spatial boundaries between competing communities in a period characterised by intensely competitive social strategies.[58] They testify to a new symbolic Cretan repertoire,[59] which in my opinion provided the most important component of conceptualisations and symbolic transpositions that gradually led to the 'Archanes script' in late MM IA–MM IB.[60] I would like to suggest that this Cretan repertoire may be compared to the Egyptian Predynastic iconic motifs on the Naqada II 'Decorated Ware' that gave rise to the Abydos inscriptions[61] and to the early Mesopotamian seal motifs that appeared before the development of writing in their own area.[62] In all three cases, the initial generative cognitive mechanism involved seems to be the association between symbols which were deeply embedded in social interactions and ideology.

Ferrara[63] has also sought for the origins of writing in the development of 'pictographic symbols', and the act of drawing. She acknowledges that 'the direct prompt that prefigured the advent of writing would reside in the iconography of seals',[64] but essentially disassociates the invention of writing from seal iconography. On the contrary, Roeland Decorte[65] envisages a limited series of early glyptic 'sematographs', dating from EM II to MM IB, which provided the conceptual background that 'must have been highly conducive to script formation before the rise of the 'Archanes script'. This view is also broadly shared by Civitillo[66] who

[52] Ferrara, Montecchi and Valério 2021b. [53] Sbonias 1995: 198.
[54] Flouda 2013: 148–51; similarly, Civitillo 2016a; Decorte 2018a: 355–7, Table 6: 'sematographs'.
[55] Flouda 2013: 148. [56] Early Minoan is abbreviated as EM and Middle Minoan as MM.
[57] Yule 1980: 229–30; Sbonias 1995: 74–121; Krzyszkowska 2005: 60–8; Weingarten 2005: 759–66.
[58] Sbonias 1999: 42–3; Relaki 2012: 295–8. [59] Flouda 2013: 148, figs. 4a–e.
[60] On the dating, see Sbonias 1995: 108; Watrous 1994: 727, n. 241; Weingarten 2007: 137.
[61] Graff 2013; 2017. [62] Schmandt-Besserat 2007: 30–3. [63] Ferrara 2015: 43–4.
[64] Ibid.: 43, citing Kenna 1962. [65] Decorte 2018a: 39–42, fig. 13. [66] Civitillo 2016a.

has systematically explored the emergence of writing on seal stones, as will be discussed in the following.

Common ground between all of these views is the notion that the boundaries between Cretan Hieroglyphic signs and images were more fluid than has been formally accepted up to now. Still, no unanimous agreement has been reached as to the character of the 'decorative' signs or 'filling' images[67] on MM II Cretan Hieroglyphic seals, that most often accompany or even appear at the middle of sign sequences, rendered in the same or in a larger size.[68] Many of these signs are otherwise accepted as syllabic but are omitted in the normalisations of the Corpus of Cretan Hieroglyphic inscriptions (*CHIC*). According to Decorte,[69] reinstating them produces different sign sequences instead of the assumed most common formulae 044-005 and 044-049 (see Civitillo, Appendix, this volume). On the other hand, he regards some of the supposed single signs as 'likely heavily abbreviated with the help of sematographic structures', which are proposed to be potential ligatures;[70] these, nonetheless, are attested only by seal impressions on crescents.

Clearly the question of whether these images had a phonetic meaning is still not equivocally resolved, but may not be addressed solely on the basis of the distinction between 'graphic signs' and 'writing signs', as will be shown in the following. Following Civitillo,[71] we may accept as a 'writing sign' any graphic sign that is part of a closed system and possesses a normative linguistic execution assigned to it in a precise linguistic environment and crystallised by convention and use. However, as she notes 'in the case of the Minoan Hieroglyphic, it is conceivable that some signs may recur, depending on the contexts of use, not only loaded with a phonetic value, but also directly with an encyclopaedia of knowledge codified by the people who conceived such a system'.

Accordingly, many researchers have considered signs previously excluded from the *CHIC* as proper script-signs that may render phonetic graphemes.[72] Jasink[73] has proposed that several of the solitary

[67] From a technical point of view, the pictorial quality of the signs on MM II seals is enhanced by the carving of the hard-stone seals with hand-held drills or with a horizontal bow drill, the latter likely introduced in MM IB (Krzyszkowska 2005: 83–5). This production technique contributed to the roundness of their constituent parts (e.g. prism HM inv.no. Σ–K.2595/*CHIC* #309; also, Ferrara, Weingarten and Cadogan 2016: 83, fig. 2), thus creating a more ornamental form than the incised signs on clay supports had.

[68] For the most recent synopsis, see Decorte 2017: 39–47; 2018b: 28–9.

[69] Decorte 2017: 39–41, fig. 3.3. [70] Ibid.: 53, fig. 3.15. [71] Civitillo 2016a: 29.

[72] Karnava 2000; Jasink 2009; Anastasiadou 2016a; Decorte 2017; Ferrara, Montecchi and Valério 2021b: 11.

[73] Jasink 2009: 11, n. 53.

ornamental or 'filling' motifs on seals may also convey linguistic meaning as logograms and/or determinatives.[74] The expanded signary certainly allows a more integrative understanding of the writing system. It includes vegetal and floral motifs, astral motifs, animals, vessels, tools, cult symbols and geometric motifs. Among them, we may note the 'cat-mask' (AB 80), which has a phonetic value in Linear A and B and is almost universally accepted as a script sign,[75] probably a determinative of the 'word' it accompanies, or a logogram connected to the seal's owner/user.[76]

A more cautious stance recognises that a few signs, which are only encountered on seals but not on clay administrative documents, may actually be writing signs.[77] This possibility would suggest the existence of homophonic signs in Cretan Hieroglyphic, the choice of which may theoretically be attributed to graphic variants or to the existence of different scribal traditions operating according to the inscription-supports.[78] Moreover, Decorte[79] rightly calls attention to what he calls 'single-sign inscriptions' on seals, by drawing a parallel with the relevant inscriptions on clay objects, such as the inscription of CH *042 on an inscribed and stamped loom weight from Palaikastro (*CHIC* #174/Heraklion Museum – henceforward HM – inv.no. Π 4815).

The fact that many of the Cretan Hieroglyphic syllabograms and almost all logograms have retained an iconic or 'naturalistic' appearance, although they represent a developed stage of abstraction,[80] arguably goes back to their conceptual beginnings. As we have already seen, this explanation has also been accepted for Egyptian hieroglyphs that are akin to images with cross-culturally recognisable referents,[81] including female figurines in the round. Baines[82] has particularly suggested that 'the affinity of the hieroglyphic signs to the amulets shows that they both derive from the same conceptual prototypes'. Taking this train of thought further and trying to identify conceptual prototypes or 'archetypes', I have elsewhere suggested that the form of some of the Cretan Hieroglyphic signs attested in MM II reproduces earlier three-dimensional material objects in an abstracted two-dimensional form; this is particularly true for EM 'Egyptianising' bone and stone amulets as well

[74] For a critique, see Civitillo 2016a: 52–4; Facchetti 2012: 21–4.
[75] Younger 1996–1997 [1998]: 387; Ferrara, Montecchi and Valério 2021c: 29 mention it as a possible addition to the Cretan Hieroglyphic inventory.
[76] Jasink 2009: 31; Ferrara, Weingarten and Cadogan 2016: 89–90; Civitillo 2015: 72–3, for a contrasting view.
[77] Civitillo 2016a: 30, 42.
[78] On graphic variants, see Ferrara, Montecchi and Valério 2021c: 12–16, 24–5, 30 Table 1.
[79] Decorte 2018b: 28–9, n. 43. [80] Ferrara 2015: 31. [81] Goldwasser 1995; Vernus 2016: 1–3.
[82] Baines 2007: 122.

as zoomorphic and anthropomorphic stamp seals.[83] These amulets represented whole animals, human and animal feet and everyday objects.[84] Furthermore, the shapes of two other Hieroglyphic signs are possibly derived from three-dimensional objects with a codified symbolic meaning, namely the double axe and the Egyptian sistrum.[85]

Karnava[86] converges with the logic behind these notions, as she has also argued for considering many Cretan Hieroglyphic signs as 'miniaturisations' of real-world objects or animate beings. Her idea of CH 044 as reproducing a *Petschaft*-type seal (loop-handled signet)[87] is also shared by Ferrara and Cristiani,[88] who stress that twelve occurrences of the sign even depict its upper part as perforated.[89] The proposal that, if CH 044 occasionally had the value of a logogram, this could iconically represent the specific action of accounting and authorising an administrative transaction,[90] is certainly insightful but also hard to prove at the same time. On the other hand, the suggestion that clay votive figurines and miniature human limbs may be among the material referents that inspired the invention of signs[91] gains support from their integration in the widespread ritual practices taking place in the MM IIA–MM IIB open-air peak sanctuaries throughout the island. Last but not least, Ferrara, Montecchi and Valério[92] trace the material prototype to sign CH 052, which according to them lacks a corresponding seal icon, to a Protopalatial footed teapot with a possible metal prototype.[93]

On the whole, all these suggestions on deriving the conceptual origins of Cretan Hieroglyphic signs from material prototypes gain support from the theory according to which cognition extends beyond the brain, and artefacts are among the components of cognitive processes.[94] Abstract qualities, such as weight, have first to be perceived as a physical reality before they can be conceptualised in the brain,[95] and a similar mechanism may have contributed to the inception of writing.

[83] Flouda 2013: 154–5, fig. 9. [84] Branigan 1970: 94–7, fig. 22.
[85] Flouda 2013: 155; on the sistrum, see Sakellarakis and Sapouna-Sakellaraki 1997: 329; Sapouna 2001: 267; Brogan 2012: 15–16, fig. 3.1.
[86] Karnava 2015: 141–3. [87] Karnava 2000. [88] Ferrara and Cristiani 2016: 26–8, fig. 4.
[89] An argument, though, that complicates matters further is that the ivory cylinder seal from Chrysolakkos at Malia (*CMS* II.1, 420/HM 1442, *CHIC* #207), which bears sign CH *044, most probably dates before MM II (Yule 1980: 103; Poursat 1990a: 31), namely before the chronological horizon of extant *Petschaft*-type seals produced in the course of MM II (Krzyszkowska 2005: 83).
[90] Ferrara and Cristiani 2016: 33–4. [91] Karnava 2015: 147–8.
[92] Ferrara, Montecchi and Valério 2021b: 15–16, fig. 11.
[93] The sign also forms part of the 'Archanes script'. [94] Clark 2008; Malafouris 2013.
[95] Renfrew 2007: 199.

Additionally, a contribution from the Egyptian repertoire in terms of specific signs and iconographic stylistic trends, albeit minimal, is proposed by Ferrara, Montecchi and Valério.[96] Particularly compelling is their case for the derivation of logogram CH 156 from the Egyptian vine hieroglyph M43. This hieroglyph functioned as a determinative and has been attested on wine jar stoppers dating to around the middle of the third millennium BC.[97] What is most interesting in this case is the attestation of the associated Cretan Hieroglyphic logogram CH 156 on many different seals. In my view, we may infer that these seals were destined for producing legible impressions in the framework of regulating and authorising transactions, mainly through administrative documents such as nodules, noduli and roundels.

A similar strand of thought has recently been developed in the case of Linear A, thus expanding the potential for a better understanding of the undeciphered Cretan scripts. Expanding on recent suggestions that the signs of Linear A and B may derive from stylisation of themes originating in the natural world,[98] Salgarella[99] has elaborated a theoretical model of the direction of motif transferral from what she calls the 'iconographic substratum' onto other media of cultural production, including the scripts (Meissner and Salgarella, this volume). According to her, the first level of transferral would be from the natural world to script, a suggestion that fits with the theory already discussed by cognitive scientists, including Dehaene.[100] A second level of motif transferral would be from the natural world to glyptic and, then, from glyptic to script. Although this view is offered as a tentative interpretation, the fact that signs shared by Linear A and B, amongst which are some with Cretan Hieroglyphic graphic parallels, may all be derived from material objects that functioned as referents, lends particular support to Salgarella's reconstruction of the first level of transferral.[101]

3.3 The Role of the Inscription-Support: Directionality and Graphic Composition as a Basis for Deducing Inscription Meaning

The directionality and alignment of the Hieroglyphic signs should be treated as indexes for inferring the subtle ways in which they may have affected the use of the inscribed artefacts in administrative practices

[96] Ferrara, Montecchi and Valério 2021a: 19. [97] Ibid.: 7–9, fig. 4.
[98] E.g. Nosch and Ulanowska 2021. [99] Salgarella 2021: 4–6, figs. 3–4, n. 17.
[100] Dehaene 2009.
[101] Salgarella 2021: 11–21. For example, AB 26/-*ru* is associated with CH 092, AB 24/-*ne* is associated with CH 052 that occurs in the Archanes script and AB 61/-*o* is associated with CH 013.

as well as the way they were generally perceived by social actors.[102] Directionality concerns the direction in which the graphic signs were read, whereas alignment refers to their relative position with respect to each other. Cretan Hieroglyphic does not have a fixed dextro- or sinistroverse order and, therefore, the 'initial-x stiktogram' has been interpreted as mainly indicating reading direction. This reading-aid was also applied in the case of the multi-faced clay crescents, whereby reading the inscription was important for classifying and monitoring the transaction involved (e.g. *CHIC* #001-004, 008, 012-013, 016-019, 021-024, 026-029). On the contrary, reading the inscriptions impressed with Hieroglyphic seals on clay administrative documents may not have been so meaningful, if we consider the Knossian crescent *CHIC* #026, whereby the seal with the inscription was partially impressed on the limited space available in contrast to the non-Hieroglyphic seal that left a complete impression (HM inv. no. Σ-T 207; Figure 3.1). Moreover, in the case of most Knossian inscribed medallions (e.g. *CHIC* #032, 034, 036–042, 045, 047) and of the Petras medallion PE He 009,[103] the use of the 'initial-x stiktogram' seems to differentiate 'words', often in the presence of logograms and arithmograms. Still, on many hieroglyphic seals the placement of the 'initial-x stiktogram' seems to be random and irrational.[104] Especially on seals with a circular face, the signs often compose a radiant composition that defies any sense of alignment. But even on 3- and 4-sided prisms the signs do not always follow a linear alignment (e.g. see seal impressions of prisms *CHIC* #139, 142, 147, 164).

Although there is no consistent orientation in which the sign groups are engraved on seals, they usually compose a graphic composition that favours symmetry (e.g. *CHIC* #126, Hieroglyphic seal impression on a nodulus).[105] The study of a number of stone prisms rather supports the hypothesis that the meaning of the inscriptions relies on two or three impressed faces being read together.[106] We may hypothesise that the literate seal-engravers even manipulated the shape of the seals accordingly; they possibly oriented the inscribed faces either to form

Figure 3.1 Clay hanging nodule *CHIC* #026 (HM inv. no. Σ-T 207), face α with seal impressions and face γ with inscription and 'initial-x stiktogram'

[102] Flouda 2013: 155; also, Valério, this volume.
[103] Tsipopoulou and Hallager 2010: 75–6.
[104] Civitillo 2016a: 70–1; e.g. *CHIC* #123–33.
[105] Poursat 1990a: 26; Civitillo 2016a: 62–4, fig. II.3.
[106] Younger 1990: 89–90.

complementary meanings or to facilitate separate seal impressions and associations[107] probably with the intention to guide seal-users who were not necessarily literate.

Notwithstanding this lack of a standardised layout, the graphemic understanding of single signs on Hieroglyphic seals presents different challenges. For example, the flat-based nodule *CMS* II.8, 38 (HM inv. no. Σ-T 404) from the Eastern Temple Repository has most probably been impressed with a *Petschaft*-seal bearing the syllabogram CH 018 (profile 'wolf's head' with protruding tongue). The nodule probably dates to the mature LM IA, where the assemblage belongs,[108] but the *Petschaft* impressed on it was most probably an heirloom from MM II.[109] Although the presence of a single sign would render the initial 'x-stiktogram' redundant, since we do not have a multisyllabic sequence, here it is probably intended as a diacritic marker highlighting the presence of script more generally[110] rather than a filler like the motifs present in other occurrences of the 'wolf's head'.[111]

The lack of a straight alignment and of a standardised size for signs within inscriptions frequently characterises the inscriptions on clay documents as well and, in some cases, presents challenges. For instance, the rotation at an angle of almost 90° of sign CH 011 on medallion *CHIC* #041.b has led to its identification as such, whereas it could rather be seen as a variant of CH 040 (boat), which is frequently attested on contemporary seals with inscriptions or not.[112] Both features are in marked contrast with two of the three main principles that underlie the syntagmatic organisation of graphemes within inscriptions of Egyptian hieroglyphs.[113] Some of the Cretan Hieroglyphic signs are occasionally being rotated at an angle of 90° or even everted completely (180°) thus perplexing things even further. Noteworthy in this sense is the 4-sided prism *CHIC* #309 from Myrtos Pyrgos (HM inv. no. Σ-K 2595/PYR S (4/4) 01; Figure 3.2), which provides useful insights to the fluid interface between graphic signs and script-signs. The prism is engraved with frequently recurring formulae that denote either transactional terms[114] or administrative entities;[115] it may have functioned as a marker of status in administrative transactions.[116] On its face α, the trowel sign CH

[107] E.g. *CMS* XII, no. 112/*CHIC* #287, see Younger 1990: 88–92, fig. 9; Flouda 2013: 157.
[108] Petrakis 2017a: 88.
[109] The sign of the 'wolf's head' with protruding tongue is also represented on an administrative document from the MM IIB sealing deposit at Phaistos (*CMS* II.5, no. 300); *CMS* II.5, no. 299 may possibly be identified with CH 17. On comparanda and chronology, see Krzyszkowska 2012, 146–7, n. 8, figs. 1–2.
[110] Decorte 2018b: 26. [111] Krzyszkowska 2012: 147, fig. 2.
[112] Ferrara, Montecchi and Valério 2021c: 11–12. [113] Vernus 2016: 3–5.
[114] Younger 1996–1997 [1998], with previous bibliography.
[115] Weingarten 1995: 303; Poursat 2000: 187–91. [116] Ferrara, Weingarten and Cadogan 2016: 95.

*044 is rotated at an angle of 90° and is also singled out by two spirals (*SM* 136) and double 'x-stiktograms' above it. These individualising features have provided ground for a tentative 'reading' of CH *044 as a logogram and of the preceding full-bodied cat sign as an adjunct to it.[117] This hypothesis follows the logic behind two individual cases accepted by *CHIC* as 'adjuncts' in clay inscriptions due to their placement in front of logograms: signs CH *042 () and CH *089 () on the clay bar *CHIC* #065 (HM inv. no. Π-N 1294+1300/KN Hh (08) 01). Was it possibly meaningful that the double-axe sign in this case is not rotated 90°, as is usual? If, however, the trowel sign indeed functioned as a logogram on the Myrtos Pyrgos prism, as has been proposed for rotated signs which are introduced by multiple 'x-stiktograms',[118] one wonders what the specific semantic content of the cat sign was, since the third sign of the seal face (CH *005) also occupies a self-standing position.

Two examples on the same seal, *CHIC* #309, also highlight the isolation of initial signs from the rest of syllabic sequences to which they belong, through one or four vertical strokes, respectively: the inverted sign CH 036 on face δ and the double-axe sign CH 042 on face β, which is rotated 90°.[119] On other seals, sign CH 036 is also frequently isolated from the two-sign sequence 036-092 by way of accompanying fillers or a vertical stroke.[120] Normally vertical strokes are used as 'word'-dividers, as for example in the case of the clay bar *CHIC* #049 (HM inv. no. Π-N 1286/KN Hh (01) 01) and also of *CHIC* #013 (HM inv. no. Σ-T 206/ KN Ha (02) 10; Figure 3.3), an inscribed crescent

Figure 3.2 4-sided prism *CHIC* #309 (HM inv. no. Σ-K 2595), faces α, β, γ, δ, in *CHIC* transliteration

[117] Ibid.: 89–91, Table 2.
[118] A function of the trowel sign CH *044 as a logogram has also been suggested in the cases of *CHIC* #056 and *CHIC* #013; see Jasink 2009: 127–8.
[119] Ferrara, Weingarten and Cadogan 2016: 83 fig. 2, Table 2.
[120] Ibid.: 90, mentioning *CHIC* #263a, #265c, #267b, #288c, #299c, the latter with double x.

also employed in administrative activity.[121] The latter comes from the 'Hieroglyphic Deposit' and is one of a set of two Knossian crescents recording a transaction in which two different seal-users interacted:[122] both crescents *CHIC* #013 and #015 share a seal impression by a 4-sided, hard-stone Cretan Hieroglyphic seal (*CHIC* #167/*CMS* II.8, 71)[123], while the sign sequence on face γ of the fragmentary example *CHIC* #015 (HM inv. no. Σ-T 1611/KN Ha (02) 12) could be similar to a 'word' on the respective face of the other crescent, thus suggesting that the two monitored transactions were possibly associated. Otherwise, vertical strokes are used as sign dividers on two different seals, whereby they divide logograms CH 157 and CH 155 from klasmatograms, namely signs representing fractional amounts (seal *CHIC* #291 [5]:β–γ/*CMS* II.2, 315), or they differentiate between two klasmatograms which occur on the same prism face (seal *CHIC* #291 [5]:δ/*CMS* II.2, 315 and *CHIC* #292 [1]:β, δ/*CMS* II.2, 217). Elaborating upon this argument, I would like to suggest that vertical strokes are now documented as dividers on a non-administrative inscription, made in a different material: the ivory ring or 'sceptre' recently excavated at the Cult Centre of Knossos, which is inscribed in Linear A and also includes an elaborate series of logograms and fractions.[124] On the basis of all this evidence, the hypothesis on the semantic significance of the vertical stroke on the Myrtos Pyrgos prism is

Figure 3.3 Clay crescent *CHIC* #013 (HM inv. no. Σ-T 206), face γ, in *CHIC* transliteration

[121] Trowel sign CH *044 emerges on the latter after an 'x-stiktogram' and a vertical stroke separating it from a three-sign sequence, but due to a chipped-off edge it is not clear whether another sign followed it.

[122] Weingarten 1995: 302–3.

[123] *CHIC* #013 has also been impressed with the Hieroglyphic seal *CMS* II.8, 89/ *CHIC* #124 [2], probably a *Petschaft*.

[124] Kanta, Palaima and Perna 2023: 62, 66–7, fig. 7, 79, fig. 24; Kanta *et al.*, *forthcoming*. For the idea that rigid distinction between Cretan Hieroglyphic and Linear A should be avoided, at least on the basis of the Malia 'Dépôt Hiéroglyphique' and of the Knossos 'Hieroglyphic Deposit', which could be broadly contemporary, see Petrakis 2017a: 85–7; also, Tomas 2010: 350.

strengthened.[125] The suggestion that it possibly renders the double-axe sign CH 042 as a logogram/determinative rather than a syllabogram is a valid one, although it is not clear how this postulated semantic content can be verified.

Clay crescents are singled out as documents introduced specifically for use along with Hieroglyphic seals, since almost all of the examples found at Knossos, Malia and Petras have been impressed with inscribed seals.[126] In this respect, idiosyncratic particularities in the graphic composition of the occurring seal inscriptions may offer useful insights. For instance, crescent *CHIC* #027 & #123 (HM inv. no. Σ-T 172/KN Ha (05) 01) was impressed twice with a seal that had a circular sealing surface, most probably a 'bottle', a 'button' or a *Petschaft*, judging from its diameter (*CMS* II.8, 90; Figure 3.4). The seal bears a bi-syllabic sign sequence at the centre, surrounded by twelve instances of the 'cat-mask' sign. In this case, I would claim that the design obliterates the sign, borrowing a concept from Gombrich.[127] This fact has prompted Civitillo[128] to propose that the 'cat-mask' sign, which may have been re-elaborated from an Egyptian prototype, and also the full-bodied cat, functioned simply as 'emblems'. According to her, signs like these have most often accompanied standardised 'formulae' with administrative function, were devoid of linguistic value and served solely as 'badges' communicating the identity or group affiliation of the seal-owner.[129] Nevertheless, special cases of syntactic arrangement of the full-bodied cat, for instance, in the case of the aforementioned Myrtos Pyrgos prism (HM inv. no. Σ-K 2595/*CHIC* #309), and cases whereby

Figure 3.4 Seal impression of a *Petschaft*-seal on clay crescent *CHIC* #027 (HM inv. no. Σ-T 172), after *CHIC*: 186 (*CHIC* #123)

[125] Ferrara, Weingarten and Cadogan 2016: 90. [126] Weingarten 1995: 287.
[127] Gombrich 1984. [128] Civitillo 2015: 72–3; 2016a: 150–8; 2016a: 125–6.
[129] For different views, see Jasink 2009: 140; Decorte 2018b: 28, with previous bibliographic references.

the cat-mask sign is clearly embedded in script-sequences on seals,[130] indicate that we should acknowledge them as part of the script.

A clear use of some pictorial graphic signs as 'emblems'/'badges' is in my opinion supported by the few available seal impressions of Hieroglyphic seals on clay pots (e.g. *CHIC* #132, #133, #150, #155), usually placed on the base of handles. These do not necessarily suggest that the owners of the impressed vases had any capacity for writing or reading. The seal impressions, many of which have been made with broken or worn seals, may rather have functioned as trademarks of pottery workshops[131] or as markers of elite status[132] meant to be easily visible due to their prominent placement.

3.4 Final Thoughts

On a semantic level, our analysis demonstrates that the identification of signs through the use of multiple 'x-stiktograms', rotation or vertical strokes on Cretan Hieroglyphic seals may signal the presence of sematographs, such as adjuncts, determinatives and/or logograms. Nonetheless, the functional flexibility of the hieroglyphic signs cannot be incontrovertibly proven if our corpus of inscriptions is not significantly enriched with new documents. Thus, the need to develop concrete criteria for identifying the different semantic categories of Cretan Hieroglyphic, such as syllabic/logographic signs, ligatures, determinatives and adjuncts or abbreviations, provides a future avenue for research. From a comparative perspective, though, the combination of signs rendering phonetic content with determinatives is also attested in the earliest Egyptian script by the Abydos labels Uj 59 and Uj 127–9.[133] There is no reason why determinatives cannot be postulated for Cretan Hieroglyphic as well, since it also represents an early writing system. The hypothesis for other potential sematographs operating on Hieroglyphic seals, which probably include phonetic complementation, stiktogrammatic or diacritic markers, and simple or complex ideograms, has been put forward recently and deserves further study.[134] Besides, a thought-provoking argument by Steele,[135] who sees the considerable diversity in the repertory of Linear A logograms used at different Cretan sites as resulting from the lack of a clear logographic system and an *ad hoc* practice of abbreviations, may as well apply in the case of Cretan Hieroglyphic.

[130] Decorte 2017: 43, fig. 3.6. [131] Weingarten 2015: 75.
[132] Ferrara, Weingarten and Cadogan 2016: 96, n. 16; Montecchi 2020: 54–5, 61.
[133] Morenz 2004: 20, 49–50. [134] Decorte 2017: 49–55. [135] Steele 2017a: 164.

Moreover, if we leave aside the 3- and 4-sided prisms, developed by MM II to carry many multi-sign inscriptions meant to be easily reproduced and read through their impressions on clay administrative documents,[136] the picture emerging is a rather complex one, as shown by the discussion in a number of contributions in this volume. The alignment and the directionality of the inscriptions as well as their embellishment with pictorial elements compose a complex '*rhetorique*' of the graphic composition, from which it has been inferred that the inscriptions were not only meant to be read but also to be seen.[137] The frequent rotation of Cretan Hieroglyphic signs on seals at an angle of 90° (or 180°) is notably also practised on written documents; this fact shows that the script does not abide by the rule suggested by cognitive science, according to which our visual neurons only tolerate about 40 degrees of rotation. In this regard, the findings of cognitive linguistics studies on other logographic and logo-syllabic writing systems vividly support that visual complexity has the potential to particularly enhance reading comprehension.[138]

With regard to prototypes, the Cretan Hieroglyphic signary was not based on a small inventory of basic shapes, as cross-cultural notions derived from cognitive science have suggested for early languages. In terms of morphology, Cretan Hieroglyphic script comprises several categories of signifiers: many of them are associated with the natural and others with the material world, whereas geometric motifs are also represented. When it comes to iconic signs that are attested on MM II seals along with syllabic sequences, but seem 'decorative' in nature, such as the double-axe (CH *042), the bovine head in profile (CH *013), the bee (CH *020) and others, views differ widely on whether they had a phonetic value or not. For instance, Civitillo[139] contends that their occurrences as isolated signs on seals had a precise semantic intentionality, but refrains from defining it more closely. It is assumed that the relevant signs gradually transformed from 'icons' in the Peircean sense, namely signs which share sensory qualities and are similar with their objects of reference,[140] to script-signs through a slow process of codification. This transformation may have been completed via the rebus or acrophonic principle, whereby the first syllable of the Minoan word for the commodities represented may have been adopted as the phonetic value of the sign.[141] I would like to argue that some of these 'icons' can

[136] Flouda 2013: 155. [137] Civitillo 2016a: 84. [138] Miyamoto 2007: 349.
[139] Civitillo 2016a; 142–9 *contra* Jasink 2009, 65–7.
[140] Freadman 2004: 13; Moore *et al*. 1984: 2.4, 56.
[141] This is held as particularly possible for signs CH *001, *004 and the cat-mask sign. Civitillo 2016a: 137, 148–9, 158–9.

be traced back to the Late Prepalatial symbolic Cretan repertoire that consists of glyptic pictorial representations and material objects. This repertoire may be considered as a precursor to the 'Archanes script' that includes syllabic signs as well as probable semasiographic signs,[142] such as the 'hand' and the 'leg', if not more.[143] The integration of the earliest attestations of script into three-dimensional seals and their direct interaction with images on the sealing surfaces may have further fostered the iconic character of the Hieroglyphic signs.[144]

The abstraction of three-dimensional 'emblems' which were deep-rooted in social relationships and ideology was probably the conceptual mechanism for the transition from semasiographic to phonographic script and the gradual enrichment of the Cretan Hieroglyphic signary.[145] Besides, a similar evolution has been suggested in the case of the earliest Egyptian hieroglyphs, whereby signs were created out of clearly recognisable material prototypes. Our hypothesis arguably allows for a cumulative and multifaceted inception of the Cretan Hieroglyphic graphic repertoire through various real-world referents. Within this framework, one may argue that EM 'Egyptianising' amulets in the shape of whole animals, human and animal feet and everyday objects (e.g. the double-axe) as well as zoomorphic and anthropomorphic stamp seals probably provided inspiration for signs.[146] Most importantly, these amulets and seals also feature the first attestations of graphic signs, such as spirals and scrolls, which are finally incorporated in the script by MM II.[147] Further material referents are securely recognised through the following signs: CH *044, which recalls a *Petschaft*, various signs representing human and animal parts, as well as CH *052, which possibly references a footed teapot.[148] This reconstruction accords well with the hypothesis that symbolic transferral from the natural world to script was primarily responsible for the inception of Linear A signs.[149] Although direct imitation of Egyptian hieroglyphs does not seem a plausible hypothesis,[150] the possibility of contact with Egyptian literacy as another potential avenue for the creation of Cretan Hieroglyphic signs should be evaluated further in the future.

[142] Flouda 2013: 148, figs. 4a–e, 167; also, Civitillo 2016a: 158. [143] Decorte 2018a.
[144] See Karnava 2021: 249 for the opposite suggestion that 'the seal engraving repertory borrowed from the Cretan Hieroglyphic repertory'.
[145] The first semi-pictographic symbols found at Uruk, possibly inspired from the three-dimensional clay 'tokens' used for accounting, have also followed a process of abstraction that produced the characteristic cuneiform signs; see Sauer 2017: 25, fig. 3.3 with previous bibliography; also, Schmandt-Besserat 2007 on the 'tokens' as precursors of writing.
[146] Flouda 2013: 154, fig. 9, 155; Civitillo 2016a: 176. [147] Civitillo 2016a: 171–4, fig. III.14.
[148] Karnava 2015; Ferrara and Cristiani 2016; Ferrara, Montecchi and Valério 2021b.
[149] Salgarella 2021. [150] Valério, this volume; Ferrara, Montecchi and Valério 2021a: 19.

Last, but not least, it is hereby envisaged that the act of stamping with Hieroglyphic seals in MM II provided an additional mechanism for transmitting and adapting the script along with writing on accounting documents. It remains to be further explored whether the solitary or 'filling' seal signs, initially perceived by Godart and Olivier as '*décoration éventuellement signifiante non évidente*', allowed for the identification of individuals,[151] made reference to the meanings attributed to them culturally[152] or functioned as sematographs.[153] Irrespective of whether their attestations encoded phonetic graphemes, most of the aforementioned emblems must have been codified in the course of the Protopalatial period. From an archaeological perspective, systematic analysis of Protopalatial glyptic forms in conjunction with the nature and length of the inscriptions carried by seals (Civitillo, this volume) is the only way to infer the dynamic ways in which principles of graphic composition were intentionally employed to serve the agency of social actors involved in administrative transactions or in the negotiation of social identities.

[151] Weingarten 1995: 307. [152] Civitillo 2016a: 149–59. [153] Decorte 2017: 49.

CHAPTER 4

MACRO VIEW: USES, SOCIAL PRACTICES AND IDEOLOGICAL IMPLICATIONS OF CRETAN HIEROGLYPHIC TEXTS

Anna Margherita Jasink and Judith Weingarten

4.1 The Hieroglyphic Seals: Continuity and Innovation

Seals, by definition, are objects created to close or authenticate (that is, to seal) something, even if they are not always used as such. On Crete during the Prepalatial period, however, evidence for sealing is extremely scanty, especially compared with the large number of seals made during this long period.[1] It is therefore possible, even likely, that seals were meant above all as a mark of distinction, worn by the leaders of this time (whether merchants, landowners, or headmen or -women), rather than a sphragistic tool beyond the household, still less for administrative purposes. We know next to nothing of Minoan Prepalatial organisation, even if class differentiation is clearly visible in the typology of houses, tomb architecture and burials, and in the objects found within. Seals certainly represent a luxury good and, to some extent at least, a luxury trade, the very concept borrowed from Egypt and the Near East. Worn on a necklace or a pin, Prepalatial seals identified prominent individuals and not bureaucratic/administrative concerns.

This changed in the First Palace period (MM IB–MM IIB), beginning with the introduction of a new tool, the horizontal bow lathe in MM II, which allowed engravers to carve hard stones for the first time. Glyptic shifted from the gouging of soft materials (steatite/serpentine, bone and ivory) towards fine, sharp cutting of colourful gemstones (notably jasper and quartzes). New seal shapes appeared – especially the handled signet (*Petschaft*) and 3- and 4-sided prisms (Figure 4.1) – which were put to use by palace bureaucracies at Knossos and Malia. The *Petschaft* is really the best designed of the three for making seal impressions, especially on clay, because it is easy to hold by its handle, to stamp with and lift out cleanly.[2] *Petschafte* were almost always made of hard stone (88%), as were also most 4-sided prisms (69%) but decidedly fewer 3-sided prisms (47%), a material difference which suggests a lower ranking.[3] Alongside purely decorative motifs (e.g. floral, linear and architectonic motifs), other symbols are engraved that

[1] Weingarten 1990; *pace* Vlasaki and Hallager 1995. [2] Ferrara and Jasink 2017.
[3] Poursat 2000: Table 2.

represent 'script-signs': not merely icons which reproduce pictorial objects, but signs that record sounds of the Minoan language.[4] It is difficult to distinguish symbols with pure iconic value from those with syllabic (phonetic?) value, but symbols that appear as single signs on *Petschafte* or on faces other than those with Hieroglyphic script on 3- and 4-sided prisms are generally recognised as part of the Hieroglyphic heritage. They must at least be visually meaningful symbols (Valério, this volume).

We would argue that the Hieroglyphic seal always refers to its user/owner and not to the object(s) on which it may be stamped. Even when it does not bear clear script-signs, the Hieroglyphic seal obviously represents, both in its particular form and engraved designs, symbol(s) that reference its user/owner: if it bears an 'inscription', it identifies either the person (e.g. name, position or trade) or place of residence/origin (e.g. palace, temple, function/title).

It should be borne in mind that even inscribed seals were not necessarily used sphragistically, to seal or authorise, but were also found in tombs, presumably interred with the dead as a valued possession. In other words, it would have been a personal object, a kind of badge,

Figure 4.1 Examples of Hieroglyphic seal shapes: (a) *Petschaft* in green jasper from Ziros (*CMS* VI 124 = *CHIC* #193); (b) 3-sided prism in green jasper? (*CMS* XII 117 = *CHIC* 262); (c) 4-sided prism in green jasper, from Adromili (*CMS* II.2, 256 = *CHIC* #293) Images courtesy of *CMS* Heidelberg

[4] Ferrara and Jasink 2017: 48.

identifying the person by name or residence, or their political or religious role in life, or simply a symbol/sign of good omen.

4.2 The 'Archanes Script' as an Antecedent of the Hieroglyphic Script

In the Introduction (4.1), we intentionally skirted the complicated issue of the so-called 'Archanes formula' and the existence of a script that differs both from the later Hieroglyphic script and from Linear A. Most likely dating to the very end of the Prepalatial period (MM IA), the 'Archanes script' (for a discussion on this definition, see Meissner and Salgarella, this volume), until now, has been found engraved only on seals, and is represented mainly – but not solely! – by the formula, A-SA-SA-RA-NE (ascribing Linear B phonetic values to the signs). Unlike other authors of this book (Ferrara, Valério, Flouda, Meissner and Salgarella), we agree with Roeland Decorte (2018a) that it represents a true script: most of its signs recur in CH,[5] including the formula itself – in its entirety or just its first part, A-SA – which continues to appear on a small group of Hieroglyphic seals and seal-impressions (Table 4.1). The formula takes on a richer meaning on the triple-stacked cube bone seal from Archanes (*CMS* II.1, 391 = *CHIC* #315) where, we suggest, it 'identifies the deity/ceremony/religious institution in whose honour' animal sacrifices, offerings and a procession have been made, as described on the other seal faces.[6] If the seal was made to commemorate such an event, it most likely belonged to the leader of the procession. However, he was not alone. The 'Archanes Seals Group', most of which (but not all) bear the 'Archanes formula', would have been worn by those who belonged by birth or rank to the same religious institution as the leader, he who boasted the largest and most impressive of their seals.

Scholarly consensus dates the four seals from Archanes, the cube from Moni Odigitria (Figure 4.2) and possibly also the discoid from Knossos (Table 4.1, nos 1–6) to late MM IA.[7] The peculiar cylinder (no. 7), a *unicum* among script seals (Figure 4.3), dates within the wider

[5] The 'human leg' in profile, the 'hand', the so-called 'U-sistrum' and a 'man' holding a basket(?), are symbols that appear to be iconographic representations, but which could also have an ideographic or phonetic value as in the later Hieroglyphic script.

[6] Weingarten 2022.

[7] On the single symbols, or group of symbols, visible on some of these seals apart from the formula, see Decorte 2018a.

limits of MM I–II based on its attribution to the Border/Leaf Complex.[8] The next two seals (nos 8–9), bearing true Hieroglyphic signs, are made of hard stones so they cannot be earlier than MM II (cf. § 4.3). The use of the formula on these unusual Hieroglyphic seals could represent a *trait d'union* between the earlier seals from Archanes – which we see primarily within a religious context – while the standard Hieroglyphic seals play a most significant role in administration. The recently found no. 10 from Boughada Metochi (Knossos) appears to straddle the two roles, combining the 'Archanes formula' (side α) with signs on the narrower sides β, δ, that so regularly appear on 'matrix seals' that they may be considered 'matrix symbols' (see below, section 4.4), strongly suggesting a place in administration as well.

Nos 11–16 are seal impressions. The seal that stamped no. 11 (from Knossos) had almost certainly been engraved with the full 'Archanes formula': the fragmentary impression reads A-SA-SA, but with sufficient space for possibly two lost signs. No. 12, from the S-W Pillar Basement at Knossos, on the other hand, retains CH 042-19 and an illegible third sign, but lacks space for additional signs (though those might have appeared on another seal face). The remaining impressions found on Samothrace appear to have all been made from seals originating in a single workshop. All are engraved with A-SA plus additional signs, several of which might belong to the Hieroglyphic script. Together, they raise interesting issues of dating, script and trade, requiring further study.

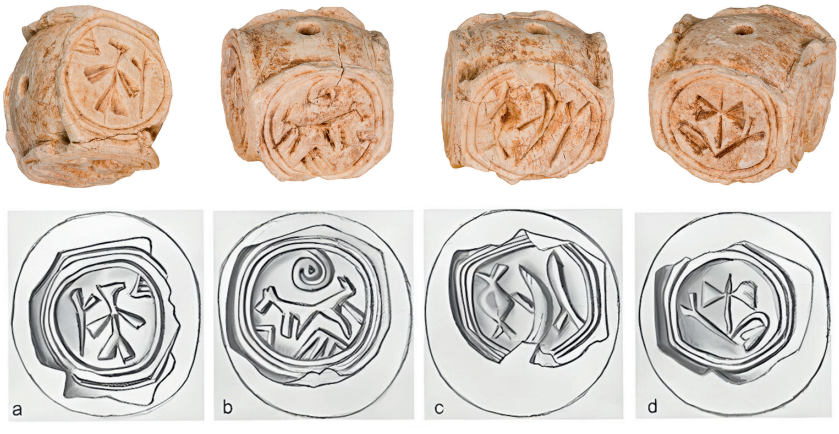


Figure 4.2 Bone cube from Moni Odigitria S35 (*CHIC* #313). Images Copyright INSCRIBE (drawing after Sbonias 2010: Pl. 61).

[8] Yule 1980: 47.210. Decorte (2018a: Table 8, Figure 14) considers the shape of the 'double axe' as 'transitional' between Archanes and Hieroglyphic script. For a possible interpretation of the two symbols next to the 'sepia', see Jasink 2017: 239.

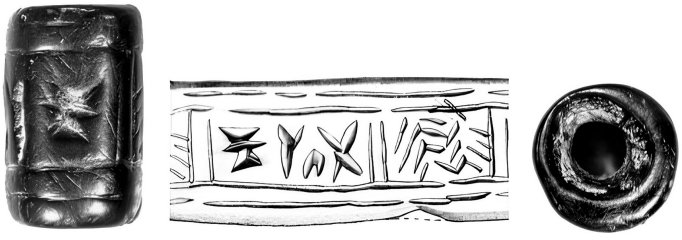


Figure 4.3 Black steatite cylinder in *CMS* XI, 73 (= *CHIC* #201). Images courtesy of *CMS* Heidelberg

Table 4.1 *Seals and sealings with the 'Archanes formula'*

	CHIC no.	*CMS* no.	Material	Shape	Provenance	Date*
1	#202	II.1 394	Bone	2-sided discoid	Archanes	MM IA
2	#252	II.1 393	Bone	3-sided prism (gable)	Archanes	MM IA
3	#315	II.1 391	Bone	Triple-stacked cube	Archanes	MM IA
4	#251	VI 14	Green steatite	3-sided prism (gable)	Archanes	MM I A
5	#313	[S35]	Bone	Cube	Moni Odigitria Ossuary	MM IA
6	#203	VI 13	Green steatite	2-sided discoid	Knossos?	MM IA
7	#201	XI 73	Black steatite	Cylinder	Unknown	MM IA–II?
8	#292	II.2 217	Pseudo-jasper	4-sided prism (with two 'stepped' faces)	Gouves	MM II
9	#205	VII 35	Grey and white agate	Cushion	unknown	MM II–III
10	—	—	Burnt steatite	Irregular cushion with four unequal engraved sides	Bougada Metochi[9]	MM II–III
11	#179	II.8 29	Sealing: bone?	Rectangular seal	Knossos	MM II (*CMS*)

[9] Recently discovered in a sanctuary context at Bougada Metochi above Knossos (Kanta, Palaima and Perna 2023; Kanta 2018; see Civitillo 2021b: 96–7. The seal is a *unicum*: it has two convex faces (which define a 'cushion seal') with, in addition, two smaller side faces; all four faces are engraved. Eleven cushion seals are engraved on both faces (Dionisio, Jasink and Weingarten 2014: 25), only four of them depict Hieroglyphic seals.

Table 4.1 (*cont.*)

	CHIC no.	*CMS* no.	Material	Shape	Provenance	Date*
12	#134	II.8 56	Sealing: soft stone	Cushion	Knossos	MMI–IIA[10]
13	#136	V.S1B 325	Sealing: soft stone	Cushion	Samothrace	MM II–III
14	#135	V.S1B 326	Sealing: soft stone	Cushion	Samothrace	MM II–III
15	#137	V.S1B 327	Sealing: soft stone	Cushion	Samothrace	MM II–III
16	#137*bis*(?)	V.S3 343[11]	Sealing: soft stone	Cushion	Samothrace	MM II–III

(* Dates mostly based on material and style)

4.3 The Cushion Seals

Cushion seals first appear in the Protopalatial period; none are securely dated earlier than MM II. A little less than half are made of soft stones (93), 110 of hard stones; the latter, of course, will have been engraved after the introduction of the horizontal bow lathe (MM II), which allowed Minoan artisans to carve hard stones for the first time.[12] Three cushions engraved with Hieroglyphic signs are of hard stone (Figure 4.4); one of them, from the sanctuary of Juktas,[13] is fragmentary, but two Hieroglyphic symbols may be identified on two different sides: 'trowel' (CH 044) and 'ear of barley(?)' (Evans No. 95).[14]

A fourth seal (Figure 4.5), though quite irregular in shape, from a plot at the modern village of Knossos, Bougada Metochi,[15] is made of burnt steatite (incised on the soft stone that was then heated until transformed into artificial enstatite, with a hardness of 5–6 on the Mohs scale). Not only is the choice of seal shape extremely unusual for Hieroglyphic seals, but their signs and/or group of signs are *also* unusual: three seals belong to an exceptional sub-group, the so-called 'matrix' seals (Table 4.2, 1–3; see Fig. 4.4C), a group of seals that displays symbols or signs which,

[10] MM IIA probable, but an earlier date cannot be excluded (Dionisio, Jasink and Weingarten 2014: S-1, 103 and n. 3).

[11] The diamond-shaped sign preceding CH 019 read as CH 042 by M. Del Freo (2008: 201), who assigned to the sealing the *CHIC* #137*bis*(?) number; reading accepted by Jasink 2009: 109–10 and n. 305, 195.

[12] Dionisio, Jasink and Weingarten 2014: 12–35.

[13] Karetsou and Jasink 2015.

[14] Recognising an 'ear of barley' – instead of a variant of the 'parallel branches' CH 068 – on two seals, #225α and # 272γ, already proposed by Jasink 2009: 100–1.

[15] See n. 9.

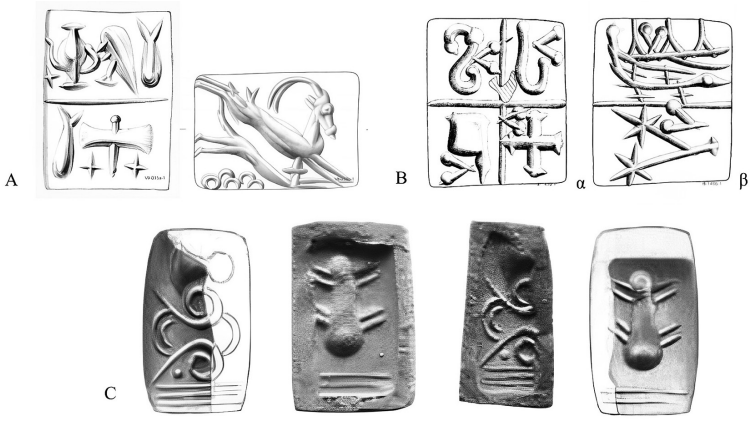


Figure 4.4 Three Hieroglyphic cushions: (A) *CMS* VII, 35 = *CHIC* #205, (B) *CMS* III, 149 = *CHIC* #206), (C) HM 2570 (courtesy of A. Karetsou)

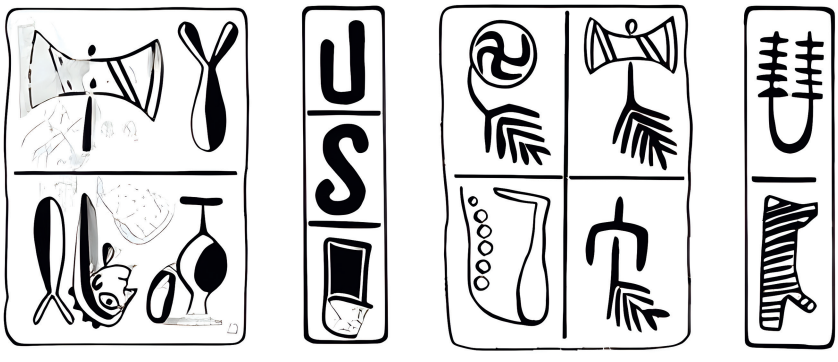


Figure 4.5 KN S (4/4) 01, modified from Kanta–Palaima–Perna 2023: figs. 8c, 24c, 25c, 32c; courtesy of A. Kanta

although on the same seal face, are not necessarily linked: rather, the seal face is split into different panels either by division lines [|] or it is 'stepped' so that the symbols/signs are on different levels which would allow them to be stamped separately. The role of 'matrix' seals in Minoan administration seems beyond doubt.

4.4 Matrix Seals and Matrix Symbols

Three Hieroglyphic cushions are defined as matrix seals[16] two of which display the 'Archanes formula' (nos 1, 3). Another two matrix seals (nos 4, 5) are 4-sided, stepped prisms, one of which (no. 4) also bears this formula. A few Hieroglyphic symbols are

[16] Jasink 2005; 2009: 147–58; 2011.

so often repeated on matrix seals that we may consider them, at least partly, as 'matrix symbols': [sign] | [sign] | + | [sign] | [sign] | [sign] | [sign] | [sign].[17] While some of these symbols are also attested on regular Hieroglyphic seals – where they might have a syllabic, logographic or perhaps fractional value – they seem to have a particular meaning on matrix seals, possibly not unlike that of the 'Archanes formula'. Matrix seals apparently represent an important process within palatial bureaucracy, whether identifying specific sectors of administration, or linked to specific commodities. Two symbols, in particular, [sign] and [sign], are, respectively, very similar to the Linear B ideograms for AES and AROM, while they don't occur on other Hieroglyphic seals! As to CH **181* [sign], attested in the Bougada Metochi matrix seal (KN S (4/4) 01), it has been recognised in *CHIC* as a script-sign only on the Lastros seal (see below), but its occurrence also in Linear A documents reveals its relevance in Minoan administration.

A further symbol, CH 044 [sign] (conventionally called 'trowel'), is not present on the matrix seals, but is attested on the cushion seal from the sanctuary of Juktas and so could be added to the matrix symbols.[18] It is one of the most commonly attested Hieroglyphic signs, in most cases presumably having a syllabographic value. It is part of the two most common Hieroglyphic formulae on seals ('trowel-arrow' [sign][sign] and 'trowel-eye' [sign][sign]).[19] It may not be chance that this sign occurs also on

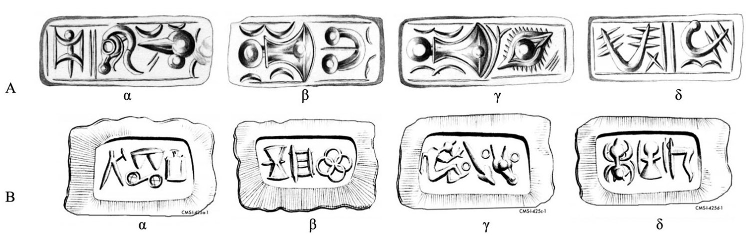


Figure 4.6 Two examples of 4-sided prisms with faces displaying 'strange' modes of partition: (A) jasper prism from Lastros (*CMS* IV, 136 = *CHIC* #305); (B) carnelian prism from Sitia (*CMS* I, 425 = *CHIC* #310)

[17] For a fuller analysis of these symbols, with the exclusion of [sign], see Jasink 2009, especially 147–53. As to the symbol on the lower box of face δ of the Bougada Metochi seal, according to Kanta, Palaima and Perna 2023, it resembles logogram CH **164* / **165* [sign] / [sign], attested only on the bar *CHIC* #48.

[18] A new interpretation of CH 044 [sign] – not as 'trowel' but itself representing a *Petschaft* seal – opens new ways of looking at this symbol (Ferrara and Cristiani 2016).

[19] On the so-called 'formulae', several of which have been partly deconstructed, perhaps to be read as logograms, see Ferrara and Weingarten 2022; for a more general discussion, Jasink 2009: 186–8; Civitillo 2021b and, this volume, Chapter 5.

seals either as a solitary symbol or divided from other symbols by various visual devices.[20] For example, on some hard-stone, 4-sided prisms (Figure 4.6):

1 *CHIC* #305 (*CMS* IV, 136, jasper, 'Lastros'). Figure 4.6A. The formulae trowel-arrow and trowel-eye appear on two separate faces. While trowel-arrow, though surrounded by decoration symbols, are not divided one from the other, trowel-eye are divided by a complex symbol very like CH 031 , probably simply intended to mark a division. On the two other faces, division is at least strongly implied by two bars.[21] Intriguingly, the same two symbols on face δ, CH **180*  and CH **181*  (the latter a matrix sign), occur together again on the Linear A inscription on the ivory circle, KN Zg 58, from the Cult Centre of Knossos.[22]

2 *CHIC* #310 (*CMS* I, 425, carnelian, Sitia). Figure 4.6B. On face γ, the trowel is separated by division lines from the signs on either side: |  |  .[23]

3 *CHIC* #309 (M-P 75/3, jasper, Myrtos-Pyrgos).[24] The first face of this seal seems to divide the 'trowel' from the 'eye' by the insertion of a full-bodied cat sign:  .[25] A second face apparently divides both the initial 'double-axe' sign, CH 042 , and the final 'textile' sign, CH 041 , from the two-signs intermediate sequence – the 'ship' CH 040 and the 'vessel' CH 053 – by sharp division lines.

4 *CHIC* #298 (*CMS* XI, 14, carnelian). The fourth face presents the trowel flanked by eye and arrow in the sequence: ||  ||  , with the trowel separated from eye and arrow by double division lines. In this case, the seal potentially could impress two different 'formulae' by combining either the eye or arrow together with the central 'trowel'.

5 *CHIC* #283 (*CMS* VI, 100, jasper, Candia district). The first face bears both formulae, divided by a central 'double bar':  ||  .

These examples highlight how Hieroglyphic scribes could divide the seal face in order to manipulate special symbols, either as entities on their own (icons, ideograms?) or as phonetic script-signs.

[20] Jasink 2009: 127–8; 155–7.

[21] While on face δ *CHIC* considers the two bars as a dividing symbol, on face α the 'double' bar is numbered as CH 66 ‖, becoming part of a four-sign word.

[22] For a full discussion on both symbols, see Kanta, Palaima and Perna 2023; Kanta *et al*., *forthcoming*.

[23] The first symbol, the 'spider'  , listed in *SM* I as *SM* 85, was eliminated as a Hieroglyphic sign in *CHIC*; restored in Jasink 2009. The remaining sides have normal Hieroglyphic signs but each with the addition of a full-size symbol not usually identified as a script-sign: a 'seated man'  , 'four intersecting circles'  and a closed S-spiral with crosses in its circles.

[24] This seal is discussed in detail in Ferrara, Weingarten and Cadogan 2016.

[25] Restoring the 'cat' and 'cat-mask' to Hieroglyphic script, see Civitillo 2021b.

Table 4.2 *Matrix seals*

	CHIC	*CMS*	Shape	Material	Symbols	Provenance
1	#205	VII no. 35	Cushion	Agate	α. Archanes *formula* (*two squares*) b. Ibex attacked by a dog	Unknown
2	#206	III no. 149	Cushion	Agate	α. 𐄀 |𐄁|𐄂 |𐄃 | (*four squares*) β. 𐄇 |𐄈	Malia?
3			Irregular cushion: with 4 unequal engraved sides	Burnt steatite	α. Archanes *formula* (*two squares*) β. 𐄃 | 𐄀 | 𐄁| (*three squares*) γ. four symbols[26] (*four squares*) δ. 𐄉 | 𐄊 (*two square*s)	Bougada Metochi
4	#292	II.2 no. 217	4-sided stepped prism	Marble	α. part of Archanes *formula* (*stepped face*) β. 𐄀 |𐄂 (*flat face, two squares*) γ. part of Archanes *formula* (*stepped face*) δ. 𐄁 | 𐄃 (*flat face, two squares*)	Gouves
5	#291	II.2 no. 315	4-sided stepped prism	Black steatite	a. lizard (*stepped face*) β. 𐄌 | 𐄁 (*flat face, two squares*) γ. 𐄇 | 𐄂 (*stepped face, two squares*) δ. 𐄃 | 𐄀 (*flat face, two squares*)	Unknown

4.5 Extended Implications of the Hieroglyphic Script

In this section, we discuss two inscribed seals, each of a unique shape: the first is a veined agate (sardonyx), 8-sided prism; the second, of white steatite, is the longest 4-sided prism found to date (an exceptional 3.95 cm). Both seals might best be interpreted not as sphragistic tools to be used within palatial administration but as status-symbols to be worn as luxury ornaments (longitudinally pierced pendants) intended to display social distinction and perhaps also emblems of a different kind of authority. The message of their 'inscriptions', comprising single signs and sign groups (whether it was possible to read them or not), may have been to add prestige to the objects and, thus, to their owners. Both seals have been systematically analysed elsewhere.[27] Consequently, we concentrate here on how the Hieroglyphic signs and symbols – and the

[26] For a likely interpretation, see Kanta, Palaima and Perna 2023. [27] Jasink *forthcoming*.

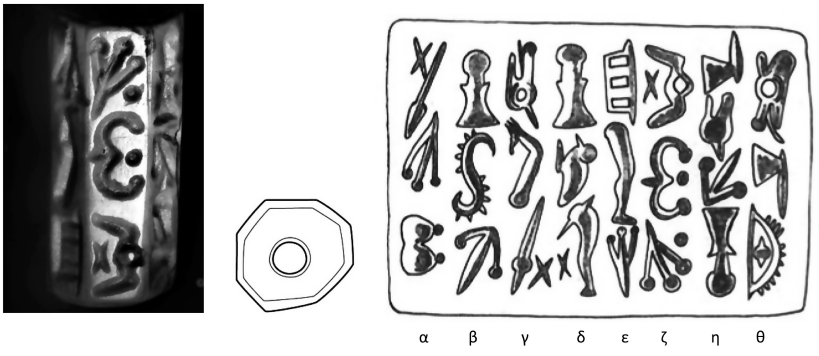


Figure 4.7 Neapolis agate 8-sided seal (*CHIC* #314). Images (left) courtesy of *CMS* Heidelberg

extravagant prismatic shapes – worked together to enhance the value of the object in the eyes of people who saw them.

CHIC #314 = *CMS* VI, 102 (Figure 4.7) presents eight faces completely carved with Hieroglyphic signs, although not all are accepted as such by *CHIC*.[28] Rather, we propose[29] to include both 'spiral' (on face β)[30] and 'duck/seated bird' (on face δ) as Hieroglyphic signs. On the other hand, the symbol (on face θ), taken by *CHIC* as a variant of the eye (CH 005), possibly represents a different symbol, simply not [yet] attested elsewhere in our scanty documentation. Similarly, the 'animal's head' on faces γ, η and θ (all identified as CH 018 in *CHIC*) may be better taken as two different signs: CH 018 , on faces γ and θ[31]– 'wolf's head with protruding tongue' (Evans, *SM* No. 73); and CH 014 or CH 017 , on face η – 'ass' or 'calf's head' (Evans, *SM* No. 68 and No. 64).[32] The engraver of this prism also repeats certain sequences of signs found elsewhere on Hieroglyphic texts, especially the so-called formulae. However, sequences of such formulae are never joined together in this manner on any other Hieroglyphic seal; that is to say, there is no evidence of any logical reciprocal sense to bring them together to make a more ample phrase.

[28] Two symbols do not belong to Hieroglyphic signs recognised in *CHIC*: one is a simple dot carved two times on face ζ, next to H 031 and inside H 092 ; the other, an ***x*** symbol, repeated four times (on faces α, γ, δ, ζ), usually is considered a *stiktogram* (*CHIC*: 445). Possibly both symbols represent simple filling patterns on this seal. However, we don't exclude a meaningful role for the ***x*** symbol as indicating the reading direction of a sign group. Sometimes, it might distinguish what is iconic from what is writing *stricto sensu*, to underline (as it were) that the symbol is not a picture, but a sign.

[29] Jasink 2009: 4–12, 50.

[30] The spiral is adorned with small linear decorative appendices also in other seals, and analogous appendices may be observed also for other symbols, which likewise have not been considered as script-signs (for example, on *CHIC* #300). For a discussion, see Jasink *forthcoming*: n. 4.

[31] We are dealing with the same symbol, now reversed.

[32] For a discussion on this (or these) 'animal's head', see Jasink 2009: 102–4.

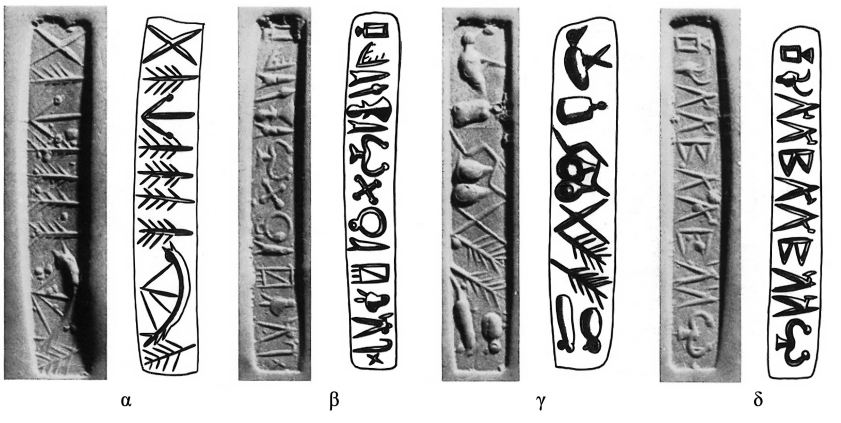


Figure 4.8 4-sided prism NAM Π 8915 (*CHIC* #294)

The four faces of the prism *CHIC* #294 (Figure 4.8) are divided into two slightly wider faces (α and γ) and two slightly narrower faces (β and δ).[33] This differentiation is not haphazard since all symbols on faces β and δ are evidently script-like, while those on α and γ apparently mix script-signs and decorative symbols, the latter quite possibly part of the 'message' but surely not meant to be read. This fourfold repetition of a single symbol on face α – hypothetically identified with the 'tree' CH 025 – may not be meaningless; nor need be the three larger symbols: 'cross' (similar to the stiktogram 'cross' X), 'ship' CH 40 and 'arrow' CH 49 . Could they be explained as ingenious devices to identify the seal's owner in a kind of code or even as a rebus? Arthur Evans certainly thought along these lines: 'the ship and trees seem to point to oversea traffic in timber',[34] a rather more literal interpretation than any we are inclined to. Yet, one could easily imagine such an extravagant elongated prism being made for someone like an ambitious merchant, not involved with a palace, but who wanted a striking pendant seal as a personal mark of his importance.[35] This seems to be the simplest interpretation of faces α and δ. At this point, we would stress how the engraver uses different semantic schemes to produce eye-catching patterns: the composition of face α relies on the visual sequences of 'tree-signs' (of which four in a row obviate any reading); on face δ, anyone who views the seal closely must notice that the series of signs are repeated two by two, whether or not they have any real meaning.

[33] Civitillo 2023b discusses this prism, with a review of previous interpretations, and proposes a new hypothesis.

[34] *SM* I 154, P. 26.

[35] Jasink, *forthcoming*: §3.1.

In conclusion, although so different in material, shape and engraved symbols, the two seals might express the similar patron–artisan relationship whereby the seal's owner commissioned an object to be 'seen' and admired rather than 'read' yet boasting some of the most frequently recurring sign groups and formulae of the Hieroglyphic script. Such extension of the Hieroglyphic script reveals ideological implications beyond the palatial élite and bureaucracy and implies possible relevance for persons outside those circles in Protopalatial society.

4.6 Archanes, Cretan Hieroglyphic and Linear A

The essential contemporaneity of the earliest surviving documents in Cretan Hieroglyphic and Linear A seems extremely probable, as attested for Hieroglyphic on seals and Linear A on administrative and cult documents. On current evidence, the earlier 'Archanes script' represents an archetype for both scripts (Godart, Valério, Flouda, this volume)[36] albeit perhaps scripts created for different purposes. On an island with varying regional traditions, their close connection through the 'Archanes script' may represent the only certain fact.[37]

Between the latest Prepalatial period, when seals were engraved with the 'Archanes script', and MM II, when two distinct writing systems flourished, it appears possible, even likely, that they manifest two distinct approaches to the purpose of writing. On the one hand, the signs of the 'Archanes formula' and the iconic symbols on the 'Archanes Group' seals come together − with some slight variations − in the Cretan Hieroglyphic script. As with the earlier formula itself, signs passed from a purely visual value to a phonetic one even while maintaining an iconic appearance. The resulting words seem to relate to the subjects rather than the objects of the recorded activities; that is, identifying those who operated (or their locations), and not the *chaîne opératoire* of production and distribution in an economic-administrative system.

[36] There is no scholarly consensus on which script came first nor on a possible direct derivation of one of the two scripts from the 'Archanes script' nor whether it is itself Hieroglyphic or Linear A. However, the most recent study concludes that it is unlikely to be a prequel to Linear A religious sequences but rather a manifestation of the iconic glyptic practices of the Hieroglyphic tradition: Ferrara, Montecchi and Valério 2021b (also argued by Flouda 2015b: 65, as a 'formative phase of Cretan Hieroglyphics').

[37] For a clarification of the problem, see Karnava 2016a: 81–2; Perna 2016: 103–6; Anastasiadou 2016a; Decorte 2018a. On some seals, possible overlapping of 'Archanes script' and Minoan Hieroglyphics, cf. Jasink 2011.

Precisely such a focus on economic-administrative matters is, however, seen on the earliest Linear A documents, mainly economic records incised on clay tablets. Unlike Cretan Hieroglyphic, Linear A administration did not require inscribed seals, but rather created seals with high-quality geometric and pictorial images from a rich iconographical repertory. Nonetheless, the 'Archanes formula' sequence of signs survived in Linear A, with the signs assimilated to the more evolved Linear A forms. The formula still maintained a sacral meaning, as can be deduced by the many inscriptions found on libation tables, among the rare surviving non-administrative Linear A documents.

4.7 Sealings and Hieroglyphic Sealed Documents

Sealings stamped by Hieroglyphic seals testify to the use of these seals within administrative systems at Malia (MM IIB), Knossos (MM IIB or IIIA?)[38] and Petras (MM IIB; very fragmentary). With the exception of seals engraved with the so-called two/three-sign 'formulae',[39] there are very few repetitions of 'words' between seals and clay documents.[40] It is also striking that the most common formula, 'trowel-arrow' 044-049, found sixty-one times on seals/sealings, appears just eleven times on clay documents, while no other sphragistic formula appears more than three times on clay documents.[41] This very limited overlap makes it likely that the two/three-sign formulae, whatever they meant in practice, were predominantly the concern of seal-users and not scribes, although the latter were not entirely excluded (see Civitillo, this volume).

When comparing the use of seals and sealing-types from Malia, *Quartier Mu* and *Bâtiment A* (nineteen seals stamped on twenty-three sealings), with those from the Knossos Hieroglyphic Deposit (fifty-four seals on thirty-nine sealings), we note some significant differences.[42]

1 At Malia, there were five direct object sealings, including at least one peg and one pommel – types very well-known from MM IIB Phaistos but not found in the Knossos Hieroglyphic Deposit.

[38] MM IIB, thus late Protopalatial, or MM IIIA, early Neopalatial? New evidence based on the sealings found in Samothrace (Matsas 2009) may decisively tilt the debate on the date of the Knossos Hieroglyphic Deposit.

[39] Partially deconstructed in Ferrara, Weingarten and Cadogan 2016; Ferrara and Cristiani 2016; Ferrara and Weingarten 2022.

[40] Jasink 2002. [41] Civitillo 2016a: 100–8, Table IV.

[42] Weingarten 1995: Figs. 1.1–2, 4.1–4. For the latest review of the shapes of sealed documents, see Karnava 2000: 113–35 and 2016: 68–78.

Figure 4.9 Two examples of *noduli* from Malia, *Quartier Mu* (Mu V 5 and IV 13 respectively). (A) *CMS* II.6, 180 = *CHIC* #126; (B) *CMS* II.6, 179 = *CHIC* #131. Images courtesy of *CMS* Heidelberg

2 At Malia, more than half of the 'sealings' (thirteen of twenty-three) were in fact noduli (Figure 4.9),[43] not sealings at all, but rather a seal-impressed mini-document; cf. just two *noduli* found at contemporary Knossos.
3 Multiple stamping[44] was very rare at Malia, with just one example (Figure 4.10), a single crescent stamped by *CMS* II.6, 195 + 184; however, each seal also appeared alone on crescents: *CMS* II.6, 184 (from a Hieroglyphic 4-sided prism [*CHIC* #172], thrice; *CMS* II.6, 195 (from a figurative soft-stone seal), once. Since these are the *only* crescents found in *Bâtiment A*, we may postulate a connection between crescents and the Multiple Sealing System, at least on this site. Multiple stamping is far more common at Knossos, where twelve of the twenty-nine crescents were stamped by two different seals. Furthermore, twenty-three crescents bore added Hieroglyphic signs ranging from a single logogram to three-, four- and five-sign 'words'; there were no added signs on the Malia sealings.
4 Seven sealings at Knossos (but none at Malia) were of the new flat-based type that sealed leather/parchment documents, a type that will become common in later deposits.[45] Two of them are remarkable:
   a HM 132 is stamped by at least five different seals: a Hieroglyphic 4-sided prism (*CHIC* #157), a 4-sided prism depicting a 'bird-headed' woman and two of the three ring impressions in the Deposit, an oval ring depicting a naturalistic animal-hunt,[46] and a circular ring with geometric design,[47] plus one or two illegible impressions.

[43] In *Quartier Mu* but outside *Bâtiment A*, two more noduli: *CHIC* #126 / *CMS* II.6 180, #131 / *CMS* II.6 179.
[44] Weingarten 1992.
[45] After Weingarten 1995, two more document sealings have been identified at Knossos: *CMS* II.8, 98, 106, both cushion seals with simple geometric motifs.
[46] Becker 2018: A-31. [47] Becker 2018: A-5.

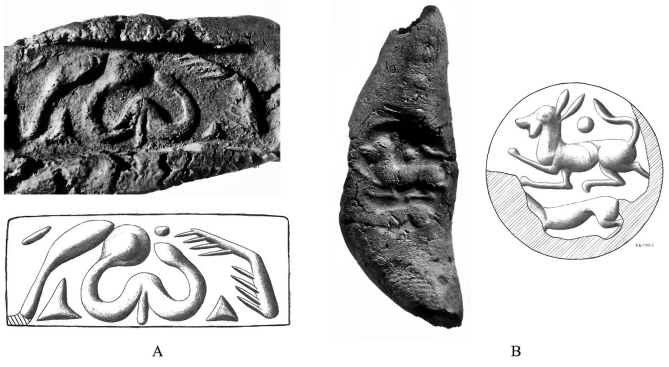


Figure 4.10 Sole example of 'multiple stamping' on crescents at Malia: (A) crescent stamped by a Hieroglyphic prism (*CMS* II.6, 184 = *CHIC* #172) and (B) a figurative seal (*CMS* II.6, 193). Images courtesy of *CMS* Heidelberg

b HM 180 is stamped by three different seals: the so-called 'Prince' (*CMS* II.8, 41); an 'Egyptian-eyed' male head (*CMS* II.8, 42); and an architectonic design impressed by an oval metal/stone ring.[48]

When we next view administrative sealings at Knossos in the Temple Repositories, inscribed seals have vanished, scribes are writing in Linear A and officials are stamping semiliterate roundels. The only trace of the Hieroglyphic system will be the enduring habit of multiple stamping which continued at the Temple Repositories and down (at least at Zakro) into LM IB.

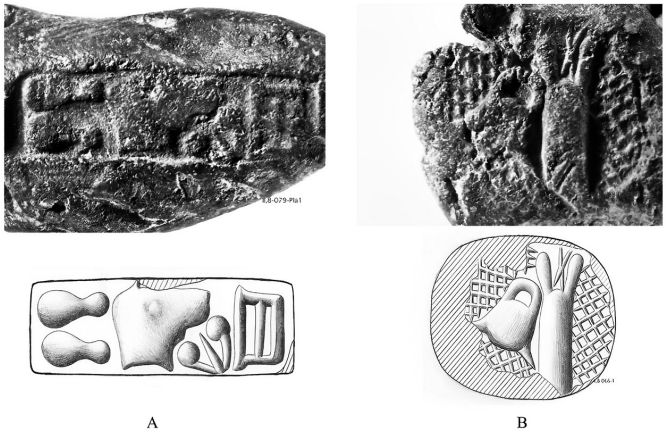
4.8 From the Multi-Faced Seal to the Clay Documents Typical of the Hieroglyphic Script: Bars, Lames ('Blade-Shaped') and Medallions

The document shapes used by Hieroglyphic and Linear A scribes are generally quite different. Hieroglyphic bars and lames appear to have been moulded with local seal-forms in mind, apparently modelled after 2-sided and prismatic seals. Linear A tablets, on the other hand, are shaped more like their contemporary Near-Eastern documents; possibly, along with the tablet shapes, scribes borrowed formatting and concepts of palatial administration as well. Jean-Pierre Olivier[49] recognised

[48] Becker 2018: A-8. [49] Olivier 1994–1995: 266–7.

that the Hieroglyphic administration dealt with very large numbers in recording transactions: probably 'big numbers represent the totals of something(s) which were already added and registered on different documents'.[50] One is tempted to connect this insight with the 'new' MM II flat-based 'document sealings', which first appear in the Knossos Hieroglyphic Deposit, indicating administrative records kept on leather/parchments. Those who sealed these new documents had a penchant for using more naturalistic seals as well as rings, perhaps indicating their higher rank, although Hieroglyphic prisms (Figure 4.11) were not excluded (*CMS* II.8, 79 = *CHIC* #164, *CMS* II.82, 82 = *CHIC* #157).[51] Document sealings would soon be appropriated by Linear A scribes and will be found in all later sealing archives. Knossos scribes were particularly enthusiastic: in the MM IIIB Temple Repositories, along with one Linear A tablet and six roundels, were twenty-seven document sealings (38.5% of seventy nodules).[52]

No Hieroglyphic seals were used in the Temple Repositories, though a few remnants do look back to that earlier time.[53] Rather it is the



A B

Figure 4.11 Knossos Hieroglyphic Deposit: A. *CMS* II.8, 79 = *CHIC* #164 + B. *CMS* II.8, 66 = *CHIC* #176. Note: *CMS* II.8, 79 (*CHIC* #164) (A) is also stamped alone on the flat-based 'document sealing' HMs 195. Images courtesy of *CMS* Heidelberg

[50] Karnava 2000: 153.

[51] *CMS* II.8, 79 = *CHIC* #164, a hard-stone, 4-sided prism, stamped a crescent together with *CMS* II.8, 66 = *CHIC* #176, a Hieroglyphic 3-sided prism; *CMS* II.8, 79, alone, also stamped a 'new' flat-based document sealing, which underlines the unity of the Hieroglyphic deposit (Poursat 1990a).

[52] Weingarten 1989: 42, and table 3.

[53] Three 'Archaic' seals probably originated as single Hieroglyphic signs (CH 116, 94, 107); no less likely is *CMS* II.8, 38, a dog-head with protruding tongue, the Hieroglyph CH 018, with a cross stiktogram in the field to prove it.

Multiple Sealing System that links the Hieroglyphic Deposit, where 46% are multiply stamped, to the Temple Repositories (47%), and possibly, too, the burst of fifteen high-quality metal rings in sphragistic use there, a development presaged in the Hieroglyphic Deposit.

4.9 The Difference Between Hieroglyphic and Linear A Administrative Documents

Hieroglyphic and Linear A administrative documents were composed at much the same time and in apparently analogous administrative contexts, the former at Knossos, Malia and in eastern Crete, the latter at Phaistos. Documents in both scripts were present at MM III(B?) Malia, and possibly at Knossos (MM IIA, SW House: *CHIC* #49), while one or two roundels – a mini-document otherwise associated with Linear A – were found at MM IIB Petras.[54]

The simultaneous existence of two scripts on the island and their possible simultaneous use at three sites is puzzling. One possible explanation, not so far explored, is that the scripts were created for different purposes. There can be little doubt that Linear A was designed specifically to record precise economic information on transactions of inbound or outbound commodities to and from palatial storehouses or workshops, as well as the people directly responsible for those operations. The oldest tablets from Phaistos (MM II) can already be interpreted in this sense. Olivier (1986), noting that Hieroglyphic administrative documents often referred to very large numbers, proposed that they concerned the entire state apparatus, while the much lower numbers on Linear A documents indicated accounts kept by a single building or department. Possibly the differences in numerical entries or even the numerous 'administrative' documents in Cretan Hieroglyphic that lack numbers entirely might not only have measured different things but reflected different ideological concepts that underlay the creation and use of the two scripts. If, as we believe, the Hieroglyphic script was born on seals, having from the start a religious bent and only later expanding into general administrative purposes, those purposes were probably not related to individual storehouses or workshops but to larger complexes (e.g. palace and temple). Such a genesis might also hint at an inherent weakness in Hieroglyphic

[54] Malia 'Hieroglyphic Deposit' has remnants of deposits mixed in a dump (Pelon *et al.* 1986: 701–3). Uncertain if the very fragmentary KN 49 (tablet or 2-sided bar or label?) is indeed written in Linear A (Schoep 2007: 131–4).

data recording, perhaps a reason why the script began to disappear in MM IIIA when Knossos was becoming the pre-eminent palace on Crete. The more efficient Linear A recording system was adopted in its place, spreading throughout the island, to further the bureaucratic and economic needs of palaces and villas. As the use of Cretan Hieroglyphic declined, its prestige inexorably faded and inscribed seals lost their privileged place. High-ranking seal-users chose semi-precious stones and metal rings engraved with subjects more in keeping with images that were soon to appear on palace walls.

CHAPTER 5

FORMS, MATERIALS AND SEQUENCES

Matilde Civitillo

5.1 Introduction

The contexts in which Cretan Hieroglyphic texts were used, stored and displayed, along with the social practices which involved them, have a prominent role in their interpretation process, as was explained in the preceding chapters. Other factors of paramount importance, strictly related to their find contexts, are the materials and formats of the writing supports on which these texts were written, and the different writing techniques employed.[1] In fact, as is well known,[2] the writing support makes a paramount contribution to the significance of what is written on it. As we will see below, in the case of Cretan Hieroglyphic script, particular texts (or even sequences) presuppose specific physical properties of the surface, because – we can assume – the same text on supports with different physical characteristics (from the selection of its form to the materials chosen for its manufacture) may not be able to convey the intended sense; in fact, in some cases, it is the text itself that determines the choice of its writing support. Within the two major categories of inscribed texts, seals and clay documents, hieroglyphic administration relied on very specific formats[3] that would have guided their use and facilitated the unambiguous interpretation of their textual contents, being as important as the written words.[4] Therefore, given that these distinctive document typologies had a precise role in the different steps of the Cretan Hieroglyphic administrative chain, we can establish that formats, materials and written contents, analysed jointly with the places in which the inscribed artefacts were used and stored, work

[1] They were incised with styli in the case of clay documents, clay vases (*CHIC* #316, #324, #327) and a pithos lid (*CHIC* #323); engraved (using the freehand technique or cutting wheels and different drill bits) on soft- and hard-stone seals; painted on a single Chamaizi vase (*CHIC* #326); carved and punched on two metal seals (*CHIC* #192 and #306); carved on a libation table from Malia (*CHIC* #328).

[2] Harris 1995: 113–20. [3] Finlayson 2013.

[4] Cf. Zinna 2004: 88–9: '*Le scritture non hanno alcuna esistenza fuori dal contesto delle altre unità o dal supporto che ne determina l'uso*'; […] '*La scrittura è il punto di contatto tra la memoria interna e intensa del soggetto verso una memoria oggettivata nello spazio esterno ed estenso delle materie*'.

synergically in any comprehensive interpretation of Cretan Hieroglyphic inscriptions.[5] In accordance with this assumption, a careful analysis of the distribution patterns of syllabic sequences on the various document formats that were aimed at performing different specific purposes in Cretan society and administration can help us to define, at least in a broad fashion, the semantic field in which to place some of the most frequently recurring Cretan Hieroglyphic words – albeit that this script remains undeciphered.

5.2 Cretan Hieroglyphic Sequences on Different Document Formats: Distribution, Materials, Forms and Functions

Starting with the most numerous – at least, at the moment – category of inscribed document format, Cretan Hieroglyphic seals, we can group their total number known to date (145; see Index I.1, this volume) into four basic typologies based on their forms: twenty-three 1-sided seals (15 *Petschafte*: *CHIC* #180–93 and P.TSK06/145;[6] five half-ovoid seals: *CHIC* #194–8; two half-cylinders: *CHIC* #199–200); and six 2-sided seals (two discoid seals: *CHIC* #202–3; one amygdaloid seal: *CHIC* #204; two cushion seals: *CHIC* #205–6 and one wedge-shape seal: *CHIC* #207). The corpus of Cretan Hieroglyphic 3- and 4-sided prisms, in turn, consists of 112 seals in total, distributed among seventy-four 3-sided (*CHIC* #208–77, to which we can now add P.TSK14/2604;[7] P.TSK13/1485;[8] MA/V S (1/3) 02[9] and P.TSK12/1249)[10] and thirty-eight 4-sided seals (*CHIC* #278–312, plus P.TSK05/259,[11] VRY S (4/4) 01[12] and P.TSK05/291[13]), inscribed on a differing number of faces. To these, must be added the irregular cushion with four unequal engraved sides recently published by Kanta, Palaima and Perna[14] (KN S (4/4) 01; Jasink and Weingarten, this volume).

As for recorded textual information, the majority of seals we know to date (52%) are inscribed with just one syllabic sequence; 11% have

[5] For some evaluations of the relations between Cretan Hieroglyphic documents, their uses, materials and contents, see Ferrara and Jasink 2017. Cf. Olivier 2000; Poursat 2000; Perna 2014; Jasink 2002.
[6] Krzyszkowska 2012: 148–50, fig. 4.
[7] Krzyszkowska 2017: 149–50, fig. 5; Del Freo 2017: 8 (PE S (1/3) 02).
[8] Krzyszkowska 2017: 149–50, fig. 5; Del Freo 2017: 8 (PE S (1/3) 01), and n. 31.
[9] Del Freo 2012: 6. [10] Krzyszkowska 2017: 151, fig. 6; Del Freo 2017: 8 (PE S (2/3) 01).
[11] Krzyszkowska 2012: 151–2, fig. 6 and n. 24; Del Freo 2017: 7 (PE S (3/4) 01).
[12] Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5; Del Freo 2017: 8–9.
[13] Krzyszkowska 2012: 152–3, n. 30, 31 and fig. 7; Del Freo 2017: 7–8 (PE S (3/4) 02).
[14] Kanta 2018 cat. 305; Kanta, Palaima and Perna 2023.

Table 5.1 *Amount of textual information on seals*

	1F Seals (23)	2F Seals (5)	3S Prisms (74)	4S Prisms (37)	*Varia* (3)	**TOT /143**[15]
Seals with 1 inscribed sequence	#181–201; P.TSK06/145 **(22)**	#202–5 **(5)**	#208–41; #256; P.TSK14/2604; P.TSK13/1485; MA/V S (1/3) 02 **(37)**	#278–82, #292 **(6)**	#313, #315, KN S (4/4) 01 **(3)**	**74 (52%)**
Seals with 2 inscribed sequences	#180 **(1)**	#207 **(1)**	#242–50, #259; P.TSK12/1249 **(11)**	#284–6 **(3)**		16 (11%)
Seals with 3 inscribed sequences			#251–5, #257–8, #260–75, #277 **(25)**	#283, #287–90, #305; P.TSK05/259 **(7)**		31 (22%)
Seals with 4 inscribed sequences			#276[16] **(1)**	#293, #295–6, #299–304, #306–12; VRY S (4/4) 01; P.TSK05/291 **(18)**		19 (13%)
Seals with 5 inscribed sequences				#298 **(1)**		1 (< 1%)
Seals with 6 inscribed sequences				#294? (probably more), #297 **(2)**		2 (1, 3%)
Seals with 11 inscribed sequences					#314	1 (< 1%)

two inscribed sign groups; 13% have four; and 22% have three carved sequences (Table 5.1). The number of inscribed sequences is broadly (but not necessarily) linked with the forms of the seals. On the one hand, not all the prism faces are inscribed; on the other, one single face (of any kind of seal) can be carved with two sequences. Among 3-sided prisms, in fact, thirty-nine have one inscribed side; ten cases have two inscribed sides, and twenty-seven cases have three. Among 4-sided prisms, five seals have just one face inscribed, four have inscriptions on two faces and five are inscribed on three sides, but the majority of them (twenty-two seals out of thirty-eight, i.e. 58%) are inscribed on all

[15] From the total number of 147 seals, we have subtracted #206 (cushion seal) and #291 (stepped 4-sided prism), inscribed with klasmatograms and logograms only.

[16] On its face γ, #276 bears the sequence 005-044-049, for which *CHIC* suggests a reading 044-005 (γ_1) and 044-049 (γ_2) by analogy with #259, #283, #297 and #298.

four sides. Although, in some cases, more than one Cretan Hieroglyphic sequence can be carved on one inscribed face, round, oval or elliptical faces of 1-sided seals are generally carved with just a syllabic sequence (but see #181, bearing two syllabic sequences), whereas 3- and – most of all – 4-sided prisms can host from one to six (or more) sequences. For example, the 4-sided prism #298 is carved with five sequences, #297 with six and #294 with probably even more sign groups. Finally, the only 8-sided prism that has been found to date (#314, from Neapolis) is inscribed on its eight sides with eleven sign groups, and for this reason was described as a 'super stamp' by Olivier.[17]

Very significantly, the number of inscribed faces of prisms and the amount of textual information written on them are linked to the materials employed in making the seals. As extensively demonstrated by Poursat[18] and Karnava,[19] in fact, it is possible to prove the existence of a recurrent correlation between soft and hard stones and the amount of textual information carved on prismatic seals. On the total of sixty-eight 3-faced prisms published in *CHIC* and analysed by these scholars, 53% are made of soft stone and 47% of hard stone; but while soft-stone prisms mainly have hieroglyphic texts on a single face (80%), hard-stone seals are mainly inscribed on three faces (66%). The same picture is confirmed by the analysis of 4-sided prisms: most of them (71%) are engraved on hard stones and, among them, 18 seals (53%) bear inscriptions on all four faces. Of course, hard materials were better suited than soft stones for carving inscriptions and produced sharper clay impressions, but they probably also had an intrinsic value as a luxury product destined to be used or possessed by the upper strata of Cretan society.[20] Moreover, the choice of these materials implied the use of highly sophisticated carving techniques, made possible by the introduction of the fixed lapidary lathe with a fast rotary or horizontal bow-drill,[21] resulting in the manufacture of prestigious inscribed artefacts.

Thus, it seems possible to hypothesise a frame of reference in which a higher amount of textual information (all prism faces inscribed = four or more written sequences) corresponds to more valuable materials and, according to Poursat, to a higher social status of the seal-owners: the more sign groups they were allowed to use administratively, the higher

[17] Olivier 1996c: 4 ('*super tampon*').
[18] Poursat 2000: 189. [19] Karnava 2000: 192–4, tab. 38–9.
[20] For a *comparandum* with the Mesopotamian milieu, cf. Nissen 1977: 20: 'another correlation becomes evident between the cost of a seal and the rank of the seal owner/user within the economic system'.
[21] Krzyszkowska 2005: 83.

would be their position in the administrative machine of Middle Minoan Crete. Conversely, a lower amount of textual information (only one face inscribed) would correspond to less valuable stones and to a lower social status of the seal-owners. In addition to the prisms studied by Poursat and Karnava, there are now the four newly discovered, 3-sided examples already mentioned (P.TSK14/2604; P.TSK13/1485; MA/V S (1/3) 02, P.TSK12/1249) and three 4-sided prisms (P.TSK05/259, VRY S (4/4) 01, P.TSK05/291), the materials of which and the number of sequences engraved on whose faces fit the picture outlined above, with the 4-sided prism coming from Vrysinas being part of the minority 4-sided prism group made of soft stones (Table 5.2). Obviously, we are talking about trends, not about absolute rules, but trends are meaningful.

For their part, while 2-face seals (notably, cushion seals) were made principally of soft stones or bone, 1-face seals (and, most of all, *Petschafte*) were 'among the most carefully and elaborately worked Minoan seals'[22] – in some cases, being real masterpieces – and were probably manufactured as prestige artefacts. Finally, it should be stressed that among seals with only one face inscribed is the only extant inscribed figurative seal (#187, in the form of a pitcher), made of rock crystal and masterfully executed. As for materials, they were predominantly of hard stone and in two cases of metal (#182 and #192). Accordingly, making a joint evaluation of forms, materials and amount of textual information, it seems sufficiently clear that these different seal formats in Middle Minoan Crete were used for different purposes – a likelihood confirmed by their sphragistic use on nodules of different types (*noduli*, direct sealings, crescent-shaped nodules) and other artefacts (mainly, pots[23]) – and

Table 5.2 *Prismatic seals found after* CHIC

3-sided prisms	1/3 faces inscribed	P.TSK14/2604	fine-grained soft to medium-hard stone (limestone?)
		P.TSK13/1485	fine-grained soft to medium-hard stone (limestone?)
		MA/V S (1/3) 02	ivory
	2/3 faces inscribed	P.TSK12/1249	carnelian
4-sided prisms	3/4 faces inscribed	P.TSK05/259	dark green jasper
	4/4 faces inscribed	VRY S (4/4) 01	red serpentine
	3 or 4/4 faces inscribed	P.TSK05/291	mottled jasper

[22] Yule 1980: 89. [23] Civitillo 2016a: 119–33, with previous bibliography.

that they were intended to be written with sequences pertaining to different semantic fields (anthroponyms, titles and administrative/countability/trade terms; *infra*).

Moving on to the second category of Cretan Hieroglyphic texts, of those incised on different formats of clay documents,[24] we can count, to date, 133 total specimens distributed (see Index I.3) among thirty-three crescent-shaped nodules (*CHIC* #001–029, #097 [Ha]; PE Ha 003–005),[25] forty-three medallions (*CHIC* #030–047; #072–084; #098–104 [He]; PE He 006–015),[26] seventeen 2-sided lames (*CHIC* #085–094; #105–110 [Hf]; SY Hf 01),[27] thirty-two 4-sided bars (*CHIC* #049–067; #095–096; #111–118; #121 [Hh]; PE Hh 016–017),[28] five tablets (*CHIC* #068–069; #119–20; #122 [Hi]), two cones (*CHIC* #070–071) and a roundel (PE Hc 002).[29] These document formats were conceived for different kinds of registrations, as recently discussed by Finlayson.[30] Their basic hierarchy seems to have counted, on the one hand, crescent-shaped nodules (the only kind of nodule bearing, in some cases, incised Cretan Hieroglyphic texts along with seal impressions), 2-face lames and medallions. These documents, all pierced, are very likely to have been designed and used for accompanying commodities (hanging from them) that arrived at magazines or storage areas. Crescent-shaped nodules are inscribed on their faces with a different number of sequences, from one to four; they could be inscribed with syllabic sequences only, with logograms identifying products (like **153* on #006, **156* on #007) or with syllabic sequences *and* logograms (cf. #021, bearing a Cretan Hieroglyphic sequence and logogram **153*; #023: a sequence and logogram **195bis*; #024 and #026: a sequence and logogram **153*). They could be stamped by one to three seals, often inscribed in turn with Cretan Hieroglyphic sequences.

Medallions are lentoid-shaped clay disks, generally bearing a sign group on one face and a logogram (**153*, **156*, **166*, **174*) and/or a short inscription plus numerals on the other.[31] Among more complex specimens, for example, #039 (from Knossos) is inscribed with three sequences on face *a* and two sign groups plus numerals on face *b*; #043 has two sequences inscribed on face *a* and another one, plus a logogram (**153*) and numerals, on face *b*. Since medallions record numbered quantities of something, they could have been attached to objects as a

[24] For a detailed analysis, see Karnava 2000: 101–9, 116–56.
[25] Tsipopoulou and Hallager 2010: 155–6. [26] Ibid.: 158–61.
[27] Lebessi, Muhly and Olivier 1995. [28] Tsipopoulou and Hallager 2010: 161, 165.
[29] Ibid.: 157.
[30] Finlayson 2013: 133–5, with previous bibliography; see also Younger 1996–1997 [1998]: 385–400.
[31] Hallager 1996: 33–4.

sort of label. The presence of some medallions in workshops at Malia *Quartier Mu* has suggested to Poursat[32] their function as working documents, associated with commodities delivered, stored or distributed to personnel. Registrations on lames, in turn, written on one or two faces, seem to refer to just one transaction, both when logograms and numerals are specified and when only sign groups are attested on their faces.[33] Finally, information about deliveries might have been written on cones.[34] However, it should be noticed that only two cones (*CHIC* #070 and #071) have survived in our documentation and, in this case as well, they come from Malia; therefore, it is very difficult to reach any consensus on their uses and purposes, at least judging on their format alone.

On the other hand, and at a different textual and archivistic stage, hieroglyphic administration relied on 4-sided bars (pierced and unpierced) and tablets, upon which more complex accounting texts seem to have been compiled. In fact, these document formats carried more textual information than other clay documents seen so far and are formatted in a way that permits the identification of headings, lists of commodities (also indicated with logograms) and numerals. The only clay documents written with a number of sequences between five to ten or, in just one case, greater than ten (#059) are, in fact, 4-sided bars (Table 5.3). Whatever the precise function of pierced 4-sided bars,[35] unpierced ones could have fulfilled an intermediate function between bars and so-called tablets. In fact, Hallager[36] has suggested that bars were basically variants of tablets and, in the same vein, Olivier[37] interpreted them by analogy with Linear B 'palm-leaf' tablets. In fact, just like unpierced 4-sided bars, Cretan Hieroglyphic tablets seem to have been conceived according to a shape and size determined by the specifics

[32] Poursat 1990a: 28–9.

[33] Karnava 2000: 145–9. Contrary to *CHIC* and based on observations of the forms and dimensions of the documents, Karnava has suggested that #90, #105 and #108 are not lames, but a 'tag', a tablet and a palm-leaf shaped document respectively. Apart from the specimen from the sanctuary at Syme (Lebessi, Muhly and Olivier 1995), lames seem to be specific to Malia: until now, in fact, they are absent from both Knossos and Phaistos.

[34] Younger 1996–1997 [1998]: 385–6.

[35] Two main hypotheses have been suggested for the purposes of pierced 4-sided bars: according to Olivier (1994–1995: 268–9), they were stored hanging from some sort of horizontal rod that enabled their sorting; if it were necessary to add additional information to texts written on them, they could be taken down from the rod and inscribed again. According to Younger (1996–1997 [1998]: 385–400), instead, they could have been attached to the commodities themselves, or to boxes that contained them, on the way to central places. These two hypotheses are not necessarily in mutual contradiction, since hanging bars accompanying commodities could have been stored in archives hanging from rods.

[36] Hallager 1996: 33.

[37] Olivier 1994–1995: 268–9.

of their scope: namely, for being stored and not attached to anything. Therefore, as in the case of Linear A and B page-shaped tablets, it has been suggested that they recorded more elaborate data.[38] However, it should be stressed that, among the only five Cretan Hieroglyphic 'tablets' known so far (*CHIC* #068–069, from Knossos; #119–120, from Malia, Palace; #122, from Phaistos), the two coming from the palace at Malia (which distinguishes itself as the place where the largest variety of Cretan Hieroglyphic documents were in use) have thick sides and, just like the bars, are inscribed *on three faces*. Tablets from Phaistos and Knossos are thinner and inscribed on the *recto* only, but their interpretation remains controversial.[39] As a consequence, although we have very scanty documentation to deal with, it seems sufficiently clear that the tablet format is very poorly represented in the Cretan Hieroglyphic corpus, so it appears as a rather unusual document format in the bureaucratic practices that relied on this script (Jasink and Weingarten, this volume).

Table 5.3 *Amount of textual information on clay documents*

	Cones	Crescent-shaped nodules	Medallions	2-sided lames	4-sided bars	Tablets
One or two sequences	#070–071	#001–002, #004–005, #008, #010–017, #019–026; #097	#030–031; #033–037; #041; #044–047; #072–084; #098–104; PE He 006–007; PE He 009–012	#085–089; #090–094; #105–108; #110; SY Hf 01	#051; #055; #060; #064; #066–067; #095; #111; #115–118; #121; Hh 017	#068–069; #122
Three to five sequences		#003, #018, #027–029; PE Hh 003	#032; #038–040; #042–043	#109	#050, #052–054; #057; #065; #114	#119; 120
Six to ten sequences					#049; #056; #058; #061–63; #112–113; PE Hh 016	
More than ten sequences					#059	

[38] Hallager 1996: 31; Younger 1996–1997 [1998]: 386.

[39] It should be noted that some peculiarities they show in the use of some signs have led Karnava (2000: 154–5) to hypothetically suggest that the tablets from Knossos could have been written in Linear A.

5.3 Cretan Hieroglyphic Sequences on Different Media: 'Formulae' and 'Non-Formulaic' Sign Groups

By looking at Cretan Hieroglyphic documents and jointly evaluating forms, materials and the amount and typology of sequences written on them, we can gain some interesting results about the apparently codified patterns of use of specific sequences on precise document formats made of particular materials. In fact, Cretan Hieroglyphic sign groups are unequally distributed not only among clay documents (crescents, medallions, cones, lames, bars, tablets) and seals (and their impressions), but also – as regards seals – among 1- and 2-sided seals and 3-/4-sided prisms. The total number of sequences of two or more signs recurrent on seals, in fact, is 286 (cf. Index I.1 and Index II.a–d), but the total of *different* sequences attested (each counted once) is 143, with a very high degree of word repetition. As may be observed in Index III.a, the sequences attested five or more times[40] are the so-called 'formulae'. This definition was first used by Evans[41] to indicate sequences frequently attested on seals and, in some cases (four, to date: cf. Index III.a), on clay documents as well. According to him, these sign groups would have been used for indicating official titles,[42] ideographically representing designations such as 'warrior and founder' ( , trowel[43] + arrow), 'overseer and builder of palaces' ( , trowel + eye), 'guardian and leader' ( , gate + leg), 'builder or founder' ( , adze + trowel'), etc.[44] In 2000, Poursat recognised eight 'formulae' plus the so-called 'Archanes formula'.

As for the recurrence of these sequences, it seems possible to discern meaningful patterns of attestation on specific seal typologies. In fact, they recur mostly on 3- and 4-faced prisms, as confirmed by the analysis of sealed documents (cf. Index III.a).  (trowel-arrow, CH 044-049), for instance, is the most frequently attested sequence in the entire Cretan Hieroglyphic corpus, with seventy-six total occurrences. It recurs fifty-nine times (78%) on seals, fifty-four of which are on prisms (thirty-five times on 3-sided and nineteen on 4-sided prisms); this medium-specific recurrence is confirmed by its five impressions, all coming from prisms (one from a 3- and four from a 4-sided). Conversely, this 'formula' recurs only three times on 1- and

[40] Olivier 1990: 11–24; Godart 2001: 144. [41] *SM* I: 260.

[42] Ibid., 265: 'groups or single word-signs which, both for their apparent ideographic value and their recurrence on seals, we have good reason for identifying with official titles'.

[43] It should be observed that the so-called 'trowel' sign more probably represents a *Petschaft*: Ferrara and Cristiani 2016.

[44] *SM* I: 268. In some cases, those 'titles' could have been accompanied by signs used as 'canting badges', i.e. 'types parlants' expressing personal badges, actual names or *cognomina* of the seal-owners like, for example, 'Cat', or 'Lion', 'Fish', etc. Cf. *SM* I: 263–72.

2-face seals (#180, #188, #207.β) and two times on the 8-sided prism #316. (trowel-eye, CH 044-005), for its part, recurs on prisms thirty times out of its forty total recurrences, and seven times out of eight on impressions made from this seal typology. As in the case of (trowel-arrow), we can observe a considerably minor use of this 'formula' on 1- and 2-face seals (once, on #194) and on impressions from this seal form (just one, on #138). The same picture is confirmed by other formulae like (038-010), (038-010-031) and (042-038), predominantly attested on prisms and impressions from them and just once on 1-face prisms, while (036-092), (036-092-031), (057-034-056), (046-044) and (042-054-061) are attested on prisms and their impressions *only*. Thus, the surface *along with* the texts carved on it appear to be codified and, therefore, meaningful.

The so-called 'Archanes formula' (42-019-019-095-052)[45] (Valério, Flouda, and Jasink and Weingarten, this volume) is decidedly a case apart. As already observed,[46] its attestation patterns are very specific (and thus, probably, codified) and different from other 'formulae'. This sign group, in fact, is *never* on standard prisms, but on discs (#202), discoids (#203), cushion seals (#205), cubes (#313), a 4-sided stepped prism (#292.α-γ), two gable-shaped prisms (#251.β-α, #252.β-α), a triple-stacked cube (#315) and an irregular cushion with four unequal engraved sides (KN S (4/4) 01),[47] mostly made in soft stone or bone. Its imprints (or its partial imprints) on sealings, made almost exclusively from cushion seals, fits this picture, as well as the typology of impressed sealings, that are not crescent-shape nodules (the main stamping support of prisms engraved with the other 'formulae'),[48] but different kinds of *noduli*.[49] Consequently, in this case as well, the surface *along with* the texts carved on it *and* the materials chosen appear to have been recurrent and codified. Finally, while the other 'formulae' often recur with other 'formulae', the 'Archanes formula' *never* appears together with these special sign groups, showing a completely different use (and, therefore, belonging to a different semantic field).

Coming back to prisms, their main feature, in fact, is to be inscribed with a 'formula' (different from the 'Archanes formula') accompanied or not by other 'formulae' or other sequences (which we refer to as 'non-formulaic' sign groups). On the other hand, the attestation on prisms of sequences *different* from 'formulae' *only* is limited: on

45 For a more appropriate definition of this sequence as 'Archanes inscription', see Karnava 2021: 246.
46 Civitillo 2016b.
47 Kanta 2018 cat. 305; Kanta, Palaima and Perna 2023.
48 Poursat 1989: 221–2; 1990a: 28–9; Weingarten 1995.
49 Civitillo 2016b.

sixteen out of seventy-five 3-sided prisms and in seven out of thirty-five 4-sided prisms considered (see Table 5.4). One-faced seals (*Petschafte*, half-ovoid and half-cylinder seals, a cylinder), instead, mainly have sign groups different from 'formulae', with only five attestations of 'formulae' (and one of the so-called 'Archanes formula' on a cylinder) out of a total of twenty-two seals (cf. Index IV). These five cases apart, the

Table 5.4 *Sequence typologies attested on seals: formulae and non-formulaic sign groups*

	1F Seals (22)	2F Seals (5)	3S Prisms (75)	4S Prisms (35)
Seals with sequences different from 'formulae' only	#182, #183, #184, #185, #186, #187, #189, #190, #191, #192, #193, #196, #197, #198, #200, P.TSK06/145 **(16)**	#204 **(1)**	#224, #225, #236, #239, #241, #234, #222, P.TSK14/2604, P.TSK13/1485, P.TSK12/1249, #243, #245, #259, #271, #273, #256 **(16)**	#280, #282, #289, #304, #306, #307, P.TSK05/291 **(7)**
1 'formula' seals	#181, #188, #194, #195, #201 (Arch. f.) **(5)**	#202, #203, #205 *(in all cases, Arch. f.)* **(3)**	#208, #209, #210, #211, #213, #215, #216, #220, #226, #227, #230, #231, #237, #240, #233, #235, #212, #214, MA/V S (1/3) 02, #229, #238, #217, #219, #221, #228, #223, #218 **(27)**	#278, #281, #279 **(3)**
1 'formula' + non-formulaic sequence/s	*#180* ***(1)***	*#207* ***(1)***	*#209, #246, #242, #251, #252, #270, #267, #255* ***(8)***	*#286, #285, #290, #292* ***(4)***
2 'formulae' seals			#244, #249, #248, #250, #247 **(5)**	#284 **(1)**
2 'formulae' + non-formulaic sequence/s			*#268, #275, #272, #266, #277, #269, #265, #264, #254* ***(9)***	*#283, #287, #305, #300, #301, VRY S (4/4) 01, #312, #303, #296, #297* ***(10)***
3 'formulae' seals			#260, #274, #261, #258, #253, #257, #262, #263 **(8)**	#288, P.TSK05/259 **(2)**
3 'formulae' + non-formulaic sequence/s			*#276* ***(1)***	*#302, #295, #309, #310, #311, #308, #293, #298* ***(8)***
4 'formulae' seals			#299 **(1)**	

sequences inscribed on their surface are, in all cases but one (analysed *infra*), *hapax legomena* and, for this reason, probably express anthroponyms; they could have indicated titles, as already proposed (Jasink and Weingarten, this volume), but we wonder if, in that case, we should have expected a wider attestation of these terms.

To this picture must be added the 8-faced prism #314, with six 'formulae' + four non-formulaic sequences. As for what we can tentatively call the 'syntax' of the sequences written on prisms, it is interesting to observe (cf. Index IV) that, among 'formulae', [hieroglyphs] is attested jointly with [hieroglyphs] twenty times in its thirty total attestations (in #247, #253, #261, #264, #266, #274, #276, #277, #283, #287, #295, #297, #298, #299, #301, #305, #308, #311 and VRY S (4/4) 01, sharing a sign in #298.δ1-δ2; #276.γ e #259.β-α; β-γ). However, while [hieroglyphs] is the 'formula' more widely attested on 3-sided prisms with one side inscribed only (twenty-one times out of twenty-seven attestations of 'formulae' on this kind of seal) and – as we have already seen – made of soft stone, [hieroglyphs] is *never* attested on one-face-inscribed-only seals, but starts to be written on prisms with two (or more) faces inscribed. [hieroglyphs]/[hieroglyphs] (probably inflected),[50] [hieroglyphs] and [hieroglyphs] are rarely attested on prisms with just one face inscribed, recurring primarily on prisms with two or more faces bearing inscriptions (and thus more frequently made of hard stone), along with [hieroglyphs], [hieroglyphs], [hieroglyphs] and [hieroglyphs]. As a consequence, if all-sides-inscribed prisms (made with progressively more valuable materials) can be written with all 'formulae', the other prism typologies (i.e. with fewer than 3 inscribed sides) only attest about half of the formulae. Thus, it seems possible to glimpse a sort of hierarchy in the use of 'formulae'. If [hieroglyphs] is primarily attested on one-face-inscribed-only, 3-sided prisms, when the number of inscribed faces is two or three, this 'formula' is associated principally with [hieroglyphs] (sixteen times out of the total of seventy-three prisms with more than one face inscribed). When this last 'formula' is absent, [hieroglyphs] is associated mainly with [hieroglyphs]/[hieroglyphs] (on #249, 258, 260, 284, 300, 293). If, on the contrary, [hieroglyphs] is absent, [hieroglyphs] is associated (with just one exception: #254) with [hieroglyphs]/[hieroglyphs] and, if another 'formula' is carved, this is [hieroglyphs]/[hieroglyphs]. Finally, when [hieroglyphs] and [hieroglyphs] are absent, the most frequent 'formulae' association is [hieroglyphs]/[hieroglyphs] with [hieroglyphs]/[hieroglyphs] or [hieroglyphs] on six prisms (#248, #257, #265, #269, #272, #275). Only one seal is carved with 'formulae' on all sides (#299, made of green jasper and masterfully carved), which are: [hieroglyphs] - [hieroglyphs] - [hieroglyphs] - [hieroglyphs]. Finally, only #314 (made of agate) has five 'formulae' written on its surface: [hieroglyphs] - [hieroglyphs] - [hieroglyphs] - [hieroglyphs] - <[hieroglyphs]>[hieroglyphs].

[50] On the possibility that these two terms were variants (inflections?) of the same term, see e.g. Olivier 2000: 153–4.

Therefore, it seems conceivable, in accordance with Poursat[51] – albeit with the necessary caution – that the number of faces inscribed and the differences in the appearance of diverse number and typology of 'formulae' according to this criterion, and jointly with the evaluation of the materials chosen, corresponded to the functions that the owner of a seal could perform within the administration, through the active use of these sequences for stamping documents, accessing progressively more complex bureaucratic/administrative responsibilities. The increased recording complexity of 4-sided prisms with all faces inscribed, combined with the more frequent use of them to seal written documents (notably, crescent-shaped nodules), seems to witness a distribution of such artefacts through a hierarchy of administrators operating on MM II–III Crete. All that said, the precise meaning of 'formulae' remains an open question.[52] On the basis of their frequent associations, Olivier[53] hypothesised that  and  could have indicated two extremely popular institutions involved in the same sphere of influence, perhaps mutually complementary, cautiously suggesting an interpretation of them as referring, *exempli gratia*, to the notions of temple/palace. Weingarten,[54] on the other hand, hypothesised that they could indicate two different branches of the palace administration, 'perhaps one as the royal estate, the other as a department of bureaucracy', considering the 'temple' as the place referred to by the so-called 'Archanes formula'.[55]

The analysis of the attestation of these sequences on administrative documents, along with the contextual analysis of sign groups attested in association with them, may provide more glimpses into the evaluation of their possible meanings. In fact, as already said, among 'formulae', four are attested on clay documents as well. More specifically, / (044-049) is attested on eight 4-sided bars (#049.a, #049.b, #050.c, #056.aA, #056.<aB>*, #056.b-e #056.dB, #059.dA) and on two medallions (#040.b1, #042.b1) from Knossos. In its attestations, (044-049) *always* occurs (except in #059.cB, where it is followed by a *lacuna*) before numerals.  (042-054-061) when incised on bars (#050.a, #058.a, #062.[a], #062.cB and #062.*dB**) is also associated (when there are no *lacunae*) with numerals. Finally,  (036-092) is attested on a 2-face lame from Malia (#109.b) along with *hapax* sequences. The attestations of  (044-005) on clay documents provide even more

[51] Poursat 2000: 188–90.

[52] For different hypotheses, cf. Olivier 1990: 17–18; Weingarten 1994: 179–80; 1995: 303; Poursat 2000: 189; Boulotis 2008: 75.

[53] Olivier 1990: 17–18.

[54] Weingarten 1995: 303.

[55] In the same vein, for an interpretation of this 'formula' as referring to something like 'offerings/things delivered to the deity', cf. Civitillo 2016b with bibliography.

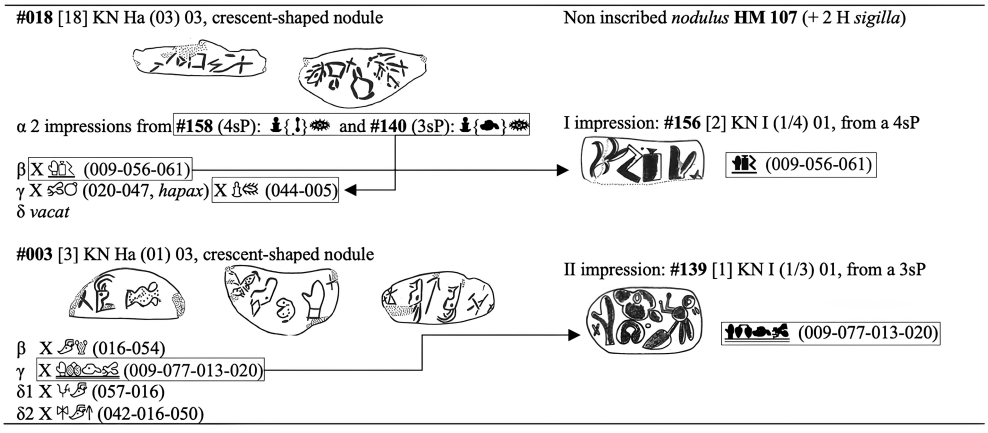


Figure 5.1 *CHIC* #018, #003 and HM 107

stimulus for a general discussion on these special sequences. Aside from the 4-sided bar #059.aA, where it is followed by numerals, it was incised on the crescent-shaped nodule #018.γ that was, in turn, stamped from two different prisms with the same 'formula' (#140 and #158; see Figure 5.1).

Based on this evidence, Younger[56] – rightly, in our opinion – hypothesises that this sequence 'actually means something like "received"', whereas its impression on the nodule 'authenticates and verifies the incised statement'. The same authentication value could have been expressed also by (044-049), when stamped on sealings, always from 4-sided prisms (#157, #159, #161, #170). Therefore, if 'formulae' would belong to a shared administrative/transactional vocabulary, we can tentatively hypothesise – in the same vein as Poursat[57] – that the progressively more complex administrative tasks assigned to the owners of seals with a different number of inscribed 'formulae' could have been related to things checked or to be checked, paid/delivered/received or to be paid/delivered/received, sent or to be sent, used or to be used for something, and the like. Consequently, we may imagine a hierarchy of officials who could operate or validate different transactions, of increasing complexity, for which precise 'formulae' were needed. The hypothesis that they could refer to titles[58] could also fit with their pattern of attestations on clay documents, where they might have indicated the recipients of the things/operations registered – which is why they were followed by numerals. However, this does not seem to take adequate account of the evidence that, as we have seen,

[56] Younger 1996–1997 [1998]: 391–2. [57] Poursat 2000. [58] Finlayson 2013: 133–4.

one or more 'formulae' often occur together on the same prisms; at least, this hypothesis would require a precise explanation for the combined presence on prisms of what would appear to be a 'hierarchy' of titles, but with different combinations.[59]

The information expressed by 'formulae' could have been completed, on prisms, using other terms. The latter appear in most of the cases of *hapax legomena* (see Index IV) and, for this reason, it is generally agreed that they represent anthroponyms[60] (or the names of families/clans of the seal-owners) or titles; this last hypothesis, however, seems – again – more uncertain for *hapax* words. Titles would more probably have been expressed, in our opinion, by sequences attested more than one time on seals and sealings like, for example,  (044-036-018) (Index III.b). This word is attested on three 3-sided prisms: P.TSK12/1249.α (in association, on face β, with  , 077-051 ><, *hapax*); P.TSK14/2604.β (on the only inscribed face of the seal); and #255.α, from Crete, in association with a 'formula' on face γ ( , 046-044) and a very long *hapax* sequence (if they are not two sequences written in *scriptio continua*) on face β, *hapax*. Finally, the same sequence recurs on face *c* of #300, from Crete (?), in association with two 'formulae' ( , 044-049, on face *a*, and  , 038-010-031, on face *b*) and one *hapax* on face *d*. On these two seals we can hypothesise the presence of two administrative/bureaucratic terms ('formulae'), a title ( , 044-036-018) and an anthroponym (the *hapax* sequence). Unfortunately,  (044-036-018) is the only sequence different from 'formulae' attested more than one time on seals which we have detected so far; consequently, our hypothesis has to be taken as just a suggestion.

In turn, it seems possible to hypothesise that other sequences, different from 'formulae', attested more than one time on seals/sealings *and* on clay documents,[61] could have expressed less common bureaucratic, economic or transactional terms (see Table 5.5).

Looking again at Figure 5.1, it seems very interesting that face β of the crescent #018 has the engraved sequence X  (009-056-061), which recurs on a non-inscribed Knossian *nodulus* (HM 107) impressed from a 4-sided prism (#156). This *nodulus* is stamped with a second impression as well, from a 3-sided prism (#139), inscribed

[59] On this point, discussing his own hypothesis, see Olivier 1990: 18: 'something like "palace" and "temple" would not be unsuitable, but it would perhaps be difficult to explain their conjunction'.

[60] Cf. Karnava 2000, vol. I: 200: sequences different from 'formulae' on seals would designate 'personal names, indicating perhaps the owner of the seal'. 'The frequent sign group [sc. 'formulae'] seems to intermingle randomly and they do not attach any special characteristics to a seal. What is special and particular are actually the non-frequent sign groups.'

[61] For a more detailed account, see Karnava 2000: 60–2; Olivier 1990; 2000; 2010.

Table 5.5 *Sequences attested on seals/sealings and on clay documents (selected most secure cases)*

1		006-057-092 o[62]	#243.β (3-sided prism from central Crete)
		]oo6-057-092 ><	#063.a1 (4-sided bar from Knossos)
2		011-056 ><[63]	#297.γ (4-sided prism from central Crete)
		011-056	#024.γ (crescent-shaped nodule from Knossos)
		] 011-056[><	#015.γ (crescent-shaped nodule from Knossos)
3		009-056-061[64]	#156 (impression from a 4-sided prism on a non-inscribed *nodulus* from Knossos)
		009-056-061	#018.β (crescent-shaped nodule from Knossos)
4		009-077-013-020	#139 (impression from a 3-sided prism on a *nodulus* from Knossos)
		009-077-013-020	#003.γ (crescent-shaped nodule from Knossos)
5		031-021-061[65]	#149 (impression on a crescent-shaped nodule from a 3-sided prism from Malia); #197 (half-ovoid seal from Malia); P.TSK05/291 (4-sided prism from Petras)
		031-021-061	#059.cB (4-sided bar from Knossos)
6		056-047-031	#166 (impression on a crescent-shaped nodule from a 4-sided prism from Knossos)
		056-047-031	#032.a (medallion from Knossos)
7		057-023[66]	#243.γ (3-sided prism from Crete)
		057-023	#049.b (4-sided bar from Knossos)
		057-023-**051**	#039.b (medallion from Knossos)

with the sequence X  (009-077-013-020), in turn attested on a crescent-shaped nodule from Knossos (#003.γ), thus signalling another 'bridge' between seals and clay documents. Another link between seals and crescents is given by the sequence  ></  (011-056), attested in #297.γ (4-sided prism, all sides inscribed, from central Crete), in association with 'formulae' 044-049 and 044-005, and 3 *hapax*: 050-019 ><, 038-008 >< and 036-010 >< (Table 5.5 and Figure 5.2). In #024 (crescent-shaped nodule from Knossos), it is incised on face γ, while face δ is inscribed with logogram **153*; on face α, there are two impressions from the same 3-sided prism (#142), bearing the sequence 018-039-005 o, *hapax*. The same sequence is possibly attested, in the form]  >< (] 011-056[><), on #015.γ (crescent-shaped nodule from Knossos), which on face α bears an impression from a 4-sided prism (#167) carved with the sequence 049-070-070 ><. It has to be observed

[62] *SM* I: 261, fig. 116g; Olivier 2010: 289. [63] Olivier 1990: 16, b.4, 19; Olivier 2010: 289.
[64] Olivier 1995: 180 and n. 39; Olivier 2010: 289. [65] Ibid. [66] Olivier 1990: 16, b.3, 19.

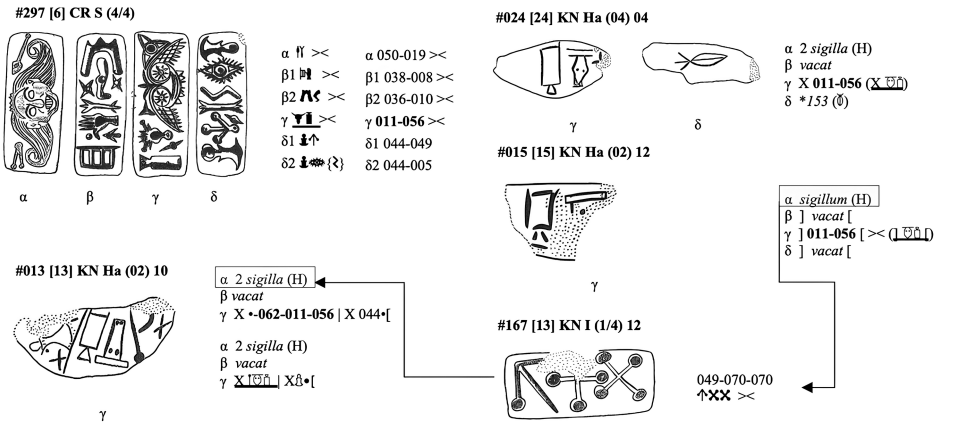


Figure 5.2 Attestations of sequence 011-056

that the same seal was used to stamp side α of another crescent-shaped seal from Knossos, #013. On face γ, this nodule is inscribed with the sequence X •-062-011-056 (X •), followed by one of the two 'formulae' 044-049 or 044-005. If •-062-011-056 (•) could be interpreted as the same word present in #015.γ ( ) – but here attested with a 'prefix' – it may be possible to recognise a precise motivation for stamping the sign group 049-070-70 on crescents on which the sequences 011-056/•-062-011-056 are incised; in other words, this repetition has to be somehow meaningful, although impossible to define, based on our current knowledge.

Another four Cretan Hieroglyphic sequences recur on seals, on bars and on medallions. The first is /] (006-057-092), attested on #243.β (3-sided prism, 2/3 inscribed, from central Crete), in association with a *hapax* (057-023 ><), and on #063.a1 (4-sided bar from Knossos), in association with the 'formula' 044-049 and four *hapax*:]041-006[67],]*o57*-053 ><, [ ]049-061 >< and]053-006[><. /(056-047-031), in turn, is attested as an impression from a 4-sided prism (#166) on a crescent inscribed on face γ with the sequence 049-049⟦*028*⟧, *hapax*, and bearing a second impression (#156) with the 'formula'] (044-005). On the medallion #032.a, from Knossos, it is followed by the sequence 050-016, seemingly a *hapax* (but see]050-016 >? on crescent #002.δ from Knossos), and, on line *b*, by a *hapax*. Finally, (057-023) is inscribed on face γ of a 3-sided prism from Crete (#243) in association with the (006-057-092) just mentioned. On

[67] But see 049-041-006-025 on #316 and 049-041-006-*057* on #327.

the 4-sided bar #049, where it is attested on line *b*, it recurs with the 'formula' (044-049), attested twice, and seven *hapax*. Lastly, its possible 'inflected' form (057-023-051) is written on a medallion from Knossos (#039.b) in association with three *hapax* (names of products, toponyms, *alia*?) and with a sequence (043-070) recurrent on another medallion from the same site (#042.a).

Aside from these sequences, the best attested (and most interesting) non-formulaic sequence among those listed in Table 5.5 is / (031-021-061) (see Figure 5.3). It recurs on different seal typologies: a half-ovoid seal (#197); a 4-sided prism – in association with three *hapax legomena* – (P.TSK05/291); and an impression on a crescent-shaped nodule from a 3-sided prism (#149). This evidence seems to prove that on 1-face seals, in addition to anthroponyms and alongside rare 'formulae', terms pertaining to administrative/accounting vocabulary could have been written as well. In fact, recurs, along with 'formulae' and other sequences, on a very interesting 4-sided bar from Knossos, #059.cB, where it is followed by the 'formula' , 044-049. The importance of this bar lies in the fact that it is inscribed with four terms (044-005, 031-021-061, 044-049, 072-049) attested on other document formats as well. But, more significantly, it bears three of the four sequences attested in a very interesting 4-sided prism from the Minoan peak sanctuary at Vrysinas,[68] namely 'formulae' 044-049 (on *cB* and *dA*, where it is followed by the numeral 6̣) and 044-005 (in *aA*, followed by 40[). Moreover, as remarked by Del Freo (2017, 8–9), on line *dA* the sequence 072-049 (followed by the numeral 11 and immediately preceding 044-049) can match the sequence 049-072 >< (thus readable as 072-049) carved on face γ of this same seal. This word is attested, in addition, on a medallion (#034.b, followed by the numeral 10) and on two 4-sided bars (#059, followed by the numeral 11 and #065.d, followed by 1), all coming from Knossos. Finally, on face δ of this Vrysinas prism recurs the less frequent 'formula' (042-038), attested as an impression on a flat-based nodule ('document sealings') from a 3- or 4-sided prism (#154) from Malia; on a 3-sided prism from Pinakiano, along with a *hapax* term (031-006-034) and the two 'formulae' 044-049 and 044-005 (sharing one sign); on one 4-sided prism from Sitia, in association with two 'formulae' (on face α and on face γ); and, on face β, with a sequence (><, *017*-050 ><) in turn attested on a 3-sided prism from Malia (#234.α), as well as on another 4-sided prism from Sitia (#310.β).

This 4-sided prism from Vrisynas is thus a very important document, because for the first time we have a seal inscribed on all faces with

[68] Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5.

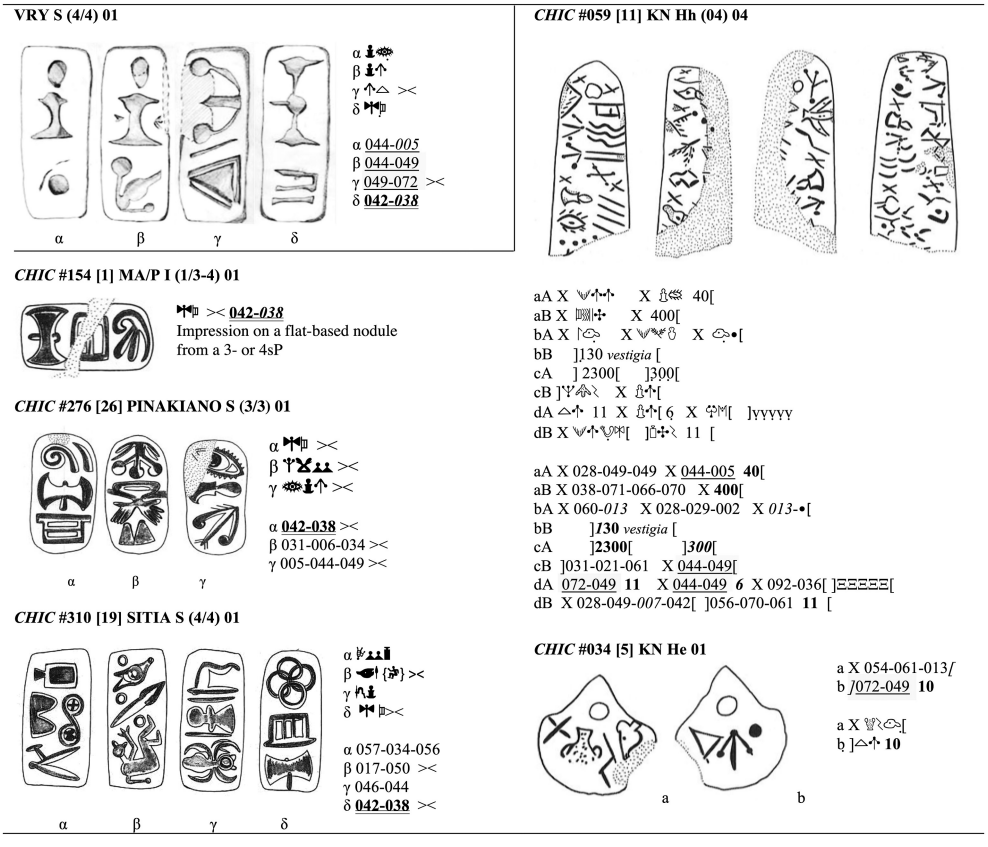


Figure 5.3 Sequence cross-links between different Cretan Hieroglyphic document formats

sequences *all* recurring on clay documents: three have a precise correspondence with a Knossian bar (#059) and the last (042-038) is recurrent at Malia, Pinakiano and Sitia, marking the notable *koine* of the vocabulary (and the associated practices) in use in 'Cretan Hieroglyphic' Crete. Moreover, its find context confirms the use of writing for administrative purposes (aside from palatial and palatial annexed archives and bureaux) in religious contexts, as the 2-face lame from Kato Syme and, more recently, the Bougada Metochi[69] seal had already proven.

In our opinion, the use of these sequences on seals, sealings and clay documents demonstrates that the words they expressed were somehow connected to each other, tentatively belonging to a shared transactional/bureaucratic vocabulary and, as such, to be put in the semantic field

[69] Kanta 2018 cat. 305; Kanta, Palaima and Perna 2023.

of administration or countability: they could have been incised on a clay document with administrative use (perhaps along with toponyms, anthroponyms, product names, trade names, etc.), written on crescent-shaped nodules (where, we can assume, transactions with administrative/accounting scope were registered) or impressed on them using (in the absolute majority of the cases) prismatic seals, where they may have been accompanied by anthroponyms, titles and other administrative terms. Thus, even if these sequences that link different document formats are limited, the association of them with other sign groups in their attestation context can, in our opinion, be meaningful, showing a complex web of cross-links between different typologies of Cretan Hieroglyphic documents.

Other sequences possibly attested on different document formats, but in a form that we would call generically 'inflected' (or being prefixed or suffixed), are listed in Table 5.6. These terms, along with a good number of less doubtful ones,[70] need to be studied more systematically and will find more suitable space in another publication.

These sequences confirm and reinforce the relationships already detected between different formats of clay documents and between

Table 5.6 *Sequences attested on seals/sealings and on clay documents with a different 'inflected' form*

1		056-070	#118.a (4sB from Malia)
		056-070-**040**	#298.α (4sP from Crete)
		056-070-**070**	#061.e (4sB from Knossos)
2		008-019-**036**	#282.α (4sP from Pyrgos)
		008-019-**013**	#120 v.A (tablet from Malia)
3		008-056-**070**	#132 (impression from 1fS from Malia)
		008-056-**013**	#076.a (medallion from Malia)
4		019-040-**013**	#192 (*Petschaft* from Neapolis)
		019-040-**061**	#049.c (4sB from Knossos)
5		047-070[71]	#286.β (4sP from Malia)
		047-070-**031**	#058.b (4sB from Knossos)
6		049-041-006-025[72]	#316 (Chamaizi vase from Malia)
		049-041-006-*057*	#327 (Chamaizi vase from Malia)
7		076-013[73]	#312.δ (4sP from Xida)
		076-013-**031** ><	#304.δ (4sP from Crete?)
8		**054**-005-050	#273.α (3sP from Mirabello)
		070-005-050	#273.γ (3sP from Mirabello)

[70] Olivier 2000. [71] Ibid.: 167, n. 31. [72] Ibid.: 152, who thinks, in this case, 'à des doublets'.
[73] Ibid.: 167, n. 31.

them and seals. Two cases merit special attention. The repetition on two vases of possibly the same word in an 'inflected' form (049-041-006-025/*057*, no. 6) could be a very interesting clue regarding the relatedness of inscriptions recurring on these special objects, the Chamaizi juglets, that were possibly involved in ritual and collective performances.[74] Therefore, we can tentatively hypothesise that the inscriptions on their shoulders may include personal names, dedicatory inscriptions to a deity or even theonyms. As for no. 7, we would merely point out, as a further possible link between Cretan Hieroglyphic sequences recurrent on different document formats, that syllabogram 031 ( ) is attested as the third sign of five pairs of sequences[75], which would thus be 'inflected' or suffixed: 036-092/036-092-031, / ; 038-10/038-010-031, / ; 042-019/042-019-031, / ; 047-070 ></047-070-031, ></ ; 076-013/076-013-03 ><, / ><; for all, cf. Civitillo, Appendix, this volume.

But what, finally, about 4-sided prisms inscribed on all faces with sequences *different* from 'formulae' (cf. Index IV)? Among 3-sided prisms, only two bear non-formulaic sequences written on all their sides: #271 and #272. The first, made of green steatite (an infrequent case of the use of a soft stone for prisms with all inscribed sides), bears three *hapax* sequences and the second, in green jasper, is inscribed with a *hapax* sequence and two possibly related words (054-005-050/070-005-050, >< and ><) on sides α and γ (Table 5.6, no. 8). This would be the only instance of a term written in two forms ('inflected', prefixed or suffixed depending on the direction of writing) on two different sides of the same seal. What their 'meaning' may have been is difficult to establish. Among 4-sided prisms, four have all faces inscribed with sequences different from 'formulae': *CHIC* #304, #306, #307 and P.TSK05/291. #307 is made of soft stone (black steatite), while #304 is made of green jasper; P.TSK05/291 is made of unusual mottled jasper, claret-red and yellow; and #306 is made of gold. Even if our evidence is very scanty, it is very interesting that the only golden prism we have, to date, is inscribed only with sequences different from 'formulae' (anthroponyms? titles?). Moreover, we wonder if it could be mere chance that this seal was engraved with two different *hapax* sequences which used two of the four 'potential' syllabograms (*014* { } and *076* { }) detected by the *CHIC* author.[76] Are they just a testimony of more conservative graphic variants in use on the glyptic surface or could they have been consciously chosen as precise graphic variants, perhaps

74 Poursat 2009: 76. 75 See, for example, Karnava 2000: 68; Olivier 2000; Facchetti 2005; 2008.
76 *CHIC*: 13–14; cf. Civitillo, Appendix, this volume.

considered more prestigious and, thus, more suited for a high-culture artefact and for the content of the inscription engraved on it?

Turning to the amount and typology of textual information on clay documents (Index I.3 and Index II.1), they register 270 sequences in total but 248 different sign groups (each counted *once*), with only eleven words repeated two or more times (Table 5.7). The word more frequently repeated is, again, 𐄁•𐄀• (044-049), recurring twelve times at Knossos (two on medallions and ten on 4-sided bars).

In general terms, these sequences reiterate the connections observed already between bars and medallions; if 022-056-070-061, attested on 4-sided bar #059.*dB** from Knossos, is incised on cone #071 from Malia as well, that would establish a further connection between bars and the very peculiar documents that the cones are. Finally, it is interesting to observe that two of the listed sequences (nos 6 and 10) are both incised on the two tablets from Malia, #119 and #120. Therefore, based

Table 5.7 *Sequences attested two or more times on clay documents (identical sequences only)*

1	] 𐄇 𐄉	]*042*-054-061[77]	#062.cB, #062.*dB* In #062.*bB* a reading]•𐄉 (]•-054-61) is possible as well	4sB	KN
2	𐄌•𐄐	022-056-070-061	#071	cone	MA/M
	Possibly attested in				
	#059.*dB**: [ ] 𐄌•𐄐	[ ]056-070-061	#059.*dB**	4sB	KN
3	𐄇𐄉	042-054-061	#037.a	medallion	KN
			#050.a, #058.a	4sB	KN
4	𐄋𐄐	043-070	#039.a, #042.a **(5)**	medallions	KN
5	𐄁•𐄀•	044-049	#040.b1, #042.b1 #049.a, #049.b, #050.c, #056.aA, #056.<aB>*, #056.b-e, #056.dB, #059.dA;	medallions 4sB	KN KN
	𐄁•𐄀[	044-049[	#059.cB, #063.a2 (15)		
6	𐄀𐄂𐄌	050-057-056	#119.*r*., #120.*v*.B	tablets	MA/P
7	𐄂𐄎•𐄀•	057-013-049	#038.b	medallion	KN
			#054.a	4sB	KN
8	𐄐𐄁𐄃	070-031-019	#054.e, #056.aA	4sB	KN
9	𐄆•𐄀•	072-049	#034.b	medallion	KN
			#059.dA, #065.d	4sB	KN
10	𐄍•𐄀•𐄎	073-049-013	#119.*r*., #120.*r*.A	tablets	MA/P
11	𐄋𐄁	092-031	#065.b, #067.c	4sB	KN

[77] Cf. *009*-054-061-•[and 042-054-061 as well.

on the picture outlined above, it seems persuasive to identify a first level in the administration in which information was approved through the impression of prisms on crescent-shaped nodules; a second level, in which crescent-shaped nodules and medallions worked as kinds of provisional documents; and a third level in which the written information from these two classes of documents would have been included on (recapitulating?) clay bars (and tablets).

5.4 Concluding Remarks

In conclusion, the evidence we have from seals and sealings, jointly evaluating glyptic forms, the amount and typology ('formulae' or other sequences) of textual information and materials chosen for seal manufacture, seems to fit – with the necessary caution – a general picture in which *Petschafte* and other 1-face seals, often made of hard stone and exquisitely engraved, would have been the format *par excellence* generally intended to be inscribed with one sequence, predominantly (except the rare cases in which a 'formula' is written on their surface) *hapax* and, thus, probably with anthroponyms – or titles. It seems possible that *Petschafte* inherited their uses and their ideological connotations from the Prepalatial period, when they were probably designed as emblematic devices meant to enhance the social *status* (or the clan, the family, the affiliation) of their owners, being 'signs' of social rank in themselves.[78] Two-sided seals in (mainly) soft stone would have been the support *par excellence* of the so-called 'Archanes formula', playing a special and apparently codified role in an administrative sphere different from that in which other 'formulae' played their role. During MM II, with the rise of more complex administrative procedures mainly based on hieroglyphic texts, new seal-forms were invented. Three- and 4-sided prisms, in fact, were used by the new bureaucracies and were closely tied to the running of the administration, as demonstrated by their sphragistic use principally on crescent-shaped prisms, themselves inscribed. With their plain and rectangular faces, prisms (no longer concerned with recording unique non-formulaic sequences) were functional for bearing as many inscriptions as possible, or as necessary, with texts written with a horizontal alignment, so that they were easy to read when impressed on clay.[79] The number of inscribed sequences on their surface was generally (with some exceptions that do not prevent us from identifying recurring trends) proportional to progressively more

[78] Ferrara and Jasink 2017. [79] Flouda 2013: 155.

prestigious materials, possibly reflecting the *status* of seal-owners. In fact, they were (with few exceptions) inscribed with at least one 'formula', completed by other 'formulae' or with sequences interpretable as less frequent economic/administrative terms (when they are not *hapax* and are attested on clay documents as well), anthroponyms (*hapax*) or titles (more difficult to identify). Within this general framework, the few 4-sided prisms made of semi-precious stones or even gold we have to date, inscribed with sequences different from 'formulae', could have been associated with the highest levels of Minoan society. In fact, if the basic administrative operation would have been performed using 'formula'  (044-049) – for this reason written on less valuable seals – tasks of major responsibility for seal-owners would have corresponded to the use, by them, of a greater number of 'formulae' (up to five in 'super-seal' #314). At the top of Minoan society, we could imagine seal-owners with their names and/or titles inscribed on particularly prestigious artefacts, just like the above-mentioned golden prisms, once this format had spread and, with its many faces, had proved more advantageous than *Petschafte* for longer written texts. However, there is no reason to exclude the possibility that Minoan administrators could have possessed more than one seal of different shapes, to perform different functions: namely, running administrative operations and/or stamping their names or titles on different sealed supports intended for different purposes.

Clay documents (most of all, 4-sided bars), for their part, were conceived as tools for recording ephemeral but more complex, recapitulatory administrative information, being written with the highest number of Cretan Hieroglyphic sequences we are aware of (most of all, again, 4-sided bars), along with logograms and numerals, following the different steps of the Minoan administrative machine. More fragile but re-usable, with very different claims in terms of durability, ideological implications and prestige than seals, some (unfortunately quite few) sequences they are inscribed with reveal an intricate web of connections between them *and* seals and sealings, in the complex running of Cretan Hieroglyphic administration. These links (to be further explored) could shed some light on the – difficult – reconstruction of the bureaucratic chain of Middle Minoan Crete; but, primarily, they reveal a precisely codified set of written documents ('messengers' of the written words)[80] in which textual contents, formats and materials were consistently selected by the users of Cretan Hieroglyphic script.

[80] According to Krämer (2008: 9–19), the medium of a message transforms the content and, for this reason, can be compared to the role of the messenger.

CHAPTER 6

SCRIBAL PRACTICES, SYNTAX AND MORPHOLOGY

Philippa M. Steele

6.1 Introduction

As other contributions to this volume show, it is quite clear that the rise of what we call Cretan Hieroglyphic is intrinsically linked with seals and sealing practices (Jasink and Weingarten, Valério and Flouda, this volume). The very genesis of the writing system has to be understood as a development from practices that began as pre-literate or proto-literate, stemming from iconographic repertoires where images themselves had systematic meanings, and moving from there towards an adaptable means of representing language. This system (or something closely linked with it) also began to appear incised directly on clay documents at an early stage, marking a new and fundamentally different means of recording. The coherence of what we call Cretan Hieroglyphic, appearing in these two contexts, may indeed be questioned – although there is considerable merit in attempting to reconcile the sets of signs found in each tradition to attempt to gain a more holistic view of the properties of this relatively poorly attested branch of the Aegean scripts (on these issues, see further Meissner and Salgarella, this volume). The attestation of sequences of signs that appear on both seals and clay documents indeed points towards these two types of writing support, and their inscriptions, existing within the same sets of administrative practices (also Civitillo, this volume).

The present contribution begins by considering the question of what happens as the system develops out of sealing practices and starts to be used on clay documents, first from a material and then from a cognitive perspective. This involves looking at the way that this new usage affects the system itself, as well as the practices surrounding and encompassing writing. Moving on from this consideration of changing scribal practices, we then turn to questions surrounding the language or languages underlying Cretan Hieroglyphic writing: given that the move to recording information on clay documents leads to some longer and more complex inscriptions, are we able to identify patterns that reveal linguistic features? As we will see, the potential for identifying such features is quite severely limited, if not entirely out of reach (also Davis, this volume, on related questions).

6.2 A 'Clay Turn'? Material Perspectives[1]

Considerations of the origins of Cretan Hieroglyphic writing have generally looked for its genesis in seals and the practices associated with them, growing out of a long-standing glyptic tradition. This would involve a progressive development of sematographic signs drawn from the glyptic repertoire, and surfacing in occasional archaeological finds that pre-date what is usually thought of as Cretan Hieroglyphic proper, most famously in the objects comprising the so-called 'Archanes formula'.[2] It has been argued that both Cretan Hieroglyphic and Linear A stem from a single, earlier pre-literate system,[3] although the relationship between those two scripts remains a subject of scholarly debate (see further, pp. 122–3). The regionalism evident in the ongoing development of writing is a further complicating factor, as Cretan Hieroglyphic and Linear A come to be strongly associated with different areas of the island.[4]

From a material perspective, while the emergence of writing from a pre-existing glyptic tradition could be seen as preserving a certain continuity from the Pre/Protopalatial period onwards, the use of clay as a medium for writing appears to be an innovation of the later part of the Protopalatial period as far as we can tell from surviving evidence. We have surviving clay documents from MM IIB through to MM III: deposits (or 'archives') are found principally at Malia, in both *Quartier Mu* (MM IIB) and the Palace (MM III); at Petras (MM IIB); and in the Palace at Knossos (MM IIB–III?).[5] The documents themselves are shaped pieces of clay that are in many cases designed specifically to carry inscriptions,[6] and are distributed across a number of types, comprising tablets, 2-sided lames, 4-sided bars, crescent-shaped nodules, medallions, cones and one example of a roundel. It may be assumed

[1] One important point to make at the outset is that we cannot know what we are missing in terms of writing on perishable materials. The existence of such a tradition can be inferred from the discovery of flat-based seals in contexts related to other archival material, but in the absence of direct evidence we are forced to evaluate writing on Crete almost exclusively based on what has survived.

[2] See Flouda 2013: 148–55; Civitillo 2016b; Decorte 2018a; 2018b; 2018c; Ferrara, Montecchi and Valério 2021c; Salgarella 2021; Valério and Flouda, this volume. On Cretan Hieroglyphic as an autonomous Cretan invention, see most recently Ferrara, Montecchi and Valério 2021a.

[3] Schoep 1999.

[4] Anastasiadou 2016a.

[5] Evans eventually dated this deposit to MM IIB, which has found general acceptance, but see Pini (1990; 2002: 6–7) for the suggestion that the Cretan Hieroglyphic Deposit at Knossos could date slightly later, to MM III or even MM III–LM IA.

[6] Apparent exceptions include the nodules, which can also be anepigraphic or can carry a seal impression without any incised writing.

that the range of document types corresponds with differences in usage and in types or quantities of information recorded.

Perhaps an obvious question is what prompted the move towards writing directly on clay. It might be tempting to see some inspiration from the contemporary Near East in the use of clay, especially for administrative purposes, given that clay had been in regular use there for more than a thousand years before the first appearances of verifiable writing on Crete. However, the very considerable differences in document shape and type (not to mention sealing practices)[7] make it impossible to draw any specific links. It is far from unthinkable that the use of clay in other spheres including ceramic production is what made the virtues of this highly available and reusable material clear to the first Cretan writers to use it,[8] or that the impression of seals on other clay surfaces (e.g. vessels and loom weights)[9] over time inspired the recording of information directly on clay, with clay then being shaped into document types designed specifically for carrying writing. In any case, we seem to be dealing with a very different scenario from the invention of writing in the Near East, where the progression towards texts directly written on clay documents evidently has its origins in a long-standing use of tokens with directly incised symbols or pictograms.[10]

Writing directly onto a clay surface with a stylus of some kind (on which, see p. 123) is a very different act from carving signs onto the hard surface of a seal, or using that seal to make an impression in another soft material. While carved signs on seals make use of depth to create a three-dimensional effect evident also in their impressions, drawn signs on clay are reduced largely to a two-dimensional outline of the thing depicted – although the use of round impressions (made presumably with the same stylus used to draw lines, perhaps with its reverse end?) as well as drawn lines in some sign shapes may well represent an attempt to capture something of the variant shapes and depths more evident in incisions on carved seals. It is perhaps unsurprising that a move

[7] There is, however, one cylinder seal with what seems to be a Cretan Hieroglyphic inscription whose shape and type is strongly reminiscent of Near-Eastern examples (#201 CR(?) S (1/1) 01; *CMS* XI 073); see also Kenna 1968 on the sporadic use of anepigraphic cylinder seals on Crete. The related Cypro-Minoan system attested in Late Bronze-Age Cyprus, situated much closer to the Levant and to areas using cuneiform, appears more frequently on cylinder-shaped seals.

[8] See also Karnava 2000: 227–8. On the idea that using clay was a useful way of protecting the archives from mice, see *Docs*², 109!

[9] Note however that the evidence for direct object sealing before MM IIB is very limited, which makes it challenging to reconstruct earlier sealing practices: see Krzyszkowska 2005: 77–8, 98–9.

[10] See e.g. Schmandt-Besserat 1996. For another view taking into account artistic and glyptic repertoires, see Cooper 2004.

from carving in the (also highly decorative) medium of the seal towards the linear outlines possible on a flat(ish) clay surface will also impact on iconicity, i.e. the ability (or indeed the desire) to make the sign visually resemble the thing that it is meant to be a depiction of. Just as any move between different media and implements creates new problems associated with sign shapes and their tolerable degree of variation – i.e. the degree to which the sign shape can be changed while remaining identifiably an example of its sign – so we see in Cretan Hieroglyphic perhaps some tension between the effectiveness of the new medium and the capability of scribes to maintain the visual properties of the writing system as established already on seals (particularly given the fact that seals are used alongside direct writing on clay documents). As has been emphasised in studies of other writing systems, the cognitive processes associated with developing new writing traditions also impact on sign shapes, motivating in some cases more standardised forms and/or a reduction in iconicity as users become accustomed to the regular – and increasingly abstracted – relationships between signs and the things denoted; a long-term comparison between Cretan Hieroglyphic, Linear A and Linear B may indeed reflect such changes over time, although they are less evident in this early period.[11]

One important question revolves around the relationship between Cretan Hieroglyphic and Linear A. Some scholars have seen Cretan Hieroglyphic as principally associated with seals while Linear A represents writing as intended for administrative documents,[12] but such a suggestion clearly under-represents the considerable numbers of clay documents inscribed with Cretan Hieroglyphic writing. A better way of understanding the relationship between Cretan Hieroglyphic and Linear A might be to see them as two different or divergent traditions of writing on clay, following on from the systematic sets of meaningful sign associations that had grown up principally in the context of seal usage. The differences between them are both visual/stylistic (in terms of sign shapes, the degree of iconicity/abstraction, text layout, etc.) and material (in terms of document types and even probably methods of inscription or tools used). Seeing a sort of divergent synergy between Cretan Hieroglyphic and Linear A as they develop might also help us to understand why there exist some documents whose identification as belonging to one or the other tradition is difficult or contentious.[13] A recent palaeographic assessment of the two traditions places Linear A as significantly more innovative in its features,[14] which may not be unrelated

[11] E.g. Overmann 2021 on cuneiform. [12] E.g. Godart 1979: 32–3; Perna 2014.
[13] See Petrakis 2017a: 81–2. [14] Ferrara, Montecchi and Valério 2022.

to its relative success and longevity, while Cretan Hieroglyphic has been argued to represent a short-lived phenomenon whose 'gradual abandonment is due to the fact that it proved less suited to administrative requirements'.[15] The archaeological record gives us the impression that Cretan Hieroglyphic gave way quite suddenly to the more enduring Linear A tradition, but there remain some open questions surrounding the potential influence of Cretan Hieroglyphic administrative practices even on the development of Linear B as late as LM II.[16] It is also very difficult to be certain of the exact duration and distribution of Cretan Hieroglyphic writing, particularly in archival contexts, since our evidence comes mainly from 'snapshots' of unintentionally baked sets of documents from destruction horizons.

Another question surrounds the administrative practices and tools associated with Cretan Hieroglyphic writing. Cretan Hieroglyphic seals are evidently the products of skilled craftsmen working with tools developed for working soft and hard stones, in some cases perhaps using visual aids to magnify the often very small surfaces to which they added inscriptions.[17] Writing in administrative archival contexts will have been done by different individuals in different circumstances (although whether the writers might have also been seal-bearers is more difficult to tell), using different tools for their professional duties. No identifiable examples of a writing implement have been found from contexts that have produced Cretan Hieroglyphic inscriptions, but from the surviving documents it is possible to reconstruct the shape of the stylus, which would have been round with a tapering point, with varying thickness:[18] documents are incised by a combination of drawing the tip of the implement through the clay for lines and curves and impressing the point (or perhaps sometimes the reverse end?) of the implement into the clay to create small round 'strokes'. Unlike in Linear A, where the appearance of anything similar is more sporadic, these round impressions seem to be a fairly standardised element of some sign shapes. While it is difficult to reconstruct the extent of Cretan Hieroglyphic literacy, it should be noted that writing does appear occasionally either incised or painted on vessels, and the administrative document from the sanctuary at Kato Syme also suggests the presence of literate individuals outside of archival contexts.[19]

[15] Flouda 2015b: 73. [16] Tomas 2017.
[17] On seal production, see e.g. Krzyszkowska 2012.
[18] See Karnava 2000: 98–109; Steele 2020: 6.
[19] SY Hf 01: see Lebessi, Muhly and Olivier 1995.

6.3 Text Layout, 'Syntax' and Cognitive Developments

Writing is a phenomenon closely bound up with cognitive processes, involving not only the processing of information and language, but also knowledge of the relationships between a series of signs and their associated meanings, developed skills in reproducing the signs and laying them out in meaningful arrangements, embodied tool use and numerous other aspects. Cognitive studies of writing and reading have, unsurprisingly, usually focused on modern and overwhelmingly literate societies, meaning that their relevance to early developing systems of writing is questionable. Nevertheless, at this very early stage in the development of writing traditions in Crete we can observe some palpable trends in the development of writing that point also towards developments in the cognitive processes surrounding these practices.[20] A move from variable orientation and arrangement of signs towards linear writing is particularly striking.

The first point to make is that writing on seals and writing on clay documents certainly involve different types of cognitive behaviour. As noted above, a seal is carved, presumably by an expert craftsman, working sometimes very finely at a very small scale; whether the craftsman is himself literate/fully acquainted with the signs and their meaningful relationships, or whether he might simply be working from a template drawn up by another literate person, is an open question, although there are some indications that engravers had some understanding of the rules and structure of the writing system as well as the shapes of its signs.[21] However, the carver of the seal is presumably unlikely to be its intended owner, and so we must envisage a situation where the person using the seal in meaningful contexts is not the person who 'wrote' the sequence it bears (although it is obviously possible that they commissioned the content of their seal in some sense).[22] Meanwhile, the sequence on the seal remains fixed, and has to be transferred to a sealed surface as a whole, which is itself an act that is meaningful to both the sealer and to other individuals and groups involved in administrative practices.[23]

Writing a sequence of signs on a document made of clay (or for that matter a document made of a perishable material designed for the purpose) is done directly and immediately by a person involved in administrative practice, and the act of writing requires that they have

[20] Cf. Overmann 2016; 2021; 2022 on the reorganisation of neural activity associated with the development of writing in ancient Mesopotamia; also Malafouris 2012 on Linear B, and Malafouris 2013 more generally on materiality and cognition.
[21] See e.g. Younger 1990: 88–92; Karnava 2000: 230–1; Flouda 2013: 146; Civitillo 2021b: 89–91.
[22] On seal-owners, see Ferrara and Jasink 2017. [23] Civitillo 2016a; 2021a; 2021b.

knowledge of the system of signs and their shapes and meanings, as well as an ability to reproduce them using the tools and media required. Where impressing a seal is constricted by the engraved sequence, writing directly on clay allows creativity in terms of the content of an inscribed sequence, as well as other features such as the length and layout of text. It is also likely that writing on clay documents was intended to be less permanent than a sequence engraved on a seal, thus making it well suited to quotidian administrative practice, just as the clay itself could be archived or re-used as required.

The arrangements of signs on seals (generally referred to as their 'syntax')[24] often defy easy interpretation (Flouda, this volume) – to the extent that signs have sometimes been divided, on highly questionable grounds, between the meaningful and the purely decorative.[25] Their relative orientation can vary, such that even a common 'formula' or group of signs can be found in multiple different arrangements (all presumably sharing the same meaning), making a 'linear' reading of the sequence of signs difficult – although this should not cause us to assume that they cannot be read in a meaningful way, as early scholarship often did. Linearity is simply not a property of most seals, especially the ones with round or oval sealing surfaces, even as what has been called 'frieze syntax' develops in the later Protopalatial period.[26] Even seals with rectangular sealing surfaces, which might lend themselves to a linear arrangement of signs,[27] tend not to have their signs arranged in a line along the longest side (unlike, for example, the clay labels or bars), favouring something closer to a columnar arrangement while the orientation of signs continues to vary.

Strikingly, although some clay documents display a decisive move towards linear writing (i.e. signs arranged into lines read usually from left to right), there remain some that do not. Document types with rectangular or roughly rectangular surfaces most obviously have lines of text, sometimes just one line (as for example on labels and most bars), but sometimes featuring two lines with a ruling (as occasionally attested on bars and more commonly on tablets): see Figures 6.1 and 6.2.

Clay documents with larger rounded surfaces, i.e. particularly the medallions (less so the nodules with their very constrained writing surfaces), vary somewhat in their arrangements of signs. Some feature arrangements not so different from, and perhaps influenced by, the sorts of arrangements found on rounded seal surfaces, with variable

[24] See Yule 1980: 185–8. This is the sense in which the word 'syntax' is usually applied to Cretan Hieroglyphic; given the restricted nature of the corpus, any linguistic investigation into sentence-level syntax would be premature, to say the least.

[25] See Jasink 2009; Decorte 2017. [26] Yule 1980: 65–8. [27] Flouda 2013: 155.

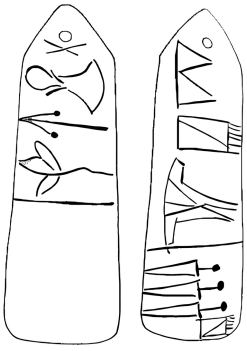


Figure 6.1 *CHIC* #089 MA/M Hf (04) 01, a label featuring linear text

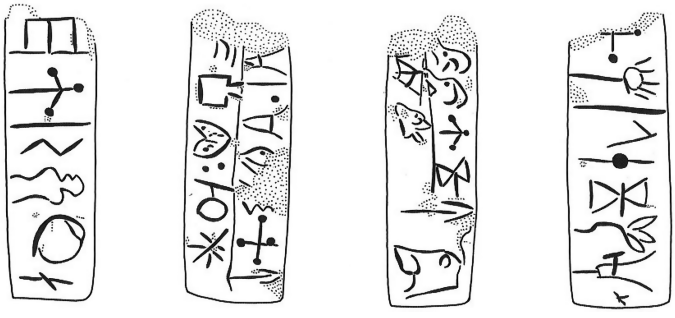


Figure 6.2 *CHIC* #113 MA/P Hh (07) 02, 4-sided bar with linear text, with two sides showing ruled lines of text

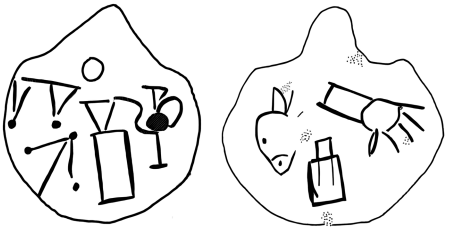


Figure 6.3 *CHIC* #031 KN He (01) 02 (left) and #076 MA/M He (01) 05 (right), medallions showing complex orientations/arrangements of signs

alignment and orientation (e.g. Figure 6.3). Others feature curving lines of text, which are undoubtedly intended to be read in a line despite the way they accommodate the shape of the writing surface. Where quite a long sequence of signs is required, the writer sometimes leaves space in the middle of the medallion and writes the line of text around the outside – presumably to preserve its linearity, since the signs are obviously intended to be read in order from the beginning to the end of

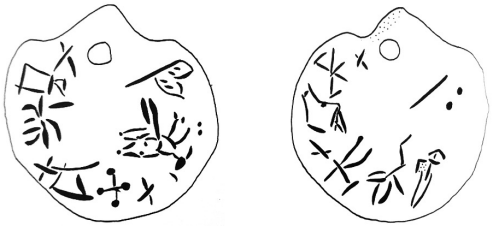


Figure 6.4 *CHIC* #039 KN He (04) 06, medallion inscribed on both sides showing linear writing curved around the outside of the round writing surface

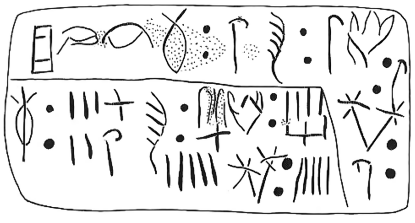


Figure 6.5 *CHIC* #122 PH Hi 01, showing mixed orientation of lines of text

the sequence (e.g. Figure 6.4). Despite the curvature of the line of text on such a medallion, this linearity is a property closely shared with the rectangular-surfaced clay documents, and it seems quite likely that there was some influence from one type of document to another. Wherever the move towards linear writing originates, multiple document types appear to have been affected by this trend in writing.

The use of clay documents, and the developments in fitting sequences of writing onto a range of different surface shapes, clearly affects the ways in which those sequences are laid out in order to be read. Nevertheless, we still have to see the genesis of some of these practices as already present in seal usage, just as sealing and writing clearly continue alongside each other in administrative practice throughout MM IIB–III. The use of the X mark to indicate the beginning of a sequence, for example, is found in and perhaps originates in the seals, but its use is carried over into writing on clay documents, even sometimes in circumstances where it is less obviously needed. The original tension between laying out the signs in an arrangement that matches the shape of the inscribed surface (in some cases probably with a further aesthetic element), and making it clear in what order the signs should be read, seems to have been a long-standing concern. The existence of more 'columnar' arrangements on seals with rectangular surfaces might also help to explain why a tablet such as PH Hi 01 can split up its lines of text such that the first line effectively seems to spill over into a column (Figure 6.5).

Ironically, it was the existence of Cretan Hieroglyphic writing in documents with more obvious linear arrangement of text that had convinced more sceptical scholars of the existence and independence of this writing system in the first place, although this went hand in hand with the unfortunate relegation of sequences on seals to a status of something less than 'real writing'. This has quite rightly led to a backlash from scholars arguing for the interpretation of signs and sign sequences on seals as being meaningful and constituting examples of writing.[28] However, this does not necessarily mean that writing on seals and writing in clay documents work in exactly the same way: a pressing case can be made for at least some signs in seals to function logographically or iconically,[29] while for the clay documents we can demonstrate more clearly that the majority of signs are syllabic in nature, functioning also alongside logograms and numerals. If it is correct to see a progression of phonetisation of the signs in the development of Cretan Hieroglyphic, then it is also important to observe the degree to which this process seems to go hand in hand with the progressive linearity of text in the longer inscriptions. Linear A could very well be seen as a system whose origins – however closely related or not to the development of Cretan Hieroglyphic – include just such processes of progressive phonetisation and linearity.

Writing on clay documents is also marked by the use of logograms, numerals and fraction signs, whose presence in administrative contexts is easy to interpret and shows considerable similarities with administrative practice in Linear A and B, except for the use of some different signs associated with counting and measuring. Cretan Hieroglyphic numerals are somewhat different from those of Linear A and B (though still apparently done on a decimal basis), with upright lines for single units but dots for tens (made by sinking the stylus into the clay in the same way as the round 'strokes' incorporated into some signs) and lozenge shapes for thousands. The so-called 'klasmatograms' in Cretan Hieroglyphic, i.e. a set of signs used probably as fractions for measuring both dry and liquid amounts, are shared with Linear A and are presumably used in a similar way, though the number of attestations is too small to analyse effectively.[30] Some of these fraction signs are in fact also found among the seal inscriptions, though it has been argued that they should not be understood as fraction signs in this context but rather as syllabic signs.[31] The layout of information in the clay documents

[28] For critical discussions see e.g. Younger 1996–7 [1998]; Karnava 2000; Jasink 2009; Decorte 2017.
[29] See Civitillo 2016a: 200–1, as well as Meissner and Salgarella, this volume.
[30] See Karnava 2001; Montecchi 2017. [31] Jasink 2005.

(mostly the 4-sided bars and the tablets) looks very similar to what we find in Linear A, with sequences of syllabic signs sometimes followed by a logographic sign and then a fraction sign and/or numeral.

We should finally note that the concept of the logogram (or ideogram) could well have two different, although perhaps overlapping, existences within the Cretan Hieroglyphic corpus. In the seals, as we have already observed, it is very difficult to establish sequences of signs that should be read syllabically, and we may very well guess that many signs are, rather, sematographic: i.e. that they convey meaning but are not necessarily intended to be read phonetically. We assume that writing on the clay documents is different, and that syllabic-looking sequences are just that. So, many signs in seals may well be logographic/ideographic in the sense that the reader is intended to access the meaning as a whole word/concept, and it is clear that they co-exist in meaningful configurations that also have a degree of variation. Logographic signs in the clay documents, on the other hand, are most obvious when they are followed by a numeral or fraction sign, where they evidently function in a similar way to logograms in Linear A and B: while syllabic sequences spell out words phonetically, the logograms aid the accounting process by visually symbolising the commodity in question so that it can be measured or counted. There are apparent logograms that appear without concomitant fraction signs or numerals, but in these cases it is more difficult to demonstrate that they are acting as logograms (especially in cases where we might suspect the sign also has a syllabic value, such as the fig tree sign classified as sign *024* as a syllabogram and **155* as a logogram, with parallels in Linear A and B).

6.4 Looking for Morphology

Although we have no linguistic means of identifying the meaning of Cretan Hieroglyphic words or phrases, some progress can be made through studying highly repetitive attested sequences in the seals (most of which are usually identified as 'formulae', a few of which can also be found in the clay documents) and looking closely at their contextual associations (Civitillo, this volume). Any attempt to classify or describe the language(s) underlying Cretan Hieroglyphic writing is, however, far more difficult (also Davis, this volume). One possible way forward is to try to identify possible linguistic features in the sequences attested on surviving documents. However, in a relatively poorly attested writing system, especially one with the issues seen in Cretan Hieroglyphic with regard to the difficulties of establishing the full repertoire of signs,

this is a highly problematic task. The issues are somewhat similar to those of identifying language features in the related Cypro-Minoan writing system, whose repertoire remains difficult to establish with certainty and whose inscriptions are small in number (ca. 250) and mostly very short.[32]

One important and well-established method is to compare sequences of signs that share most of the signs but differ in one or two, which could help us to identify morphological features such as prefixes, infixes or suffixes – beginning with an open mind as to how such features might work, given that we have no knowledge and no obvious starting assumptions we can make concerning the typology of language(s) that may be represented in the corpus. Indeed, Alice Kober's investigations into Linear B sequence patterns employed exactly such a methodology and paved the way for the identification of sign values and morphological features represented in that writing system, which of course turned out to be recognisably Greek. The fact that Linear B happened to represent a well-understood language was highly serendipitous, and it is unfortunately highly unlikely that Cretan Hieroglyphic shares such an advantage.

To avoid chance similarities when using this method to identify possible morphological features, longer sequences are preferred (i.e. three shared signs rather than one or two); unfortunately, however, the corpus preserves only one pair of sequences that share three signs: 049-041-006-025 in #316 and 049-041-006-057 in #327, both on clay vessels; however, the final sign in the second vase is uncertain as it is mostly missing with just traces of the top and bottom surviving). It is difficult to be certain that sequences sharing only two signs and differing in the addition or lack of a third, are actually cognate in the first place. Consider the sets of sequences in which 031 can appear as a final sign, according to the 'word' lists in *CHIC*:

036-092 (in #109, #131, #229, #263, #265, #267, #288, #299)
036-092-031 (in #254, #257, #258, #262, #272, #308, #309, #312, #314)

038-010 (in #181, #212, #214, #228, #249, #253, #258, #260, #265, #268, #275, #286, #288, #311)
038-010-031 (in #162, #169, #195, #218, #242, #248, #250, #254, #257, #261, #262, #263, #269, #272, #274, #279, #284, #293, #298, #299, #300, #302, #309, #312, #314)

042-019 (in #134, #135, #136, #137, #201)
042-019-031 (in #301)

[32] See Steele 2013: 66–71.

047-070 (in #286)
047-070-031 (in #058)

076-013 (in #312)
076-013-031 (in #304)

The temptation would certainly be to isolate a suffix of some sort in -031, and to assume that its appearance or absence is linguistically motivated, perhaps representing some sort of optional morphological suffix – although there would then be numerous possibilities as to how to interpret its significance, for example as inflectional or agglutinative suffixing. The number of different sequences apparently sharing this pattern could be seen to lend weight to such an argument. However, there remains a possibility that this is not a morphological pattern at all. Consider, for comparison, how easy it would be in English to assume that a final -e was a morphological suffix if we knew nothing about the language structure – and yet we can easily think up numerous pairs of sequences in which the presence or absence of a final -e is not morphologically motivated at all:

mat
mate
hat
hate
dam
dame
bar
bare
cut
cute

But this is not the only problem with interpreting -031 as some sort of possible suffix. Most of the inscriptions in which the sequences listed above are found are seals (with 047-070-031 in #058 being the only exception). In order to preserve frequently repeated combinations in its lists of sign groups, *CHIC* often reorders the signs found in seals or interprets them as a simple linear sequence despite questionable orientation, and even misses out repetitions of signs or extra signs dismissed as decorative motifs. Even a cursory glance at pictures of the inscriptions shows that the orientation of the signs can vary, and even more strikingly that the sign -031 can be positioned in questionable alignment with respect to the other signs, or indeed in the middle of the other two signs (#254, #272)! Given that the signs on seals are very

difficult to interpret as syllabic sequences, as already noted above, not to mention the difficulties with understanding the 'order' of signs in many examples, we simply cannot view -031 as a Cretan Hieroglyphic suffix with any kind of linguistic value.

In the absence of repeated sequences that can be studied for variations, sign frequency in a particular position could also be called on as a way of identifying morphological features, but again we should beware. Looking again to Cyprus for comparison, we may see some hope for such a method, as the very high frequency of sign -023 (the one certainly representing the syllable *ti* as in related systems) in final position is almost certainly morphologically significant: this is a feature observable also in the later and very probably related 'Eteocypriot' language, where we have longer sequences (including Greek names with Eteocypriot endings) available for study.[33]

On the other hand, sign frequency in word-initial position could be indicative of sound value rather than any morphological feature. For example, sign 042 (the double axe) appears almost exclusively at the beginning of words, again as listed in *CHIC*'s list of sign groups (some of which are drawn from seals, but a good number are from the clay documents). However, this is surely not for any morphological reason (such as a prefix). Rather, the explanation has to be sought in the typology of the system, which is usually assumed to encode open syllables in the same way that can be demonstrated for Linear A and Linear B: in this type of system, a sign that has high frequency in word-initial position but low frequency elsewhere is very likely to be a vowel-only sign (V) rather than a consonant-plus-vowel sign (CV), because in mid-sequence the vowel would not need to be written with a separate sign. Sure enough, the sign derived from the double axe shape represents the vowel *a* as in all other related systems, and this is one example where we can be quite certain of a Cretan Hieroglyphic sign's value.

So, a note of caution is important when looking for morphological features in any linguistic sense, and in the absence of long inscriptions, and especially of repeated sequences long enough to establish significant kinds of variation, we are currently unable to identify morphologically significant sequences. The Cretan Hieroglyphic corpus unfortunately gives us very little to go on when looking for linguistic features, but the most important point to be made is that an examination of the inscriptions themselves and their 'syntax' or layout is crucial in trying to make sense of the way they make meaning. The division of the corpus between seals on the one hand and clay documents on the other

[33] Valério 2016: 397–401; Steele 2018: 104–6.

(with just a small number of inscribed clay and stone vessels beyond this) makes it challenging to present any comprehensive overview of the ways in which signs are meaningfully combined, and it is probably right to see the seals and the clay documents as forming meaningful arrangements of signs in different – if related – ways to each other. This should be viewed against a background of developing administrative practices where seals and clay documents have different functions and are used in different ways but nevertheless in synergy.

CHAPTER 7

THE RELATIONSHIP BETWEEN CRETAN HIEROGLYPHIC AND THE OTHER CRETAN SCRIPTS

Torsten Meissner and Ester Salgarella

7.1 On the Nature and Unity of the Cretan Hieroglyphic Script

There is no general agreement as to the nature of the Cretan Hieroglyphic script nor to the number of characters belonging to it, nor indeed is it clear that all writing traditionally called 'Cretan Hieroglyphic' is in fact a unified whole. From a typological perspective, Cretan Hieroglyphic is traditionally classified as a logo-syllabic script (like the Aegean Linear scripts), meaning that its signs are subdivided into the functional categories of 'syllabograms' (signs representing syllables, e.g. /pa/, /e/), and 'logograms' (signs standing for an entire word) or 'ideograms' (iconic signs standing for objects or ideas that could then be interpreted as entire words).[1] As we have already seen (Ferrara, Valério, this volume), the total number of characters of the writing system proper, explicitly identified as syllabograms, is given as ninety-six in *CHIC*: 17, to which are added thirty-three different logograms/ideograms, nine klasmatograms (i.e. signs representing units of measurement and fractions thereof), four signs for numerals and two stiktograms (i.e. signs used to mark the beginning of a sign sequence). By categorising the signs found on the Cretan Hieroglyphic documents in this way, the entire script is implicitly brought into the vicinity of the Linear scripts A and B to such an extent that it could reasonably be interpreted as their direct ancestor. However, we must be aware that such a categorisation of Cretan Hieroglyphic signs may not actually be accurate, inasmuch as it is the result of extrapolating backwards from a comparison with Linear A and

[1] The terms 'logogram' and 'ideogram' are both found in the literature (at times interchangeably), with the former being preferred over the latter in traditional scholarship (Thompson 2012). A logogram implies a reference to a lexeme (or lexical morpheme) in a given language, whereas an ideogram expresses semantics without reference to a given word in a given language. In Linear B there is evidence for the use of both (less so in Linear A and Cretan Hieroglyphic): e.g. Linear B sign **201* depicts a 'tripod' cooking pot and its name is also spelled out fully (*ti-ri-po*) on tablets, hence this is a logogram; Linear B sign **173* is a half-moon and stands for the concept 'month', hence this is an ideogram. In the present discussion, we will use both terms in compliance with the definitions set out above to the extent that is possible on present evidence. If the sign's context of use and function is unclear, we will leave both options open (logogram/ideogram).

Linear B. But if the total number of Cretan Hieroglyphic signs is indeed in the region of ninety-six, then this figure is very close to the number of signs in Linear A and Linear B and would provide an additional argument for an essentially syllabic nature of the script.

In establishing the sign list and, in doing so, the characterisation of the nature of the Cretan Hieroglyphic script and its workings, the editors of *CHIC* base themselves essentially on the evidence from the incised clay documents (*CHIC:* 12–15), working on the premise that all signs on evidently administrative and inherently non-prestigious documents are supposed to be readable and read (as happens in Linear A and Linear B). On seals, on the other hand, the situation is more complicated, as it is difficult to distinguish the nature and structure of the written message, if any, and the inclusion of a 'decorative' or 'explicatory' ('*explétifs*') character. In principle, this two-pronged approach does have merits. The inscribed Cretan seals stand in a tradition of iconography and glyptic that goes back to the Early Minoan period (see chapters by Valério and Flouda, this volume). Originally characterised by simple, often geometric designs,[2] representations become more complex and elaborate at the beginning of the Middle Minoan period, suggesting somewhat more complex 'meaning making' on the seals.[3] A good number of the motifs employed here eventually lead to characters of the writing system *sensu stricto*, but to what extent this has happened on the seals is difficult to determine.[4] The approach taken by the editors of *CHIC* can thus be characterised as cautious. However, it is also the case that some certain or likely elements of the writing system (i.e. those that are repeatedly attested in sign sequences and are not in any way marked out as special) are attested only on seals (signs CH 014, 048, 076 and 095). Although this is acknowledged in *CHIC*, this very circumstance only goes to show that simply basing oneself on the signs attested on clay documents risks distorting the picture and giving an unrepresentative view of what Cretan Hieroglyphic 'can do' and 'looks like'. Chance (due to the extreme dearth of evidence) may also be a factor in the non-attestation of signs 014, 048, 076 and 095 on clay documents. In any event, it would seem obvious that the Cretan Hieroglyphic on seals is in many ways closer to the glyptic tradition than the 'developed' Cretan Hieroglyphic on the administrative clay

[2] See Decorte 2017. [3] See Anastasiadou 2011.

[4] See Jasink 2009 for a list of motifs left out by *CHIC*. On the role of glyptic iconography in the creation of Cretan Hieroglyphic signs, see esp. Yule 1980; Sbonias 1995; Webb and Weingarten 2012; Flouda 2013; Ferrara 2015; Anastasiadou 2016a; Civitillo 2016a; Ferrara and Jasink 2017; Schoep 2020; Salgarella 2021; Ferrara, Montecchi and Valério 2022.

documents is. Notwithstanding this, it is also true that a purely developmental and evolutionary explanation of the slightly different character of Cretan Hieroglyphic on administrative documents if compared with seals may be somewhat dismissive of the different contexts of use (and therefore different purposes) of the two document typologies. In other words, we should be open to consider that the administrative context, requiring a distinct yet competing method of recording information, may have had a bearing on (at least some of) the structural characteristics of the script and may not necessarily imply a developmental relationship. Put differently, the meaning-making on seals may well work according to different principles, at least in part, from those employed on incised clay documents. This, in turn, then raises the question of the unity of Cretan Hieroglyphic: to what extent is it actually legitimate to speak of the Cretan Hieroglyphic script? Do we have to assume two rather different types, with one still firmly rooted in the glyptic tradition and possibly operating according to different principles than the strictly administrative type on clay documents? We must be careful not to open up too large a gap here. It is evident that several 'formulae', i.e. complete sign sequences, are found on both seals and clay documents (e.g. 044-005 or 044-049; see Civitillo, this volume), and of course the use of inscribed seals was part of the administrative practice as were the clay documents. The fact that the number of signs only found on incised clay documents is substantial (thirty-two according to *CHIC*) may be partly due to chance attestation, misidentification (it seems unlikely, for example, that sign 032, only attested on the clay documents, is to be differentiated from 031) or misinterpretation (074 and 075 are probably numerals and 071 may be a stiktogram, i.e. a divider).[5] On the other hand, a good number of other signs are *hapax legomena* (79, 80, 81, 84, 86, 87, 89, 90, 91) and their nature is hard to evaluate. However, these signs could be testament to an increasingly sophisticated graphic rendering of administrative records if, as seems reasonable, the seals are innately more conservative and restricted in their breadth of use, given that they are made of stone (predominantly semi-precious stone such as steatite and jasper).

The number of signs attested on seals (55–60, depending on the interpretation) and on incised clay documents (about 85–90, with uncertainty concerning the *hapax legomena*) differs considerably and, in view of the above, one might question whether it is legitimate simply to add them together so as to get to one total number of about ninety as is usually done.[6] Doubts as to the internal unity of the Cretan

[5] See Younger 2003–2012. [6] See the list in *CHIC*: 17.

Hieroglyphic script have been expressed above all by Olivier, who considered the use of Hieroglyphic on seals as '*une écriture ornementale*'.[7] In fact, there can be little doubt that, while the use of the script shows a supplement of signs that may be decorative or emblematic or both,[8] the basic inventory of signs is the same on seals and on other supports, lending support to the hypothesis that the seal inscriptions can be read according to the same linguistic principles as the remainder of Cretan Hieroglyphic inscriptions.[9] Contrariwise, the use of logograms/ideograms on Cretan Hieroglyphic documents other than seals is no obstacle to regarding Cretan Hieroglyphic as one unit, as these signs clearly form part of the writing system but not of the script and may instead be seen as an 'evolved' use of the Hieroglyphic writing system. The view is thus taken here that Cretan Hieroglyphic should be considered as one script, independent of the support on which it is found.

7.2 How to Relate Scripts

The term 'script relationship' is not unproblematic. In its simplest form it can mean a derivative relationship between two scripts. By way of example, the Roman alphabet was developed out of the Etruscan alphabet, keeping almost all of its signs (with the appropriate sound values if possible) and introducing or developing new signs over time (such as <G> from <C>) for sounds that the language from which the script was adapted (i.e. Etruscan) did not possess.[10] In this case, a script was adopted by speakers of another language (although, given that Etruscan was the prestige language in Rome at the time, these speakers may well have been bilingual), and both the principle of writing (alphabetic) and the inventory and the morphology of the signs were preserved as much as possible and changed only where the phonology of the new language required an adaptation. In the context of the Aegean scripts, a similar situation is found between Linear A and Linear B, the latter having developed out of the former[11] to write Greek. Also in this case, both the principle of writing (syllabic) and the morphology of the

[7] Olivier 1981: 105, 115; similar Olivier 1990: 13: 'I am more strongly convinced than ever that the script on the seals is a decorative one.'
[8] On the nature, role and re-evaluation of the so-called 'decorative motifs', see esp. Jasink 2009; Decorte 2017; 2018a–b.
[9] For a complete re-evaluation of the question, see Civitillo 2016a.
[10] See Wachter 1987, in particular 324–33; Haarmann 2002.
[11] See most recently Salgarella 2019; 2020.

majority of signs was kept, together with, as far as we can see, a good number of phonetic values. However, a close phonetic correspondence is difficult to evaluate with certainty, above all because the phonology of the Minoan language is not well understood.[12] Equally importantly, while the script itself remains relatively stable on the way from Linear A to Linear B, the writing system as a whole does undergo a number of important changes, such as the near-complete abandonment of Linear A ideograms, the creation of new logograms/ideograms in Linear B, the introduction of a completely new system of numerical fractions, etc.[13] These two examples may suffice to illustrate that both the *kind* and the *degree* of innovation can vary during the script transfer via adaptation.

Sometimes, considerable changes even occur when the script is not adapted for another language but continues to be used for the same language. Thus, Sumerian cuneiform starts off as a pictographic system but quickly develops into an essentially logographic script which over time gets progressively more phonetic inasmuch as the overall number of signs is reduced radically from ca. 1500 signs at the beginning of the third millennium BC to about 600 signs in the second half of the third millennium. While a logographic element is kept, the remaining signs now predominantly indicate open and closed syllables.[14] However, two scripts may also be less directly related. As an example, we shall look at the Old Persian cuneiform script. Despite its name, it is not as such derived from the 'Classic' Babylonian cuneiform, which by the time Old Persian is recorded (probably the last quarter of the sixth century BC) was used for a considerable number of languages, the adjacent Akkadian and Elamite chief among them. While the signs of the Old Persian script look wedge-shaped, the individual signs bear no relationship to the corresponding sign, or indeed any sign, of the Classic cuneiform script.[15] The Old Persian script also works according to different principles: while it does contain a few logograms just like Babylonian cuneiform, the main body of signs indicates open syllables only and there are contrasting syllabic signs such as *da, di, du*. Notwithstanding

[12] See Davis 2014: 193–245 for an attempt at a closer phonological characterisation of the language; Davis, this volume, on the syllabotactic analysis of the Linear A and Cretan Hieroglyphic scripts.

[13] On the Linear A to Linear B transmission process, see lastly Salgarella 2020; on the mathematical values of Linear A fractional signs, see Corazza *et al.* 2021.

[14] See Schmandt-Besserat 1996; Houston 2004a; Rogers 2004.

[15] The sole exception is the sign for *la* which, however, does not occur in genuine Old Persian words but rather in Akkadian loan words, meaning that the sign together with the sound was borrowed from the Babylonian cuneiform script. For the development of the Old Persian script, see Brandenstein and Mayrhofer 1964: 17–18.

this, it is incorrect to call it a syllabic script because, except for *a*, all vowels (*i, u*) are explicitly written, either with the help of a discrete sign (as above), or, more commonly, by modifying the basic sign with the vowel signs *i* and *u*. For the great majority of consonant-vowel sequences, Old Persian has only one sign which renders the consonant plus the vowel *a*. In other words, the unmarked vowel *a* can be said to be inherent to a sign while the other two vowels are not and are indicated by a completely different sign (clearly syllabic behaviour) or by modifying the basic sign (similar to an abugida, as found in many scripts used to write other Indo-Iranian languages, e.g. Devanāgarī). Thus, e.g. *di* is a syllabic sign in its own right while a sequence /pi/ is written *p(a)-i*; an actual sign *pi* does not exist in the Old Persian script. This, then, means that /pi/ is written with two signs, one effectively indicating the consonant /p/, the other the vowel /i/. In other words, this is similar to the contemporary Greek alphabet, with which the Persians had certainly come into contact by the end of the sixth century, but also similar to the Aramaic script which, as a West Semitic script, principally wrote consonants only but could indicate vocalic values with the help of *matres lectionis*.[16] The Old Persian script, often called a 'semi-syllabary' thus defies an easy classification. It is clearly not derived from Babylonian cuneiform, but its creation is partly (general shape of signs, use of logograms) dependent on it. The principles according to which the script is used, however, are closer to the alphabet that was used to the west and the Indo-Iranian abugidas that would come to be used to the east of Persia. There is thus some form of relationship between Babylonian cuneiform and Old Persian cuneiform, but this relationship is of a very different kind to that between the Etruscan and Roman alphabets. There are multiple different ways in which scripts can be related and thus no universal algorithm exists to evaluate them. Rather, each analysis of a relationship between two or more scripts needs to take into account not just linguistic and graphological data, but also the socio-historical background and context. This also means that script invention and script adaptation are best seen not as polar opposites but as forming part of a spectrum of complex creative processes leading to a conventionalised, codified form of meaning-making with the help of graphic symbols.

[16] It should be noted that the Aramaic language, together with the Imperial Aramaic script, rather than Old Persian was used as the *lingua franca* of the Persian administration; see again Brandenstein and Mayrhofer 1964: 17.

7.3 The Workings of the Cretan Hieroglyphic Script

Before examining the relationship between Cretan Hieroglyphic and the other Cretan scripts, it is worth investigating how Cretan Hieroglyphic works, i.e. which (functional and linguistic) entities the Cretan Hieroglyphic signs actually stand for and render. We need to remind ourselves that the way in which a writing system works is not necessarily a reliable indicator when it comes to evaluating the relationship with the other scripts, as we have just seen. Although it is true that the principles on which a system works may give us some clues as to script relations (if comparable principles, especially if 'marked', can be identified), no straightforward connection can be demonstrated given the lack of an accurate understanding of the socio-historical context within which any two systems were developed. Nevertheless, in the Aegean context, it may well be that some of the underlying principles are shared between Cretan Hieroglyphic and the Linear scripts, which is a theory that needs to be proved. Given that in script development over time there is a general trend towards increasingly phonetic character,[17] it could thus be that any script developed out of Cretan Hieroglyphic may be more phonetic than Cretan Hieroglyphic itself. Cretan Hieroglyphic is usually taken as a syllabic script writing open syllables only, assuming therefore a typological interpretation that brings it close to Linear A (and Linear B), with which it co-existed for about 200 years. This assumption is so well established in the scholarship that the typological nature of Cretan Hieroglyphic is usually not even discussed, nor questioned, in the mainstream literature.[18] There are, of course, obvious reasons for taking Cretan Hieroglyphic signs as syllabic and/or logographic/ideographic in character: first of all, the considerable graphic resemblance between Cretan Hieroglyphic and Linear A that will be explored further below, and secondly, and arguably more importantly, the total number of signs in the Cretan Hieroglyphic graphic inventory. While the overall state of documentation is poor and almost certainly incomplete, and while there may be several gaps and misidentifications, the number of ninety-six different signs as given in *CHIC* is highly compatible with the sign inventories of Linear A and Linear B. Even though there are good reasons to take issue with the sign classification found in *CHIC*, it is unlikely that any coherent alternative classification will alter the picture so dramatically as to sever any connection

[17] See Valério and Ferrara 2019. However, while clearly widespread, this trend is not universal: for a good example of the reverse of this process, see Petrakis 2012.

[18] See e.g. the sign list in *CHIC*: 17, or Davis, this volume.

between Cretan Hieroglyphic and the Linear scripts in this respect.[19] Moreover, this numerical range of signs is compatible with a syllabic system, but with neither a fully ideographic one (expect substantially more than 100 signs) nor an alphabetic one (fewer than fifty signs). Still, Ferrara, Montecchi and Valério[20] admit the possibility that Cretan Hieroglyphic may be partly logographic, on the grounds that 'in all potentially newly created iconic scripts (i.e. scripts with novel shapes in the repertoires of their signs) words were spelt logographically, and sometimes logo-phonetically, especially at their earliest stages of development'. This point needs to be borne in mind, and that Cretan Hieroglyphic, at least on patently administrative documents, made use of logograms (and/or ideograms) is not in serious doubt. But apart from this, the logographic character of the script is not evident and the total number of different signs, at least those attested to date, militate against Cretan Hieroglyphic being an essentially logographic/ideographic script and might instead suggest the basic syllabic nature of the script. However, we must not forget that more than half of all occurrences of Cretan Hieroglyphic script-signs are attested on seals and seal impressions.[21] This type of document, characterised by a very small physical space, frequently displays, typologically speaking, 'abbreviated' writing. In this context, it is important to note that Civitillo[22] has proposed to interpret a number of 'isolated' or 'marked-off' Cretan Hieroglyphic signs on seals as 'icons'/'badges' and not as logograms *sensu stricto*. This suggestion might then be considered in light of the fact that abbreviations (in the form of individual signs standing by themselves) are frequently found in both Linear A and Linear B: for example, in Linear A the use of 'monosyllabic signs' ('transaction' and 'single'), that are often 'marked off' by a dot placed before and after the sign,[23] and in Linear B the frequent use of adjuncts to ideograms (e.g. the sign for /o/ being the abbreviation of ὄφελος/op^{h}elos/'deficit'). If this proposal is correct, this abbreviated writing might conceivably contain names but also administrative processes, as the potential parallels with Linear A and Linear B might suggest. On the basis of this interpretation, we may speculatively suggest taking the frequent Cretan Hieroglyphic

[19] The most radical re-analysis of Cretan Hieroglyphic signs is Jasink 2009, who considers as potentially meaningful a number of motifs occurring on seals which have not been included in *CHIC*.

[20] Ferrara, Montecchi and Valério 2022: 89.

[21] Based on the documents published in *CHIC*, out of a total of 1,753 attested identified Cretan Hieroglyphic signs, 911 (52%) occur on seals and sealings, 773 (44%) on clay documents and 51 (3%) on other supports. The authors would like to express their deep gratitude to Matilde Civitillo for providing these figures.

[22] Civitillo 2016a: 158–9, 200–1.

[23] See Schoep 2002a: 37–9, 135–43; Salgarella 2020: 50–4.

'formula' 044-005 (depicting a *Petschaft* seal and an eye) as standing for the concept 'inspected and approved' *vel sim.*

7.4 Cretan Hieroglyphic and the Phaistos Disk

A first comparandum to the Cretan Hieroglyphic script is provided by the Phaistos Disk (PD), found in 1908. Unfortunately, much regarding the disk remains unclear to this date. This starts with the dating. The object was not found *in situ* but, according to the excavator Pernier, had fallen from a higher level and was mixed, *inter alia*, with vase fragments typical for the last phase of the first palace at Phaistos,[24] although this may only be a *terminus ante quem* and scholars routinely used to allow for a wider chronological span;[25] more recent research, however, seems to suggest MM IIIA as the most likely date.[26] At the time of its discovery, pretty much everything about it was unique: the signs themselves which seemed to bear little resemblance to any other writing system known from Crete (i.e. Cretan Hieroglyphic, Linear A or Linear B); the type of object (large clay disk); the way the signs were applied (stamped); and the way the information is arranged (running in a spiral from the rim to the centre) and divided (into cells, long known from the cuneiform writing tradition but until then not attested on Crete, containing between two and seven signs). Because of its peculiar character and uncertain dating, the Phaistos Disk has been suspected to be a forgery[27] but convincing arguments in favour of its authenticity have since been put forward.[28] However, as a result of further studies and discoveries over the years, much of its uniqueness has been eroded.

In this respect, the single most important discovery may have been the bronze axe from the Arkalochori cave (henceforth AA), found in 1935. Its date is uncertain because of the highly disturbed context and the lack of stratigraphy that might help place it chronologically.[29] The excavator Marinatos assumed a Neopalatial date of MM III or LM I;[30]

[24] Pernier 1908: 644.

[25] See e.g. Duhoux 2000: 597, who states that: '[t]he object's archaeological context indicates that it was deposited at Phaistos some time in MM II–IIIB (ca. 1850–1600 B.C.).'

[26] Anastasiadou 2016b: 15, with further references.

[27] Eisenberg 2008a; 2008b.

[28] See Hnila 2009 and, for a sound and effective refutation of Eisenberg's arguments, Anastasiadou 2016b. For a general overview of the Phaistos Disk see Duhoux 1978; Godart 1995; Younger 2005–21.

[29] See Flouda 2015a: 45–8 for a thorough discussion of the content and context of the Arkalochori Cave assemblage.

[30] Marinatos 1935: 250–9.

other scholars either accept this date[31] or regard the axe as contemporary with the Phaistos Disk (PD).[32] The main reason for the latter dating may be the striking resemblance between several signs on the axe and the disk: the axe contains only ten or eleven different signs, and fifteen signs in total, while the Phaistos Disk displays forty-five different characters, and 241 (or 242) signs in total. Still, not only is the general appearance of the signs on the two objects undeniably similar, at least three of the signs – the 'plumed head' (AA 01 = PD 02, following the numeration found in Godart 1995), the 'plane' (AA 02 = PD 19) and the arrow sign (AA 09 = PD 10) – look so similar that they should be taken as shared signs between the two scripts.[33] Two further equations are plausible: signs AA 05 and 06 may correspond to PD 39 and 22 respectively,[34] and if sign AA 04 and its probable variant AA 4b really are a divider as suggested by Younger (*ibid.*), then this may be paralleled by the similarly shaped device on the outermost circle on both sides of the Phaistos Disk. Even if we only accept the identity of signs AA 01, 02 and 09 with their obvious Phaistos Disk correspondences, this is a highly remarkable degree of similarity, especially given that neither the Phaistos Disk with its forty-five different signs nor, in particular, the axe with only ten (or eleven) different signs is likely to display anything near the total number of characters.[35] While it cannot be established with any certainty whether the signs on the axe and the Phaistos Disk do indeed belong to the same writing system,[36] it is also interesting to note that the 'plumed head' is the most frequent sign on both the axe (three, or possibly four times) and the Phaistos Disk (nineteen times).

Other 'unique' features now have parallels elsewhere on Crete: Phaistos Disk 21 (the 'comb') is found on a Minoan seal also from Phaistos (*CMS* II 5, 246) found in 1955; the spatial organisation of the writing into a spiral running from the rim to the centre is also found on the Linear A inscribed gold ring from the cemetery of Mavro Spilio (KN Zf 13)[37] and

[31] Flouda 2015a: 48. [32] Thus Younger 2005–2021.
[33] Flouda 2015a: 50; Duhoux 1998: 14–16. [34] See again Younger 2005–2021.
[35] Duhoux 2000: 599 assumes about sixty signs for the Phaistos Disk script, using the formula established by MacKay 1965. However, in the context of the Arkalochori axe, where the application of the same formula would predict a total number of about thirty signs (and therefore a likely alphabetic character of the script), Duhoux admits that 'if applied to very restricted samples of a syllabic script, MacKay's 1965 formula may dramatically over- (113) or under- (30) estimate the number of its signs' (Duhoux 1998: 15). We remain agnostic about the total number of characters.
[36] Duhoux 1998: 14 maintains that '[t]he axe's script is clearly cognate to the Phaestos disc's writing […]. Nevertheless, the two systems are basically distinct, although they share the same graphic ambience.'
[37] *GORILA* IV: 152–3, 162 (MM III–LM IA).

two painted conical cups (KN Zc 6–7);[38] the use of stamps is now well documented on pots from the MM period;[39] and finally, the organisation of text into cells is now also found on the ivory sceptre Linear A inscription from Knossos, as yet unpublished.[40] These parallels not only make the disk lose quite a lot of its unique character, but also, taken together, they should be seen as a strong indicator of its authenticity. However, it must also be stated that the sign distribution across the two sides of the disk does not conform with what one would expect of a natural language. Trauth observes that twenty-one (out of forty-five) signs occur on one side only, and others are much more frequent on one side than the other.[41] Also, the length of words (if this is what the individual cells indicate) varies much more (between two and seven signs, with an average of just under four signs) than would be expected.[42] However, it is not clear whether the individual sign groups really do always indicate one word only. Furthermore, it is worth pointing out that the words (or 'sign units') on the Linear A libation tables are also much longer than in the administrative texts: word 1 usually contains six signs; word 2 up to eight signs; word 3 (which varies the most) is almost unfailingly the shortest; while words 4 and 5 usually consist of five or six signs. Nevertheless, if we try to compare the script with Cretan Hieroglyphic, then it is evident that both are highly pictorial in character, i.e. they frequently depict real-world referents in a recognisable and naturalistic manner (cf. e.g. PD sign 15  is self-evidently an axe, and CH 008  a hand). In the absence of further information regarding the nature of the Phaistos Disk script, it is certainly possible that these writing systems are laterally related; in other words that there was a stimulus leading to the creation of one of them in a way not too dissimilar to what we saw above regarding Old Persian cuneiform writing. However, it has also been suggested that there may be more to it. Duhoux[43] reckons that there 'are no more than ca. ten syllabograms on the disk which could possibly match Linear A or 'hieroglyphic' signs'. More optimistic is Owens, who in an oral presentation[44] tried to equate

[38] *GORILA* IV: 118–25 (MM III?). [39] See Anastasiadou 2016b: 27 and 37.

[40] In the view of these authors, the so-called Linear B 'simili joins' of the KN Vc series (on which, see in the first instance Driessen 1987) can also be regarded as examples of the organisation of information into individual cells. This archaic trait is entirely in keeping with the fact that these tablets came from the *Room of the Chariot Tablets*, and it was Mühlestein (1963: 1) who first saw that these tablets had incised vertical lines from the top to the bottom of the tablet along which they were broken up into individual 'mini-tablets'. It may further be suggested that the word divider found in the linear scripts is none other than a shortened version of this dividing line.

[41] Trauth 1990: 159 and table on p. 160.

[42] By way of comparison, in the languages of Western Europe between 85% and 95% of words contain 1–3 syllables.

[43] Duhoux 1998: 11–12. [44] Owens, online (youtube.com/watch?v=6Chcplx3tZ8).

about 90% of the Phaistos Disk signs with signs in Cretan Hieroglyphic and the Linear writing systems and sees an 'epigraphic continuity' from the Phaistos Disk all the way down to Linear B. This was critiqued effectively by Younger[45] who, in the absence of proper argumentation on the part of Owens, is prepared (not unlike Duhoux) to accept eight equations between the Phaistos Disk, Cretan Hieroglyphic, Linear A and Linear B. These are as follows:

Table 7.1 *Comparisons between Phaistos Disk, Cretan Hieroglyphic, Linear A and Linear B signs*

PD	CH (seal and clay forms resp.)	LA/B	Owens ID
08	009	AB 28 I	B 52 NO
12	047	AB 77 KA or 78 QE	AB 78 QE
14	034	AB 59 TA	AB 59 TA
15	043	B 12 SO	B 12 SO
19	027	AB 01 DA	AB 01 DA
23	062	AB 06 NA	AB 06 NA
34	021	AB 39 PI	AB 39 PI
35	025	AB 04 TE	AB 04 TE

It goes without saying that even in these least controversial equations there is a considerable degree of uncertainty in many instances. Due to the extreme dearth of evidence, variation within the evidence and our inability to interpret the writing linguistically, we are reduced to a judgement on the basis of general plausibility, and this will be applied differently on an individual basis. While some may wish to accept all of these equations, others (these authors included) are more sceptical when it comes to equating PD 12 with CH 047 and AB 77/*ka* (implausible in our view) or 78/*qe*; PD 14 with CH 034 and AB 59/*ta*; PD 23 with CH 062; and AB 06/*na* or PD 34 with CH 021 and AB 39/*pi*. Owens' further proposals are also discussed by Younger, but as the links to Owens' work are dead and they do not seem to feature on the author's website (https://daidalika.hmu.gr), it would not seem appropriate to discuss them further here. Suffice to say that the suggested identifications clearly form a sliding scale of plausibility. If, however, Owens were right and more than 90% of the Phaistos Disk signs could be equated with signs from Cretan Hieroglyphic, Linear A and Linear B (and on this basis given a sound

[45] Younger, online (people.ku.edu/~jyounger/misc/Owens_response.pdf).

value) then the Phaistos Disk script would, in effect, be nothing more than a peculiar form of Cretan Hieroglyphic, and indeed Owens explicitly states that 'The Cretan Hieroglyphic script (ca. 2000–1600 BC) was an invention of the First Palaces and is found in inscriptions of both an administrative and religious context/nature. The best-known example of this is the (in)famous the Phaistos Disk […].'[46] But if we were to believe that the Phaistos Disk and Cretan Hieroglyphic are so closely related as to represent, essentially, the same script then we immediately run into problems. For example, one of the clearest and most frequent signs in Cretan Hieroglyphic (CH 042) is not actually found in the Phaistos Disk inventory at all, and its putative sound value /a/ is, in Owens' view, realised on the disk by PD 01  , which is entirely unrelated. Caution is clearly advised here. While an independent origin of Cretan Hieroglyphic and of the Phaistos Disk script from Early Minoan glyptic cannot be ruled out, a closer link between the two scripts has yet to be demonstrated. In a recent article, Davis has put forward phonotactic arguments to argue that Cretan Hieroglyphic and the Phaistos Disk encode the same (or very closely related) language(s).[47] This may well be right, but in itself this has little bearing on any relationship between the scripts which remains an open question.

7.5 Cretan Hieroglyphic and the 'Archanes Script'

A small number of seals and seal impressions (fifteen examples in total) loosely dated to 2000–1900 BC (EM III–MM IA) bear a formulaic inscription traditionally called the 'Archanes script',[48] after the place where its first examples were unearthed (the cemetery of Phourni near Archanes on north Crete).[49] Elevating these inscriptions to the level of a 'script', however, is a questionable leap (Jasink and Weingarten, this volume). For the inscriptions only ever show the same four characters and, at present, there is no contextual evidence of any additional signs that might have complemented those attested to form a potential early syllabary. Hence, more recently scholars have taken to referring to these early examples of writing, taken altogether, as the 'Archanes formula' or 'Archanes inscriptions',[50] which is traditionally tentatively read as A-SA-SA-RA-NE[51] (by applying the phonetic values we have for the homomorphic Linear A/B signs). The debate surrounding the

[46] Owens, online (https://daidalika.hmu.gr/wp-content/uploads/2020/10/enigma.pdf, 187).
[47] Davis 2018. [48] Yule 1980: 170; Sbonias 1995; Karnava 2000: 195–8.
[49] Valério, this volume. [50] Esp. Karnava 2016a; 2021.
[51] There are, however, good reasons to question this reading, cf. in particular Ferrara, Montecchi and Valério 2021b.

nature of the Archanes formula and the role it played in the formation of Cretan scripts is still ongoing: while most scholars seem to regard it as an early form of Cretan Hieroglyphic,[52] the formula has also been argued to have a close connection with Linear A,[53] to be the ancestor of both Cretan Hieroglyphic and Linear A,[54] or even a script *sui generis* though with strong connections to Cretan Hieroglyphic.[55] For the purposes of this chapter, we shall now briefly review the main arguments in support of a possible relationship of the Archanes inscriptions with Cretan Hieroglyphic and/or Linear A. Among the elements that support a connection with Cretan Hieroglyphic are: a) the very early date of most of the seals carrying the formula, which is compatible with an early form of Cretan Hieroglyphic but much less so of Linear A (no attestations of Linear A date this far back in time and proponents of a close relationship between Archanes and Linear A are faced with an unexplained chronological gap); b) the 'seal' writing support, that is typical of the Cretan Hieroglyphic writing tradition, but barely ever used in Linear A;[56] c) the shape of the carved signs and their general ductus, including the use of other signs such as the 'x' stiktogram (see Valério, this volume), which is much closer to Cretan Hieroglyphic than to Linear A. However, there are also elements that distance the Archanes script from Cretan Hieroglyphic, such as the length of the inscription (either two words, or a very long sign group)[57] and that the last two signs of the formula do not have a parallel in Cretan Hieroglyphic.[58] If the last sign of the formula is indeed attested in Linear A as AB 24/*ne*, this would strengthen the links with Linear A. Another argument that has been put forward in support of a possible Linear A connection is the occurrence of the formula on a number of votive Linear A inscriptions (bearing the so-called 'libation formula'), where the formula may also show the alternation *a-/ja-* at sequence-start and *-ne/-me* at sequence-end.[59] However, the claim that the sequence *a-sa-* may be

[52] E.g. Sbonias 1995: 108; *CHIC*: 18; Perna 2014: 252; Karnava 2016a: 81; Ferrara 2021; Ferrara, Montecchi and Valério 2021b; Valério, this volume.

[53] Godart 1999; Anastasiadou 2016a: 177–82.

[54] See in particular Schoep 1999: 266, 270–3.

[55] Decorte 2018a. In fact, this may be tantamount to saying that the 'Archanes script' is nothing other than an early form of Cretan Hieroglyphic, although some decorative signs (not carried over into 'classical' Cretan Hieroglyphic) may have interacted meaningfully with the formula and given it its particular shape.

[56] The only known examples of a sphragistic use of Linear A are: ARM Zg 1, KN Zg 55, CR (?) Zg 3 (see Del Freo 2005: 663–5).

[57] For a comparison of the Archanes formula with the Cretan Hieroglyphic 'formulae' and the Linear A 'libation formula' see esp. Civitillo 2016b.

[58] The penultimate sign of the formula is equated with CH 095, which, however, is only attested as part of the formula and never elsewhere.

[59] These are: IO Zb 10, PR Za 1c, PK Za 11b–c, PK Za 2, PL Zf 1, PO Zg 1. On the 'libation formula', see most recently Davis 2013; Karnava 2016b.

a typical morphological feature of Linear A has recently been subject to criticism[60] by showing that the sequence has parallels elsewhere in Cretan Hieroglyphic, and even if the equation were entirely correct then this might say more about language identity than script relationship. This, together with the chronological gap between the Archanes inscriptions and Linear A, the markedly different contexts of their use and the further features observed by Valério (this volume), puts the Archanes inscriptions closer to Cretan Hieroglyphic than to Linear A. Nonetheless, questions as to the exact relationship remain and that the Archanes script should be the direct and immediate ancestor of the Cretan Hieroglyphic script as attested on seals is by no means certain.

7.6 Cretan Hieroglyphic and Linear A

Cretan Hieroglyphic is now commonly seen as an original script indigenous to Crete, quite conceivably having come about by stimulus diffusion.[61] Because of the more simplified (i.e. stylised or schematic) graphic appearance of Linear A signs compared with Cretan Hieroglyphic, Linear A was initially thought to have derived straight out of Cretan Hieroglyphic within an evolutionary framework envisaging a unidirectional development from pictographic to more cursive (and phonetic) writing over time.[62] This evolutionary model in script development, however, has since been called into question,[63] and more nuanced views are now expressed by recent scholarship, routinely taking a more cautious approach and withholding judgement until conclusive evidence is either found or put forward.[64] The viewpoint of Linear A as derivative from Cretan Hieroglyphic is further enhanced by the fact that the earliest Cretan Hieroglyphic attestations (MM IB seals) predate the earliest recognisable Linear A inscriptions (MM IIA–B), and the primacy of Cretan Hieroglyphic is clear also from the fact that Cretan Hieroglyphic is grounded in earlier Minoan glyptic.[65] However, it is also sometimes argued that Cretan Hieroglyphic and Linear A are parallel systems since they show chronological overlap (MM II–III, ca. 1800–1600 BC) but geographically are in near-complementary

[60] Ferrara, Montecchi and Valério 2022. For a defence of the nature of *(j)a-sa-* as a prefix, given that it is often physically separated from the rest of the text, see people.ku.edu/~jyounger/LinearA, 17 'hyphenization'.
[61] See in particular Ferrara 2015 and 2021: 214; Decorte 2018b; Schoep 2020.
[62] Evans 1894b: 275, 324, 333.
[63] See esp. Houston 2004b.
[64] See esp. Schoep 1999; 2020; Flouda 2013; 2015a; Perna 2014; Ferrara 2015; Karnava 2015; Anastasiadou 2016a; Decorte 2018a–c; Salgarella 2021; Ferrara, Montecchi and Valério 2021b.
[65] See in the first instance Decorte 2018a–c.

distribution, with Cretan Hieroglyphic being at home in north and east Crete (with focal points at Knossos, Malia and Petras), while Linear A in this early period is predominantly found in south-central Crete (esp. Phaistos), before becoming more widespread after Cretan Hieroglyphic ceased to be used (MM III). There are, in fact, a number of clay documents that cannot be unquestionably classified as either Cretan Hieroglyphic or Linear A as they show features compatible with both scripts: the 'dubitanda' from the Knossos 'Hieroglyphic Deposit' and the Malia 'Dépôt Hiéroglyphique'.[66] If Linear A and Cretan Hieroglyphic were parallel systems, then, given the undeniable similarity of many of the signs, the question of a common origin arises, leading back to the 'Archanes script' dealt with in the preceding section.

To establish script relations, it is constructive to compare and contrast both script-internal and script-external features of each script under examination. Among the former, we have script typology (in our case, arguably logo-syllabic, although with a number of reservations as illustrated earlier on in this chapter), total number of signs attested and their functional use (e.g. syllabograms, logograms/ideograms, icons, klasmatograms, word-dividers), graphic rendering of signs and their variants (i.e. palaeographical features). Among the latter, we have the type and function of the material supports (and media), pinacological features (in the case of clay documents), context of use of the inscribed document, not to mention chronological and geographical distribution of the evidence. Linguistic comparison is an area of investigation we are not touching upon in the present contribution, given that both Cretan Hieroglyphic and Linear A remain to date undeciphered in the sense that the underlying language(s) is/are unknown.

When comparing the Cretan Hieroglyphic and Linear A scripts (and especially their sign inventories), we face a number of obstacles from the very outset of our examination: the paucity of evidence (ca. short of 300 inscriptions in Cretan Hieroglyphic and 1,400 in Linear A), often in a poor and fragmentary state of preservation; the short and significantly formulaic nature of the texts; and, most crucially, the absence of sign sequences that are shared between the two scripts.[67]

For the purposes of this contribution, we will focus on script-internal features (especially sign comparison), with a view to assessing the plausibility of the proposals put forward to date and testing the

[66] *CHIC*: 18; Petrakis 2014.

[67] By way of contrast, Linear A and Linear B do share a number of sign sequences, mostly anthroponyms and toponyms; see Steele and Meissner 2017.

methodologies so far used to identify cognates and draw meaningful sign comparisons. Our goal is to evaluate the total reconstructable number of signs, and their typology, that can be taken as shared between the two scripts with a reasonable degree of likelihood. The higher the number of securely identifiable cognates, the higher the likelihood that Linear A is directly derived from Cretan Hieroglyphic. If this is not the case, then this might be an argument in favour of those who argued for parallel traditions between Cretan Hieroglyphic and Linear A. The list of potential Cretan Hieroglyphic–Linear A parallels can be viewed in Table 7.2.[68] These parallels are collected from both *CHIC* and later scholarship.[69] Where more than one Linear A sign has been suggested as a continuation of a Cretan Hieroglyphic sign and there is no agreement on which one has the edge over another,[70] proposals are listed in decreasing order of likelihood in the present authors' view. Proposals put forward in this paper by the authors are in bold.

Table 7.2 *Cretan Hieroglyphic and Linear A signs and their real-world referents*

CH Sign (clay variant if available)	LA Comparanda	Referent	Semantic Field
CH 001	AB 100/*VIR*	Man	Human body
CH 002	AB 70/*ko*	Man's bust	Human body
CH 003		Man's bust + branch	Human body
CH 004	AB 102/*MUL*?	Woman	Human body
CH 005	AB *79	Eye	Human body
CH 006	AB 48/*nwa*, A 342	Crossed arms	Human body
CH 007	AB 73/*mi*	Bent arm	Human body
CH 008	AB 28/*i* > *i*, A 28b, B 52/*no*	Hand with fingers	Human body
CH 009	AB 01/*da*	'Glove' hand	Human body
CH 010	AB 53/*ri*	Leg	Human body

[68] Following *CHIC* sign classification and numbering. It has to be noted, however, that in the *CHIC* list signs are often 'multiplied' in case they are understood to function as both 'syllabograms' and 'logograms/ideograms' (see e.g. the sign representing a calf's head: as syllabogram it is CH 013, as logogram/ideogram it is CH 152). This classification method may well be in need of revision for future editions. Note also that this table focuses on sign shapes only; it does not take into account sign functions.

[69] For specific references to the scholar(s) who put forward each proposal see Ferrara *et al.* 2021b. Salgarella 2021 puts forward the proposals: CH 009 = AB 01/*da*, CH 011 = AB 05/*to*, CH 013 = AB 61/*o*, CH 025 = AB 04/*te*, CH 026 = AB 09/*se*, CH 046 and/or CH 087 = A 301.

[70] This is not only because we are still unsure as to the precise derivation of a number of Linear A signs, but also because more than one CH graphic antecedent may have given rise to a single Linear A sign, as suggested in Ferrara, Montecchi and Valério 2022.

Table 7.2 *(cont.)*

CH Sign (clay variant if available)	LA Comparanda	Referent	Semantic Field
CH 011	AB 05/*to*	Ox head (frontal)	Animal/Cattle
CH 012	A 306 (= B 42/*wo*), AB 23/*mu*	Ox head (lateral)	Animal/Cattle
CH 013	AB 61/*o*	Calf's head	Animal/Cattle
CH 014–15	-	(animal's head)	Animal/Cattle
CH 016	AB *22	Goat's head	Animal/Cattle
CH 017	AB 85/*au*	Pig's head	Animal/Cattle
CH 018	A 336	Dog's head	Animal/Pet
CH 019	AB 31/*sa*	Fish	Animal/Sea
CH 020	B 15/*mo*, AB 13/*mu*, (A?) B 43/*ai*	Bee/wasp	Animal/Bug
CH 021	AB 39/*pi*	Fly/moth	Animal/Bug
CH 022	AB 39/*pi*	Fly?	Animal/Bug
CH 023	A 122, B 33/ra_3	Crocus?	Plant
CH 024	AB 30/*ni*	Fig-tree branch	Plant
CH 025	AB 04/*te*	Tree branch	Plant
CH 026	AB 09/*se*	Tree branch	Plant
CH 027	A 316	Tree branch	Plant
CH 028	AB 09/*se*, AB 38/*e*	Tree branch	Plant
CH 029	AB 30/*ni*	Tree branch	Plant
CH 030	AB 29/pu_2	Tree branch	Plant
CH 031	AB 27/*re*, A 328	Flax plant	Plant/Textile industry
CH 032	**variant of CH 031**, AB 29/pu_2	-	Plant
CH 033	AB *79, AB *47	-	-
CH 034	A 356, A 305, AB 87/*twe*, AB 59/*ta*	Mountains?	Landscape
CH 035	AB 58/*su*	-	-
CH 036	A 305, AB 38/*e*, B 62/*pte*, B 72/*pe*	-	-
CH 037	AB 123/*AROM*, AB 40/*wi*, AB 54/*wa*	-	-
CH 038	AB 57/*ja*, AB *56, A 327	-	-
CH 039	AB 55/*nu*, AB *56	-	-
CH 040	AB *86, A 359	Boat	-

Table 7.2 *(cont.)*

CH Sign (clay variant if available)	LA Comparanda	Referent	Semantic Field
CH 041	AB 54/*wa*	Loom	Tool/Textile industry
CH 042	AB 08/*a*	Double axe	Cultic
CH 043	A 364 (= B 12/*so*), A 363, A 324, AB 11/*po*	Stunning axe	Cultic
CH 044	B **19*, AB 17/*za*	*Petschaft*	Tool
CH 045	AB 74/*ze*	Comb	Tool/Textile industry
CH 046	A 301	Nautilus? Adze?	Animal/Sea Tool
CH 047	A 309, AB 78/*qe*	Sieve?	Tool
CH 048	variant of AB 81/*ku*, A 305	Flying bird	Animal
CH 049	AB 20/*zo*, AB 37/*ti*, A 304	Arrow?	Weapon
CH 050	A 304, AB 20/*zo*, AB 37/*ti*	Arrow	Weapon
CH 051	A 312, **AB 03/*pa***	Dagger	Weapon
CH 052	AB 24/*ne*	Spouting jug	Vessel
CH 053	A 412 (= B 204), AB 60/*ra*?	One-handle jug	Vessel
CH 054	AB 16/*qa*, A 325	Two-handle jug	Vessel
CH 055	-	-	Vessel
CH 056	variant of CH 044?	-	-
CH 057	A 355, A 354, AB **65*, AB 67/*ki*	Sistrum? Cup	Musical instrument Vessel
CH 058	AB 29/pu_2, AB 69/*tu*	-	-
CH 059	A 704, AB 10/*u*	Plough	Tool
CH 060	-	-	-
CH 061	AB 11/*po*, B 75/*we*	-	-
CH 062	**AB 70/*ko***, AB 06/*na*	Spindle with whorl	Tool/Textile industry
CH 063	Variant of 062? **AB 70/*ko***, AB 03/*pa*, AB 02/*ro*	Spindle with whorl	Tool/Textile industry
CH 064	AB 03/*pa*	-	-
CH 065	A 319	-	-
CH 066–7	-	-	-
CH 068	AB 03/*pa*	-	-
CH 069	AB 76/ra_2	-	-

Table 7.2 *(cont.)*

CH Sign (clay variant if available)	LA Comparanda	Referent	Semantic Field
CH 070	AB 02/*ro*	-	-
CH 071	A 314	-	-
CH 072	A 353, AB 66/*ta*$_2$	-	-
CH 073	A 309a, AB 78/*qe*, AB 77/*ka*	-	-
CH 074/75	AB 78/*qe*	-	-
CH 076	AB 61/*o*	-	-
CH 077 (= CH 178)	A 311, AB 40/*wi*	-	-
CH 078	B 14/*do*	-	-
CH 079–82	-	-	-
CH 083	AB 55/*nu*	-	-
CH 084	-	-	-
CH 085	AB 40/*wi*, AB 41/*si*	-	-
CH 086	-	-	-
CH 087	A 301, B 36/*jo*	-	-
CH 088–91	-	-	-
CH 092	AB 26/*ru*	Lyre? Scorpion?	Musical instrument Animal
CH 093	AB 37/*ti*	-	-
CH 094	AB 38/*e*	-	-
CH 095	AB 60/*ra*, AB 10/*u*	Man's head[71]	Human body
CH 096	AB 16/*qa*, AB **79*	Two-handled jug?	Vessel?
Logograms/ideograms			
CH 153	AB 120/*GRA*, A 339	Wheat	Agriculture
CH 154	AB 122/*OLIV*	Olive tree for 'olives'	Agriculture
CH 155 (= CH 024)	AB 30/*FIC*	Fig-tree branch for 'figs'	Agriculture
CH 156	AB 131a/*VINa*	Vine shoot for 'wine'	Agriculture
CH 157	AB 123/*AROM*	Spice jar? For 'spices'	Agriculture

[71] The shape of AB 60/*ra* as a 'bearded man's face' (profile view) is clearly recognisable as such in the KN ivory sceptre and CH 095 may actually be the conflation of more than one shape/sign (cf. 'seated bird' and 'hand'; the discussion in Salgarella 2021: 88, n. 72).

Table 7.2 *(cont.)*

CH Sign (clay variant if available)	LA Comparanda	Referent	Semantic Field
CH 158	A 303, B 130/*OLE* (NB: A 302 = B *OLE*)	Olive-tree branch for 'oil'	Agriculture
CH 159	-	-	-
CH 159*bis*	B 33/*ra*$_3$, B 144/*CROC*	Crocus flower	Agriculture
CH 160	B 209	Amphora	Vessel
CH 161	-	-	Vessel
CH 162	-	-	-
CH 163	AB 54/*TELA*	Loom	Tool/Textile industry
CH 164–5	AB 180	-	-
CH 166–73	-	-	-
CH 174 (= CH 031)	AB 27/*re*	Flax	Agriculture
CH 175 (= CH 042)	AB 08/*a*	Double axe	Cultic
CH 176 (= CH 050)	A 304 (= B 231/*SAG* or B 254/*JAC*? →)	Arrow	Weapon
CH 177 (= CH 062)	**AB 70/*ko*** , AB 06/*na*	Spindle with whorl	Tool/Textile industry
CH 179–80	-	-	-
CH 181	AB 38/*e*, B 134 (=190)	-	-
CH 182 (cf. 180)	-	-	-

7.7 Towards Further Identifications

The way of equating Cretan Hieroglyphic and Linear A signs is controversial. To be sure, in a number of instances the signs are graphically so similar that it seems impossible to deny them: that the 'double axe' symbol CH 042 corresponds to AB 08/*a* is as evident as it is uncontroversial, and that CH 024 'fig tree' is reflexed in AB 30/*ni* is likewise obvious. But it is clear that *a priori* much is in the eye of the beholder as the changes invoked on the way from Cretan Hieroglyphic to Linear A range from the modest to the radical. *CHIC* (p. 19) accept thirty equations of syllabograms between Cretan Hieroglyphic and Linear A, but many further proposals have been put

forward.[72] Again, scholars will make up their own minds as to what they regard as plausible here and what not. Suggestions for equations are usually made on the basis of putative graphic similarities, with little control of what constitutes a plausible development. In order to rein in the speculations and put the sign development on a sounder methodological footing, Ferrara, Montecchi and Valério 2021b group together signs that underwent similar graphic changes and, on this basis, establish seven different ways (or categories) in which signs can plausibly change their shape. This attempt at imposing a degree of control over what constitutes a plausible graphic change and what does not is certainly very welcome. However, seven different ways which, in addition, are not mutually exclusive but may occur concomitantly, is still a large number given the total number of signs under discussion. In what follows, we shall explore a different approach to the problem, which takes into account the complex relationship between script and the contemporary iconographic background as well as material culture production.[73] It is evident that many Cretan Hieroglyphic signs are close depictions of real-world referents, such as the 'double axe' or the 'eye'. But in a larger number of cases, the identification of such a referent is uncertain. In this instance, a specific object underlying the creation of a Cretan Hieroglyphic sign can be motivated, and the suggestion gains more plausibility if it can be shown to belong to the same semantic field as another established and uncontroversial one. Thus, in a recent article, Nosch and Ulanowska drew attention to the central role that the textile industry played in the creation of Cretan Hieroglyphic signs and identified, amongst other motifs, the flax plant (amply attested on Middle Bronze-Age seals from Crete) as underlying Cretan Hieroglyphic sign 031.[74] As a second step, the sign development from Cretan Hieroglyphic to Linear A/Linear B needs to be motivated and, as a result, an approximate sound value can be obtained for this sign (with the proviso and the limitations regarding Linear A set out above). Finally, the plausibility of the proposed identification can then be significantly enhanced if the resulting sign can be shown to match the beginning of a word (acrophonic principle)[75] for

[72] See the list in Table 1 and the discussion in Ferrara, Montecchi and Valério 2021b.

[73] See esp. Salgarella 2021 for a theoretical framework of motif transferral across different media.

[74] Nosch and Ulanowska 2021: 79.

[75] On this principle, the sound value associated with a sign corresponds to the first syllable of the word standing for the real-world referent the sign represents. For example, sign AB 30, graphically representing a branch with fig-tree leaves (Weilhartner 2014: 299–300; 2015: 256), is read with the syllabic value /ni/ and is also used as the logogram for 'fig'. This sign has been demonstrated (Neumann 1962) to be the acrophonic abbreviation of νικύλεον /nikyleon/, probably the Minoan word for 'fig' as strongly suggested by the gloss: Ἑρμῶναξ δ' ἐν γλώσσαις Κρητικαῖς σύκων γένη ἀναγράφει ἀμάδεα καὶ νικύλεα 'Hermonax in the Cretan glosses records as kinds of figs the ἀμάδεα [/hamadea/] and the νικύλεα [/nikylea/]' (Athenaios 3.76e).

the underlying real-world referent in Greek (provided that this Greek word has no likely etymology and is plausibly a loan word and, in addition, sits well in the Aegean Bronze-Age material and cultural context). Applying this method, in what follows we shall look at a number of selected case studies.[76]

CH 042 = AB 08/*a*[77]

(Referent: Double Axe; Semantic Field: Cultic, Weapons)

The most iconic of all 'Minoan' symbols, the double axe, has a long and unbroken history in the development of the Cretan scripts. It is well attested on seals as the sole sign (e.g. *CMS* II 2, 155c, Malia, *Atelier des sceaux*), or as part of a pictorially represented scene (held by an individual, e.g. *CMS* II 3, 008, Knossos, Court of the Stone Spout), or indeed as the very shape of the seal (e.g. *CMS* VS, 3, Moni Odigitria?). Further on the road to script creation, it surfaces on Cretan Hieroglyphic inscriptions both on seals and on clay before passing into Linear A and Linear B, in both of which it has the sound value /a/.[78] This identification is not new, of course; rather it seems entirely uncontroversial and universally accepted. The sign development is as simple as it is modest, reducing the x-shaped internal strokes to a single horizontal line. But it may even be possible to connect it to an attested Greek word. In Homer, one of the words for a short-range weapon is ἄορ /aor/. This is traditionally translated as 'sword', presumably because it is used in the same way and contexts as a ξίφος /ksip^{h}os/. Closer inspection shows, however, that to a large extent ἄορ is simply a rare metrical alternative to ξίφος in a formulaic context.[79] The word is also attested in Hesiod, but apart from a single Homeric reminiscence in Euripides (*El*. 475) it disappears from Greek and is never attested in prose until much later epic poets start using it again but use it for any weapon, e.g. Poseidon's trident in Callimachus *Del.* 31 or even the horn of a rhinoceros (Oppian, *Cyn.* 2.553). It is evident that the word is fading in meaning and use from Homer onwards. In Mycenaean, the word is not attested as such, but does appear in the personal name *a-o-ri-me-ne* Ἀοριμένης /Aorimene:s/ on a tablet from Pylos (PY Qa 1296). As far as the etymology is concerned, two proposals have been put forward. Already the Greeks

[76] Further proposals are put forward in Salgarella 2021.

[77] Palaeographic charts: for CH 042, see *CHIC*: 401–2; for AB 08 in Linear A, see *GORILA* V: xxix and *SigLA* (look up 'AB08'); for AB 08 in Linear B, see *Docs*^{2}: 41, fig. 9.

[78] Cf. e.g. the name equation Linear A *a-ra-na-re* (HT 1.4): Linear B *a-ra-na-ro* (masc. anthrop. on KN As 1516.1).

[79] See *LfgrE s.v.*

connected it with ἀείρω /aeiro:/ 'raise, hang',[80] but this etymology is problematic not just because of the semantics but more importantly for formal reasons. ἀείρω has no known cognates, but if it is old then the root would seem to require a reconstruction *h$_2$u̯er-, which is incompatible with Mycenaean *a-o-ri-me-ne*. If it is not old then the extremely archaic formation (neuter root noun with ablaut in the root vowel) is hard to accept. The alternative etymology, commonly ascribed (see *EDG* s.v.) to Ruijgh 1970 but in fact already found in Prellwitz 1892 s.v., connects it with Lat. *ensis* 'sword' and Skt. *así-* 'butcher's knife', containing the zero grade *n̥s- < *nes- 'to save'. In fact, this is, if anything, more difficult than the traditional etymology. The stem formation *n̥s-r̥ remains entirely unexplained, the zero grade of the root is unexpected and from a morphological point of view such a reconstruction is unacceptable. Furthermore, the inflection as an r-stem is incomprehensible as we would rather expect a heteroclitic inflection.[81] The conclusion must thus be that neither etymology is acceptable. This leads us to reconsider the entire problem. It can be observed that the ἄορ has strong cultic connections. The epithet χρυσάωρ /k^{h}ry:sa:o:r/, -ορος /-oros/, also thematised as χρυσάορος /k^{h}ry:sa:oros/, -ου /-u:/ 'with a golden ἄορ', is an epithet of Apollo in the *Iliad* and in Hesiod and, uniquely, even surfaces as a personal name Χρυσάωρ /K^{h}ry:sa:o:r/ (Hesiod *Th.* 979). This use in a personal name is mirrored in Mycenaean *a-o-ri-me-ne* 'who has spirit through the ἄορ' quoted above – and that this is the name of a priest in Linear B is rather telling; as a weapon that is actually used in battle, however, the word is conspicuously absent in Mycenaean. The suggestion put forward here, then, is that ἄορ is in origin the word for the double axe and a Minoan loan word, and that sign CH 042 = AB 08/*a* is the acrophonic rendering of this.

CH 051 = AB 03/*pa*[82]

(Referent: Dagger; Semantic Field: Cultic, Weapon)

A very frequent sign in both Linear A and Linear B, *pa* is so far lacking an antecedent in Cretan Hieroglyphic. The standard way of drawing it

[80] Cf. *Lexicon anepigraphum quod incipit a voce αἰμωδεῖν* p. 619: ἄορ σημαίνει τὸ ξίφος παρὰ τὸ ἀείρω, 'aor means the sword, from the verb aeiro:'.

[81] Ruijgh 1970: 313 invokes μεγαλήτορος/ /megale:toros/, μεγαλήτορι /megale:tori/ < *ἦτορ /e:tor/ as a parallel for the inflection, but this does not work. In a compound, this way of creating an animate form is entirely regular and expected, and the resulting μεγαλήτωρ /megale:to:r/ has close inflectional parallel in the agent nouns of the type ῥήτωρ /r^{h}e:to:r/; for a neuter noun to inflect in this way, however, is without parallel.

[82] Palaeographic charts: for CH 051, see *CHIC*: 409; for AB 03 in Linear A, see *GORILA* V: xxviii and *SigLA* (look up 'AB03'); for AB 03 in Linear B, see *Docs*^{2}: 41, fig. 9.

in both Linear A and Linear B is a vertical line with two horizontal lines crossing it in the middle: 𐄪. But this is probably not the oldest shape of the sign. At Phaistos and Ayia Triada, this sign sometimes shows a significant variant inasmuch as the lower horizontal stroke is, in fact, a large dot, e.g. PH 7a (dating from MM IIB)  [83] and it can furthermore be observed that if the lower stroke is indeed a stroke at these two sites it is often significantly shorter than the upper one. This is certainly not accidental, and now also has a clear parallel on the Linear A inscribed ivory sceptre ring from Knossos (preliminarily dated to about 1600 BC), as yet unpublished, where the lower 'stroke' towards the bottom of the vertical line is clearly a relatively large round dot. A good number of signs on this ring look 'hieroglyphicised', not dissimilar to some of the signs on the libation table IO ZA 2,[84] providing a remarkable bridge between Cretan Hieroglyphic and Linear A. The early date of the PH attestation speaks clearly in favour of this being the older shape of the sign and it is much more plausible to argue that it was 'linearised' by transforming the dot into a second horizontal line (eventually of roughly equal length) than vice versa. It is suggested here that the real-world referent for this sign is a dagger or short sword, with the pommel at the bottom and the cross-guard a bit further up. This might make it comparable to CH 051, which is clearly a short sword or dagger. The graphic change on the way from Cretan Hieroglyphic to Linear A would simply have been the merging of the diagonal lines, i.e. the edges of the blade, into one vertical one (which is what the sword/dagger looked like from the side). The fact that in the Linear scripts the sign is attested in a pretty much unchanged form as a logogram/ideogram need not contradict this. Logogram/ideogram and syllabogram sometimes went their own ways; or of course the logogram/ideogram could have been re-created at any point in time. But it is interesting to note what the logogram/ideogram stands for. On KN Ra 1540 the logogram for daggers is explicitly referred to as *pa-ka-na* φάσγανα /p^{h}asgana/. In later Greek, φάσγανον /p^{h}asganon/ is clearly a highly poetic word, found from Homer onward, and not attested in prose. It is practically impossible to explain this word in any credible way as inherited.[85] The root shape and structure with its a-vocalism and the sequence -σγ- /-sg-/ looks thoroughly non-Indo-European. This is shown even more clearly by the fact that we get an irregularly metathesised root form σφαγ- / sphag-/ in σφάζω /sp^{h}azo:/, σφαγή /sp^{h}age:/ etc. It is highly significant that in Homer the verb does not mean 'to kill' in a general sense,

[83] Source: Image from *SigLA*, courtesy of the authors. [84] *GORILA* V: 18–19.
[85] See also *EDG* s.v.

but is always used to refer to slaughtering cattle by cutting the throat (i.e. exactly what a short weapon would be used for), and generally so for sacrificial purposes. This meaning of the root is also attested in Mycenaean in the place name *pa-ki-ja-ne* /Sp^{h}agianes/ *vel sim.*, apparently the most important religious site at Pylos, as well as in the later name of the island Σφακτηρία /Sp^{h}akte:ria:/. It is thus suggested here that AB 03/*pa* represents the dagger, that this sign has an antecedent in CH 051 and that this refers to a weapon that is used in a cultic or religious context,[86] just like CH 042 = AB 08/*a* for ἄορ /aor/.

CH 062/063= AB 70/*ko*[87]

(Referent: Spindle Whorl; Semantic Field: Textile Industry)

CHIC lists CH 062 and 063 as two different signs. This is possible because there are no shared sequences between these two signs, i.e. no sequence in which 062 occurs is ever written with 063. Still, there are reasons to think that they are, in fact, the same sign. The shapes of CH 062 and 063 vary solely by the position of the dot on the vertical line. CH 062 has it at the top, the much more rarely attested CH 063 in the middle. It would be highly unusual for two signs to be differentiated in such a minimal way and that they are simply variants of one and the same sign seems highly plausible. No certain successor to this sign (assuming it is just one) has been identified in the Linear scripts and in what follows a very tentative suggestion will be made. In their influential article already mentioned, Nosch and Ulanowska have identified the textile industry as a core semantic field for the creation of Cretan Hieroglyphic signs.[88] They argue compellingly for CH 062 and 063 to be the spindle with a whorl. This would, incidentally, also neatly account for the difference in graphic representation as, depending on the technique employed, the whorl might sit in different positions on the spindle; the usual CH 062, therefore, would depict the drop spindle. In the Linear scripts, the sign graphically closest to this might be AB 70/*ko* 𐀞. The Greek word for 'spindle' is ἄτρακτος /atraktos/ and thus cannot acrophonically be equated with AB 70/*ko*, though the word, in this sense, is not attested until the fifth century BC. But in many languages, the word for spindle, although originating in textile production, is then also used for a variety of unrelated (from a practical point of view) but

[86] See e.g. the Mycenaean daggers from the Grave Circles at Mycenae (Karo 1930–1933; Papadopoulos 1998).

[87] Palaeographic charts: for CH 062/063, see *CHIC*: 413–14; for AB 70 in Linear A, see *GORILA* V: xxxix and *SigLA* (look up 'AB70'); for AB 70 in Linear B, see *Docs*^{2}: 41, fig. 9.

[88] Nosch and Ulanowska 2021.

similarly shaped objects. Thus, in English, 'spindle' also signifies the long metal bolt to which the door-knob is attached. In Greek, there is a word κόλλοψ /kollops/ (gen. sing. κόλλοπος /kollopos/) signifying the peg of a lyre around which the string is wound (*Od.* 23.407+). This word is clearly a loan word[89] (just like the word itself, and CH 092 = AB 26/*ru* may very well acrophonically stand for the lyre); this is clearly confirmed by the existence of the variant κόλλαβος /kollabos/ (Lucian, *DDeor.* 7.4.+) with the typical oscillation between voiceless and voiced stop and o/a vowel interchange. Furthermore, it is tempting to connect it with σκόλοψ /skolops/ (gen. sing. σκόλοπος /skolopos/) 'palisade, prickle', in other words, another wooden implement with a sharp point. The use of the 'spindle and whorl' motif in Middle Minoan iconography is not in any doubt[90] and the depiction of the spindle and whorl on several seals[91] looks virtually identical to standard renderings of AB 70/*ko*. The only significant change along the way from Cretan Hieroglyphic to Linear A and Linear B would have been the standardisation of the position of the whorl at the top. This is unsurprising as Linear A and Linear B signs tend to have their most diacritic feature either at the very top or at the very bottom of the sign. Although it is not as straightforward as the first two signs considered, there are good reasons to think that CH 062/063 = AB 70/*ko* and that the word underlying it meant 'spindle' or, more generally, given the slightly different reflexes in Greek, 'pointed peg/pole'.

CH 019 = AB 31/*sa*[92]

(Referent: Fish; Semantic Field: Nature, Seascape)

Attested on both seals and clay documents, CH 019 has a long history of use, as its shape is also recognisable in the second and third signs of the earlier Archanes inscription (traditionally read A-SA-SA-RA-NE).[93] A frequent symbol on seals, it has been suggested that CH 019 represents some kind of fish, possibly a 'sepia'[94] or 'cuttlefish.'[95] Although the

[89] Just like the word for the lyre itself: λύρα /lyra:/ is clearly not an inherited word (see *EDG* s.v.). Remarkably, CH 092 = AB 26/*ru* has exactly the shape of the lyre and, given that the sound value /ru/ is secure in both Linear scripts (cf. e.g. Linear A *ku-ru-ku* HT 87.4, a personal name appearing in Linear B as *ku-ru-ka* KN Vc 5510), it is very plausibly acrophonic. Conceivably, therefore, both signs, CH 062/063 and 092, belong not just to the same semantic sphere but to the very same object.

[90] See Nosch and Ulanowska 2021: 89.

[91] E.g. *CMS* IV, 136a = *CHIC* #305α (Nosch and Ulanowska 2021: 90 (f)).

[92] Palaeographic charts: for CH 019, see *CHIC*: 392–3; for AB 31 in Linear A, see *GORILA* V: xxxiv and *SigLA* (look up 'AB31'); for AB 31 in Linear B, see *Docs*²: 41, fig. 9.

[93] See section 7.5. [94] Thus *SM* I: 205. [95] Jasink 2009: 69–71, 146.

precise identification remains uncertain, an iconographic interpretation of this sign's shape as 'fish' makes it belong in the semantic fields of 'nature' and, more precisely, 'seascape'.[96] Seascapes, with naturalistic designs of plants and marine life alike, permeate the visual culture of Middle and Late Bronze-Age Crete, culminating in the development of the 'Marine Style' (ca. MM III–LM IA). Thus, in addition to being a real-world referent, fish is a well-established and common motif appearing on a variety of media, such as glyptic, pottery decoration, frescoes. We may therefore reconstruct a pattern of motif transferral from the naturalistic world (animal), through material culture production (esp. glyptic context), to script, where the motif 'fish' became further stylised to become a script-sign.[97] This sign continued on into the Linear tradition, as sign AB 31/*sa*, which is read with the phonetic value /sa/.[98] We can be reasonably certain that the Linear sign is a continuation of the Cretan Hieroglyphic sign not only for the remarkable formal similarity (although it underwent further stylisation in Linear A), but also because the so-called 'Archanes formula' is also attested in a number of inscriptions clearly identifiable as Linear A (from non-administrative contexts) (see section 7.5). Here we would like to go a step further and suggest that the phonetic value /sa/ associated with this sign originated by way of acrophony from a word belonging to the Pre-Greek substratum that stood for the real-world-referent 'fish' (either a generic name or that of the specific type of fish represented, that still escapes us). Remarkably, in Greek there are a number of words beginning in /sa/ which do not have a clear etymology. We have σάνδαλον /sandalon/ (alternating with σάμβαλον /sambalon/) 'name of a flat fish' (*EDG* s.v., in *DELG* compared to Lat. *soleas*),[99] σαλαμάνδρα /salamandra/ 'salamander, kind of newt' (*EDG* s.v.) and a number of nouns generically defined as 'name of a fish' (*EDG* ss.vv.), namely σαπέρδης /saperde:s/, σαργός /sargos/, σάρδα /sarda/[100]. In addition to these, there is also the noun σαγήνη / sage:ne:/ 'large fishing net, trawl' (*EDG* s.v.), whose etymon is understood to be Pre-Greek. That the name of 'fish' or 'of a fish' (or a way

[96] Other signs belonging in the semantic field 'nature / seascapes' are: AB 50/*pu* (without Cretan Hieroglyphic antecedent) and A 301 (= CH 046 or 087), said to be the stylisations of an octopus and a nautilus respectively (Salgarella 2021: 78–81). To these, we propose to add AB 41/*si* (without Cretan Hieroglyphic antecedent), which is likely to be the stylisation of the real-world referent 'trident' (see e.g. image in Andreadaki-Vlasaki *et al.* 2008, vol. I, item no. 60).

[97] In Cretan Hieroglyphic there are at least two other symbols (not numbered in *CHIC*) representing fish (Jasink 2009: 48, 146), whose precise function in the script is, however, unclear (signs, decorative elements, other?).

[98] Graphic parallel first put forward by Evans 1921 and accepted in *CHIC*.

[99] See also Strömberg 1943: 37.

[100] See also ibid.: 86 (σάρδα /sarda/), 134 (σαργός /sargos/).

of referring to the semantic field of 'fish') may have begun with /sa/ in the Minoan language(s) is therefore a plausible and rather appealing suggestion, which may deserve further critical consideration. For the time being, however, a degree of uncertainty remains.

7.8 Conclusions

In this chapter, we have argued that from a purely graphic point of view, Cretan Hieroglyphic is clearly closest to Linear A. The recent find of the ivory sceptre ring from Knossos (see section 7.4), which shows for the first time Linear A signs that are carved as if on seals, only serves to confirm their relatedness. However, it is important to stress that a close graphic similarity does not imply that Cretan Hieroglyphic functions just like Linear A. To what extent the acrophonic 'syllabic principle' was already being used by the people who carved and used the seals remains unclear. Moreover, we do well to remember that, in addition to signs rendering syllables, Linear A uses a large number of logograms/ideograms (some of them still clearly close depictions of real-world referents) and individual (single and transaction) signs having a meaning probably at word (or conceptual) level. Finding parallels for these functional categories in Cretan Hieroglyphic may not necessarily prove a fruitful approach, as we should not confuse the graphic with the functional level when comparing scripts and their writing conventions (and systems). Graphic connections between Cretan Hieroglyphic and Linear A signs can be motivated in significantly more cases than *CHIC* – who understandably took a rather conservative approach here – would suggest and admit. This has potentially serious implications for our view of script development. It seems plausible to suggest that, in principle, most signs of the Linear A script are based on and derived from those found in Cretan Hieroglyphic.[101] Recent analyses, including the present chapter (see Table 7.1), strongly suggest that the number of shared signs may be larger than hitherto admitted, which brings Cretan Hieroglyphic and Linear A even closer than previously assumed. However, the whole matter will not be entirely settled until further sign equations (or the clear proof of the lack thereof) are established. That a certain degree of fluidity had to be reckoned with here is beyond doubt. For, on the one hand there may well be signs and motifs used in Cretan

[101] This is true for almost all Linear A simple signs (see Salgarella 2020: 300–56 for significant exceptions), whereas Linear A composite signs do not find parallels in Cretan Hieroglyphic and are genuine Linear A innovations.

Hieroglyphic that have not yet been found (or identified as such), and on the other hand some Linear A signs might have more than one Cretan Hieroglyphic antecedent, especially given that the sign classification of Cretan Hieroglyphic is in many ways uncertain.

It is thus plausible to assume that within Cretan Hieroglyphic script formation was not yet complete. Cretan Hieroglyphic is not just chronologically earlier than Linear A, it is also rooted in earlier Middle Minoan glyptic, both as far as visual motifs are concerned and as regards the supports on which it is employed.[102] The same cannot be said for Linear A. There are no matching clay documents or any of the other supports on which Linear A is found that are written in anything (other than in Cretan Hieroglyphic) that could plausibly be regarded as the ancestor of Linear A (see section 7.5 for a discussion of the 'Archanes script'). As the gap between Cretan Hieroglyphic and Linear A seems to be narrowing with the most recent advances in the field, the most plausible scenario regarding the historical reconstruction of the script formation and transmission process may be set out as follows. Cretan Hieroglyphic develops out of earlier Minoan glyptic by standardising motifs and creating new signs based on real-world referents, and by conventionalising their use on seals. To what extent Cretan Hieroglyphic already possesses a phonetic, more specifically syllabic, character at this stage in the way Linear A does is not clear. At some point, Linear A was developed essentially on the basis of Cretan Hieroglyphic, most probably to meet more complex administrative needs. The obvious alternative, the derivation of Linear A out of the 'Archanes script group' cannot ultimately be excluded but faces serious difficulties (as illustrated in section 7.5). Put differently, there is insufficient evidence for an earlier stage with two parallel writing traditions, although it remains entirely possible that differences in the signs, sign shape, use and function of Cretan Hieroglyphic across different sites on Crete existed.

The creation of a fully fledged script, indeed a complex writing system, namely Linear A, was a major step, involving the wholesale application of the acrophonic principle (most likely among others),[103] and may well have been a reaction to the increased need for recording more complex economic transactions than the traditional sealing practice could afford. This increased need, in turn, may have been the result of an increasing economic complexity in key areas, above all an upswing in textile production, in MM II/III. Another reaction to this need was the transfer of Cretan Hieroglyphic onto clay for more

[102] See Decorte 2018c; Ferrara 2021: 218–21.
[103] See e.g. 'analogical principle' in Salgarella 2021.

complex administrative purposes, resulting in a script that was so similar to Linear A in appearance that a number of 'dubitanda' exist (see section 7.6) and meaning that the early clay documents are not tied to a single script. This simple transfer of Cretan Hieroglyphic to clay remained geographically restricted to the north-eastern part of the island and, although it may well have involved a degree of development of Cretan Hieroglyphic in itself, it proved ultimately unsuccessful: neither in geographical nor in chronological terms, nor in the breadth of use and the kind of supports could Cretan Hieroglyphic match the flexibility of Linear A. This does mean that for a short period of time, perhaps 100 years or so, Cretan Hieroglyphic and Linear A were indeed used as parallel systems (with Cretan Hieroglyphic at home in north and north-east Crete, and Linear A primarily in central-south Crete), and it is also possible the Cretan Hieroglyphic on the north-east coast continued to influence the shape of Linear A, providing part of the reason for the differences in Linear A across the various sites. Leaving aside the difficult question regarding the position of the 'Archanes script', it would appear that Cretan Hieroglyphic has the strongest connections with Linear A. In fact, the gap between the two scripts seems to be getting ever smaller. While *CHIC* only accepts fifty-four sign equations (thirty-four syllabograms, thirteen logograms/ideograms, seven fractional signs),[104] other scholars have put forward additional candidates, and in section 7.7 we add a number of further suggestions. Taken together they mean that Linear A parallels have been put forward for the great majority of Cretan Hieroglyphic signs. Not all of them will be acceptable to all scholars, but the gap between Cretan Hieroglyphic and Linear A has undoubtedly narrowed over the last few decades, to the extent that a straight derivation of Linear A out of Cretan Hieroglyphic now seems the most plausible scenario.

[104] *CHIC*: 19.

CHAPTER 8

INVESTIGATIONS INTO THE LANGUAGE(S) BEHIND CRETAN HIEROGLYPHIC AND LINEAR A

Brent Davis

In a recent article[1] I employed a new method of analysis to evaluate the likelihood that Linear A and the Phaistos Disk encode the same language. This new method of analysis relies on *syllabotactics*[2] – the linguistic constraints that dictate how syllables can be combined to form words. All languages have such syllabotactic constraints, and these constraints are language-specific – that is, they differ from language to language. Thus in the case of Aegean syllabic scripts such as Linear A, Cretan Hieroglyphic, Linear B and Cypriot Syllabic, the syllabotactic constraints on the language behind each script have the effect of limiting the range of *syllabograms* that can sit side by side within a word in each script – that is, these constraints limit the range of *word-internal pairs*[3] of syllabograms in each script; and they do so in similar ways in scripts that encode the same language, and in dissimilar ways in scripts that encode different languages.[4] Furthermore, there is a strong and growing body of evidence indicating that in the Aegean family of syllabic scripts, *homomorphs* in any two of these scripts (i.e. syllabograms that closely resemble each other in any two of these scripts) are most often also *homophones*, or nearly so (i.e. they represent the same or very similar phonetic values).[5] These characteristics of Aegean syllabic scripts thus provide us with a valuable method of *syllabotactic analysis* for evaluating the probability that any two of these scripts encode the same language – i.e., one can (1) identify a set of homomorphs in the two scripts; (2) tabulate the ways in which those homomorphs form word-internal pairs in each script; and (3) evaluate the degree of similarity between the two tables. If the two tables are

[1] Davis 2018.

[2] The term was originally coined by Alamolhoda (2003). Though the study of syllabotactics has not yet made significant inroads into linguistics, syllabotactic approaches have proven very useful in the field of automatic language and speech recognition (e.g., Antoine *et al*. 2004; Zhu *et al*. 2005; Zhu and Adda-Decker 2006a; 2006b; Hieronymus *et al*. 2009; Kordek 2012; González 2015).

[3] As an illustration of what I mean by *word-internal pair*: a four-sign word ABCD contains three word-internal pairs of signs: AB, BC and CD.

[4] For a detailed illustration involving Linear A and Linear B, see Davis 2018: 374–6.

[5] For example: (1) Linear B *vs* Linear A: Davis 2014: 189; (2) Linear B *vs* Cypriot Syllabic: Woodard 1997; (3) Linear A *vs* the Phaistos Disk: Davis 2018.

similar to a statistically significant degree, then the likelihood is that both scripts encode the same language; but if the two tables are *not* similar to a statistically significant degree, then the likelihood is that the two scripts encode different languages.

In this chapter, I use this method of analysis to address the question, 'What is the likelihood that Cretan Hieroglyphic and Linear A encode the same language?' The structure of this syllabotactic analysis is identical to the structure of the analysis in Davis 2018, in that it consists of two experiments: (1) a control experiment; and (2) a main experiment. Both experiments involve evaluating a *target text* (from the Cypriot Syllabic corpus in the control experiment, and from the Cretan Hieroglyphic corpus in the main experiment) for its syllabotactic similarity to two large *benchmark texts* (one from the Linear B corpus, the other from the Linear A corpus).[6]

(1) In the **control experiment**, the Cypriot Syllabic target text is evaluated for its syllabotactic similarity to the Linear B and Linear A benchmark texts.[7] This experiment is designed to illustrate the validity of this method of analysis, in that if the method is valid and productive, we should expect the Cypriot Syllabic target text to show a significant degree of syllabotactic similarity to the Linear B benchmark text, but not to the Linear A one.
(2) In the **main experiment**, the Cretan Hieroglyphic target text is evaluated for its syllabotactic similarity to the Linear B and Linear A benchmark texts. In this experiment, we should expect the Cretan Hieroglyphic target text to show an *insignificant* degree of syllabotactic similarity to the Linear B benchmark text, while the degree of syllabotactic similarity between the Cretan Hieroglyphic target text and the Linear A benchmark text will serve as an indicator of the likelihood that both texts encode the same language.

For each experiment, this process of evaluation consists of four steps:

(1) **Defining the sets of homomorphs**: (1a) For the control experiment: identifying a set of homomorphs that exist in all three scripts used in that experiment (Cypriot Syllabic, Linear B and Linear A); and (1b) for the main experiment: identifying a set of homomorphs that exist in all three scripts used in that experiment (Cretan Hieroglyphic, Linear B and Linear A);

[6] The two target texts and the two benchmark texts are defined in detail later in this chapter.
[7] Importantly: in the control experiment, Cypriot Syllabic is treated as an *undeciphered script* – that is, the experiment is conducted using Cypriot Syllabic texts as originally inscribed, with no reference to the phonetic values of the signs.

(2) **Defining the four texts, and tabulating word-internal pairs they contain**: (2a) For the main experiment: defining the Linear B and Linear A benchmark texts and the Cretan Hieroglyphic target text, and tabulating the ways in which the Linear B, Linear A and Cretan Hieroglyphic homomorphs identified in Step 1b form unique word-internal pairs with each other in these three texts (and by 'unique', I mean that duplicates are not counted); and (2b) for the control experiment: defining a Cypriot Syllabic target text analogous to the Cretan Hieroglyphic target text in terms of the number of unique word-internal pairs that it contains, and tabulating the ways in which the Linear B, Linear A and Cypriot Syllabic homomorphs identified in Step 1a form unique word-internal pairs with each other in the Linear B and Linear A benchmark texts and the Cypriot Syllabic target text;

(3) **Scoring the target texts for their syllabotactic similarity to the benchmark texts**: (3a) In the control experiment: for the Cypriot Syllabic target text, determining the number of its unique word-internal sign pairs (as tabulated in Step 2b) whose *Linear B and Linear A homomorphs* are also attested in the Linear B and Linear A benchmark texts, with those two numbers then serving as the syllabotactic similarity scores for the Cypriot Syllabic target text vs the Linear B and Linear A benchmark texts; and (3b) in the main experiment: for the Cretan Hieroglyphic target text, determining the number of its unique word-internal sign pairs (as tabulated in Step 2a) whose *Linear B and Linear A homomorphs* are also attested in the Linear B and Linear A benchmark texts, with those two numbers then serving as the syllabotactic similarity scores for the Cretan Hieroglyphic target text vs the Linear B and Linear A benchmark texts; and finally;

(4) **Evaluating the scores**: (4a) In the control experiment: evaluating where the two scores for the Cypriot Syllabic target text vs the Linear B and Linear A benchmark texts each sit relative to the average score that we would expect to be produced by chance alone; and (4b) in the main experiment: evaluating where the two scores for the Cretan Hieroglyphic target text vs the Linear B and Linear A benchmark texts each sit relative to the average score that we would expect to be produced by chance alone. In both experiments: any score that sits two or more standard deviations above the average score produced by chance alone is deemed to indicate a *statistically significant degree*[8] *of syllabotactic similarity* between the relevant

[8] In this chapter, 'statistical significance' is defined as including scores that sit two or more standard deviations above the average. All definitions of 'statistical significance' are ultimately subjective, but this definition is by far the most widely used one in the literature.

target text and benchmark text, strongly implying that both texts encode the same language; while any score that sits less than two standard deviations above the average score produced by chance alone is deemed to indicate a *statistically insignificant degree of syllabotactic similarity* between the relevant target text and benchmark text, strongly implying that the two texts encode different languages.

8.1 Step 1: Identifying Homomorphs

Step 1a *(For the Control Experiment): Identifying a Set of Cypriot Syllabic/Linear B/Linear A Homomorphs*

This step was effectively completed in Davis 2018,[9] resulting in a set of ten trios of Cypriot Syllabic/Linear B/Linear A homomorphs. Table 8.1 shows these ten trios, together with the AB numbers of the Linear A and Linear B signs in the bottom row:

Table 8.1 *Ten trios of Cypriot Syllabic/Linear B/Linear A homomorphs*

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CS	𐠀	𐠒	𐠙	𐠞	𐠡	𐠨	𐠩	𐠭	𐠯	𐠰
LB	𐀀	𐀨	𐀙	𐀞	𐀡	𐀭	𐀮	𐀅	𐀴	𐀵
LA	𐘇	𐘴	𐘅	𐘂	𐘊	𐘞	𐘈	𐘀	𐘠	𐘄
AB	*08	*60	*06	*03	*11	*31	*09	*01	*37	*05

Step 1b *(For the Main Experiment): Identifying a Set of Cretan Hieroglyphic/Linear B/Linear A Homomorphs*

In identifying a set of Cretan Hieroglyphic/Linear B/Linear A homomorphs, I have conservatively relied entirely on the established suggestions of past scholars,[10] resulting in a set of twenty-one trios of

[9] Davis 2018: 380–1, tables 9 and 13.

[10] Trios 5 and 6 were suggested by *Docs*[2] (33, fig. 6), while trio 10 was suggested by Younger (2013: Sign 010); all the other trios were suggested by *CHIC* (19). Thus, with the exception of trio 10 (which was suggested years ago), all these homomorphs were suggested decades ago. Note that a few other homomorphs suggested by these scholars have been excluded from Table 8.2: (1) *Docs*[2] (ibid.) suggest that CH 046 and A *301 are homomorphs, but these signs have no homomorph in Linear B; (2) *Docs*[2] (ibid.) also suggest that the Cretan Hieroglyphic 'catface' sign is a homomorph of A *80 / B *80 𐀔, but *CHIC* (14, n. 37) treat the Cretan Hieroglyphic sign as a 'decoration' rather than a syllabogram, an assessment that I

Cretan Hieroglyphic/Linear B/Linear A homomorphs. Table 8.2 shows these twenty-one trios, together with the *CHIC* numbers of the Cretan Hieroglyphic signs in the top row, and the AB numbers of the Linear A and Linear B signs in the bottom row:

Table 8.2 *Twenty-one trios of Cretan Hieroglyphic/Linear B/Linear A homomorphs*

	1	2	3	4	5	6	7	8	9	10	11
CHIC	042	094	008	038	007	012	052	095	031	010	070
CH											
LA											
LB											
AB	*08	*38	*28	*57	*73	*23	*24	*60	*27	*53	*02

	12	13	14	15	16	17	18	19	20	21
CHIC	092	019	025	049	041	005	017	006	069	040
CH										
LA										
LB										
AB	*26	*31	*04	*37	*54	*79	*85	*48	*76	*86

8.2 Step 2: Defining the Four Texts and Tabulating the Word-Internal Pairs They Contain

Step 2a *(For the Main Experiment): Defining the Linear B and Linear A Benchmark Texts and the Cretan Hieroglyphic Target Text, and Tabulating the Word-internal Pairs They Contain That are Formed from the Twenty-one Trios of Homomorphs in Table 8.2*

The Linear B benchmark text was defined as the Linear B corpus as transcribed by Aurora.[11] From that corpus, I tabulated the total number of unique word-internal pairs[12] consisting solely of the twenty-one Linear B

can find no justifiable reason to reject; and (3) *CHIC* (19) suggest that CH 024 and 035 are homomorphs of A *30 / B *30 and A *58 / B *58 , respectively, but as the Cretan Hieroglyphic corpus contains no instances of either of these Cretan Hieroglyphic signs forming secure word-internal pairs with any of the other Cretan Hieroglyphic signs in Table 8.2, there was no point in including these two trios in this analysis.

[11] *DĀMOS*.

[12] This and all other statements regarding word-internal pairs in Linear B have been checked against *DĀMOS*, which contains a searchable corpus of all Linear B inscriptions published to date.

signs in Table 8.2, resulting in a list of 219 unique word-internal pairs, as shown in Table 8.3:

Table 8.3 *The twenty-one Linear B signs in Table 8.2 form 219 different word-internal pairs in the Linear B benchmark text*

𐀀𐀁	𐀀𐀂	𐀀𐀃	𐀀𐀄	𐀀𐀅	𐀀𐀆	𐀀𐀇	𐀀𐀈	𐀀𐀉	𐀀𐀊	𐀀𐀋	𐀀𐀌
𐀀𐀍	𐀀𐀎	𐀀𐀏	𐀀𐀐	𐀁𐀃	𐀁𐀉	𐀁𐀊	𐀁𐀍	𐀁𐀁	𐀁𐀁	𐀁𐀂	𐀁𐀃
𐀁𐀄	𐀁𐀅	𐀁𐀆	𐀁𐀇	𐀁𐀈	𐀁𐀉	𐀁𐀊	𐀁𐀋	𐀁𐀌	𐀁𐀍	𐀁𐀎	𐀁𐀏
𐀂𐀀	𐀂𐀃	𐀂𐀄	𐀂𐀅	𐀂𐀆	𐀂𐀇	𐀂𐀈	𐀂𐀉	𐀂𐀊	𐀂𐀋	𐀂𐀌	𐀂𐀍
𐀂𐀎	𐀂𐀏	𐀂𐀐	𐀃𐀀	𐀃𐀁	𐀃𐀂	𐀃𐀃	𐀃𐀄	𐀃𐀅	𐀃𐀆	𐀃𐀇	𐀃𐀈
𐀃𐀉	𐀃𐀊	𐀃𐀋	𐀃𐀌	𐀃𐀍	𐀃𐀎	𐀃𐀏	𐀃𐀐	𐀄𐀀	𐀄𐀁	𐀄𐀂	𐀄𐀃
𐀄𐀄	𐀄𐀅	𐀄𐀆	𐀄𐀇	𐀄𐀈	𐀄𐀉	𐀄𐀊	𐀄𐀋	𐀄𐀌	𐀄𐀍	𐀄𐀎	𐀄𐀏
𐀄𐀐	𐀅𐀀	𐀅𐀁	𐀅𐀂	𐀅𐀃	𐀅𐀄	𐀅𐀅	𐀅𐀆	𐀅𐀇	𐀅𐀈	𐀅𐀉	𐀅𐀊
𐀅𐀋	𐀅𐀌	𐀅𐀍	𐀅𐀎	𐀅𐀏	𐀅𐀐	𐀆𐀀	𐀆𐀁	𐀆𐀂	𐀆𐀃	𐀆𐀄	𐀆𐀅
𐀆𐀆	𐀆𐀇	𐀆𐀈	𐀆𐀉	𐀆𐀊	𐀆𐀋	𐀆𐀌	𐀆𐀍	𐀆𐀎	𐀆𐀏	𐀆𐀐	𐀇𐀀
𐀇𐀁	𐀇𐀂	𐀇𐀃	𐀇𐀄	𐀇𐀅	𐀇𐀆	𐀇𐀇	𐀇𐀈	𐀇𐀉	𐀇𐀊	𐀇𐀋	𐀇𐀌
𐀇𐀍	𐀇𐀎	𐀇𐀏	𐀇𐀐	𐀈𐀀	𐀈𐀁	𐀈𐀂	𐀈𐀃	𐀈𐀄	𐀈𐀅	𐀈𐀆	𐀈𐀇
𐀈𐀈	𐀈𐀉	𐀈𐀊	𐀈𐀋	𐀈𐀌	𐀈𐀍	𐀉𐀀	𐀉𐀁	𐀉𐀂	𐀉𐀃	𐀉𐀄	𐀉𐀅
𐀉𐀆	𐀉𐀇	𐀉𐀈	𐀉𐀉	𐀉𐀊	𐀉𐀋	𐀉𐀌	𐀉𐀍	𐀉𐀎	𐀉𐀏	𐀉𐀐	𐀊𐀀
𐀊𐀁	𐀊𐀂	𐀊𐀃	𐀊𐀄	𐀊𐀅	𐀊𐀆	𐀊𐀇	𐀊𐀈	𐀊𐀉	𐀊𐀊	𐀊𐀋	𐀊𐀌
𐀊𐀍	𐀊𐀎	𐀊𐀏	𐀊𐀐	𐀋𐀀	𐀋𐀁	𐀋𐀂	𐀋𐀃	𐀋𐀄	𐀋𐀅	𐀋𐀆	𐀋𐀇
𐀋𐀈	𐀋𐀉	𐀋𐀊	𐀋𐀋	𐀋𐀌	𐀋𐀍	𐀋𐀎	𐀋𐀏	𐀋𐀐	𐀌𐀀	𐀌𐀁	𐀌𐀂
𐀌𐀃	𐀌𐀄	𐀌𐀅	𐀌𐀆	𐀌𐀇	𐀌𐀈	𐀌𐀉	𐀌𐀊	𐀌𐀋	𐀌𐀌	𐀌𐀍	𐀌𐀎
𐀌𐀏	𐀌𐀐	𐀍𐀀									

The Linear A benchmark text was defined as the Linear A corpus as transcribed by Younger.[13] From that corpus, I tabulated the total number of unique word-internal pairs[14] consisting solely of the twenty-one Linear A signs in Table 8.2, resulting in a list of 140 unique word-internal pairs, as shown in Table 8.4:

[13] Younger 2020.

[14] This and all other statements regarding word-internal pairs in Linear A have been checked against Younger 2020, which contains a searchable corpus of all Linear A inscriptions published to date.

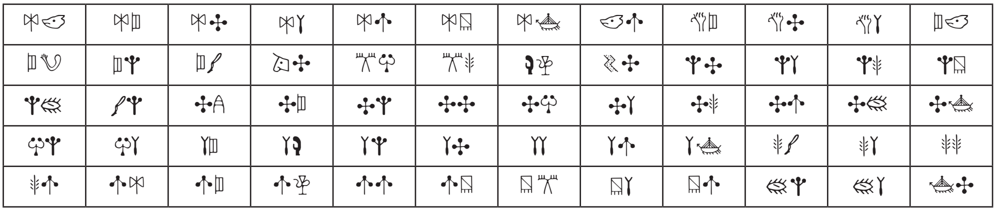
Table 8.4 *The twenty-one Linear A signs in Table 8.2 form 140 different word-internal pairs in the Linear A benchmark text*

The Cretan Hieroglyphic target text was defined as the Cretan Hieroglyphic corpus as transcribed by Olivier and Godart and augmented by Younger.[15] From that corpus, I tabulated the total number of unique word-internal pairs[16] consisting solely of the twenty-one Cretan Hieroglyphic signs in Table 8.2, resulting in a list of sixty unique word-internal pairs, as shown in Table 8.5:

[15] The starting-point for the Cretan Hieroglyphic corpus used in this analysis was the 'Index des Signes' in *CHIC* (319–79), from which I first excluded the following items: (1) italicised (i.e. insecure) readings of signs; (2) asterisked (i.e. secondary) readings of inscriptions; (3) inscriptions marked '0' (indicating that it is impossible to determine which sign begins the inscription); (4) inscriptions marked '>?' (indicating that a left-to-right direction of reading is only probable), with one exception (#101.a); and (5) inscriptions marked '><' (indicating that the direction of reading is uncertain), with nine exceptions (#074.a, #154, #163, #168, #222.b, #224.α, #276.α, #297.β1, #310.δ). The exceptions to exclusions (4) and (5) include inscriptions with CH 008 or 042 at one end or the other; these signs are homomorphs of Linear A/B vowel signs A *28 / B *28 and A *08 / B *08, respectively, and indeed, the Cretan Hieroglyphic signs behave like vowel signs as well, in that in inscriptions containing secure instances of these signs and with a known direction of reading, CH 008 is always word-initial, while CH 042 is word-initial most of the time. Thus, in each of the ten exceptions to exclusions (4) and (5), the occurrence of CH 008 or 042 was taken as the beginning of the word. (It is worth noting that the effect of these exceptions was actually quite minimal, in that together, they contributed just three of the word-internal pairs in Table 8.5). As a final step: to this amended corpus I then added the Cretan Hieroglyphic documents that have been found since *CHIC* was published: (1) the documents from Petras (Younger 2010); four miscellaneous documents from Malia, Pyrgos and Kato Syme (Younger 2016b: MA/V Yb 03, MA/V Yb 04, PYR Yb 01 and SY Hf 01); and (3) twelve seals and seal-impressions (Younger 2016a: 'Additions since (or not in) *CHIC*').

[16] This and all other statements regarding word-internal pairs in Cretan Hieroglyphic have been checked against *CHIC* and Younger 2010, 2016a and 2016b.

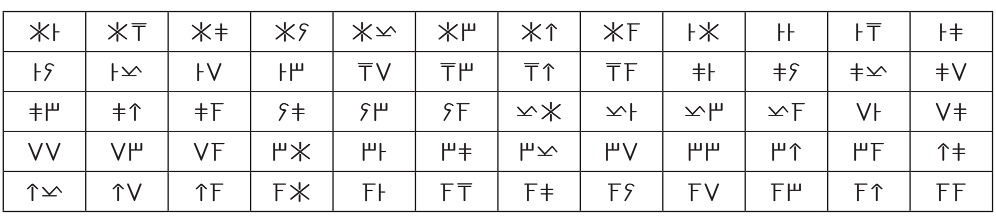
Table 8.5 *The twenty-one Cretan Hieroglyphic signs in Table 8.2 form sixty different word-internal pairs in the Cretan Hieroglyphic target text*



***Step 2b** (For the Control Experiment): Defining the Cypriot Syllabic Target Text, and Tabulating the Word-internal Pairs It and the Linear B and Linear A Benchmark Texts Contain That are Formed from the Ten Trios of Homomorphs in Table 8.1*

The Cypriot Syllabic target text was defined so as to contain sixty unique word-internal pairs formed from the ten Cypriot Syllabic signs in Table 8.1, thus making it analogous to the Cretan Hieroglyphic target text in terms of the number of different word-internal pairs that it contains.[17] Table 8.6 shows those sixty Cypriot Syllabic pairs:

Table 8.6 *The ten Cypriot Syllabic signs in Table* 8.1 *form sixty different word-internal pairs in the Cypriot Syllabic target text*



From the Linear B benchmark text as defined in Step 2a, I tabulated the total number of unique word-internal pairs consisting solely of the 10 Linear B signs in Table 8.1 resulting in a list of seventy-eight unique word-internal pairs, as shown in Table 8.7:

[17] Masson 1983. This concatenated body of texts consists of inscriptions no. 1 up through the sequence [illegible] in Line 26 of no. 217 (Masson 1983: 95–237). In counting word-internal pairs, pairs containing any sign transcription in non-italic text, denoting an uncertain reading, were ignored.

Table 8.7 *The ten Linear B signs in Table 8.1 form seventy-eight different word-internal pairs in the Linear B benchmark text*

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						

Finally: from the Linear A benchmark text as defined in Step 2a, I tabulated the total number of unique word-internal pairs consisting solely of the ten Linear A signs in Table 8.1, resulting in a list of fifty-two unique word-internal pairs, as shown in Table 8.8:

Table 8.8 *The ten Linear A signs in Table 8.1 form fifty-two different word-internal pairs in the Linear A benchmark text*

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]								

8.3 Steps 3a and 4a: Completing the Control Experiment

Step 3a *Scoring the Cypriot Syllabic Target Text for its Syllabotactic Similarity to the Linear B and Linear A Benchmark Texts*

In this step, the Cypriot Syllabic target text is scored for its syllabotactic similarity to the Linear B and Linear A benchmark texts. The procedure is straightforward: first, determine the number of word-internal pairs in the Cypriot Syllabic target text (Table 8.6) whose *Linear B homomorphs* appear in the Linear B benchmark text (Table 8.7). (The Linear B homomorphs of the pairs in the Cypriot Syllabic target text are arrived at through consulting the list of Linear B/Cypriot Syllabic homomorphs in Table 8.1.) The results are shown in Table 8.9:

Table 8.9 *Fifty-two pairs in the Cypriot Syllabic target text (Table 8.6) whose Linear B homomorphs appear in the Linear B benchmark text (Table 8.7)*

𐠋𐠀	𐠋𐠈	𐠋𐠊	𐠋𐠏	𐠋𐠑	𐠋𐠓	𐠋𐠖	𐠋𐠔	𐠀𐠀	𐠀𐠈	𐠀𐠊	𐠀𐠏
𐠀𐠑	𐠀𐠕	𐠀𐠓	𐠈𐠕	𐠈𐠓	𐠈𐠖	𐠈𐠔	𐠊𐠀	𐠊𐠏	𐠊𐠑	𐠊𐠕	𐠊𐠓
𐠊𐠔	𐠊𐠔	𐠏𐠓	𐠏𐠔	𐠑𐠋	𐠑𐠀	𐠑𐠓	𐠑𐠔	𐠕𐠀	𐠕𐠊	𐠕𐠕	𐠕𐠔
𐠓𐠀	𐠓𐠑	𐠓𐠖	𐠓𐠖	𐠖𐠋	𐠖𐠖	𐠖𐠖	𐠖𐠖	𐠔𐠋	𐠔𐠖	𐠔𐠕	𐠔𐠔
𐠓𐠓	𐠓𐠑	𐠓𐠖	𐠓𐠔	𐠖𐠊	𐠖𐠑	𐠖𐠕	𐠖𐠔	𐠔𐠋	𐠔𐠈	𐠔𐠊	𐠔𐠏
𐠔𐠕	𐠔𐠓	𐠔𐠖	𐠔𐠔								

As there are sixty pairs in the Cypriot Syllabic target text, the syllabotactic similarity score for the Cypriot Syllabic target text vs the Linear B benchmark text is thus **52/60**. Finally, determine the number of word-internal pairs in the Cypriot Syllabic target text (Table 8.6) whose *Linear A homomorphs* appear in the Linear A benchmark text (Table 8.8). (The Linear A homomorphs of the pairs in the Cypriot Syllabic target text are arrived at through consulting the list of Linear A/Cypriot Syllabic homomorphs in Table 8.1.) The results are shown in Table 8.10:

Table 8.10 *Thirty pairs in the Cypriot Syllabic target text (Table 8.6) whose Linear A homomorphs appear in the Linear A benchmark text (Table 8.8)*

𐠋𐠀	𐠋𐠈	𐠋𐠊	𐠋𐠏	𐠋𐠑	𐠋𐠓	𐠋𐠔	𐠀𐠋	𐠀𐠀	𐠀𐠈	𐠀𐠊	𐠀𐠏
𐠈𐠖	𐠈𐠓	𐠊𐠀	𐠊𐠏	𐠊𐠖	𐠊𐠔	𐠏𐠔	𐠑𐠋	𐠕𐠀	𐠕𐠊	𐠕𐠔	𐠓𐠏
𐠓𐠖	𐠓𐠔	𐠔𐠋	𐠔𐠖	𐠔𐠓	𐠖𐠖						

As there are (again) sixty pairs in the Cypriot Syllabic target text, the syllabotactic similarity score for the Cypriot Syllabic target text vs the Linear A benchmark text is thus **30/60**.

Step 4a *Evaluating the Scores*

Step 3a has now produced the following two syllabotactic similarity scores for the control experiment:

> The Cypriot Syllabic target text vs the Linear B benchmark text = 52/60
> The Cypriot Syllabic target text vs the Linear A benchmark text = 30/60

In this final step of the control experiment, each of these scores is evaluated against a representative average score produced by chance alone; thus, for each of the two comparisons listed above, the average score produced by chance alone must be calculated first. The method of

calculating this average score is straightforward (if somewhat tedious). I will begin by calculating a representative average score produced by chance alone for the first of the comparisons listed above: the Cypriot Syllabic target text vs the Linear B benchmark text.

In Table 8.11, row LB1 contains the ten Linear B signs from Table 8.1, while row LB2 contains the *Linear B homomorphs* of the ten Cypriot Syllabic signs present in Table 8.6:

Table 8.11 *Row LB1: the ten Linear B signs from Table 8.1; row LB2: the Linear B homomorphs of the ten Cypriot Syllabic signs present in Table 8.6 (the pairs in the Cypriot Syllabic target text)*

	1	2	3	4	5	6	7	8	9	10
LB1	𐄀	𐄁	𐄃	𐄇	𐄉	𐄊	𐄋	𐄌	𐄍	𐄎
LB2	𐄀	𐄁	𐄃	𐄇	𐄉	𐄊	𐄋	𐄌	𐄍	𐄎

In Table 8.12, the ten signs in row LB2 of Table 8.11 have been randomly rearranged:

Table 8.12 *Table 8.11, with the ten signs in row LB2 randomly rearranged*

	1	2	3	4	5	6	7	8	9	10
LB1	𐄀	𐄁	𐄃	𐄇	𐄉	𐄊	𐄋	𐄌	𐄍	𐄎
LB2	𐄎	𐄌	𐄋	𐄊	𐄇	𐄉	𐄁	𐄍	𐄃	𐄀

In Table 8.13, row LB3 contains the *Linear B homomorphs* of the pairs in the first row of Table 8.6 (i.e. the first twelve pairs in the Cypriot Syllabic target text), while row LB4 contains those same pairs with each sign replaced by the corresponding (random) sign from row LB2 of Table 8.12:

Table 8.13 *Row LB3: the Linear B homomorphs of the Cypriot Syllabic pairs in the first row of Table 8.6; row LB4: those same pairs retranscribed according to the random permutation of signs in row LB2 of Table 8.12*

LB3	𐄀𐄌	𐄀𐄃	𐄀𐄇	𐄀𐄉	𐄀𐄁	𐄀𐄋	𐄀𐄍	𐄀𐄎	𐄌𐄀	𐄌𐄌	𐄌𐄃	𐄌𐄇
LB4	𐄎𐄍	𐄎𐄋	𐄎𐄊	𐄎𐄇	𐄎𐄌	𐄎𐄁	𐄎𐄃	𐄎𐄀	𐄍𐄎	𐄍𐄍	𐄍𐄋	𐄍𐄊

If we continue in this way to retranscribe the *Linear B homomorphs* of all sixty Cypriot Syllabic pairs in Table 8.6 according to the random permutation of signs in row LB2 of Table 8.12, then count the number

of randomly retranscribed pairs in row LB4 that also appear in the Linear B benchmark text, the result is forty-five – that is, the syllabotactic similarity score for this randomly retranscribed set of pairs from the Cypriot Syllabic target text vs the Linear B benchmark text is **45/60**.

Thus this score of 45/60 is one representative of a score produced by chance alone; yet this score is the product of the single permutation of signs in row LB2 of Table 8.12, when in fact those ten signs can be rearranged in a very large number of ways.[18] To generate a much more representative average score produced by chance alone, I therefore rearranged the signs in row LB2 of Table 8.12 in 1,000,000 different random ways, retranscribed the *Linear B homomorphs* of the sixty Cypriot Syllabic pairs in Table 8.6 according to each random permutation of signs, and scored each set of retranscribed pairs by counting how many of them also appear in the Linear B benchmark text, just as was done in the preceding example. The results are shown in Table 8.14:[19]

Table 8.14 *Syllabotactic similarity scores for 1,000,000 different sets of randomly retranscribed Linear B homomorphs of the Cypriot Syllabic pairs in Table 8.6 (the pairs in the Cypriot Syllabic target text) vs the Linear B benchmark text*

Score out of 60:	**Permutations with that score:**	**% of permutations:**	**Score out of 60:**	**Permutations with that score:**	**% of permutations:**
40	40	0.0040%	51	42,619	4.2619%
41	586	0.0586%	52	16,597	1.6597%
42	3,794	0.3794%	53	4,872	0.4872%
43	15,973	1.5973%	54	1,069	0.1069%
44	47,728	4.7728%	55	142	0.0142%
45	101,940	10.1940%	56	12	0.0012%
46	160,380	16.0380%	**Tot. permutations:**	1,000,000	100%
47	193,008	19.3008%	**Average score:**	47.422 / 60	
48	183,939	18.3939%	**Std deviation (σ):**	2.013 / 60	
49	141,057	14.1057%	**Avg. score + 2σ:**	51.448 / 60	
50	86,244	8.6244%	**Score of 52/60:**	Avg. + 2.27σ	$p = 0.0227$

[18] The total number of possible permutations is equal to 10! ('10 factorial') = the product of integers 1 through 10 = 3,628,800.

[19] Note to statisticians: as each of the four statistical analyses in this paper is based on a random sample of 1,000,000 permutations (out of populations of 10! in the first two analyses, and 21! in the other two – thus never the whole population), σ^2 is always calculated as a sample variance – that is: $\frac{\sum(x-\bar{x})^2}{(n-1)}$.

As Table 8.14 shows, the 1,000,000 random permutations produce an average score of 47.422/60, with a standard deviation (σ) of 2.013/60, such that the region of 'statistical significance' (2σ or more above the average) begins at 51.448/60 (i.e. scores of **52/60** or greater). Meanwhile, the original syllabotactic similarity score for the Cypriot Syllabic target text vs the Linear B benchmark text (as shown in Table 8.9) is **52/60**, which is **2.27σ above** the average score produced by chance alone (i.e. within the region of statistical significance); and the *p*-value (produced by adding the percentages in the right column for all scores of 52/60 or more) is 0.0227, meaning that of the 1,000,000 random permutations, just 2.27% of them scored 52/60 or higher. The potential meanings of this score will be discussed shortly.

The Cypriot Syllabic Target Text vs the Linear A Benchmark Text

Next, a representative average score produced by chance alone can be calculated for the Cypriot Syllabic target text vs the Linear A benchmark text in just the same way, as follows. In Table 8.15, row LA1 contains the ten Linear A signs from Table 8.1, while row LA2 contains the *Linear A homomorphs* of the ten Cypriot Syllabic signs present in Table 8.6 (the pairs in the Cypriot Syllabic target text):

Table 8.15 *Row LA1: the ten Linear A signs from Table 8.1; row LA2: the Linear A homomorphs of the ten Cypriot Syllabic signs present in Table 8.6 (the pairs in the Cypriot Syllabic target text)*

	1	2	3	4	5	6	7	8	9	10
LA1	𐘀	𐘁	𐘂	𐘃	𐘄	𐘅	𐘆	𐘇	𐘈	𐘉
LA2	𐘀	𐘁	𐘂	𐘃	𐘄	𐘅	𐘆	𐘇	𐘈	𐘉

Rearranging the ten signs in row LA2 of Table 8.15 in 1,000,000 different random ways;[20] retranscribing the *Linear A homomorphs* of the sixty Cypriot Syllabic pairs in Table 8.6 according to each random permutation of signs; and scoring each set of retranscribed pairs by counting how many of them also appear in the Linear A benchmark text produces the results shown in Table 8.16:

[20] The total number of possible permutations is 3,628,800; see note 18.

Table 8.16 *Syllabotactic similarity scores for 1,000,000 different sets of randomly retranscribed Linear A homomorphs of the Cypriot Syllabic pairs in Table 8.6 (the pairs in the Cypriot Syllabic target text) vs the Linear A benchmark text*

Score out of 60:	Permutations with that score:	% of permutations:	Score out of 60:	Permutations with that score:	% of permutations:
19	13	0.0013%	35	64,527	6.4527%
20	39	0.0039%	36	38,994	3.8994%
21	197	0.0197%	37	20,069	2.0069%
22	826	0.0826%	38	9,151	0.9151%
23	2,758	0.2758%	39	3,385	0.3385%
24	7,317	0.7317%	40	1,030	0.1030%
25	16,305	1.6305%	41	205	0.0205%
26	30,416	3.0416%	42	44	0.0044%
27	49,971	4.9971%	43	4	0.0004%
28	73,679	7.3679%	44	1	0.0001%
29	98,143	9.8143%	**Tot. permutations:**	1,000,000	100%
30	118,721	11.8721%	**Average score:**	31.239/60	
31	129,553	12.9553%	**Std deviation (σ):**	2.967/60	
32	128,968	12.8968%	**Avg. score + 2σ:**	37.174/60	
33	114,389	11.4389%	**Score of 30/60:**	Avg. – 0.42σ	$p = 0.7203$
34	91,295	9.1295%			

As Table 8.16 shows, the 1,000,000 random permutations produce an average score of 31.239/60, with a standard deviation (σ) of 2.967/60, such that the region of 'statistical significance' (2σ or more above the average) begins at 37.174/60 (i.e. scores of **38/60** or greater). Meanwhile, the original syllabotactic similarity score for the Cypriot Syllabic target text vs the Linear A benchmark text (as shown in Table 8.10) is **30/60**, which is **0.42σ below** the average score produced by chance alone (i.e. nowhere near the region of statistical significance); and the *p*-value (produced by adding the percentages in the right column for all scores of 30/60 or more) is 0.7203, meaning that of the 1,000,000 random permutations, more than 72% of them scored 30/60 or higher.

We now have final evaluations of the two syllabotactic similarity scores produced by the control experiment, with respect to representative averages produced by chance alone:

> The Cypriot Syllabic target text vs the Linear B benchmark text = 52/60 = 2.27σ above the average
>
> The Cypriot Syllabic target text vs the Linear A benchmark text = 30/60 = 0.42σ below the average

Figure 8.1 depicts these two evaluations, with the region of statistical significance shaded light grey:

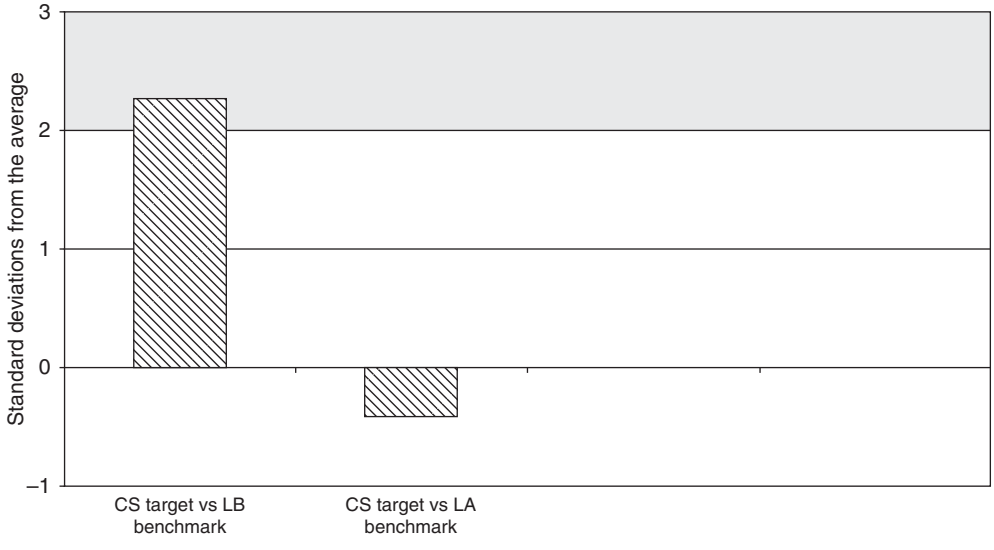


Figure 8.1 Evaluation of results: syllabotactic similarity of Cypriot Syllabic target text vs Linear B and Linear A benchmark texts

8.4 Results of the Control Experiment: Discussion

In the first half of the control experiment (evaluating the syllabotactic similarity score for the Cypriot Syllabic target text vs the Linear B benchmark text), Table 8.14 is an example of a *frequentist statistical analysis*, in which the syllabotactic similarity score of 52/60 for the Cypriot Syllabic target text vs the Linear B benchmark text is essentially being evaluated against the notion that the score is accidental – that is, due to chance alone. In frequentist statistics, this notion that the result being evaluated is accidental is called the 'null hypothesis' (abbreviated as H_o); thus, for Table 8.14, H_o can be stated as follows:

- H_o = The syllabotactic similarity score of 52/60 for the Cypriot Syllabic target text vs the Linear B benchmark text is due to chance alone.

What Table 8.14 tells us, though, is that to a statistically significant degree, the score of 16/16 is 'statistically incompatible'[21] with

[21] Wasserstein and Lazar 2016: 131.

H_o, and that we should therefore reject H_o in favour of the 'alternative hypothesis' (H_A):

- H_A = The syllabotactic similarity score of 52/60 for the Cypriot Syllabic target text vs the Linear B benchmark text is *not* due to chance alone.

Importantly, rejecting H_o in favour of H_A results in a crucial corollary of H_A regarding the phonetic values of the Cypriot Syllabic and Linear B signs:[22] by preferring H_A over H_o, we are also implicitly preferring the corollary that the Cypriot Syllabic and Linear B homomorphs in Table 8.1 are homophones, or nearly so ... for if the Cypriot Syllabic signs have markedly different phonetic values than their Linear B homomorphs, then the score of 52/60 (indicating that the two sets of homomorphs form word-internal pairs in remarkably similar ways) must clearly be due to chance alone – i.e. the opposite of what H_A asserts. In short: if we are to favour the hypothesis that the score is *not* due to chance alone (i.e. H_A), as the statistics tell us we should, then we must, to the same degree, favour the corollary that the Cypriot Syllabic and Linear B homomorphs are also homophones (or nearly so), as H_A and this corollary are inextricably linked. H_A can therefore be augmented with its corollary as follows:

- H_A = The syllabotactic similarity score of 52/60 for the Cypriot Syllabic target text vs the Linear B benchmark text is *not* due to chance alone. *Corollary:* The Cypriot Syllabic and Linear B homomorphs in Table 8.1 are thus at least closely homophonous.

What the statistics in the control experiment cannot tell us, though, is precisely *why* the Cypriot Syllabic and Linear B texts form pairs in such similar ways; if we imagine Cypriot Syllabic and/or Linear B to be undeciphered, this would have to be a matter for interpretation. However, the simplest explanation for this phenomenon involves a single assumption: that in H_A above, the target and benchmark texts encode the same language (or perhaps two very closely related languages, or two dialects of the same language, or two chronological stages of the same language), as any explanation for this phenomenon based on the notion that the two scripts encode two *unrelated* languages invariably requires more than one assumption.[23] Thus Occam's

[22] Remember that, for the purposes of this control experiment, we are for the moment treating Cypriot Syllabic as an undeciphered script, and the phonetic values of the Cypriot Syllabic signs as unknown.

[23] Two examples: (1) The target and benchmark texts encode unrelated languages, and the languages share a large number of loanwords (two assumptions); (2) The target and benchmark texts encode unrelated languages, and the two languages are phonemically very similar, and the two languages happen to construct words using very similar syllabotactic constraints (three assumptions).

Razor suggests that, based on the data, we should adopt Hypothesis 1 (and its corollary) as the most preferable one for the first half of the control experiment:

> *Hypothesis 1:*
>
> In the control experiment, the Cypriot Syllabic and the Linear B texts both encode the same language (or perhaps two very closely related languages, or two dialects of the same language, or two chronological stages of the same language).
>
> *Corollary:* The Cypriot Syllabic and Linear B homomorphs in Table 8.1 are thus at least closely homophonous, such that the phonetic values of the Cypriot Syllabic signs can tentatively be assigned to their Linear B homomorphs, and vice versa.

Importantly: note that we have been able to complete this analysis and formulate this hypothesis based solely on the *syllabotactic behaviour* of the Cypriot Syllabic and Linear B signs, not on their phonetic values (which are mentioned nowhere in this chapter) – that is, we would still have arrived at Hypothesis 1 even if Cypriot Syllabic and/or Linear B really were undeciphered.

Of course, both scripts have in fact been deciphered, and the phonetic values of the Cypriot Syllabic and Linear B homomorphs are known, so we can directly assess the accuracy of Hypothesis 1 and its corollary: they are both correct, in that Cypriot Syllabic and Linear B both encode Greek – although different dialects of Greek separated in time by a few centuries.[24] With regard to the corollary of Hypothesis 1, Table 8.17 shows the actual phonetic values of the ten Cypriot Syllabic and Linear B homomorphs in Table 8.1:

Table 8.17 *Actual phonetic values of the ten Cypriot Syllabic and Linear B homomorphs in Table 8.1*

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CS	𐠀	𐠊	𐠎	𐠒	𐠖	𐠚	𐠞	𐠢	𐠦	𐠪
	a	ta, t^ha, da	na	pa, p^ha, ba	po, p^ho, bo	la	sa	se	ti, t^hi, di	to, t^ho, do
LB	𐀀	𐀊	𐀎	𐀒	𐀖	𐀚	𐀞	𐀢	𐀦	𐀪
	a	da	na	pa, p^ha, ba	po, p^ho, bo	ra, la	sa	se	ti, t^hi	to, t^ho

[24] Linear B did not survive long past 1200 BC, while the earliest Cypriot Syllabic inscription is dated to 1050–950 BC (Duhoux 2012: 71).

Thus, the phonetic values of the Cypriot Syllabic and Linear B homomorphs are exactly the same in six cases, and partly the same in the other four. There are some other notable differences between the two scripts as well:[25]

- Linear B omits certain phonemes from its writing more often than Cypriot Syllabic does;
- The two scripts spell two-consonant clusters in different ways;
- The two scripts treat word-final consonants in different ways;
- Linear B almost always separates words with word-dividers, whereas Cypriot Syllabic is less rigorous in doing so (especially when it comes to the definite article: e.g. *to-na-ra-ku-ro-ne* /ton arguron/ 'the silver [acc.]'); and
- Linear B, especially at Knossos, contains a substantial number of non-Greek (most likely Minoan) person- and place-names, whereas Cypriot Syllabic does not.

The differences outlined in Table 8.17 and in the bulleted list above must surely be adding a certain amount of noise to the data; and yet the results in Table 8.14, together with the relative accuracy of Hypothesis 1 and its corollary, strongly suggest that this noise is simply not strong enough to prevent this method of syllabotactic analysis from detecting the signal that the same language is behind both scripts.

However, a crucial point must be made here: if Cypriot Syllabic and/or Linear B actually were undeciphered, we could not in any way claim that the analysis in the first half of the control experiment has on its own proven Hypothesis 1, which would still remain a hypothesis – though one supported by strong statistical data, such that we *could* validly claim that this hypothesis should be adopted as the prevailing one regarding the nature of the language behind the Cypriot Syllabic and Linear B texts used in the control experiments. Indeed – if either Cypriot Syllabic or Linear B were undeciphered, adopting this hypothesis as the prevailing one would clearly be a productive move for scholars of the undeciphered script, as the hypothesis correctly suggests that the script encodes Greek, and identifying the language behind an undeciphered script is a primary key to its decipherment.

As for the last half of the control experiment (evaluating the syllabotactic similarity score for the Cypriot Syllabic target text vs the Linear A benchmark text), Table 8.16 makes it clear that, in this case, we have no grounds for rejecting H_o:

[25] For a much fuller discussion of these differences, with examples, see Davis 2018: 387–8.

- H_o = The syllabotactic similarity score of 30/60 for the Cypriot Syllabic target text vs the Linear A benchmark text is due to chance alone.

That is: the strong implication is that in the last half of the control experiment, the Cypriot Syllabic target text encodes a language *unrelated* to the language behind the Linear A benchmark text. Thus, as Greek is the language behind the Cypriot Syllabic target text, this result adds to the growing body of statistical evidence that Greek is *not* the language behind Linear A.

8.5 Steps 3b and 4b: Completing the Main Experiment

Step 3b *Scoring the Cretan Hieroglyphic Target Text for its Syllabotactic Similarity to the Linear B and Linear A Benchmark Texts*

In this step, the Cretan Hieroglyphic target text is scored for its syllabotactic similarity to the Linear B and Linear A benchmark texts. As in the control experiment, the procedure is straightforward: first, determine the number of word-internal pairs in the Cretan Hieroglyphic target text (Table 8.5) whose *Linear B homomorphs* appear in the Linear B benchmark text (Table 8.3). (The Linear B homomorphs of the pairs in the Cretan Hieroglyphic target text are arrived at through consulting the list of Linear B/Cretan Hieroglyphic homomorphs in Table 8.2.) The results are shown in Table 8.18:

Table 8.18 *Forty pairs in the Cretan Hieroglyphic target text (Table 8.5) whose Linear B homomorphs appear in the Linear B benchmark text (Table 8.3)*

𐄀𐄁	𐄀𐄂	𐄀𐄃	𐄀𐄄	𐄀𐄅	𐄃𐄁	𐄃𐄂	𐄃𐄃	𐄁𐄇	𐄁𐄄	𐄅𐄂	𐄆𐄄
𐄈𐄂	𐄄𐄂	𐄄𐄃	𐄄𐄉	𐄄𐄅	𐄂𐄀	𐄂𐄁	𐄂𐄄	𐄂𐄂	𐄂𐄋	𐄂𐄃	𐄂𐄉
𐄂𐄄	𐄋𐄃	𐄃𐄁	𐄃𐄆	𐄃𐄄	𐄃𐄂	𐄃𐄃	𐄃𐄄	𐄉𐄀	𐄉𐄉	𐄄𐄀	𐄄𐄁
𐄄𐄆	𐄄𐄅	𐄅𐄃	𐄅𐄆								

As there are sixty pairs in the Cretan Hieroglyphic target text, the syllabotactic similarity score for the Cretan Hieroglyphic target text vs the Linear B benchmark text is thus **40/60**. Finally, determine the number of word-internal pairs in the Cretan Hieroglyphic target text (Table 8.5) whose *Linear A homomorphs* appear in the Linear A benchmark text (Table 8.4). (The Linear A homomorphs of the pairs in the Cretan Hieroglyphic target text are arrived at through consulting the list of Linear A/Cretan Hieroglyphic homomorphs in Table 8.2.) The results are shown in Table 8.19:

Table 8.19 *Thirty-two pairs in the Cretan Hieroglyphic target text (Table 8.5) whose Linear A homomorphs appear in the Linear A benchmark text (Table 8.4)*

As there are (again) sixty pairs in the Cretan Hieroglyphic target text, the syllabotactic similarity score for the Cretan Hieroglyphic target text vs the Linear A benchmark text is thus **32/60**.

Step 4b *Evaluating the Scores*

Step 3b has now produced the following two syllabotactic similarity scores for the main experiment:

The Cretan Hieroglyphic target text vs the Linear B benchmark text = 40/60

The Cretan Hieroglyphic target text vs the Linear A benchmark text = 32/60

In this final step of the main experiment, as in the final step of the control experiment, each of these scores is evaluated against a representative average score produced by chance alone, as follows:

The Cretan Hieroglyphic Target Text vs the Linear B Benchmark Text

In Table 8.20, row LB1 contains the twenty-one Linear B signs from Table 8.2, while row LB2 contains the *Linear B homomorphs* of the twenty-one Cretan Hieroglyphic signs present in Table 8.5 (the pairs in the Cretan Hieroglyphic target text):

Table 8.20 *Row LB1: the twenty-one Linear B signs from Table 8.2; Row LB2: the Linear B homomorphs of the twenty-one Cretan Hieroglyphic signs present in Table 8.5 (the pairs in the Cretan Hieroglyphic target text)*

	1	2	3	4	5	6	7	8	9	10	11
LB1											
LB2											

	12	13	14	15	16	17	18	19	20	21
LB1										
LB2										

Rearranging the twenty-one signs in row LB2 of Table 8.20 in 1,000,000 different random ways;[26] retranscribing the *Linear B homomorphs* of the sixty Cretan Hieroglyphic pairs in Table 8.5 according to each random permutation of signs, and scoring each set of retranscribed pairs by counting how many of them also appear in the Linear B benchmark text produces the results shown in Table 8.21:

Table 8.21 *Syllabotactic similarity scores for 1,000,000 different sets of randomly retranscribed Linear B homomorphs of the Cretan Hieroglyphic pairs in Table 8.5 (the pairs in the Cretan Hieroglyphic target text) vs the Linear B benchmark text*

Score out of 60:	Permutations with that score:	% of permutations:	Score out of 60:	Permutations with that score:	% of permutations:
4	1	0.0001%	31	63,116	6.3116%
6	2	0.0002%	32	60,421	6.0421%
7	6	0.0006%	33	56,410	5.6410%
8	17	0.0017%	34	51,546	5.1546%
9	53	0.0053%	35	45,893	4.5893%
10	141	0.0141%	36	39,576	3.9576%
11	335	0.0335%	37	33,179	3.3179%
12	686	0.0686%	38	26,557	2.6557%
13	1,240	0.1240%	39	20,645	2.0645%
14	2,077	0.2077%	40	15,652	1.5652%
15	3,435	0.3435%	41	11,026	1.1026%
16	5,277	0.5277%	42	7,407	0.7407%
17	7,871	0.7871%	43	4,753	0.4753%
18	11,097	1.1097%	44	2,686	0.2686%
19	15,113	1.5113%	45	1,566	0.1566%
20	19,911	1.9911%	46	744	0.0744%
21	25,525	2.5525%	47	339	0.0339%
22	31,069	3.1069%	48	153	0.0153%
23	37,374	3.7374%	49	53	0.0053%
24	43,707	4.3707%	50	17	0.0017%
25	49,303	4.9303%	51	1	0.0001%
26	54,630	5.4630%	**Tot. permutations:**	1,000,000	100%
27	59,162	5.9162%	**Average score:**	29.531 / 60	
28	62,420	6.2420%	**Std deviation (σ):**	5.941 / 60	
29	63,486	6.3486%	**Avg. score + 2σ:**	41.413 / 60	
30	64,322	6.4322%	**Score of 40/60:**	Avg. + 1.76σ	$p = 0.0444$

[26] The total number of possible permutations is equal to 21! ('21 factorial') = the product of integers 1 through 21 = 5.1×10^{19}.

As Table 8.21 shows, the 1,000,000 random permutations produce an average score of 29.531/60, with a standard deviation (σ) of 5.941/60, such that the region of 'statistical significance' (2σ or more above the average) begins at 41.413/60 (i.e. scores of **42/60** or greater). Meanwhile, the original syllabotactic similarity score for the Cretan Hieroglyphic target text vs the Linear B benchmark text (as shown in Table 8.18) is **40/60**, which is **1.76σ above** the average score produced by chance alone (i.e. not within the region of statistical significance); and the *p*-value (produced by adding the percentages in the right column for all scores of 40/60 or more) is 0.0444, meaning that of the 1,000,000 random permutations, 4.44% of them scored 40/60 or higher. The potential meanings of this score will be discussed shortly.

The Cretan Hieroglyphic Target Text vs the Linear A Benchmark Text

In Table 8.22, row LA1 contains the twenty-one Linear A signs from Table 8.2, while row LA2 contains the *Linear A homomorphs* of the twenty-one Cretan Hieroglyphic signs present in Table 8.5 (the pairs in the Cretan Hieroglyphic target text):

Table 8.22 *Row LA1: the twenty-one Linear A signs from Table 8.2; row LA2: the Linear A homomorphs of the twenty-one Cretan Hieroglyphic signs present in Table 8.5 (the pairs in the Cretan Hieroglyphic target text)*

	1	2	3	4	5	6	7	8	9	10	11
LA1	𐘀	𐘁	𐘂	𐘃	𐘄	𐘅	𐘆	𐘇	𐘈	𐘉	𐘊
LA2	𐘀	𐘁	𐘂	𐘃	𐘄	𐘅	𐘆	𐘇	𐘈	𐘉	𐘊

	12	13	14	15	16	17	18	19	20	21
LA1	𐘋	𐘌	𐘍	𐘎	𐘏	𐘐	𐘑	𐘒	𐘓	𐘔
LA2	𐘋	𐘌	𐘍	𐘎	𐘏	𐘐	𐘑	𐘒	𐘓	𐘔

Rearranging the twenty-one signs in row LA2 of Table 8.22 in 1,000,000 different random ways;[27] retranscribing the *Linear A homomorphs* of the sixty Cretan Hieroglyphic pairs in Table 8.5 according to each random permutation of signs; and scoring each set of retranscribed pairs by counting how many of them also appear in the Linear A benchmark text produces the results shown in Table 8.23:

[27] The total number of possible permutations is 5.1×10^{19}; see note 26.

Table 8.23 *Syllabotactic similarity scores for 1,000,000 different sets of randomly retranscribed Linear A homomorphs of the Cretan Hieroglyphic pairs in Table 8.5 (the pairs in the Cretan Hieroglyphic target text) vs the Linear A benchmark text*

Score out of 60:	Permutations with that score:	% of permutations:	Score out of 60:	Permutations with that score:	% of permutations:
2	4	0.0004%	24	46,370	4.6370%
3	13	0.0013%	25	36,004	3.6004%
4	72	0.0072%	26	26,509	2.6509%
5	214	0.0214%	27	18,853	1.8853%
6	697	0.0697%	28	12,570	1.2570%
7	1,689	0.1689%	29	7,876	0.7876%
8	3,506	0.3506%	30	4,709	0.4709%
9	6,878	0.6878%	31	2,653	0.2653%
10	12,215	1.2215%	32	1,490	0.1490%
11	19,362	1.9362%	33	732	0.0732%
12	28,724	2.8724%	34	355	0.0355%
13	39,537	3.9537%	35	143	0.0143%
14	51,576	5.1576%	36	58	0.0058%
15	63,740	6.3740%	37	25	0.0025%
16	73,358	7.3358%	38	10	0.0010%
17	81,344	8.1344%	39	3	0.0003%
18	85,821	8.5821%	**Tot. permutations:**	1,000,000	100%
19	87,278	8.7278%	**Average score:**	18.944/60	
20	83,192	8.3192%	**Std deviation (σ):**	4.489/60	
21	77,317	7.7317%	**Avg. score + 2σ:**	27.922/60	
22	67,602	6.7602%	**Score of 32/60:**	Avg. + 2.91σ	$p = 0.0028$
23	57,501	5.7501%			

As Table 8.23 shows, the 1,000,000 random permutations produce an average score of 18.944/60, with a standard deviation (σ) of 4.489/60, such that the region of 'statistical significance' (2σ or more above the average) begins at 27.922/60 (i.e. scores of **28/60** or greater). Meanwhile, the original syllabotactic similarity score for the Cretan Hieroglyphic target text vs the Linear A benchmark text (as shown in Table 8.19) is **21/60**, which is **2.91σ above** the average score produced by chance alone (i.e. well within the region of statistical significance); and the *p*-value (produced by adding the percentages in the right column for all scores of 32/60 or more) is 0.0028, meaning that of the 1,000,000 random permutations, just 0.28% of them scored 32/60 or higher.

We now have final evaluations of the two syllabotactic similarity scores produced by the main experiment, with respect to representative averages produced by chance alone:

> The Cretan Hieroglyphic target text vs the Linear B benchmark text = 40/60 = 1.76σ above the average
> The Cretan Hieroglyphic target text vs the Linear A benchmark text = 32/60 = 2.91σ above the average

The right half of Figure 8.2 depicts these two evaluations, while the left half of Figure 8.2 contains the two evaluations produced earlier by the control experiment (as shown before in Figure 8.1). The region of statistical significance is shaded light grey:

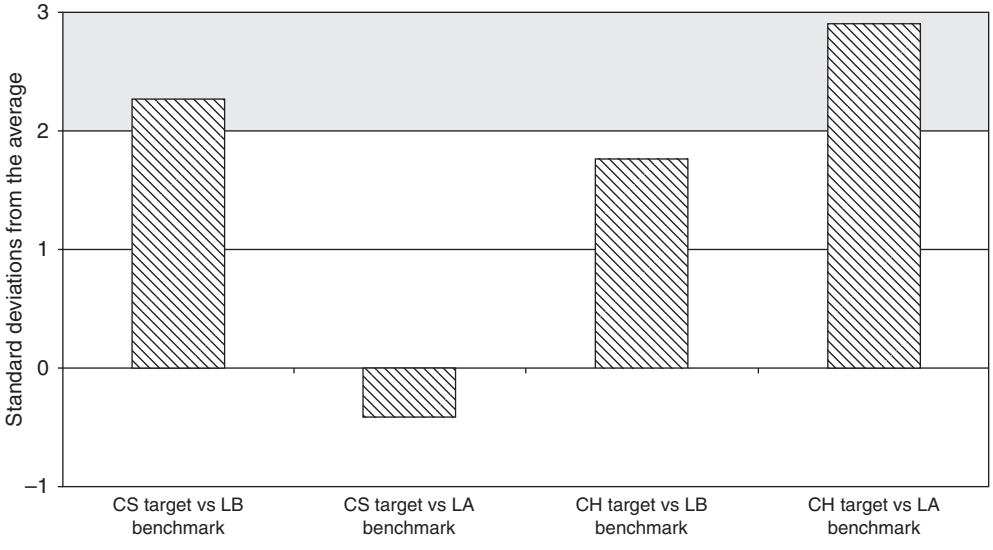


Figure 8.2 Evaluation of results: syllabotactic similarity of Cypriot Syllabic and Cretan Hieroglyphic target text vs Linear B and Linear A benchmark texts

8.6 Results of the Main Experiment: Discussion

In the first half of the main experiment (evaluating the syllabotactic similarity score for the Cretan Hieroglyphic target text vs the Linear B benchmark text), Table 8.21 makes it clear that we have no grounds for rejecting H_o:

- H_o = The syllabotactic similarity score of 40/60 for the Cretan Hieroglyphic target text vs the Linear B benchmark is due to chance alone.

That is: the strong implication is that the Cretan Hieroglyphic target text encodes a language *unrelated* to the language behind the Linear B benchmark text. Thus, as Greek is the language behind the Linear B benchmark text, this result constitutes strong statistical evidence that Greek is *not* the language behind Cretan Hieroglyphic. However, in the last half of the main experiment (evaluating the syllabotactic similarity score for the Cretan Hieroglyphic target text vs the Linear A benchmark text), Table 8.23 clearly tells us that, in this case, the syllabotactic similarity score is to a statistically significant degree 'statistically incompatible'[28] with the 'null hypothesis' that the score is due to chance alone (H_o), and that we should therefore reject H_o in favour of the 'alternative hypothesis' (H_A):

- H_A = The syllabotactic similarity score of 32/60 for the Cretan Hieroglyphic target text vs the Linear A benchmark text is *not* due to chance alone.

By the same logic outlined in the discussion of the results of the first half of the control experiment, rejecting H_o in favour of H_A results in an inextricably linked corollary of H_A regarding the phonetic values of the Cretan Hieroglyphic and Linear A signs, such that H_A can be augmented with that corollary as follows:

- H_A = The syllabotactic similarity score of 32/60 for the Cretan Hieroglyphic target text vs the Linear A benchmark text is *not* due to chance alone.

  Corollary: The Cretan Hieroglyphic and Linear A homomorphs in Table 8.2 are thus at least closely homophonous.

As in the discussion of the first half of the control experiment, the simplest explanation for the fact that the Cretan Hieroglyphic and Linear A homomorphs form pairs in such similar ways is that in H_A above, the target and benchmark texts encode the same language (or perhaps two very closely related languages, or two very similar dialects of the same language, or two chronological stages of the same language); thus Occam's Razor suggests that, based on the data, we should adopt Hypothesis 2 (and its corollary) as the most preferable one for the last half of the main experiment:

Hypothesis 2:

In the main experiment, the Cretan Hieroglyphic and Linear A texts both encode the same language (or perhaps two very closely

[28] Wasserstein and Lazar 2016: 131.

related languages, or two very similar dialects of the same language, or two chronological stages of the same language).

Corollary: The Cretan Hieroglyphic and Linear A homomorphs in Table 8.2 are thus at least closely homophonous, such that the phonetic values of the Linear A signs can tentatively be assigned to their Cretan Hieroglyphic homomorphs.

Of course, as is the case with Hypothesis 1 in the discussion of the first half of the control experiment, the analysis in the last half of the main experiment has not *proven* Hypothesis 2: it still remains a hypothesis – though one supported by strong statistical data, such that this hypothesis should be adopted as the prevailing one regarding the notion of a linguistic connection between Linear A and Cretan Hieroglyphic. Indeed, the results of the first half of the control experiment strongly suggest that adopting Hypothesis 2 as the prevailing one would be a productive move for scholars of Linear A and Cretan Hieroglyphic – because this hypothesis has at least two important implications that could very well be of substantial assistance in the process of deciphering both scripts:

(1) Assigning tentative phonetic values to Cretan Hieroglyphic signs based on the phonetic values of their Linear A homomorphs may be a much more productive and valuable method than has been previously thought; and
(2) The notion of a linguistic connection between Linear A and Cretan Hieroglyphic effectively links the decipherment of the two scripts, in that advances in the study of one of them have the potential to produce parallel advances in the study of the other, while the decipherment of one of them could very well lead to decipherment of the other.

Thus, we should employ Hypothesis 2 to underpin all future work on Linear A and Cretan Hieroglyphic, at least until we have a strong, data-supported reason for doing otherwise.

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CHAPTER 9

THE FUTURE OF CRETAN HIEROGLYPHS: OUTLOOKS AND TRAJECTORIES

John Bennet and Vassilis Petrakis

9.1 Pioneers, Problems and Paths Forward

We owe the term 'Hieroglyphic', as applied to the Cretan Hieroglyphic script, as we owe so much in Minoan studies, to Arthur Evans. His studies, beginning with his announcement in 1893, in a lecture on the Aegina Treasure, that he had identified 'a native Greek system of hieroglyphics, distinct from the Egyptian on the one hand, and the so-called Hittite on the other',[1] continued with his two substantial publications on the 'prae-Phoenician' scripts[2] and culminated in *SM* I,[3] the first systematic overview of Cretan Hieroglyphic (and the other Aegean scripts). We might term this the first 'watershed' in the study of Cretan Hieroglyphic. In his exposition of the development of writing on Crete, Evans was influenced by contemporary scholarship in the then-emerging fields of anthropology and prehistory, in particular by his Oxford colleague Edward Burnett Tylor, appointed to the UK's first Readership in Anthropology in the same year (1884) as Evans became Keeper of the Ashmolean Museum.[4]

Evans' influence on the field remained strong, less so following the decipherment of Linear B in 1952. That decipherment acted as a spur to the systematic investigation of the other scripts: Linear A and Cretan Hieroglyphic. We owe to Louis Godart and the late Jean-Pierre Olivier the first systematic corpus of Linear A, completed in 1985,[5] and, towards the end of the following decade, their corpus of Cretan Hieroglyphic.[6] *CHIC* represents the second 'watershed' in the study of Cretan Hieroglyphic and its importance for the field is signalled by its omnipresence in this volume, running like a warp thread through its weft.[7] We would like to see the current volume, not necessarily itself as a third 'watershed' (only history will tell), but as capturing a 'watershed

[1] Reported in *Journal of Hellenic Studies* 14: 1894: lx. [2] Evans 1894a; 1894b; 1895; 1897.
[3] For an insightful perspective on this work, see Karnava (2021). [4] Bennet 2016; 2018: 63.
[5] *GORILA* I–V; a Supplement to this by Maurizio Del Freo and Julien Zurbach is in preparation.
[6] *CHIC*.
[7] A direct consequence of *CHIC*'s publication was the systematic analytical study embodied in a doctoral thesis supervised by Olivier: Karnava 2000.

moment' in the study of Cretan Hieroglyphic, reflecting in particular the important contributions of what one might call the 'third generation' of Aegean script studies (after those of Ventris and Chadwick, and of Killen, Olivier and Melena), represented (among others regularly cited herein) by the authors of the various contributions included here. A point worth emphasising is the contribution of teamwork, particularly that of the INSCRIBE project, led by Silvia Ferrara, but also that of Philippa M. Steele's CREWS (and now VIEWS) projects, all three awarded by the European Research Council, the latter now funded by the UKRI Frontier Research Grant scheme.[8]

In this chapter we reflect on the themes presented in this volume and suggest potential trajectories for future study of Cretan Hieroglyphic: a similar endeavour one of us called elsewhere a 'Rumsfeldian exercise', as far as it is based on an assessment of known knowns, known unknowns and unknown unknowns.[9] Our perspective might be termed 'quasi-extraneous', since it embodies a viewpoint based on our knowledge of the Linear B system, still Aegean but utilised within a political and socio-economic landscape that may have differed profoundly from that of Cretan Hieroglyphic. We have tried to avoid repetition, inevitable as we return to similar topics from different angles, and to develop themes, rather than strictly following the structure of the volume.

9.2 Accommodating (or Rehabilitating) the Study of Cretan Hieroglyphic (and Other Aegean Writing Systems) within Grammatology: Some General Issues

Study of writing systems, grammatology, has developed over the last seven decades, its origins often traced to Ignace Gelb's all-encompassing *A Study of Writing*,[10] coincidentally first published in the year of Linear B's decipherment. The study of writing systems has its past in early studies of cultural evolution,[11] as well as in linguistics, where Saussure's statement that, the systemic independence of writing from speech notwithstanding, '[writing] exists for the sole purpose of representing [language]'[12] has been influential. Grammatology has approached certain grand questions regarding the origins, definition and development of writing through macroscopic

[8] INSCRIBE: www.inscribercproject.com/; www.site.unibo.it/inscribe/en/about-1; CREWS: www.crewsproject.wordpress.com/; VIEWS: www.viewsproject.wordpress.com/

[9] Bennet 2014: 137. [10] Gelb 1952; 1963.

[11] E.g. Tylor 1865: 1–2; 1871 I: 63–144. For this approach, see also Trigger 2004.

[12] Saussure 1959: 23. For a comprehensive discussion and critique, see Coulmas 2003: 10–17.

overviews of writing practices and case studies devoted to specific writing systems.[13]

Since the editors have expressed a wish in their Introduction that this volume be of wider relevance than the field of Aegean scripts, it is worth noting that study of Aegean Bronze-Age scripts appears somewhat isolated from important debates in the field of grammatology, with relatively few exceptions.[14] While grammatology rather stagnated until revisions of the Gelbian orthodoxy began to emerge in the 1980s, the same period was intensely formative for the dynamic field of Mycenaean studies, where focus was necessarily inward: towards a better understanding of Mycenaean Greek, the identification of certain undeciphered Linear B signs (a task not yet completed),[15] its phonology and morphology, its relationship with later Greek dialects and the multifaceted challenges of textual interpretation.[16] This time was, however, considerably less productive for the study of Cretan writing systems other than Linear B, especially Cretan Hieroglyphic, whose 'watershed moment' really arrived in 1996 with *CHIC*. Although criticised on several points, it is the *existence* of *CHIC* that has made such criticism, as well as all systematic discussion about Cretan Hieroglyphic, even possible in the last four decades. It is on *CHIC*'s foundation that scholars have subsequently built.[17] The last decade has seen clear signs of renewed attempts to reach beyond the Aegean through major publications that were either focused on Aegean evidence,[18] or featured a notable participation of Aegeanists.[19] In recent years, the productivity of INSCRIBE project members and affiliates, some contributors to this volume, has boosted the status of Aegean epigraphy profoundly.

The idiosyncratic terminology employed even in the study of Linear B, the best-known and best-documented Aegean system, is a factor and a side-effect of isolation from the wider field of grammatology. The term 'ideogram' can be retained for lack of a more recognisable term among Aegean epigraphers, but this must be accompanied by a clarification of how the term is used in our specialist field.[20] It is discarded in the study of other writing systems, being associated with the 'ideographic fallacy' surrounding earlier attitudes towards writing systems

[13] E.g. Sampson 1985; DeFrancis 1989; Coulmas 2003; Sproat 2000; Powell 2009; Sproat 2010.
[14] Bennett 1963; Bennet 2008; Thompson 2012; Petrakis 2017b. [15] Judson 2020.
[16] See e.g. Palaima 2003 and Bennet 2014 for overviews of the field's development.
[17] E.g. Younger 1996–1997; Olivier 2000; Poursat 2000; Karnava 2000; Jasink 2009.
[18] Jasink, Weingarten and Ferrara 2017 – a collection of studies of direct relevance to major grammatological questions, although focused on paraliterate or preliterate phenomena; similarly, Ferrara and Valério 2018; Steele 2017b.
[19] Piquette and Whitehouse 2013. [20] Thompson 2012.

whose graphemes had a 'pictorial' or 'iconic' appearance.[21] Consistent use of such terminology is one area that will prove crucial in seeking to accommodate (or rehabilitate) the study of Cretan Hieroglyphic, and other Aegean systems, into broader grammatological debates.

The interchangeable use of 'logogram' and 'ideogram' is also potentially confusing. A 'logogram' is commonly understood by grammatologists as a sign *representing* an uttered lexeme, what we often call 'word', however elusive a universal definition of that term may be.[22] In deciphered Linear B we have relative certainty that 'words' (i.e. sign groups divided by the interpunctuation marks commonly called 'dividers') are conceived as *accentual units*, a point inferred from the patterns of sign-group division, where proclitic and enclitic elements are not graphically separated (e.g. *o-u-di-do-si* /ou dídonsi/ 'they do not give').[23]

'Logograms', *defined as word-/morpheme-signs*, do not seem to exist in Linear B. The signs often called 'logograms' are specialised commodity signs (the term occasionally extended to other non-phonograms, e.g. measurement units, numerals); and while commodity signs could *correspond* to lexical 'words' (but never grammatical ones) they are never used within phonographic sequences. One of us has proposed to term non-phonographic signs in Linear B 'sematograms' to indicate non-phonographic signs not bound to specific uttered forms: graphemes that stand for the *thing*, rather than the *word for the thing*.[24]

Identification of 'logograms' has led to the characterisation of Aegean systems as 'logo-syllabic'/'logosyllabaries', a term used, albeit qualified, in this volume.[25] Since most grammatologists would understand the term to mean the *concurrent* use of 'logograms' and 'syllabograms' in phonography – for which we possess negative evidence from Linear B and lack positive evidence from other Aegean scripts – its use might appear inconsistent to the wider field of grammatology.[26] We Aegeanists may certainly continue to use *logo-*/ *ideo-*/ *semato-*/ or *semasio- -graphy* / *-graphic* / *-gram*(*s*) or any other term we like, interchangeably or not, as long as collectively agreed definitions are presented. However, we suggest, communication with the broader grammatological community

[21] Petrakis 2017b: 159–62.

[22] Coulmas 2003: 38–40 on the difficulties. Although we can define the parameters of what we mean by the terms 'word' or 'lexeme', it is difficult to arrive at a universal, cross-linguistic definition (see Dixon and Aikhenvald 2002).

[23] Melena 2014: 15, 123–8, 171.

[24] Petrakis 2017b: 149–51.

[25] Civitillo, Ferrara and Meissner, Introduction, and chapters by Valério, Flouda, and Meissner and Salgarella.

[26] Unless, of course, some of the earliest attestations involve the combination of syllabograms with single signs that qualify or modify the message: most explicitly in Decorte 2017.

would be of benefit if the agreed use of such terms is *not* restricted to Aegean epigraphy and compromises are made to facilitate the accommodation of our discussions to larger agendas and the broader picture.

A broader issue in that field since Gelb has been an assessment of the difference between the so-called 'broad' and 'narrow' definitions of writing: whether to include or exclude non-glottographic (or 'semasiographic') marking systems from the category 'writing'. For Gelb, 'semasiography' is the 'forerunner' or 'precursor' of glottography,[27] but, as one of us has observed,[28] (specialised) semasiography often develops in literate contexts, employing glottographic elements (e.g. international road signs, music staff notation or mathematical signs). The *place* of non-glottographic visual signaries in the development of writing deserves full attention, however, and study of the possibility of such 'semasiographic' elements in Cretan Hieroglyphic is directly relevant to an important grammatological debate.

Broader questions regarding the genesis,[29] development (both within the same system, within the same regional 'tradition' or, in macro-scale, across all writing systems)[30] and, eventually, the disappearance of writing systems[31] may usefully frame pertinent discussions centred on Aegean writing, in which the Cretan Hieroglyphic material is of key importance.

The term '*change*' is also another deceptively broad category that may conceal an interesting range of diverse phenomena with different motivations and character. Richard Salomon has usefully distinguished between *external* (changes in graph[32] *form*) and *deeper* or *systemic* change (the strategy of mapping language onto graphs) in writing systems.[33] These two 'levels' of script change seem to operate at different paces or even in different contexts of script use. While systemic change can occur in cases of script adaptation across a linguistic frontier (e.g. that of Greek alphabetic writing from a West Semitic script), one cannot generalise this association. External script changes are far more frequent and linked to a complex array of factors: material (such as writing surface and writing implement in shaping the ductus or the physical scale of the inscriptions), located at the interface between writing and other forms of visual communication, as well as the social function of writing and the position of literacy (defined as the specialised skills

[27] Gelb 1963: 24–59. [28] Petrakis *forthcoming*.
[29] Cf. papers in Houston 2004a; Houston 2004d. [30] See papers in Houston 2012.
[31] Baines, Bennet and Houston 2008; Houston, Baines and Cooper 2003.
[32] On the useful distinction proposed between 'graphs' and 'graphemes', see Ferrara, this volume.
[33] Salomon 2012: 126.

involved in the production and consumption of writing) within any specific historical context.

Salomon's distinction is useful in the study of an *undeciphered* script, such as Cretan Hieroglyphic, where the only directly observable type of change is the *external*, although Brent Davis' syllabotactic analysis may provide us with an effective tool to assess the statistical likelihood of *systemic* change.[34] We therefore run the serious risk of *reading too much* (no pun intended) into our only accessible genre of evidence: in the case of Cretan Hieroglyphic, the diversity in the 'outward form' of the written signs, as this appears before us in a variety of types and materials, including seals, clay administrative documents and small vessels, such as the Chamaizi juglets.

The end of a writing system is another area where caution is needed to distinguish between potentially different phenomena that might yield similar outcomes in the material record: the seeming 'replacement' of one writing system by another (e.g. of the Cypriot Syllabic script by Greek alphabetic writing, or the Arabic script by an adaptation of the Latin alphabet in post-Ottoman Turkey) and the loss of literacy *altogether* (e.g. the Linear B script with the demise of the Mycenaean palatial system in the early twelfth century BC). It is important to abandon teleological thinking in favour of context-specific features of such 'disappearances'. Scripts do not become obsolete because of some 'objective' assessment of a supposed 'deficiency'. Such points, made repeatedly with regard to Linear B,[35] are often made from an 'alphabetic' viewpoint, reinforced by Gelb's evolutionary view, in which the alphabet (with which Linear B was never an historical competitor) reigns supreme.[36] Rather, the critical conditions affecting such episodic 'script deaths' must be sought in the socio-political milieu of script use.

In the case of pre-Linear B writing in the Aegean, 'script death' is a less straightforward issue, affected by the position one takes with regard to the relationship between Cretan Hieroglyphic and Linear A.[37] One of us has previously stressed the abrupt character of the disuse of Linear A,[38] observing the close correlation between the latest horizon of its *administrative* use and the destruction of Neopalatial administrative centres at the end of LM IB. The end of the Cretan Hieroglyphic script is potentially obscured by uncertainty over the dating and coherence

[34] Davis 2018, this volume.
[35] For critical response to such views on Linear B, see Schwink 1998–1999; Schwink 1999.
[36] The alphabetocentric viewpoint is widely criticised in post-Gelbian grammatology: see e.g. Perri 2016: 96–100.
[37] Meissner and Salgarella, this volume; cf. Petrakis 2017a for a different position.
[38] Bennet 2008: 22; contrast Salgarella's (2020) more nuanced position.

of certain important assemblages of clay administrative documents, as well as by the *possibility* of some continued Cretan Hieroglyphic literacy in the use of Cretan Hieroglyphic seals (see further 9.9).[39]

Before we move on to topics more specific to Cretan Hieroglyphic, we stress two important methodological points, also instrumental in recent advances in grammatology.

The first is the *prioritisation of archaeological and epigraphic evidence*. Chronological indications, spatial distribution and contextual information on the use of those artefacts that functioned as material carriers of writing might be conceived as forming a factual framework, on which model-building must be based. Here we must be wary of explanations that appear 'logical' or 'reasonable' to us, since these involve our own (therefore entirely *etic*) perception of 'common sense' and 'likelihood'. Such notions surround assertions about the origins of writing, its development and its demise, concealed under the veil of the 'apparent'. This does not imply that we need to proceed without working assumptions, but we should be aware of the limitations of our own 'common sense' by constantly revisiting the degree to which our ideas about writing, its nature, use, experience and significance are informed by the fact that we, as scholars and agents within an era of unprecedented global literacy, are totally enmeshed in the *current forms* of the very phenomenon we strive to study. A significant challenge in the prioritisation of archaeological information advocated here lies in the treatment of fragmentary data, negative evidence and those filters that may have removed classes of evidence (e.g. lack of burning required to preserve clay documents).

The second point concerns '*comparison*': in its broadest sense the juxtaposition of two objects, items or categories with the aim of assessing their similarities and differences and drawing meaningful conclusions from such assessment. One could argue that a specific form of comparison – *analogy* – is central to all scholarship about the past, an inescapable facet of all archaeological thinking.[40] Comparison has been with us since the inception of the study of Aegean writing in Evans' work. We wish to advocate *explicitness* and *comprehensive exposition of the entire framework of 'comparisons'* as crucial for the application of such methods. It is valuable – at least heuristically – to distinguish different types of comparative efforts: 'genetic', 'historical' or 'analogical'.[41] For such efforts to be constructive, however, we need to be explicit about their background (working hypotheses or assumptions made prior to 'comparison'), their properties (exact range – chronological, geographical

[39] Weingarten 2009. [40] Johnson 2020: 54–5. [41] Bennet 2017.

or the contextual diversity – of the objects compared) and their aims and projected outcome (what do we expect to test by the 'comparison' and what kind of inference might we expect to emerge). Through such explicitness, the fruits of comparison will be better understood, better used and can better be critiqued.

9.3 Grammatogeny on Crete: Its Context and Its Archaeological Correlates

A broad consensus holds that grammatogeny on Crete was not a primary or pristine phenomenon like that in Mesopotamia or Egypt, since it appears in a broad region (Egypt and the Eastern Mediterranean) where several writing systems already existed. Direct evidence, however, pertaining to the earliest appearance of writing on Crete (and, effectively, the Aegean as a whole) is restricted, since much of it depends on accidental preservation of unfired clay documents, or on objects deposited in funerary contexts, whose chronology is problematic, given the long periods of use of these tombs.

Nevertheless, we assume that the 'Archanes script' constitutes *a form of writing*[42] and that at least some of that small corpus dates as early as MM IA. Any understanding of Cretan grammatogeny must be based on material *prior to* that period and the most relevant phenomenon is the creation and *use* of seals that goes back at least to the EM IIA period.[43] The *sphragistic use* of seals – as opposed to use for display or as amulets, the two not being exclusive – is also attested on the EH II Greek mainland in Lerna III, Geraki and Petri. The practice may have originated in Anatolia[44] and 'creatively appropriated to fit local traditions of door construction' which they secured.[45] That such an innovation should have spread around the Aegean in EB II, the period of the 'international spirit' when links between both shores of the Aegean and with Crete to the south were intense, is unsurprising.[46]

Evidence of EM II–MM I sealings is admittedly limited.[47] Although we have fewer than thirty examples, the largest single group is classifiable as direct-object sealings, similar to those attested in larger numbers on the mainland.[48] Their presence even at small sites, such as Myrtos Fournou Koryphi and Trypiti Adami Korfali, suggests the

[42] Decorte 2018a. [43] E.g. Krzyszkowska 2005: 57–78.
[44] See the discussion in Bennet 2017: 466 with references; Maran and Kostoula 2014.
[45] Maran and Kostoula 2014: 151. [46] E.g. Broodbank 2000: 276–319.
[47] Schoep 1999; 2004; Relaki 2009; 2012.
[48] Relaki 2009: 366, table 1.

practice was widespread. Their rarity at Knossos and Malia, already large sites by this time, can be attributed to later construction or limited episodes of burning to fire the clay.[49] The distribution of *similar* motifs on Prepalatial seals and on sealings across the island[50] might be taken to imply a degree of systemic integration, although Relaki prefers to view the pattern as reflective of the amuletic function of the seals. These sealings are essentially similar to those attested in greater quantities at Phaistos and Monastiraki in the Protopalatial period, and there is some evidence of continuity in motifs between third-millennium and Protopalatial examples.[51]

It is in the context of seals that further innovations appear on Crete: the use of hippopotamus ivory for some examples deposited in late third-millennium BC burials and the occurrence of imported Egyptian scarabs in the MM IA period.[52] Georgia Flouda has cautiously argued for an emulative process whereby imported Egyptian scarabs prompted developments towards the use of certain seal motifs as *emblems* (Parading Lions/Spirals seal group)[53] and, eventually, influenced the *use* of writing on Aegean seals as a *secondary* development.[54] She observes how the processes of the development of such iconicity in Late Prepalatial seals 'coincides' with rather than leads to the development of Cretan writing. These innovations are part of a wider adoption of new objects and materials towards the end of the third millennium, accelerated by the appearance of sail-powered craft that collapsed the distance between Crete and the Eastern Mediterranean.[55] On the basis of shared preferences in the choice of Egyptian stone vessels, and bearing in mind the extreme difficulties of navigating *directly* from Egypt to Crete, Bevan has argued convincingly that such contacts were mediated through the heavily Egyptianised city of Byblos.[56]

These connections suggest a plausible *context* in which the *idea* of writing could have arrived on Crete, going beyond the rather bland formulation of 'stimulus diffusion' – the practice of copying or imitation at a very general level, impossible to prove or disprove and resting on arguments about dates and relative physical proximity, as Houston has noted.[57] It seems very unlikely that a particular system was adopted

[49] See Bennet 1992: 177–8 for a discussion. [50] Relaki 2009: 357–8, fig. 1.
[51] Ibid.: 360, fig. 2. Bevan (2007: 91–3) also notes inter-craft interaction between soft-stone vessels and seals.
[52] See, for example, Flouda 2013: 153–4. [53] Anderson 2016: 140–69.
[54] Flouda 2013: 152–5. [55] E.g. Broodbank 2000: 341–9; Bevan 2004: 109.
[56] Bevan 2004: 109; 2007: 86–93; Bennet 2017: 466–7, with references.
[57] Houston 2004b: 10–11.

on Crete,[58] but the existence of an apparently syllabographic writing system at Byblos by the early second millennium BC, although not related to Cretan Hieroglyphic, might be symptomatic of contemporary grammatogenic dynamics in an Egyptianising environment.[59] The Cretan system would thus be a local blending of indigenous motifs that came to be used conventionally under the influence of Egyptian scarabs and a structure suggested by encounters with a syllabographic script, 'stimuli for invention' as phrased by Silvia Ferrara, Barbara Montecchi and Miguel Valério.[60] While we should not underestimate our ignorance and the number of poorly documented writing systems and palaeographic traditions in the Eastern Mediterranean throughout the second millennium BC,[61] we may nevertheless note that it was in the Eastern Mediterranean, on the margins of the two great logo-syllabic traditions – cuneiform and Egyptian – that more 'economical' systems evolved, such as proto-Sinaitic and later alphabetic cuneiform.

That the first glottography appeared on the surfaces of seals should not surprise us, although we should be careful not to infer easily that Late Prepalatial seals, especially those bearing the so-called 'Archanes script', were originally non-administrative, as their deposition as grave-goods might suggest. Rather, we may be victims of a taphonomic situation where the dearth of burnt horizons has deprived us of those contexts where clay documents would have been preserved *just as early*.[62]

Many studies accept the decorated seal surface as the prime physical context where script formation occurred.[63] The identification of possible relationships between the imagery on EM III–MM II seals and Cretan Hieroglyphic graphemes has been the focus of much discussion, partly related to augmenting the *CHIC* signary,[64] but also centred around the potential iconographic background of pictorial Cretan Hieroglyphic graphemes.[65] Artemis Karnava has stressed the process of 'miniaturisation' of objects from the physical world as implicit in the production of clay votives found in Protopalatial Minoan cult contexts[66] and has even

[58] See Ferrara, Montecchi and Valério 2021a for a convincing deconstruction of the case for adoption of Egyptian signs, in agreement with scenarios that connections with Egypt were *indirect*.
[59] For a recent overview of the Byblos script, see Vita and Zamora 2018.
[60] Ferrara, Montecchi and Valério 2021a, esp. 18–19.
[61] As Sherratt (2013) has usefully reminded us from a different perspective.
[62] Macdonald 2012: 105; Bennet 2017: 467.
[63] Flouda 2013; this volume; Decorte 2018b; Valério, this volume; Steele, this volume.
[64] Cf. especially Jasink 2009; Ferrara, this volume.
[65] See also Flouda, this volume.
[66] Karnava 2015, esp. 147–8.

suggested that, in certain cases, Cretan Hieroglyphic signs might have been the *source* of the borrowing of seal motifs.[67]

Any discussion of grammatogeny in the Aegean must consider the problem of the relationship between the 'Archanes script' and other Aegean signaries, which tends to be informed by the typology of the material-carrier, where an affinity with Cretan Hieroglyphic is arguable. The early date of this material, *potentially* within the EM III–MM IA range, raises the possibility that the emergence of glottography is disassociated from the onset of the social processes attributed to the Protopalatial period (unless, of course, we consider such processes as already under way during the so-called Late Prepalatial period),[68] while the identification on a number of the seals of the so-called 'Archanes formula'[69] might link it also to the Linear A corpus.[70]

Roeland Decorte has cautiously arrived at a corpus of sixteen seals as assigned to the 'Archanes script' corpus.[71] The use of multiple criteria beyond the signary itself is certainly promising, not least because they appear to consolidate the coherence of the 'Archanes script', at least as defined in *CHIC*. When the argument for the 'Archanes script' being a 'self-contained category' is presented, however, the main evidence called in support is palaeography,[72] and a similar approach is followed in a recent reassessment, where a disassociation of the 'Archanes script' from the Linear A 'libation formula' is used to support its interpretation as an early manifestation of Cretan Hieroglyphic.[73]

The emphasis on long-term, local and potentially archaeologically observable processes suggests how such explanations help us move away from the evolutionist focus on identifying 'forerunners'/'antecedents' of writing and monogenetic explanations that insist on a single 'prime mover' in grammatogeny, while encouraging contextual studies of writing as cultural practice and exposing idiosyncratic features related to specific grammatogenic conditions.

A crucial point in any grammatogeny is the assignment of a conventional *phonetic* value to a sign, its *phoneticism*. This topic demands further examination that might move us beyond the often-made assumption that a sort of *rebus* principle or *acrophony* was at play.[74] In that, we have moved barely more than a few steps from speculative assessments

[67] Karnava 2021: 248–9. [68] E.g. papers in Schoep *et al.* 2012.
[69] Karnava 2021: 254, note 1; also Jasink and Weingarten, this volume, Table 4.1 where two more items, KN S (4/4) 01 – a recent find from Knossos Bougadha Metochi (Kanta *et al*. 2023; see now Civitillo 2021b: 97) – and a sealing from Mikro Vouni on Samothrace have been added.
[70] E.g. Godart 1999; Godart, this volume; but see Ferrara, Montecchi and Valério 2021b for a different view.
[71] Decorte 2018a, esp. Tables 1–3 for previous classifications. [72] Ibid., 367.
[73] Ferrara, Montecchi and Valério 2021b. [74] Valério and Ferrara 2019; also Salgarella 2021.

made already by Evans.[75] An important challenge will be to upgrade discussion of the possible mechanisms whereby phoneticism and, consequently, the potential of glottic reading and the passage from visual reception to true *reading* took place in the second millennium BC Aegean.

9.4 Development and Relationship to Other Aegean Writing Systems: an 'Aegean Family' of Scripts?

The relationship between different writing systems has been central to Aegean epigraphy since its inception. Questions, such as the potential 'autonomy' of the 'Archanes script', are circumscribed by paucity of evidence, while others, including the question of script inter-relationship, appear to be examined within a largely pre-determined opposition between 'Hieroglyphic' (even 'Pictographic') and 'Linear' scripts, as well as the completely *etic* differentiation between well-documented and 'readable' Linear B and less well-attested earlier Cretan scripts.

Houston has referred to what he terms the 'retroactive conceit', according to which 'later, better-understood inscriptions can be used to explain murky, earlier ones'.[76] Could our relatively superior accessibility to Linear B (to which Cretan Hieroglyphic *may* be related) have a negative effect on the ways in which we study the Cretan Hieroglyphic material? For example, can we use the parallel between 'crescent'-shaped nodules (inscribed in Cretan Hieroglyphic) and regular string-nodules (inscribed in Linear B)[77] to gain some general understanding of the role of the Cretan Hieroglyphic documents in their respective administrative system?

In their assessment of the relationship between Cretan Hieroglyphic and Linear A, Torsten Meissner and Ester Salgarella have outlined a distinction between 'script-internal' and 'script-external' features. Although their contribution here is explicitly focused on 'script-internal' features, specifically homograph correspondences, they underscore well the complexity of a seemingly simple problem of understanding a *relationship* and the multi-disciplinary approach required to tackle it effectively. They argue for a close relationship between Cretan Hieroglyphic and Linear A, whose signaries seem to share a significant amount of homomorph signs (or homographs), that *may* potentially be significant.[78] Set alongside Davis' study based on syllabotactics, a statistical assessment of the constraints on the combinatory possibilities of syllables,[79] where he argues that Cretan Hieroglyphic and Linear A

[75] E.g. *SM* I: 264. [76] Houston 2004c: 299. [77] Petrakis 2017a: 76; also Tomas 2012.
[78] Meissner and Salgarella, this volume. [79] Davis, this volume.

may represent the same or closely related languages, a close relationship is strongly suggested. However, a recent discussion of the same evidence[80] argued for severing the link between the 'Archanes formula' and seemingly parallel sequences in Linear A.[81] It will be a challenge to perform different analyses utilising *different views* on the identification of Cretan Hieroglyphic–Linear A homographic correspondences, especially those most recently presented.[82] We should keep in mind that shared sequences do not necessarily prove linguistic identity, as shared sequences between Linear A and Linear B show: their value lies in their potential to assess possible homophony behind the 'phenotype' of homography.[83]

Beyond homograph correspondences, features termed by Meissner and Salgarella as 'script-external' form a promising avenue of future research. These include elements *beyond the signary*, referring to features of how a system is used: document typology (including format and arrangement of text), chronology (necessitating assessment of the archaeological data), geographical distribution and context of script use.

Here the issue of a potential relationship between Cretan Hieroglyphic and Linear B must also be mentioned, suggested, among others, by Erik Hallager who addressed certain affinities between Cretan Hieroglyphic-related and Linear B-related *administrative practice*.[84] Further pursuit of these observations has been hampered by preconceptions of the 'distance' between Cretan Hieroglyphic and Linear B, and by an underestimation of the extent of use of Cretan Hieroglyphic into the Neopalatial period. Petrakis, for example, starting from the origins of the Linear B system, explored the intricate relationship between Cretan Hieroglyphic and Linear A *in specific assemblages*, the Knossos 'Hieroglyphic Deposit' and the Malia 'Dépôt Hiéroglyphique'.[85] He argued that the two deposits feature a remarkably similar 'co-existence' of features, including a number of documents that *could* be classified as Linear A at Knossos.[86] 'Script-external' features (document typology,

[80] Ferrara, Montecchi and Valério 2022; cf. Ferrara, Montecchi and Valério 2021c.
[81] Ferrara, Montecchi and Valério 2022: 92.
[82] Most recently Meissner and Salgarella, this volume; Ferrara, Montecchi and Valério 2022.
[83] Steele and Meissner (2017) used Linear A/Linear B shared sign sequences and other hints to suggest the validity of a projection of Linear B *conventional* values onto Linear A homomorphs.
[84] Hallager 2011; 2015; Tomas 2012. [85] Petrakis 2017a.
[86] *CHIC*: 18; Petrakis regrets terming these inscriptions as 'dubitanda' (2014; 2017a). He intended the term to imply that what is in doubt is their classification as Cretan Hieroglyphic, not that these inscriptions are of dubious authenticity (the common use of 'dubitandum' generally and in *CHIC*: 25).

administrative context of use and sealing practices) were a deliberate focus of this study.[87]

Further lines of enquiry might address 'script-internal' features beyond sign groups and homographs to other 'categories' of signs. Two questions immediately spring to mind. First, is it accidental that use of 'klasmatogrammes' on Cretan Hieroglyphic clay documents is only found in specific assemblages (the Knossos and Malia 'Deposits') or sites (such as Phaistos) where the use of Linear A is clearly documented? Second, what is the significance of the observation that, unlike 'simple signs', Linear A 'composite signs' do not share convincing Cretan Hieroglyphic homographs? A further challenge lies specifically in integrating the results of 'script-external' aspects, not as secondary to the analysis of 'script-internal' features, but as components of equal significance in assessing the validity and solidarity of the 'Aegean' as a meaningful category in script classification.

9.5 Pictorial Seduction – Reading and 'Reading' Cretan Hieroglyphic?

Study of Aegean writing in general, and Cretan Hieroglyphic in particular, was, in its first scholarly incarnation, the study of 'Cretan *pictographs*'. The pictorial quality of most of the signs appealed to Evans and a substantial proportion of his interpretative assaults in *SM* I consists of attempts to discern the potential meaning of such 'pictorial' representations.[88] Although such interpretative exercises are – rightly in our view – nowadays largely (although not conclusively) abandoned, the strong impression of the 'pictographic' character of Cretan Hieroglyphic remains subtly present in considerations of the possible parallelisms between Aegean and Egyptian grammatogenies[89] or in the interpretation of specific signs.[90]

However, since we know that Egyptian and Mayan scripts are phonographic, and we are fairly certain that the same is substantially true of Cretan Hieroglyphic, how useful is it to stress this specific 'pictorial' quality of Cretan Hieroglyphic? A remarkable number of signs have 'obvious' pictorial prototypes, elucidated by several thoughtful studies of the processes whereby such graphemes came into being.[91] But what is the significance of such 'pictoriality', since it is in fact a quality that *we* have defined? The prototypes of certain graphemes (e.g. CH 005

[87] Petrakis 2017a for a re-evaluation of the categories 'Hieroglyphic' and 'Linear'.
[88] Karnava 2021. [89] E.g. Valério, this volume; Flouda, this volume, with references.
[90] Ferrara and Cristiani 2016 on CH sign 044. Cf. also 9.6.
[91] E.g. Flouda 2013; Karnava 2015; Salgarella 2021.

'eye') are straightforward, but this is a completely *etic* affair: when we classify sign 005 'eye' among signs referring to 'parts of the human body' we do not advance our understanding of the sign's use or the structure of the system of which it was a part. We merely give this sign an *etically* disambiguating name. This is because – although we may be less explicit about it – this 'pictorial' quality reflects *our own outlook*, whereas such a sign might have a remarkable range of possible *emic* interpretations: check/control, guidance, admiration, vision/dream, or guard against malevolence, merely as indications from a range of cross-culturally attested significations of the 'eye'. The complications of penetrating the *emic* significance of a 'pictorial' motif are multiplied when identification of the prototype is contested, as in CH 044 'trowel'/'*Petschaft*-type seal'. As John Robertson has observed 'even where iconic representation is possible, the possibility of ambiguity is infinite'.[92] Considerable interpretative 'noise' would be generated following the pursuit (systematic or otherwise) of such 'possible' interpretations of 'pictorial' graphemes.

Pictoriality can indeed be recognised as a common feature of many early writing systems, such as Egyptian, Proto-cuneiform, Chinese or Mesoamerican,[93] but there are difficulties in trying to stretch the argument into a variant of the unidirectional development hypothesis whereby pictoriality would *suggest* the archaic 'nature' of any script, as if the 'course' of the development would be *from* pictoriality *towards* abstraction. The process described as the 'loss of iconicity'[94] can in fact conceal a variety of situations across different – genetically unrelated – writing systems.[95] A similar issue arises with Evans' distinction between 'pictorial' and 'linear', formed even before he had seen his first clay tablet in 1895 and still persistent in our script taxonomies.[96]

Specific mention may be made here to the case of Egyptian writing, whose association with iconography formed a remarkably intricate – yet highly *idiosyncratic* – nexus from quite early on. Baines has described the functional milieu of the earliest Egyptian writing as a communicative display system in which writing formed a vital part, but was nonetheless integrated with representational (pictorial) arts in a context where literacy was also fully embedded in elite display strategies.[97] This is not the case with the Aegean Bronze Age, where 'art' and 'writing' come

[92] Robertson 2004: 22. [93] E.g. ibid.: 27, 36; papers in Houston 2004a. [94] Cooper 2004: 93.
[95] Papers in Houston 2004a and Houston 2012.
[96] Evans 1894b: 94, cf. also tables II–III for 'linear' signs, occasionally compared to 'pictographs'. *SM* I: 17 on the so-called 'Zachyrakis tablet'.
[97] Baines 1989; 2004: 151.

only to appear occasionally in *seemingly* interchangeable positions on the same categories of physical surfaces (namely as the faces of a seal or signet ring), but were not integrated.[98] Even in the case of the Cretan Hieroglyphic seals, the medium where 'art' and 'writing' might have been more physically close, and allowing for the debated interpretation of a number of images as actual graphemes,[99] it is difficult for us to comprehend the principles whereby any possible integration of pictorial *non*-graphemes and Cretan Hieroglyphic graphemes could have functioned. This might turn out to be a completely *etic* difficulty; however, we must carefully consider the different contextual and conceptual settings between the role of Aegean and Egyptian writing in elite display strategies.

'Pictoriality' or 'pictography' as a quality can be retained to indicate a quality in the *appearance* of the graphemes, with *no necessary* implication as to how these graphemes were used within the writing *system*.[100] Such a distinction may help us understand modes of sign formation, not exclusively associated with grammatogeny, but with development within a system or a 'family' of scripts.[101] In the Aegean, the case of many innovative (i.e. unattested in earlier Aegean signaries) pictorial signs (especially 'ideograms') in Linear B[102] demonstrates that 'pictoriality' was not monopolised by 'early' writing systems in the Aegean.

9.6 The Sign Categories in Cretan Hieroglyphic

CHIC made certain decisions regarding the classification of Cretan Hieroglyphic signs into the categories of syllabograms (phonographic signs that may render syllabic units), logograms (commodity signs traditionally called 'ideograms' in Aegean epigraphy),[103] klasmatograms (signs for fractions), arithmograms (numerical notation) and stiktograms (signs of punctuation). *CHIC* categorised Cretan Hieroglyphic graphemes in a way clearly *compatible* with what we know about Linear B and what we can infer relatively safely about Linear A. A pressing problem, however, is the possible existence of categories of Cretan Hieroglyphic graphemes that may *not* be readily paralleled in other Aegean writing systems.

Valério[104] argues that Cretan Hieroglyphic is 'logo-syllabic' or 'logo-phonetic', in the sense of combining 'semantic' and phonetic

[98] Bennet 2018. [99] See chiefly Jasink 2009; Ferrara, this volume, with references.
[100] E.g. Cooper 2004: 97, endnote 25.
[101] Salgarella 2021 on possible real-world models for Linear A and Linear B signs.
[102] The term 'iconic' is preferred by Melena 2014; see Palaima 1992.
[103] See section 9.2 with references. [104] Valério, this volume, sections 2.3–2.4.

signs. We need to clarify whether 'logography' is really intended here as a sign for a *lexeme* or *morpheme* (hence glottographic) – as the term is normally used in grammatology[105] – or whether it implies a truly 'sematographic' use of certain signs. A more important issue, however, is the existence of 'mixed spellings' in an Aegean Bronze-Age writing system.

Such 'readings' – rather, interpretations – of Cretan Hieroglyphic texts, based on what Karnava has correctly identified as 'some sort of free-association play'[106] played a considerable part in *SM* I. A well-known example is Evans' 'reading' of face α of a 3-sided prism from the Ashmolean (AM 1910.235)[107] showing CH 038 *interpreted as* 'gate' as a title (appropriate on a seal): 'Keeper of the Swine'.[108] Such 'readings' have been paralleled with those in the obscure treatise *Hieroglyphika*, assigned to Horapollo (late fifth century AD),[109] which impeded the proper understanding of Egyptian writing until Champollion.[110] While non-phonographic interpretations must not be *a priori* excluded, we must approach their application to any part of the Cretan Hieroglyphic corpus with extreme caution.

Alongside Evans' speculative interpretation of certain items as indicating titles[111] (an idea recurrent with minor modifications in other works on Cretan Hieroglyphic seals)[112] we may be led to rethink even more *apparently* plausible interpretations. The interpretation by Evans of one of the most common CH signs, 044 (132x and part of the most frequent Cretan Hieroglyphic sign groups: 044-049 and 044-005) as 'trowel' has been reinterpreted as representing a 1-sided '*Petschaft*' seal.[113] Ferrara and Cristiani have suggested, with commendable caution, the 'deictic role' of this sign as suggestive of the semantic category of administrative action, in which the use of the sign's material prototype – the '*Petschaft*' seal – would be physically implicated. While the identification of this seal as the prototype appears sound, acceptance of the sign's 'deictic role' would require us to de-construct and re-think at least the (commonly accepted as phonographic) sequences 044-049 and 004-005. While compatible with John G. Younger's speculative

[105] See 9.2. [106] Karnava 2021: 242.
[107] CR S (3/3) 04. *SM* I: 153 (P.22a) = *CHIC* #256 = *CMS* VI, no.95b. [108] *SM* I: 153.
[109] Karnava 2021: 252–3. Cf. also Powell 2009: 85–99. [110] Engsheden 2013.
[111] *SM* I: 263–8.
[112] Titles or broader administrative institutional framework, which Olivier once exemplified as (rather than suggested to be) a 'temple' or 'palace' (Olivier 1990: 17–18; cf. Weingarten 1995: 303, n. 23; also Valério, this volume). The conjecture is reasonable, although the term could indicate any other common institution or render a specific segment of the Cretan Hieroglyphic technical vocabulary. Further pursuit of such speculative interpretations needs to be made with extreme caution in order not to produce interpretative 'noise'.
[113] Ferrara and Cristiani 2016: 25–34.

but interesting proposal that 044-049 would 'mean something like 'received',[114] a token of a specific transactional context, plausibly verifying/authenticating a transaction (as its high occurrence on *seals* would also suggest), this generates further questions. How can we reconcile this interpretation with the plausible homomorphy between CH 044 and (the clearly phonographic) LB **19*?[115] Might such 'deictic' signs exist elsewhere in the Cretan Hieroglyphic corpus? Can we accept the possibility that *some* Cretan Hieroglyphic graphemes were phonographic, while *others* were similarly 'deictic'?

'Mixed' spellings (as one might call a graphemic rendering making use of graphemes of *more than one* category) or sematographic/deictic interpretations of specific graphemes or sign groups do occur in Egyptian and cuneiform systems.[116] However, one reason for scepticism over their existence in Cretan Hieroglyphic is their certain *absence* from Linear B, the one Aegean writing system of which we have adequate knowledge. There, the extremely *rigorous* 'slot' division between phonograms and non-phonograms in fixed positions within the entry (or different facets on string-nodules)[117] suggests that the distinction between *phonograms* and *non-phonograms* appears to be *emic*, meaningful to Linear B-users themselves. A study of the structure of Cretan Hieroglyphic inscriptions on *clay administrative documents* suggests that a similar division may be discernible there too, with numerals and commodity signs regularly placed *after* what *appear* to be phonographic sign groups *in the suggested reading direction* of the document.

Still, could Cretan Hieroglyphic have employed a manner of spelling that was later abolished in the so-called 'Linear' scripts, or might such practice have been confined to inscriptions on seals? This is theoretically possible and we may again be reminded of Houston's 'retroactive conceit'. Questions about the 'different' nature of Cretan Hieroglyphic are intertwined with questions about the *relationship* between Cretan Hieroglyphic and Linear A or Linear B (see 9.4). The *a priori* assessment of other 'early' or 'archaic' features that Cretan Hieroglyphic might have possessed, including 'flexibility', 'fluidity' or 'multi-valence', should not necessarily be rejected, but we again stress the need to prioritise the positive inferences drawn from extant evidence, rather than generalising through projection of parallels from other contexts.

[114] Younger 1996–1997 [1998]: 391.
[115] See Meissner and Salgarella, this volume, see Table 7.2; also Judson 2020: 155–61.
[116] See generally Coulmas 2003: 168–78.
[117] Petrakis 2017b: 127–9, fig.1. The reverse order of 'slots' on PY Tn 316 *verso* .3 is an exception.

Finally, we comment on the decision, made in the most recent systematic revision of the Cretan Hieroglyphic signary, to suppress *all* classificatory divisions for Cretan Hieroglyphic graphemes included in *CHIC*, so that they can be re-investigated from scratch. This decision was made deliberately to revisit the function and definition of such categories as 'syllabogrammes' and 'logogrammes' (terms used in *CHIC*).[118] In the face of the emerging discussion of the possibility of 'sematographic' or mixed (sematographic/phonetic) spellings in Cretan Hieroglyphic, this seems to be a judicious way forward.

9.7 On Seals and on Clay: Skeuomorphism, Patchy Evidence and the Unity and Diversity of the Cretan Hieroglyphic Corpus

Cretan Hieroglyphic appears on a broad range of artefacts, if not as extensive as that of Linear A.[119] Within this diversity, inscriptions are normally grouped according to material (unintentionally fired clay, pottery, stone, metal, etc.) and form. The various document classes proposed in *CHIC*, expressed as single or two-letter prefixes reflect *our* currently accepted categorisation.[120]

Skeuomorphism expresses homomorphy across diverse materials. The resemblance of *dominant* shapes of Cretan Hieroglyphic seals – 3-sided and 4-sided prisms – to homomorphic clay documents – 3-sided and 4-sided bars – may be more than merely accidental; similarly, 2-face seals may be associated with two-faced documents, such as 2-sided bars, the so-called *lames à deux faces* or tablets; and multi-sided prisms, such as the *unique* 8-sided prism from Neapolis (*CHIC* #314), might have been prismatic adaptations of Near Eastern cylinder-seals. We can also understand the relationship between different types of documents in a 'modular' way: unique types, such as the Archanes 'baton' may be interpreted as three stacked 'cubes', as has already been ingeniously proposed.[121] The fact that both types carry 'Archanes script' signs supports this interpretation. But can we detect the *direction* of skeuomorphism? While it might appear 'obvious' to accept the chronological priority of seals (especially if the 'Archanes script' material is included)

[118] Ferrara, Montecchi and Valério 2021c: 8. [119] E.g. Bennet 2008: 10, table 1.2.
[120] H- for the various categories of clay administrative documents; S for seals; I for seal impressions; and Y- for miscellaneous supports (*CHIC*: 22).
[121] Weingarten 2007: 137; cf. also Valério, this volume; Civitillo, this volume.

and thus their role as 'prototypes', we should bear in mind that earlier clay documents may not have been accidentally burnt.

An alternative direction of skeuomorphism follows from Karnava's argument that the identification of such signs as commodity 'ideograms' or klasmatograms on seals, albeit rare (further below) suggests that seals could have been the *recipients*, rather than the source of such transfer of signs.[122] Minimally, however, her observation implies a more dynamic *interaction* between seals and clay documents.

Matilde Civitillo has suggested a correlation between status and the relative value of various kinds of stone in the production of Cretan Hieroglyphic seals.[123] In order to validate this suggestion, it would be helpful if we understood the *emic perception* of such materials and their properties (including availability, colour, affinity or likeness to other exotic or prestigious stones or other materials), as discussed in much later authors such as Theophrastus (fourth/early third century BC) or Pliny the Elder (first century BC).[124]

There has long been a debate about the potential divide between Cretan Hieroglyphic on seals and Cretan Hieroglyphic on clay, a debate related also to the question of phoneticism on seals.[125] It is important to consider the different praxeological frameworks in which inscribed seals and inscribed clay documents were situated. The seal is permanent and ever-productive, able to produce a theoretically infinite number of impressions; clay documents, however, were temporary except when accidentally fired (even if potentially retained for a period), certainly recyclable and arguably produced on the spot, in the context of an extremely well-defined (although not fully knowable *to us*) context of a finite administrative action, to which use of the document was inherently and exclusively linked.

Relevant here is Civitillo's observation that one of the prime functions for the choice of specific document formats would be disambiguation.[126] Indeed, this may have been an overarching principle throughout the extant Cretan Hieroglyphic (even Aegean?) epigraphic corpus. Such disambiguation would be *emic*, intended to dispel confusion among *script-users*, not modern scholars. This point is also relevant to the debate over the distinction of Cretan Hieroglyphic graphemes from iconographic themes or motifs on seals: such instances would have been *emically* known with no further need for specific disambiguating

[122] Karnava 2021: 249. [123] Civitillo, this volume, 5.1.
[124] See also Isaakidou 2017 for a similar approach to materials in the context of EM seal production.
[125] Pope 1968; Reich 1968; Olivier 1981; 1990; 1994–1995; 1995; 1996c; 2000 and carried over in post-*CHIC* discussions of Cretan Hieroglyphic seal motifs.
[126] Civitillo, this volume.

devices (including format).[127] This need not imply that such explicit 'aides' were not occasionally used. We note the recent proposal that the *duplication/triplication* of x-shaped marks (the type classified as 'stiktogrammes' in *CHIC*) marks a *specific function* of a sign as 'distinct' from other signs (graphemes or non-graphemes) within the same seal face, possibly in a non-phonographic function.[128]

A remarkable 'bridge' between Cretan Hieroglyphic *seals* and *clay documents* is the intriguing group of six seals that Anna Margherita Jasink has defined as 'matrix seals' (see Chapter 4, sections 4.3–4.5):[129] seals that bear signs identifiable as Cretan Hieroglyphic graphemes, but appearing *not* in sequences, but 'separated' either through the employment of dividing 'lines' or through the arrangement of the motifs on 'terraced' or 'stepped' seal surfaces that would allow for their separate impression. These seals include signs that elsewhere occur exclusively on clay administrative documents: fractional signs or klasmatograms, as well as commodity signs ('ideograms'/'logograms').[130] Although such signs may have a non-klasmatographic function, in these specific attestations we note that only *simple* and not complex forms appear on the 'matrix seals': the individual impressions could be combined as 'impressed modules' to *form complex* klasmatograms, exemplifying perhaps one way in which the 'matrix' could be utilised. Commodity signs (i.e. those classified as 'logogrammes' in *CHIC*) are also extremely scarce on seals, but do occur on 'matrix seals' or seals closely associated with them. More work (perhaps also *experimental*) is needed to understand exactly how such sphragistic devices functioned within the apparatus of clay documents on which impressions of Cretan Hieroglyphic seals appear. However, the patterns appear intriguing enough to ensure the *active* role of 'matrix seal'-users in Minoan administrations.

Further, the use of 'matrix seals' may link the milieu of Cretan Hieroglyphic with the production of texts by means of *successive seal impressions*, of which the most (in)famous is the Phaistos Disk, now

[127] For an overview of 'aides à la lecture' on Bronze-Age writing systems, see Duhoux 2017.

[128] Ferrara, Weingarten and Cadogan 2016: 88–91; see also Flouda, this volume, Chapter 3, section 3.3. Duplicate or triplicate x-marks/crosses were not indexed as separate variants or otherwise marked in *CHIC*: 444–5.

[129] Jasink 2011: 135–6 (cf. also Olivier 1995: 176–7; Jasink 2002: 202; Jasink 2009: 148–58 on the signs). The original group of four seals defined by Jasink (*CHIC* ## 205–6, 291–2 = *CMS* VII, no. 35, *CMS* III, no. 149, *CMS* II.2, no. 315 and *CMS* II.2, no. 217 respectively) has now been augmented by finds from Juktas and KN S (4/4) 01 from Knossos Bougada Metochi (see Jasink and Weingarten, this volume, Table 4.2). Jasink (2011: 135) tentatively includes a seventh, termed a 'wedge' (possibly a variant of the 'cushion' shape) from Chrysolakkos in Malia (*CMS* II.1, no. 420 = *CHIC* #207).

[130] Jasink 2005.

generally accepted as genuine.[131] The link is intriguing, given the argument that the linguistic structures underlying the Disk may have been closely related to those underlying the Linear A script,[132] suggestive of yet another bridge between the impression of seals bearing pictorial graphemes and the production of texts in a 'Linear' script.

Civitillo[133] has offered considerable insight into the occurrence of similar sign sequences on seals and on clay administrative documents.[134] Scarcity of examples might be due to taphonomy, and unsurprising, given the absence of overlap between *any* extant seal and its impression within the entire substantial Aegean corpus.[135] We may also consider the possibility that *extant* Cretan Hieroglyphic seals may differ chronologically and/or contextually from those that impressed clay documents.

Positive inferences may also be drawn from sequences shared between seals and clay documents.[136] Certain cases reveal complex patterns in which documents are linked. Civitillo calls our attention to two remarkable examples where identical (or probably identical) sequences link documents within the Knossos 'Hieroglyphic Deposit'.[137] The significance of such interlinks is enhanced by the fact that the material *comes from the same site* and mostly *from the same assemblage*. Moreover, one crescent *suspected as being inscribed in Linear A*[138] is also involved, thus potentially implicating the relationship (and possible 'fluidity') between Cretan Hieroglyphic and Linear A as categories.

Civitillo has set out fully the occurrence of identical sign groups on Cretan Hieroglyphic seal-impressions and on clay administrative documents, deserving close attention.[139] With no fewer than seven such sign groups identified, this practice is far from casual, especially if one observes that, in all cases, a document from Knossos is involved, while the sign groups that recur on seals appear so far exclusively on *Knossian* clay documents, and this includes also the sign groups on the Vrysinas 4-sided prism (VR S (4/4) 01).[140] This pattern appears too strong to disassociate it from the importance of Knossos as a centre throughout

[131] Anastasiadou 2016b. [132] Davis 2018; see also Meissner and Salgarella, this volume.
[133] Civitillo, this volume, with references, especially Civitillo 2016a: 100–8, Appendix IV. See also Index III, this volume.
[134] Cf. also Jasink 2002; Jasink and Weingarten, this volume, Chapter 4, section 4.6.
[135] Anastasiadou 2016b: 26–7 and pers.comm.; also Bennet 1992: 177–8.
[136] Civitillo, this volume, Table 5.5. Index III, this volume.
[137] Civitillo, this volume, Figure 5.1. Here we may add that these links involve two impressions, *CHIC* #140 and 158, where 'decorative' signs occur in medial position, between 044 and 005, and are omitted in *CHIC*. *If* we accept these medial signs as graphemes, we have two different sign groups rather than two instances of the same sign group (cf. Decorte 2017: 52).
[138] *CHIC*: 18 (*CHIC* #018); Petrakis 2017a; Godart, this volume.
[139] Civitillo, this volume, Table 5.5. [140] Hallager, Papadopoulou and Tzachili 2011.

MM–LM and especially in the MM IIIB–LM I period, to which the important assemblage of the 'Hieroglyphic Deposit' can be dated.[141] It also illustrates the potential to explore a hitherto relatively neglected perspective of the Cretan Hieroglyphic corpus: variation across sites and regions (see also section 9.8).[142]

The Vrysinas seal is remarkable, as the first such find in west-central Crete, as a rare (but not unique) instance of a Cretan Hieroglyphic seal from a cult context and because *all* sign groups on this 4-sided prism recur on clay documents (again from Knossos). These links to administration remind us of an actual *clay administrative document* (a 'lame à deux faces') found in the sanctuary of Kato Syme Viannou (SY Hf 01),[143] while the very recently published 4-sided seal (KN S (4/4) 01) from Knossos Bougadha Metochi, another cult context,[144] displays links to the production of clay documents, as it belongs to the group of 'matrix' seals.[145]

Such insights allow us to postulate a milieu of intense interaction between seal-users (for whom at least a certain degree of literacy must be assumed) and those agents responsible for the production and use of the clay documents, specifically at Knossos and especially at the time of the 'Hieroglyphic Deposit'.[146] Any assessment of the relationship between these two (potentially overlapping) groups should also take into account their *asymmetrical iconographic* advertisement: the representation of *seal*-bearers (e.g. the so-called 'priest' on the Vapheio red jasper lentoid *CMS* I, no. 223[147] or the 'Cupbearer' from the LM II–IIIA Knossos Procession composition) stands in stark contrast to the iconographic invisibility of 'scribes' or other categories of 'writers'.

Reflecting on the two distinct *interacting* and *overlapping modes* of writing-on-clay (through *impression* and through *incision*), we note that the two modes require different bodily movement and may differ in other ways. *Impressing* denotes the use (and perhaps ownership) of an inscribed seal, but occurs in two forms possibly reflecting

[141] This is the date proposed by Pini (*CMS* II.8, 6–8) that one of us has adopted (Petrakis 2017a: 87). Of course, we are aware that the issue is controversial with some colleagues accepting MM II or early MM III dates (e.g. *CHIC*; Schoep 2001; Karnava *forthcoming*).

[142] Petrakis 2017a took some steps in this direction exploring the distribution of Linear B non-phonograms; cf. Salgarella 2020 on Linear A phonograms.

[143] Lebessi, Muhly and Olivier 1995.

[144] Kanta *et al*. 2023.

[145] KN S (4/4) 01 facet β bears klasmatograms 302/ Δ, 309/ ϡ and 308/ Q; facet δ bears 'ideograms' **181* and **164*/**165*. All signs are isolated by vertical lines, a typical feature of 'matrix seals' (for images and transcriptions, see Kanta *et al*. 2023).

[146] The picture becomes a bit more complex (or perhaps more blurred) if one takes into account sign groups (of 2+ signs) that differ in the sign in the initial or final position (Civitillo, this volume, Table 5.6).

[147] Rehak 1994.

different levels of literacy. Where *entire sign groups* are impressed, only a general comprehension of the meaning of the sign group, potentially by-passing any 'glottic' reading *sensu stricto*, would be sufficient for an effective use of such frequently attested 'formulae' as 044-049 or 044-005, especially if these represent transactional terms. Perhaps such formulae were interpreted *in toto* by agents who were non-literate but overtly familiar with their *appearance* as visual images.[148] On the other hand, both modes seem to overlap *institutionally* (i.e. to occur within the same established modes of administrative action), as they can both appear on the same document or in similar types of documents and within the same assemblage.

It has been suggested that the large quantities recorded on certain types of documents is evidence that these represent *totalling* records.[149] If we accept this as a working hypothesis, we can approach the important topic of the relationship *between* certain types of documents *within* given assemblages, such as the Knossos and Malia palace 'Deposits', the Petras 'Archive' and the contextually interlinked documents from *Bâtiment A* in *Quartier Mu*. Here, some insight from Linear B might prove instructive, always bearing in mind that the Cretan Hieroglyphic system *might* have operated differently and, once again, remaining wary of Houston's 'retroactive conceit'. The consistent lack of arithmograms is a feature of the so-called regular string-nodules, the only type of sealing in the Linear B-using administrative system that is frequently found inscribed. Within the Cretan Hieroglyphic corpus, the one class of documents that consistently lacks quantities are the so-called 'crescents' (classified as Ha and termed 'nodules' in *CHIC*). Cretan Hieroglyphic-inscribed 'crescents' and Linear B-inscribed 'string-nodules' also share features in their form and function.[150] Such similarities support the idea that crescents are *primary* documents, representing a stage of information-processing prior to that represented in documents recording large quantities, such as clay bars, or even medallions. However, we cannot infer the place of document types within the administrative chain solely from the *relative* scale of quantities recorded.

The occurrence of pierced 'suspension' holes might allow us to deduce a regular *labelling* function for certain clay documents, such as medallions (class He), and, occasionally, 4-sided bars (classes Hh (01), Hh (02) and Hh (04)) or 'lames à deux faces' (class Hf). It is possible that such holes – as well as other means of suspension, such as the

[148] This could potentially be compatible with a 'deictic' *reception* of 044 (cf. Ferrara and Cristiani 2016), without its function within sign groups being necessarily *truly* 'sematographic'.
[149] Karnava 2000: 153. [150] Petrakis 2017a: 76.

strings that originally went through the 'crescents' – did not indicate labelling of actual commodities, but rather were a simple way of gathering relevant information spread over physically distinct documents, which could be attached together like keys on a ring and *potentially* rearranged or reclassified as needed.

The occurrence of the same or similar sign groups among different types of clay administrative documents has potential for reconstructing the relationship between different document types and their possible role in the administrative 'chain'. If we start from the assumption that information was *copied* and *modified* from one type of document to another, then the occurrence of similar sign groups across different types of clay administrative documents might support the reconstruction of a multi-stage process. Civitillo[151] has suggested that impression of crescents, recording of information on crescents and medallions and production of bars and tablets may be associated with three (temporal?) stages of administrative information-processing. If confirmed, then the process appears to resemble the centripetal system employed in Linear B. Within such a scheme, we may draw a distinction between documents that regularly bear seal-impressions ('crescents') and other document types that seem to function as bearers of writing only. We may further pursue the employment of such a scheme with more attention focused on the possibility of *regional* or *chronological variation* between the *Quartier Mu*, Petras or the Knossos and Malia palatial 'deposits' that offer sizeable concentrations of documents susceptible to this kind of analysis.

9.8 Re-defining Signaries on MM I–LM I Crete: a Proposal for a Radical Re-orientation

Definition of the signary or 'sign list' is key to the study of any writing system. For Linear B, the substantial work was undertaken, with commendable caution before the decipherment, by Emmett Bennett.[152] Definition of the Cretan Hieroglyphic signary has been far less straightforward, stretching from Evans' original sign list in *SM* I, to the rigorous strategy of *CHIC*, to the revisions introduced by Jasink and the recent thorough treatment by Ferrara and collaborators on the INSCRIBE project.[153]

The distinction between 'decorative' motifs and 'graphemes' has been a recurrent topic of discussion in the post-*CHIC* era[154] and *CHIC*'s reasoning for the exclusion of certain signs as graphemes has been much

[151] Civitillo, this volume, Table 5.7. [152] Bennett 1947.
[153] *SM* I; *CHIC*; Jasink 2009; Ferrara, Montecchi and Valério 2021c.
[154] Karnava 1997; Palaima 1998; Jasink 2009.

discussed, often related either to a sign's isolated occurrence as well as its exclusive occurrence on seals,[155] or to the long-standing debate over whether single signs can be considered 'inscriptions' proper.[156] In admitting signs to the signary, *CHIC* also privileged the occurrence of a sign on a *clay* document, even over multiple occurrences only on seals.[157]

Ferrara has usefully distinguished between 'repertoire' and 'sign list' (we use 'signary' as a synonym to the latter), as well as between 'graph' (any conventional visual mark) and 'grapheme' (the visual module of a glottographic system). In doing so, she has inevitably ventured into the problem of distinguishing 'art' motifs from graphemes, admitting the existence of a considerable 'grey' area between the two.

The recent 'rationalisation' of the Cretan Hieroglyphic signary forms the last milestone in this 100+-year adventure: Ferrara, Montecchi and Valério have attempted to integrate aspects of certain or probable Cretan Hieroglyphic graphemes, such as their 'graphic behaviour' – a nexus of features involving palaeography and information on positional and absolute frequency, into this discussion in a more comprehensive way. Further important revisions are proposed in a follow-up publication.[158] We cannot offer the extensive discussion the suggestions require here, but they represent the current status in a potentially fruitful discussion that also includes the issue of the *relationship* of the Cretan Hieroglyphic corpus with Linear A, the other (chronologically overlapping) extensive epigraphic corpus from MM–LM Crete.[159]

Possible further progress in study of the Cretan Hieroglyphic signary may be achieved through a relatively underexplored investigation into regional and/or chronological variation or differentiation, an approach that Salgarella used effectively in her analysis of Linear A phonograms, including the concept of 'core' versus 'site-specific' signs.[160] Such an approach would potentially allow us to view signaries and palaeographic variants not exclusively as Cretan Hieroglyphic and/or Linear A, but rather according to their occurrence on documents from different assemblages within sites, at the same site or in the same region, and across certain chronological phases. Following that thread, we might reclassify our material into entities tentatively

[155] Jasink 2009: 46–8.
[156] For instance, Olivier has consistently excluded single-sign inscriptions from *CHIC* and his edition of Cypro-Minoan inscriptions (see Donnelly 2020 on the latter).
[157] Examples of 3+ occurrences on clay documents with no corresponding occurrence on seals in *CHIC* are signs 002, 003, 032, 055 or 072 among 'syllabogrammes'.
[158] Ferrara, Montecchi and Valério 2022.
[159] Ferrara, Montecchi and Valério 2021c.
[160] Salgarella 2020.

termed the 'Petras signary', the 'Malia Quartier Mu signary', and so on, and study the patterns that emerge, such as the restricted occurrence of specific sign *categories* in specific assemblages, as in the case of 'klasmatograms' restricted to the Knossos and Malia palace 'deposits', the Phaistos Cretan Hieroglyphic tablet (PH Hi 01 = *CHIC* #122), as well as on 'matrix seals'.[161] Such an approach would be most promising if it were extended to include both 'script-internal' and 'script-external' features and interrelations,[162] permitting identification of idiosyncratic features in script or seal use across space and through time.[163]

The lack of any contextual information for many Cretan Hieroglyphic seals and the debated chronology (and coherence) of at least two major assemblages (Knossos 'Hieroglyphic Deposit'; Malia 'Dépôt Hiéroglyphique')[164] constitute formidable impediments, but may be balanced by the potential rewards of a systematic synchronic examination of, e.g. the Malia *Quartier Mu* and Petras systems 'in action', or diachronic comparison between the 'Knossos Hieroglyphic Deposit' and its 'successor' in the 'East Temple Repositories'.[165] The prospect of identifying either synchronic or chronological variation among Cretan Hieroglyphic administrations that might eventually lead to a reassessment of the significance of old categories is a thought-provoking challenge that might encourage (rather than discourage) exploration of the strategy proposed here.

9.9 Shut Down, Killed or Just Residual? Possibilities for the End of Cretan Hieroglyphic

A topic that receives little attention throughout the volume deserves brief mention: the end of the use of Cretan Hieroglyphic. Pinpointing its final use is controversial, as it depends on either quantitatively or qualitatively inadequate evidence.

The latest possible evidence for the use of Cretan Hieroglyphic is the seemingly 'odd' occurrence of a clay medallion associated with LM IB destruction debris in the area of the Northern Magazines at Petras, Sitia

[161] See Petrakis 2017a (for the Knossos and Malia palace deposits) and Salgarella 2020 (for the Linear A material).
[162] As defined by Meissner and Salgarella, this volume.
[163] See Jasink and Weingarten, this volume, Chapter 4, section 4.6.
[164] See Petrakis 2017a for arguments in favour of the coherence and chronological proximity of both deposits.
[165] Jasink and Weingarten, this volume, Chapter 4, sections 4.6–4.7.

(PE He 001).[166] The excavators express uncertainty over whether this 'isolated find' was produced in LM IB, leaving open the *possibility* that it originated from the nearby Cretan Hieroglyphic 'archive', although they note the different size of the pierced hole and the different form of the four signs attested from instances in the Cretan Hieroglyphic 'archive'.[167] If indeed an LM IB document, then it would be a further instance of the concurrent use of Cretan Hieroglyphic and Linear A, the latter represented by the two Linear A tablets PE 1-2 found nearby, but in a 'surface level'.

Use of Cretan Hieroglyphic in the Neopalatial period, alongside Linear A, may be confirmed by the Knossos and Malia palace 'deposits', both of which appear to post-date the MM IIB horizon of the Malia *Quartier Mu* and Petras assemblages. Whether or not the Petras medallion belongs in LM IB, the Knossos and Malia palace 'deposits' modify the simplistic postulation that Cretan Hieroglyphic is primarily a *Protopalatial* writing system: its extensive use, for the same purposes as the Linear A system, for at least part of the Neopalatial period appears worthy of consideration.

A different thread of evidence is provided by the use of Cretan Hieroglyphic seals in LM I and later contexts.[168] This is difficult to gauge, as the perpetuation of use would not necessarily imply that the inscriptions on those seals were understood and meaningfully deployed: were they simply distinctive designs or was their *content* significant? Although the numbers are not great (Weingarten lists two seals and seven sealings), given the intense interplay between the use of seals and the production of administrative documents in Cretan Hieroglyphic practice, it is noteworthy that the sealings come from sites administratively active in LM IB (Ayia Triada and Kato Zakros), as well as Knossos, the one site that displays the potential for considerable continuity throughout the MM IIIB–LM III range. Weingarten's observation that seal impressions *CMS* II.7, nos 99 and 215 (the latter *CHIC* #138) from Kato Zakros House A (LM IB), may be impressions of the different faces of the same cushion-shaped seal, which show a complex link with the same two other seal-faces (*CMS* II.7 nos 31 and 81), may be significant, but cannot demonstrate comprehension of the Cretan Hieroglyphic inscription.[169]

A potentially fruitful avenue might be to explore such 'late' uses of Cretan Hieroglyphic *without* the assumption that they are at best 'residual', entertaining the possibility of a 'parallel' use of Cretan

[166] Tsipopoulou and Hallager 1996a: 39–42, fig. 16; Petrakis 2017a: 90–1.
[167] Tsipopoulou and Hallager 1996a: 46; Cretan Hieroglyphic 'archive': Tsipopoulou and Hallager 2010.
[168] Weingarten 2009. [169] Ibid.: 212–13, 216.

Hieroglyphic and Linear A as late as LM IB or the possibility of a script-environment in which the Cretan Hieroglyphic/Linear A 'divide' was not as meaningful as 'traditionally' considered in Aegean epigraphy. It appears, however, that the end of Cretan Hieroglyphic does not feature the abrupt character of Linear A's 'disappearance' or, as one of us has termed it, its 'killing' at the end of LM IB.[170] Still, there may be taphonomic reasons for this, since those contexts where a Neopalatial use of Cretan Hieroglyphic can be argued (the Knossos and Malia palace complexes) do not feature LM IB fire destructions.

9.10 An 'Aegean' Future for a 'Cretan' Script? Revising, Rethinking and the Prospect of Decipherment

Cretan Hieroglyphic has been claimed as an expression of 'civilization['s] [...] earliest blossoms on *European* soil',[171] a claim that had political significance, particularly in Evans' day. As this viewpoint has come under detailed criticism, we do not intend here to reprise a discussion of the issues behind the term.[172] However, a point can be made about the benefits of emphasising (and utilising) more the 'Aegean' affinities of Cretan Hieroglyphic writing: thinking of it less as the 'first' and practically not at all as 'European', but more as 'one' of the 'Aegean' writing systems.

Throughout this chapter we have drawn attention to the benefits of embracing these 'Aegean' affinities, of viewing Cretan Hieroglyphic as *not so dissimilar* to its other Aegean 'cousins'. In doing so, we do not suggest that differences need not be emphasised.[173] As an investment in the future of Cretan Hieroglyphic and Aegean epigraphy, we suggest that *theoretical explicitness* and *reversibility* should be the primary concerns in making classificatory or editorial decisions. The former refers to lucid exposition of the principles and assumptions behind them and the latter to a formulation of decision in such a way as to be *potentially* reversible, enabling scholars in future to 'reshuffle' the evidence in a disciplined manner.

We feel that this must apply to all decisions, regardless of whether it is eventually deemed preferable to construct 'site/assemblage signaries' (section 9.8) or a single pan-Cretan signary, or whether the independent numeration of Cretan Hieroglyphic signs will be maintained

[170] Bennet 2008: 22, but see Salgarella 2020: 376.
[171] Evans 1894b: 271.
[172] Evans 1894b: 271, *italics* added. Decorte 2018b: 14–18 is the most vocal and detailed critique to date. See also Sherratt 2009, esp. 632 on the 'European' advertisement of Minoan writing, and other elements of the 'Minoan civilisation'.
[173] That said, we appreciate the concerns expressed by Decorte (2017: 54, n. 29).

or eventually *merged* with the AB numeration of the so-called 'Linear' scripts advocated in *GORILA* into a truly 'Aegean' HAB signary, as intimated by Meissner and Salgarella in this volume.[174]

Just as importantly, we feel that we should discourage a pseudo-messianic syndrome that often haunts the study of poorly documented or undeciphered (or both) writing systems: that we must patiently await the moment when there will be sufficient evidence for meaningful analyses, or for a miraculous find, such as a 'bilingual' or an unusually lucid inscription or assemblage.[175] Such expectations are nourished by often repeated *quantitative* assessments of the prospects of non-decipherment, for example, by Olivier.[176] We wish to stress that it is also the *quality* of the evidence available that forms a considerable impediment. Besides being the most extensively documented, the two 'deciphered' scripts of the broader Aegean-Cypriot 'family' also happen to record dialects of Greek, one of the most intensely studied languages in the world. Although sizeable corpora are important for statistical approaches, we risk underestimating the role played by the long academic tradition of Indo-European and Hellenic studies in aiding progress in Mycenaean studies (both linguistics and in textual interpretation), especially as the subdiscipline took shape in its first two decades.

Arguably, our ignorance of the linguistic structures underlying the use of phonograms in Cretan Hieroglyphic or Linear A systems forms the greatest obstacle and is unlikely to be overcome by merely reaching a 'critical mass'. Our ignorance explains why evidence of so-called 'inflected' variants of Cretan Hieroglyphic sign groups is so difficult to evaluate. Sign groups that differ only in the initial or the final grapheme have been documented,[177] but, although they are *potentially* meaningful, we are not in a position to infer even that all of these cases relate to similar linguistic phenomena. We observe the 'addition' of initial or final signs in a group of 'variants', but this is no guarantee at all that 'prefixes' or 'affixes' are concealed in such variation, or that the groupings are *morphologically* meaningful in the first place.[178] Alice Kober's famous 'inflected' triplets, presented with exemplary caution,[179] turned out to be derivative ethnic adjectives after the decipherment.

With that caveat in mind, we also note that the assessment of other features such as document typology, chronology and distribution across

[174] Cf. Olivier 1987: 242–3, justifying the *GORILA* AB numeration with regard to Linear A and Linear B.
[175] E.g. Olivier 1986: 387–8. [176] Most recently Olivier 2012: 16–18, fig. 2.
[177] Civitillo, this volume, Table 5.6. [178] Steele, this volume, Chapter 6, section 6.3.
[179] Kober 1946.

sites and assemblages may occasionally strengthen the significance of such variations (sign alternations marked in **bold**): sign groups 049-041-006-**025/057** occur on Chamaizi juglets from Malia *Quartier Mu* and the Palace (*CHIC* ##316, 327), and sign groups 008-056-**013/070** occur on different types of documents (clay medallion and a seal impression: *CHIC* ##076 and 132 respectively) from Malia *Quartier Mu*. Such cases are more likely to be meaningful, and our relative certainty is due to the good synergy between epigraphic and archaeological evidence. The prospect of decipherment should never be off the table and analyses like that offered by Davis here, if correct, constrain the challenge by suggesting that the same (or closely related) *language(s)* might lie behind the undeciphered texts of Cretan Hieroglyphic and Linear A: decipherment of either language would 'unlock' the other.

In this chapter, we hope to have followed the lead of the other contributors by demonstrating that a richer, more profitable understanding of Cretan Hieroglyphic's origin, use and ultimate demise is best realised through a totalising approach that combines all relevant disciplines. Given the current tendency in modern academia towards (hyper-)specialisation, the kind of teamwork embodied in the current volume might represent the best way forward, while leaving the door open perhaps for a twenty-first-century Michael Ventris to astound us all with a 'Minoan' decipherment.[180]

Acknowledgements. We are deeply grateful to the editors of this volume for inviting us to contribute and for their (almost) infinite patience. We also thank the contributors for their patience and generosity in providing early drafts of their chapters in advance. Petrakis presented some of these thoughts in preliminary form in October 2019 to the Linguistics Seminar convened by Torsten Meissner in the Faculty of Classics, University of Cambridge, in anticipation of a fuller study of the Knossos and Malia 'Hieroglyphic Deposits'. For sharing very recent or forthcoming works, we are also indebted to (in alphabetic order): Maria Anastasiadou, Matilde Civitillo, Roeland Decorte, Cassandra Donnelly, Yves Duhoux, Silvia Ferrara, Georgia Flouda, Louis Godart, Erik Hallager, Artemis Karnava, Danny Law, Torsten Meissner, Barbara Montecchi, the late Anna Morpurgo Davies, Marie-Louise Nosch, Hedvig Landenius Enegren, the late Jean-Pierre Olivier, Tom Palaima, Massimo Perna, Ester Salgarella, Ilse Schoep and Philippa M. Steele. We naturally assume all responsibility for any errors or misconceptions that remain.

[180] Cf. Bennet 2014: 137.

EPILOGUE

John G. Younger

I am grateful to the editors and authors of this book for the opportunity to revisit a subject that has repeatedly absorbed my interest over the past fifty-some years. My first foray[1] was to study the physical relationships of Hieroglyphic inscriptions on multifacial prism seals from Crete in the New York Metropolitan Museum; this was in the fall of 1987 when I was teaching a course for Duke University, Institute of the Arts, and the curator of the Met's Classical Collection, Joan Mertens, invited me to examine the museum's Aegean seals on Tuesday and Thursday mornings. I had been intrigued by Jean-Pierre Olivier's occasional description of Cretan Hieroglyphic inscriptions on seals as '*une écriture ornementale*',[2] and I wanted to test that description by examining the prisms in the Met to see if their presentation on the prisms followed a consistent order. Physical examination showed that they did, but in their publication (*CMS* XII) they did not.

After *GORILA* was published (1976–1985) I asked permission from the authors to create a searchable website for the Linear A corpus and, as Godart and Olivier were working on *CHIC*, they asked me to be their 'beta tester' for their new volume (August 1996). That spurred me to create another website for Cretan Hieroglyphic.

Both websites are not only searchable but they can be corrected and augmented with new discoveries, ideas and developments in our continuing understanding of the Minoan scripts, Cretan Hieroglyphic and Linear A. By preparing these websites, I have had the opportunity to learn something of a new discipline, linguistics, and to be in communication with many scholars, but I do not claim any expertise in linguistics. I still identify myself as an archaeologist and my approach to Minoan texts is strictly combinatorial, using the contexts of the scripts to elucidate their meaning.[3] It is a great pleasure to see similar combinatorial approaches at work in this volume.

Cretan Hieroglyphic is certainly the earliest complete script invented in Crete, but writing had long been recognised in the southern Aegean, as the single surviving impression of a stamp seal on an EC II hearth

[1] Younger 1990. [2] Olivier 1981: 105. [3] cf. Davis 2014: 19–21.

rim from Ayia Irini, Keos, demonstrates.[4] The circular face of the seal, probably of dentine, is bisected by an odd *djed* pillar; in the left half of the face, a waterbird and circle *Ra* disk; in the right half, a scythe and an EH II sauceboat that replaces the common Egyptian beer jug.[5] It is obvious that the EH II culture was on the verge of developing writing, but its destruction displaced and delayed that invention until the Protopalatial period in Crete.

CHIC publishes 331 inscriptions (122 inscriptions on clay, 67 impressions of seals and 136 seal stones). My Hieroglyphic website contained all this *CHIC* material and added 33 inscriptions since *CHIC*'s publication in 1996: 30 inscriptions from Petras,[6] an inscribed sherd from Pyrgos, a lame from Symi and an inscribed potter's batt from Gournia. The 364 inscriptions contain fewer than 1,000 signs. Contrast the almost 1,500 Linear A documents with close to 7,500 signs[7] and some 4,600+ Linear B documents with some 57,500 signs. If we arrange all signs on American standard sheets of paper (8″ x 11″, font Times New Roman, pitch 12, no spaces, 3,770+ characters per page) Cretan Hieroglyphic texts would take up little more than a quarter page, Linear A would take up fewer than two pages and Linear B would take up almost 14½ pages.

For Cretan Hieroglyphic, at least, it is obvious that the critical mass needed to make much grammatical or lexical sense of the script is lacking. And the same goes for Linear A, especially since neither script yields much evidence for inflectional suffixing.[8] Yves Duhoux, however, has pointed out that Linear A is heavily suffixed (just not inflectionally)[9] and Brent Davis has reconstructed a probable word order: verb-subject-object.[10]

We can amplify our understanding of the Cretan Hieroglyphic documents, however, by recognising that several documents from each site seem to go together, sometimes even physically, recording similar words/sequences and quantities. For instance, three bars from Knossos obviously form a set: the contributions on #057a–d total 100; those on *058b–d total 330; and those on #062 total 1,210 – all three subtotals combine for a grand total of 1,640, recorded on #058a.

Several scholars in this volume have remarked on the close affinities between Cretan Hieroglyphic and Linear A, starting with their almost contemporaneous invention in the early Protopalatial period.[11] Lending support for this nexus between the two scripts are those Cretan

[4] *CMS* V, no. 478; Younger 1974.
[5] Gardiner 1957, W22, p. 530. [6] Tsipopoulou and Hallager 2010. [7] Schoep 2002a: 38.
[8] Cf. Steele, this volume, esp. section 6.4. [9] Duhoux 1978. [10] Davis 2014.
[11] Godart, Preface, this volume.

Hieroglyphic documents from Knossos that seem to influence similar Linear A documents.

Finally, Civitillo brings to our attention Cretan Hieroglyphic sign groups that appear on more than one document (Tables 4.5 and 4.7). She highlights the repeated word/sequence 031-021-061 (p. 112). A reasonable phonetic rendering would be RE-PI-061, where 061 functions as a standard terminal sign. The sequence occurs on a seal stone from Malia *Quartier Mu* (#197), a sealing from *Quartier Mu* (#149) impressed by a different seal and on a bar-tablet from Knossos (*GORILA* #059cB1). As I remark in my forthcoming paper on the Malia workshop seals, on the Knossos bar 'RE-PI-• is recorded as being responsible for a shipment of ten cows, presumably from Malia to Knossos, but eleven (documented by tally marks) actually arrived'.[12] My guess is that RE-PI was the Malia official in charge of the shipment of cows to Knossos and thus responsible for the extra bovine that arrived at Knossos (a calf born on the way?).

RE-PI may have been even more important, perhaps related to the recipient of wine stored at Ano Zakros, *GORILA* ZA Zb 32.[13]

Such a relationship would connect Cretan Hieroglyphic and Linear A even more closely, augmenting our understanding of these early Minoan scripts.

[12] Younger, *forthcoming*. [13] Cf. Davis 2011: 376–7.

APPENDIX

ANNOTATED INDEX OF CRETAN HIEROGLYPHIC SEQUENCES OF TWO OR MORE SIGNS

Matilde Civitillo

This Appendix, updated to January 2023, offers a complete index of Cretan Hieroglyphic sign groups of two or more signs, integrating the sequences already published in *CHIC* with new ones published, to date, after 1996. More precisely, it includes twenty different sequences recently published from Petras,[1] four from Vrysinas,[2] one from Malia,[3] one from Pyrgos,[4] one from Gournia,[5] one from Katalimata[6] and one from Knossos.[7] For each sequence, a transliteration in Cretan Hieroglyphic fonts, a transnumeration, the indication of the support (or supports) on which it is attested and the provenance is given.

This list is not intended as a substitute for the index of occurrences of Cretan Hieroglyphic signs published in *CHIC*, since it does not include signs attested in isolation (i.e. not in sign groups). Here, the focus is not on the attestation of specific signs in different sequences (that is the purpose of the signs list published in *CHIC*) but on the distribution of these different sequences over the variety of media on which they recur at each site where they appear. For this reason, each sequence is repeated just once, along with the indication of the document typology (or typologies, if attested more frequently and on different supports) on which it recurs and its (or their) provenance.

Furthermore, the orientation of the reading on seals is often difficult to ascertain; therefore, in these cases, the sequence is marked by '><'. For instance, a sign group like 006-041 ><, recurring in *CHIC* #246.β, could be read both as 006-041 and 041-006. Given that this is one and the same sequence, we have chosen not to duplicate it in our index (as 006-041 and 041-006), but to list it just once. In some cases, no reading patterns can be established, and therefore the sign group is followed by a 'o'. This is the case, for example, with sign groups (or their

[1] Tsipopoulou and Hallager 1996a; 1996b; 2010; Krzyszkowska 2012 and 2017.
[2] Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5; Del Freo 2017: 8–9.
[3] Schoep 1995; Olivier 1999: 420; 2009: 188; Pomadère 2009; Del Freo 2012: 5–6; 2017: 6.
[4] *CMS* II.6, 230; Del Freo 2008: 200. [5] Del Freo 2017: 4 [6] Ibid.: 6.
[7] Kanta 2018 cat. 305; Kanta, Palaima and Perna 2023.

impressions) incised on round surfaces of seals which do not have an initial 'X' and have a non-linear alignment (cf. e.g. 016-019-056 0 on #193; 018-039-005 0 on #142; 019-013-040 0 on #192; 042-040-049 0 on #129) or of sequences composed of signs incised on three different faces of a prism (cf. 038-043-049 0 on #256.α-β-γ) or attested on cones (cf. 042-034-*007*-040 0 on #070).

When for a single sequence two or more readings have been proposed, we have supplied all interpretations, with references provided in footnotes. Sequences from seals and/or their impressions are rendered in bold. Finally, the signs interpreted by *CHIC* (13–15) as syllabograms and logograms '*dont nous ne pouvons pas expliquer mécaniquement la présence*' and '*Représentations autres que de signes*' ({!} in *CHIC*) are, here, reported in Cretan Hieroglyphic font between {{ }}in the third column and in footnotes.

Index of Cretan Hieroglyphic Sequences in Context

Legend: 1 or 2fS (1- or 2-face seal); 3, 4 or 8sP (3-, 4- or 8-sided prism); 2sL (2-sided lame); 4sB (4-sided bar).
NB: italic = uncertain reading; bold = sequence attested on seals or sealings; non italic/non bold: sequence attested on other kind of documents

CH phonetic sequence	Transnumeration	Document number[8]	Document format	Find spot
[ ] 𐄁𐄐 ><	[ ]049-061 ><	#063.b1	4sB	KN
[•]𐄇𐄁	[•]-029-049	PE Hh 016.b (CB1)[9]	4sB	PE
[•]𐄑𐄈[•]	[•]-031-*039*-[•]	PE Ha 003.δ (Cr1)[10]	crescent	PE
[•]𐄐𐄑𐄂	[•]-*072-019*-070	PE He 009.a (Me4)[11]	medallion	PE
Other possible reading: 𐄀𐄐𐄑𐄂	*18-072-019*-070			
[•]𐄏𐄑𐄂	[•]-*080-057*-070	PE Hh 017a (CB2)[12]	4sB	PE
[[•]] 𐄎𐄃 ><	[[•]]060-009 ><	#075.a	medallion	MA/M
]••𐄋𐄑• ><	]•-•-•-*056*-011-• ><	**#289.β**	**4sP**	**PK**

[8] Document numbers preceded by a hash sign (#) refer to their *CHIC* edition. Numbers followed by '*bis*' were published after 1994 and numbered following the progressive numeration introduced by Godart and Olivier; for these documents, as well as for others not numbered according to this system, bibliographical references are mentioned in footnotes.
[9] Tsipopoulou and Hallager 2010: 161, 178–81.
[10] Ibid.: 155, 178–81. [11] Ibid.: 162, 178–81. [12] Ibid.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
]••𐄁[>< Possible alternative readings:]•𐄀𐄁[>< or]• 𐄂𐄁[><	]•-•-057-*023*[><]•-*030*-057-*023*[><]•-*040*-057-*023*[><	#114.d	4sB	MA/P
•[ ]𐄇•𐄈	•[ ]-*010*-049	KATALIMATA Yb 01[13]	Chamaizi vase	KATALIMATA
]•𐄉𐄋	]•-013-035	#105.aB	2sL	MA/P
]•𐄉𐄊	]•-013-060	#115.b	4sB	MA/P
]•𐄌𐄋	]•-016-038	#105.aA	2sL	MA/P
]•𐄍𐄎	]•-034-056	#061.b	4sB	KN
] •𐄋𐄏 ><	]•-038-011 ><	#025.γ	crescent	KN
] •𐄐𐄑 ><	]•-042-061 ><	#035.a	medallion	KN
] •𐄐•𐄑•𐄌𐄌𐄒	]•-042-049-016-016-077	#112.a	4sB	MA/P
] •𐄎𐄒	]•-056-077	#113.b2	4sB	MA/P
] •𐄓𐄔𐄎	]•-058-031-056	#053.aB	4sB	KN
] •𐄕 [ ]𐄖𐄗[><	]•-*062*[ ]*034-010*[><	**#289.δ**	**4sP**	**PK**
] •𐄘•𐄙[><	]•-070-007-•[><	#114.a	4sB	MA/P
] •𐄘𐄚𐄖•[><	]•-092-056-034-•[><	**#289.γ**	**4sP**	**PK**
• 𐄛𐄜𐄝	•-056-*061-077*	**#294.γ1?**	**4sP**	**CR**
• 𐄕𐄋𐄎	•-062-011-056	#013.γ	crescent	KN
• 𐄞𐄋𐄙𐄌	•-*072*-038-007-016	#098.a	medallion	MA/P
] 𐄟𐄜	]*002*-061	#112.c	4sB	MA/P
] 𐄠𐄕	]005-063	#066.c	4sB	KN
] 𐄡𐄁𐄘 ><	]006-057-092 ><	#063.a1	4sB	KN
] 𐄋𐄎 [><	]011-056[><	#015.γ	crescent	KN
] 𐄉•𐄈	]013-049	#106.a	2sL	MA/P
] 𐄢 𐄣 ><	]*019*-055 ><	#029.δ	crescent	KN
] 𐄤•𐄥	]023-032	#061.a	4sB	KN
] 𐄦 𐄧 ><	]*028*-020-041 ><	**#160**	**impression** (crescent) from 4sP	**KN**
] 𐄨 •𐄈	]*029*-049	#054.d	4sB	KN
] 𐄨 𐄕•[><	]029-064-•[><	#330	vase handle	MA/V
] 𐄨 𐄘	]*029*-070	#052.d	4sB	KN
] 𐄩𐄪𐄜	]031-021-061	#059.cB	4sB	KN
] 𐄩𐄫	]031-041	#088.a	2sL	MA/M

[13] Del Freo 2017: 6.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
] [><	]*033*-018-070[><	#055.a	4sB	KN
Possible alternative reading:]•[><	]*033*-018-070-•[><			
] >?	]035-053-034 >?	#115.a	4sB	MA/P
] ><	]038-010-068 ><	#044.a	medallion	KN
] ><	]*038*-019-061 ><	#028.γ*	crescent	KN
]	]040-013	#113.cB	4sB	MA/P
]	]041-006	#063.a2	4sB	KN
] [	]042-028[	#330*bis*[14]	amphora handle	MA
] ><	]042-038 ><	**#224.α**	**3sP**	CR (?)
] [0	]042-*049*-*050*[0	**#178**	**impression** (flat-based nodule) from ?sP	KN
]	]*042*-054-061[15]	#062.cB, #062.*dB* In #062.*bB* a reading]• (]•-054-61) is possible as well	4sB	KN
] [><	]042-*054*[><	**#189**	**1fS** (*Petschaft*)	MA/M
]	]042-056-031	#061.a	4sB	KN
]	]042-061	#054.a	4sB	KN
]	]042-063-060	#112.d	4sB	MA/P
] [><	]044-*049*[><	**#285.β**	**4sP**	CR (?)
] [><	]047-092[><	#005.γ	crescent	KN
Possible alternative reading:]•[><	]047-092-•[><			
] •[><	]049-060-•[><	#099.a	medallion	MA/P
] >?	]050-016 >?	#002.δ	crescent	KN
] •[><	]*050*-019-038-•[><	#033.a	medallion	KN
] [><	]053-006[><	#063.d2	4sB	KN
]	]*054*-061	#062.a	4sB	KN
] [ ] ><	]055-*020*[ ]011-*040* ><	#117.a	4sB	MA/P
] ><	]056-070 ><	#321	vase fragment	MA/M

[14] Schoep 1995: 63–77. [15] Cf. 009-054-061-•[and 042-054-061.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
][	]*057-023*[	#114.c	4sB	MA/P
Possible alternative reading:]	]*057*			
] ><	]*057*-053 ><	#063.b1	4sB	KN
][><	]061-080-032[><	#092.a	2sL	MA/M
Possible alternative readings:][>< or][><	]061-*046*-032[><]061-*057*-032[><			
][><	]*062*-019-061 ><	#028.γ	crescent	KN
] ><	]065-063 ><	#009.γ	crescent	KN
] •[><	]070-013-•[><	#114.b	4sB	MA/P
] [><	]070-055-057-*056*[><	#103.a	medallion	MA/P
] [ ] ><	]*070*-058[ ] ><	#055.b	4sB	KN
] [><	]*073*-070[><	#069.*r.2*	tablet	KN
]	]077-042-049-016-016-056-077	#112.b	4sB	MA/P
] [ ] ><	]086 *[ ]*042 ><	#035.b	medallion	KN
] ><	]*088*-087-070-027 ><	#319	pithos lid	MA/M
]	]*092*-049	#061.d	4sB	KN
(?)	004-050 (?)	**P.TSK05/291.α**[16]	**4sP**	PE
><	006-041 ><	**#246.β**	**3sP**	KRITSA
o	006-057-092 o[17]	**#243.β**	**3sP**	CR
><	006-062-012 ><	**#302.γ**	**4sP**	CR (?)
><	006-070 ><	**#268.γ**	**3sP**	LAKONIA
>?	007-010-006-023 >?	#043.a1	medallion	KN
	008-019-013	#120.*v*.A	tablet	MA/P
><	008-*019-036* ><	**#282.α**°[18]	**4sP**	PYR
Possible alternative reading: ><	008-*011-036* ><			
o	*008*-053-017 o	**#128**	**impression** (*nodulus*) from 1fS	Ma/M
><	008-056-013 ><	#076.a	medallion	MA/M

16 Krzyszkowska 2012: 152–3, nn. 30, 31 and fig. 7; Del Freo 2017: 7–8, PE S (3/4) 02.α.

17 Cf.]006-057-092 on #063.a1, 4sB from Knossos.

18 In the inscription 008-*019-036*, the last sign is clearly reduplicated ({}) for compositional reasons and was not meant to be read phonetically (cf. *CHIC* category '*Décoration éventuellement signifiante non évidente*'; *CHIC:* 13–15).

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
	008-056-070 0	#132	**impression** (vase handle) from 1fS	MA/M
 Possible alternative reading:	*008*-068 *096*-068	#322	Chamaizi vase	MA/M
	008-070-060	#112.d	4sB	MA/P
	008-070[	#113.d	4sB	MA/P
	*009*-054-061-•[	#060.c	4sB	KN
	009-056-061	#018.β	crescent	KN
	009-056-061	**#156**	**impression** (*nodulus*) from 4sP	KN
	009-077-013-020	#003.γ	crescent	KN
	009-077-013-020	**#139**	**impression** (*nodulus*) from 3sP	KN
	010-031	**#254.α**	**3sP**	CR
	*010*-070-005	#058.c	4sB	KN
	010-092-028 ><	**#172**	**impression** (crescent) from 4sP	MA/M
	011-006-092-033	PE Hh 016c (CB1)[19]	4sBa	PE
	011-*010* ><	**#304.γ**	**4sP**	CR (?)
	011-029-037	#057.d	4sB	KN
	011-038-016 ><	**#148**	**impression** (*nodulus*) from 3sP	MA/M
Possible alternative reading:	011-038-*029* > 011-038-*030* ><	#072.a	medallion	MA/M
	011-056	#024.γ	crescent	KN
	011-056 ><	**#297.γ**	**4sP**	CR
	011-077-034	#045.a	medallion	KN
	011-092	#026.γ	crescent	KN

[19] Tsipopoulou and Hallager 2010: 161, 178–81.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
	012-016-*062*-018 ><	**#271.α**	**3sP**	MA
	012-*031*-082 ><	#080.a	medallion	MA/M
Possible alternative reading:				
	012-*031*-*083* ><			
	012-050	#113cA	4sB	MA/P
	012-070-048	**#236.α**	**3sP**	MA/V
	013-050	**#264.α**	**3sP**	IRAKLIO
Possible alternative reading:[20]				
	013-050-004			
	*013*-056-068	#002.γ	crescent	KN
	014-050 ><	**#300.d**	**4sP**	CR (?)
 o	016-019-056 o	**#193**	**1fS** (*Petschaft*)	ZIROS
	016-038-007-051	#090.a	2sL	MA/M
	016-045-056	**P.TSK05/291.β**[21]	**4sP**	PE
	016-054	#003.β	crescent	KN
	016-057-*013*-074-075	#053.c	4sB	KN
	017-039	#037.b	medallion	KN
 ><	*017*-050 ><	**#234.α**	**3sP**	MA/M
		#310.β° ({  })[22]	**4sP**	SITIA
 o	018-039-005 o	**#142**	**impression** (crescent) from 3sP	KN
	018-043	**#314.*η*2, #314.θ1**	**8sP**	NEAPOLIS
	018-046	**#301.γ**	**4sP**	CR (?)
o	019-013-040 o	**#192**	**1fS** (*Petschaft)*	<NEAPOLIS>
	019-*013*-049	**#307.a**	**4sP**	<MA/S>
 ><	019-031-061 ><	**#273.β**	**3sP**	MIRABELO
	019-034	#109.a	2sL	MA/P
	019-038-059	#004.γ	crescent	KN
 ><	*019*-039-*038*-031 ><	**#303.γ**	**4sP**	CR (?)
	019-040-061	#049.c	4sB	KN

[20] Krzyszkowska 2012: 152; Del Freo 2017: 8.
[21] Krzyszkowska 2012: 152–3, nn. 30, 31 and fig. 7; Del Freo 2017: 7, PE S (3/4) 02.β.
[22] The sign 001 (), attested as a syllabogram on clay documents but two times only on seals (in this case, with 017-050: ({}) is interpreted by *CHIC* (13–15) as signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*'.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
𐄁●[	019-047[	**#176**	**impression** (crescent) from ?sP	KN
𐄁𐄢𐄣 ><	*019*-057-029 ><	#190	**1fS** (*Petschaft*)	MESARA
𐄁𐄇	019-061	**#196°** (𐄁{{𐄐}})[23]	**1fS** (half-ovoid)	GORTIS
𐄀𐄡𐄇	019-070-061	#040.a	medallion	KN
𐄀𐄈𐄢	019-077-029	#038.a	medallion	KN
𐄃𐄅𐄆	020-016-041 ><	#082.a	medallion	MA/M
𐄉𐄋𐄈[	023-025-003[	MA/V Yb 04[24]	vase	MA
𐄃𐄌	020-047	#018.γ	crescent	KN
𐄃𐄈	020-077	#039.a	medallion	KN
𐄂𐄡𐄇	022-056-070-061	#071	cone	MA/M
Possibly attested in #059.*dB**: [ ]𐄡𐄇	[ ]056-070-061	#059.*dB**	4sB	KN
𐄉𐄇𐄀	023-*061*-019-057	#036.a	medallion	KN
𐄁𐄍	024-050	#043.a2	medallion	KN
𐄋𐄎	025-010	#043.a2	medallion	KN
𐄋𐄀𐄡𐄃-	-025-019-051-070-094-	#328 (2)	libation table	MA
𐄋𐄋••	025-025-•-•	**#294.γ2?**	**4sP**	CR
𐄋𐄊 [[•]][><	*025-046* [[•]][><	#019.γ	crescent	KN
𐄋𐄍(•?)𐄉(•?)	025-049(•?)040(•?)	**#294.α?**	**4sP**	CR
𐄋𐄏𐄌	025-056-005	PE Hh 016d (CB1)[25]	4sB	
𐄐𐄇	026-061	#056.c	4sB	KN
𐄑𐄒𐄒𐄡 ><	027-034-070 ><	#073.a	medallion	MA/M
𐄒••𐄍	028-•-*049*	#049.a	4sB	KN
𐄒𐄑𐄋	028-007-018 ><	**#296.α**	**4sP**	CR
𐄒𐄢𐄈	028-029-002	#059.bA	4sB	KN
𐄒𐄊𐄈	028-038-002	#058.d	4sB	KN
𐄒𐄊𐄍[	028-038-032[	#008.γ	crescent	KN
𐄒𐄓𐄎	028-040-004	#049.d	4sB	KN
𐄒𐄆[><	028-041[><	#102.a	medallion	MA/P
𐄒𐄍𐄁 ><	028-044-049 ><	**P.TSK05/291.**γ[26]	4sP	PE

[23] Here the sequence is accompanied by the so-called 'cat mask' (𐄁{{𐄐}}), interpreted by *CHIC* (13–15) as '*décoration éventuellement signifiante non évidente*' ('*représentations autres que de signes*').
[24] Pomadère 2009: 637, fig. 4; Del Freo 2012: 5–6; Del Freo 2017: 6.
[25] Tsipopoulou and Hallager 2010: 161, 178–81.
[26] Krzyszkowska 2012: 152–3, nn. 30, 31 and fig. 7; Del Freo 2017: 7, PE S (3/4) 02.γ.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
 [	028-049-*007*-042[	#059.dB	4sB	KN
	028-049-041-003	#053.aA	4sB	KN
 [	028-049-041-003[	#060.a	4sB	KN
 ><	028-049-042-031-056-036 ><	**#255.β**	**4sP**	CR
	028-049-049	#059.aA	4sB	KN
 [	028-049[	#012.γ	crescent	KN
 o	028-061-049-047 o	**#186**	**1fS** (*Petschaft*)	KALO HORIO
 ><	028-070 ><	#081.a	medallion	MA/M
 [	029-014-•[	**#245.γ**	**3sP**	CR (?)
 >< Possible alternative reading:  ><	029-041-056-038-*077* >< 029-041-056-*077*-038 ><	**#200**	**1fS** (half-cylinder concave)	MA
	029-077-049	**#295.β**	**4sP**	CR
 ><	030-034 ><	#083.a	medallion	MA/M
 ><	031-006-034 ><	**#276.β**	**3sP**	PINAKIANO
	031-021-061[27]	**#149**	**impression** (crescent) from 3sP	MA/M
		#197	**1fS** (half-ovoid)	MA/M
		P.TSK05/291.δ[28]	**4sP**	PE
 ><	*031*-055-081 ><	#077.a	medallion	MA/M
	032-009-056	#104.a	medallion	MA/P
	033-047	#065.c	4sB	KN
	034-*002*	#058.c	4sB	KN
 ><	034-007 ><	**#308.β**	**4sP**	PK
	034-041-084	#089.b	2sL	MA/M
	034-056	#049.c	4sB	KN
	034-056-019-049	#061.d	4sB	KN
	-034-056-077-049-038-029	#328 (3)	libation table	MA
><	036-010 ><	**#297.β2**	**4sP**	CR
 ><	036-013 ><	**#304.β**[29]	**4sP**	CR (?)
	*036*-031	#112.d	4sB	MA/P
 ><	036-038-*076* ><	**#306.β**	**4sP**	MA

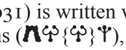
[27] Cf.]031-021-061 on #059.cB (4sB, KN).

[28] Krzyszkowska 2012: 152–3, nn. 30, 31 and fig. 7; Del Freo 2017: 7, PE S (3/4) 02.δ.

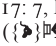
[29] Here the sequence is accompanied by a supplementary sign included in the *CHIC* category (13–15) '*Décoration éventuellement signifiante*' (ignored in the *CHIC* edition), namely the fleur-de-lys {{  }}, attested on this seal only.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
 [	036-040-*049*[	**#191**	**1fS** (*Petschaft*)	MOHLOS
 ><	036-047-009-056-062 ><	**#126**	**impression** (*nodulus*) from 1fS	MA/M
	036-092	**#131**	**impression** (*nodulus*) from 1fS	MA/M
		#288.δ	**3sP**	MA/V
		#229.α	**3sP**	MA
		#263.α	**3sP**	CR (?)
		#265.γ	**3sP**	KASTELI
		#267.β	**3sP**	KY
		#299.γ	**4sP**	CR (?)
		#150*bis*[30]	**impression** (amphora handle) from 3sP	PE
 [	036-092[	#109.b	2sL	MA/P
	036-092-031	**#254.γ, #257.β, #258.β**	**3sP** **3sP**	CR
		#262.α°[31]	**3sP**	CR?
		#272.β	**3sP**	MIRABELO
		#308.α	**4sP**	PK
		#309.δ	**4sP**	PYR
		#312.β	**4sP**	XIDA
		P.TSK05/259.β[32]	**4sP**	PE
		#314.ζ	**8sP**	NEAPOLIS
	037-011-029	#042.a	medallion	KN
		#061.b	4sB	KN
 ><	038-008 ><	**#297.β1**	**4sP**	CR
	038-010	**#181**	**1fS** (*Petschaft*)	CR (?)
		#212.α, #214.α,	**3sP**	CR
		#253.α° ()[33],	**3sP**	CR
		#258.α,	**3sP**	CR

[30] *CMS* V Suppl. 1B, no. 329; Olivier 1999: 420.

[31] Here the 'formula' (036-092-031) is written with a reduplication of the second sign clearly intended for decorative reasons (), in order to better harmonise the graphic arrangement of the signs in the glyptic space (cf. *CHIC*: 13–15).

[32] Krzyszkowska 2012: 151–2, fig. 6 and n. 24; Del Freo 2017: 7, PE S (3/4) 01.β.

[33] Here the 'formula' (038-010) is preceded by the sign 012 (), included by *CHIC* (13–15) among the signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*'.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
		#260.β° ([glyph]{[glyph]}[glyph])[34]	**3sP**	CR ?
		#228.b	**3sP**	<MA>
		#249.a	**3sP**	<SITIA>
		#265.α	**3sP**	KASTELI
		#268.β° ([glyph]{[glyph]})[35]	**3sP**	LAKONIA
		#275.a ([glyph]{{[glyph]}})°[36]	**3sP**	<MIRABELO>
		#286.α	**4sP**	MA
		#288.α°[37]	**4sP**	MA/V
		#311.α	**4sP**	SITIA
[glyph]	038-010-031	**#195**	**1fS** (half-ovoid)	CR (?)
		#162	**impression** (crescent) from 4sP	KN
		#169	**impression** (direct sealing) from 4sP	KN
		#218.γ, #261.β,	**3sP**	CR (?)
		#262.β°[38], **#263.**β	**3sP**	CR (?)
		#242.β,	**3sP**	CR
		#254.<α>*[39],	**3sP**	CR
		#257.α[40]	**3sP**	CR
		#248.α	**3sP**	PK
		#250.γ	**3sP**	ZA
		#269.α	**3sP**	LASITHI
		#272.α, #274.γ	**3sP**	MIRABELO
		#279.γ, #284.β,	**4sP**	CR (?)
		#299.δ, #300.b,	**4sP**	CR (?)
		#302.δ	**4sP**	CR (?)

34 The ‘formula’ is again accompanied by the sign 073 ([glyph]{[glyph]}[glyph]), similarly interpreted by *CHIC* (13–15) as *Décoration éventuellement signifiante non évidente* like sign 012 in the preceding footnote.
35 Here, sign 070 [glyph] is supposed to be used as an abbreviation referring to the sign group attested in γ (006-070 ><), so not intervening in the reading of the phonetic sequence 038-010 (a ‘formula’) on this seal face: [glyph]{[glyph]}.
36 The ‘formula’ is accompanied by the sign [glyph] ([glyph]{{[glyph]}}), comprised by *CHIC* (13–15) among the ‘*représentations autres que de signes*’.
37 The presence, with the ‘formula’, of sign 092 ({[glyph]}[glyph]: 038-010) is interpreted as an abbreviation possibly related to the sequence attested in γ ([glyph] ><: 036-092 ><).
38 In the ‘formula’ 038-010-031, the second sign is reduplicated ([glyph]{[glyph]}[glyph]) probably to achieve harmony.
39 Restoration proposed by *CHIC*: on the seal, only signs 010-031 are visible.
40 Here the inscription (038-010-031) is accompanied by two supplementary signs included in the category *Décoration éventuellement signifiante* in *CHIC*: the first is the snake {{[glyph]}}, attested on this seal only, and second is the full-bodied cat {{[glyph]}}, attested on #309.α as well with another ‘formula’ (044-005).

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
		#293.β	**4sP**	ADROMILI
		#298.γ	**4sP**	CR
		#309.γ	**4sP**	PYR
		#312.α	**4sP**	XIDA
		P.TSK05/259.γ[41]	**4sP**	PE
		#314.ε	**8sP**	NEAPOLIS
>< Possible alternative reading: ><	038-*010-034* >< 038-*036-034* ><	**#239.α**	**3sP**	PRESOS
Possible alternative reading:	038-017-049-034 038-017-034-049	#021.γ	crescent	KN
><	038-031-010-061 ><	**#270.γ?**	**3sP**	LASITHI
[Possible alternative reading:	038-031-025-*073*[038-031-025	#120.*r*.B	tablet	MA/P
	038-034-*066*	**#204.α**	**2fS** (amygdaloid)	MA/M
o	038-043-049 o	**#256.α-β-γ**[42]	**3sP**	CR
	038-*047-047*	#122.*r*.1	tablet	PH
><	038-049-*013-077* ><	**#164**	**impression** (flat-based nodule) from 4sP	KN
	038-*054*-034	#057.c	4sB	KN
><	038-070-011 ><	**#183**	**1fS** (*Petschaft*)	CR (?)
	038-071-066-070	#059.aB	4sB	KN
><	039-013 ><	**#304.α°** ({{}}><)[43]	**4sP**	CR (?)

[41] Krzyszkowska 2012: 151–2, fig. 6 and n. 24; Del Freo 2017: 7, PE S (3/4) 01.γ.

[42] The three signs (038-043-049) are incised on three different faces of the prism, each with a 'supplementary' sign: on face α, the wild boar {{}} and on face β, the ibex {{}}, both inserted by *CHIC* in the category *Décoration éventuellement signifiante évidente* and attested on this prism only in association with Cretan Hieroglyphic signs. Face γ has a decoration, pertaining to the *CHIC* category *Décoration non signifiante évidente – explétive* (a variant of an S sign).

[43] The sequence is accompanied by the 'cat mask' ({{}}><), inserted by *CHIC* (13–15) among '*représentations autres que de signes*'.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
 ><	039-056-*014* ><	**#306.γ**	**4sP**	MA
Possible alternative reading:				
 ><	039-056-*013* ><			
	039-070-068	PE Ha 003.β[44]	crescent	PE
	039-070-086	PE Hh 016b (CB1)[45]	4sBar	PE
 ><	040-029-029 ><	**#124**	**impression** (crescent) from 1fS	KN
	040-029-*078*[•]	PE Hh 016c.2[46]	4sBar	PE
	040-057	#118.b	4sBar	MA/P
	040-070-038	#097.γ	crescent	MA/P
	041-*025*-*065* ><	**P.TSK13/1485.γ**[47]	**3sP**	PE
Possible alternative reading:				
	041-*025*			
><	041-*031*-011 ><	**#271.β**	**3sP**	**MA**
 ><	041-031-044 ><	**#307.d?**	**4sP**	**<MA>**
 >?	041-059-025 >?	#320	vase base	MA/M
	042-003[	GO Yb 01[48]	potter's wheel	MA
	042-013-009[	#091.a	2sL	MA/M
	042-016-050	#003.δ2	crescent	KN
	042-017	#039.b	medallion	KN
	042-019	**#134**	**impression** (two-hole hanging nodule) from 2fS (cushion seal)	KN
		#135, #136	**impressions** (roundels) from 2fS (cushion seals)	SAM
		#137	**impression** (*nodulus*) from 2fS (cushion seal)	SAM

[44] Tsipopoulou and Hallager 2010: 155. [45] Tsipopoulou and Hallager 2010: 161, 178–81.
[46] Ibid. [47] Krzyszkowska 2017: 149–50, fig. 5; Del Freo 2017: 8, PE S (1/3) 01 and n. 31.
[48] Del Freo 2017: 4.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
	*042*-019	**#137*bis***[49]	**impression** (*nodulus*) from 2fS (cushion seal)	SAM
 Possible alternative reading: 	042-019-•-• 042-019-*019-095*	**#201**	**1fS** (cylinder seal)	CR (?)
	042-019-019-095-052	**#202.α-*β***	**2fS** (discoid)	ARKH
		#203.α-β	**2fS** (discoid)	KN
		#205.α1-*2*	**2fS** (cushion seal)	CR
		KN S (4/4) 01[50]	**4fS** (irregular cushion)	KN
		#251.β-*α*, #252.β-*α*	**3sP** (gable-shaped prisms)	ARKH
		#292.α-*γ*	**4sP** (stepped prism)	GOUVES
		#313.α-*β*	**4fS** (cube)	MONI OD.
		#315.I-*H*	**6fS** (4-sided bar)	ARKH
	042-019-019-*095*[	**#179.1-2**	**impression** (flat-based nodule) from ?fS	KN
	042-019-031	**#301.δ**	**4sP**	CR (?)
 >< Possible alternative reading:  ><	042-019-070-009 >< 042-019-009-070 ><	**#222.b**	**3sP**	<CR (?)>
 >< Possible alternative reading:  ><	042-*020* >< 042-• ><	**#143**	**impression** (crescent) from 3sP	KN
	042-023-011	PE Ha 003.γ (Cr1)[51]	crescent	PE
	042-023-041	PE Hh 016a (CB1)[52]	4sB	PE

[49] Olivier 2010: 290, n. 13; Del Freo 2008: 201.
[50] Kanta, Palaima and Perna 2023.
[51] Tsipopoulou and Hallager 2010: 155, 178–81.
[52] Ibid.: 161, 178–81.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
	042-*023*-049	PE He 006.a (Me1)[53]	medallion	PE
><	042-028-005 ><	**#280.α**	**4sP**	MA
	042-029-032-011	#057.a	4sB	KN
	042-033-011	PE He 001[54]	medallion	PE
o	042-034-*007*-040 o	#070	cone	MA/M
	042-034-049	#062.a	4sB	KN
><	042-038 ><	**#154**	**impression** (flat-based *nodulus*) from 3/4sP	MA/P
		#276.α	**3sP**	PINAKIANO
		#310.δ	**4sP**	SITIA
Possible alternative reading:	042-*038* 042-•	**VRY S (4/4) 01.δ**[55]	**4sP**	VRY
o	042-040-049 o	**#129**	**impression** (*nodulus*) from 1fS	MA/M
	042-040-053-041	**#309.β**	**4sP**	PYR
	042-041-011	#027.β	crescent	KN
>?	042-041-049 >?	#101.a	medallion	MA/P
	042-*045*-029	#023.γ	crescent	KN
[	042-049-016-016[	#113.cA	4sB	MA/P
o	042-052-*034*-045 o	**#125**	**impression** (direct sealing) from 1fS	KN
><	042-053 ><	**#151?**	**impression** (direct sealing) from 3sP	PH
	042-054-061	#037.a	medallion	KN
		#050.a, #058.a	4sB	KN
	042-054-061	**#293.γ**	**4sP**	ADROMILI
		#303.β	**4sP**	CR (?)
	042-056-031	#061.a	4sB	KN
	042-056-035	#119.*l.i.*	tablet	MA/P

[53] Ibid.: 158, 178–81. [54] Ibid.: 178–81.
[55] Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5; Del Freo 2017: 8–9.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
><	042-057-*010*-034-028-*093*-*065* ><	#317	pithos	MA/M
Possible alternative readings:				
>< or	042-057-*010*-034-028-*031*-*065* ><			
>< or	042-057-*010*-034-028-*049*-*065* ><			
><	042-057-*088*-034-028-*093*-*065* ><			
	042-057-038	#056.dA	4sB	KN
	042-057-070	#056.b	4sB	KN
><	042-066-016-062 ><	**#305.α**	**4sP**	LASTROS
	042-066-077-042	#095.a	4sB	MA/M
><	042-070-038 ><	**#163**	**impression** (crescent) from 4sP	KN
><	042-070-060-044 ><	#074.a	medallion	MA/M
[><	042-070[><	**#168**	**impression** (crescent) from 4sP	KN
	042-091	#331	Chamaizi vase	<PRODR.>
>?	043-009 >?	**#265.β**	**3sP**	KASTELLI
	043-070	#039.a, #042.a	medallions	KN
	044-005	#018.γ	crescent	KN
		#059.aA	4sB	KN
	044-005	**#138°** ({{}})[56]	**impression** (flat-based nodule) from 2fS	ZA
		#140° ({})[57], **#144**, **#145°** ({})[58], **#147°**	**impressions** (crescent) from 3sP	KN

[56] After the 'formula' a triton shell ({{}}) is inserted, included by *CHIC* (13–15) as '*Décoration éventuellement signifiante non évidente*' ('*représentations autres que de signes*').

[57] The 'formula' is accompanied by sign 013 in medial position ({}), included in the *CHIC* category '*Décoration éventuellement signifiante non évidente*' (signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*').

[58] Again, the 'formula' is accompanied by the logogram **153* ({}), interpreted by *CHIC* as belonging to the '*Décoration éventuellement signifiante non évidente*' category just like the sign in the preceding footnote.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
		({[sign]}[sign][sign])[59], **#158°** ([sign]{[sign]}[sign])[60], **#165**		
		#174° ([sign]{[sign]}[sign])[61]	**impression** (spindle whorl) from 4sP	PK
		#194	**1fS** (half-ovoid)	CR
		#246.α	**3sP**	KRITSA
		#247.γ° ({{[sign]}}x [sign][sign])[62]	**3sP**	MA
		#250.α	**3sP**	ZA
		#253.γ, #254.β,	**3sP**	CR
		#283.α1	**3sP**	CR
		#259.β-γ, #261.α,	**3sP**	CR (?)
		#262.γ° ({[sign]}[sign][sign])[63],	**3sP**	CR (?)
		#263.γ, #287.δ	**3sP**	CR (?)
		#264.γ° ({[sign]}[sign][sign])[64]	**3sP**	IRAKLIO
		#266.a	**3sP**	<KORDIKAKIA>
		#268.α° ({[sign]}[sign][sign])[65]	**3sP**	LAKONIA
		#274.β	**3sP**	MIRABELO
		#276.γ1*[66]	**3sP**	PINAKIANO
		#277.α	**3sP**	ZIROS
		#288.β° ({[sign]}[sign][sign])[67]	**3sP**	MA/V

59 The 'formula' is preceded by sign 042 ({[sign]}[sign][sign]), attributed by *CHIC* to the same category as well.

60 The 'formula' is accompanied by sign 065 in medial position ([sign]{[sign]}[sign]), again interpreted as '*Décoration éventuellement signifiante non évidente*'.

61 In this case as well, the 'formula' is accompanied by sign 065 in middle position ([sign]{[sign]}[sign]), included by *CHIC* in the same category.

62 The 'formula' is accompanied by the 'cat mask' after an 'x' ({{[sign]}}x [sign][sign]), interpreted by *CHIC* (13–15) as ('*représentations autres que de signes*').

63 Here the 'formula' is preceded by sign 020 ({[sign]}[sign][sign]), interpreted by *CHIC* (13–15) as a sign '*dont nous ne pouvons pas expliquer mécaniquement la présence*'.

64 Sign 013 ([sign]) is interpreted as being an abbreviation (Olivier 1995: 178–80): {[sign]}[sign][sign].

65 In this case as well, sign 070 ([sign]) is interpreted as being an abbreviation referring to the sign group attested in γ (006-070 ><): β [sign][sign] {[sign]}.

66 On the seal the signs 005-044-049 are incised, to be read, according to *CHIC*, as 044-005 and 044-049.

67 Again, sign 092 here in #288.β ({[sign]}[sign][sign]: 044-005) is included in *CHIC* as '*Décoration éventuellement signifiante non évidente*', interpreted as an abbreviation possibly related to the phonetic sequence attested in γ ([sign][sign] ><: 036-092 ><).

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
		#295.δ (**{{}}**)[68],	**4sP**	CR
		#297.δ2° (**{}**)[69],	**4sP**	CR
		#298.δ1	**4sP**	CR
		#299.β, #301.β	**4sP**	CR (?)
		#305.γ	**4sP**	LASTROS
		#308.δ	**4sP**	PK
		#309.α[70]	**4sP**	PYR
		#311.γ	**4sP**	SITIA
		#314.<θ2>	**8SP**	NEAPOLIS
	044-*005*	**VRY S (4/4) 01.α**[71]	**4sP**	VRY
Possible alternative readings:				
	044-*073*			
	044-•			
><	044-*013*-070 ><	**#184**	**1fS** (*Petschaft*)	CR (?)
><	044-025-049 ><	**#266.b**	**3sP**	<KORDAKIA>
	044-036-018	**#255.α**	**4sP**	CR
		#300.c	**4sP**	CR (?)
		P.TSK12/1249.α[72]	**3sP**	PE
	044-036-*018*	**P.TSK14/2604.β**[73]	**3sP**	PE
[	044-040[	#110.a	2sL	MA/P
	044-049	#040.b1, #042.b1	medallion	KN
		#049.a, #049.b,	4sB	KN
		#050.c, #056.aA,	4sB	KN
		#056.<aB>*,	4sB	KN
		#056.b-e,	4sB	KN
		#056.dB, #059.dA	4sB	KN

68 The 'formula' is accompanied by the 'cat mask' ({{}}), interpreted by *CHIC* (13–15) among the '*représentations autres que de signes*'.

69 The 'formula' is accompanied by sign 061 ({}), interpreted by *CHIC* in the category '*Décoration éventuellement signifiante non évidente*' (signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*').

70 The 'formula' 044-005 is accompanied by a supplementary sign interpreted by *CHIC* as '*Décoration éventuellement signifiante évidente*', namely the full-bodied cat {{}}, attested on #257.α as well with another 'formula' (038-010-031).

71 Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5; Del Freo 2017: 8–9.

72 Krzyszkowska 2017: 151, fig. 6; Del Freo 2017: 8, PE S (2/3) 01.

73 Krzyszkowska 2017: 149–50; Del Freo 2017: 8, PE S (1/3) 02.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
[044][049]	044-049	**#150**	**impression** (amphora handle) from 3sP	MA/M
		#157° ({{[cat mask sign]}}[044][049])[74]	**impression** (direct sealing) from 4sP	KN
		#159, **#161**	**impressions** (crescents) from 4sP	KN
		#170	**impression** (direct sealing) from 3sP	KN
		#180	**1fS** (*Petschaft*)	CR
		#207.β	**2fS** (wedge-shape seal)	MA/N
		#208.α	**3sP**	AVDOU
		#209.α, **#210.α**,	**3sP**	CR
		#211.α, **#213.α**,	**3sP**	CR
		#253.β, **#258.γ**	**3sP**	CR
		#215.α, **#216.α**,	**3sP**	CR (?)
		#217.β, **#219.β**,	**3sP**	CR (?)
		#220.α, **#221.β**,	**3sP**	CR (?)
		#223.γ, **#244.α**,	**3sP**	CR (?)
		#259.β-α?,	**3sP**	CR (?)
		#260.α, **#261.γ**	**3sP**	CR (?)
		#226.α, **#270.β?**	**3sP**	LASITHI
		#227.α	**3sP**	LITHINES
		#231.α, **#233.α**,	**3sP**	MA/M
		#235.α	**3sP**	MA/M
		#237.α, **#274.α°**	**3sP**	MIRABELO
		({[156]}[044][049])[75]	**3sP**	
		#230.a° ({[073]}[044][049])[76],	**3sP**	MA
		#247.β	**3sP**	MA

74 The 'formula' is accompanied by the so-called 'cat mask' ({{[cat mask sign]}}[044][049]); see *supra*.

75 The 'formula' is accompanied by the logogram *156 ({[156]}[044][049]), interpreted by *CHIC* (13–15) as the category '*Décoration éventuellement signifiante non évidente*' (signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*').

76 The 'formula' is accompanied by sign 073 ({[073]}[044][049]), interpreted by *CHIC* as '*Décoration éventuellement signifiante non évidente*'(signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*').

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
		#240.α°	**3sP**	SITIA
		({}), **#249**.b		SITIA
		#264.β°[78]	**3sP**	IRAKLIO
		#266.c	**3sP**	<KORDAKIA>
		#276.γ2*[79]	**3sP**	PINAKIANO
		#277.γ	**3sP**	ZIROS
		MA/V S (1/3) 02[80]		MA/V
		#283.α2, #295.α,	**4sP**	CR
		#296.γ, #297.δ1,	**4sP**	CR
		#298.δ2	**4sP**	CR
		#278.γ° ({})[81],	**4sP**	CR (?)
		#284.α, #287.α,	**4sP**	CR (?)
		#299.α, #300.a,	**4sP**	CR (?)
		#301.α, #302.α*[82]**,**	**4sP**	CR (?)
		#303.δ	**4sP**	CR (?)
		#290.β, #311.*δ*	**4sP**	SITIA
		#293.δ	**4sP**	ADROMILI
		#305.β	**4sP**	LASTROS
		#308.γ° ({7})[83]	**4sP**	PK
		VRY S (4/4) 01.β[84]	**4sP**	VRY
		#314.β, #314.η1	**8sP**	NEAPOLIS
[	044-049[	#059.cB, #063.a2	4sB	KN
[	044-*049*[	**#188**	1fS (*Petschaft*)	MA/M
	044-049-023	#089.a	2sL	MA/M

77 Sign 001 (), attested as a syllabogram on clay documents but two times only on seals (in this case, with the 'formula' 044-049: {}) is interpreted by *CHIC* (13–15) as '*Décoration éventuellement signifiante non évidente*' (signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*').

78 The 'formula' is written with a reduplication of the second sign intended for decorative reasons ({}{}). Moreover, sign 013 () is possibly used as an abbreviation, according to the 'badge acronymique' scheme postulated by Olivier (1995: 178–80): {}{}.

79 The seal bears the signs 005-044-049, to be read, according to *CHIC*, as 044-005 and 044-049.

80 Del Freo 2012: 6.

81 Again, the 'formula' is accompanied by the sign 065 ({}), interpreted by *CHIC* as the '*Décoration éventuellement signifiante non évidente*' category (signs '*dont nous ne pouvons pas expliquer mécaniquement la présence*').

82 The seals bear the signs 057-034-044-049, to be read (according to *CHIC*) as 057-034 and 044-049.

83 Sign 031 () in ({}) is interpreted by *CHIC* as the '*Décoration éventuellement signifiante non évidente*' category (syllabograms and logograms '*dont nous ne pouvons pas expliquer mécaniquement la présence*').

84 Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5; Del Freo 2017: 8–9.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
𐄁𐄂	046-044	**#255.γ, #257.γ**	**3sP**	CR
		#269.γ	**3sP**	LASITHI
		#275.b	**3sP**	<MIRABELO>
		#302.β	**4sP**	CR (?)
		#310.γ (𐄁𐄂{{𐄇}})[85]	**4sP**	SITIA
		#314.δ° (𐄁{{𐄀}}𐄂)[86]	**8sP**	NEAPOLIS
𐄁	*046*-063	#049.a	4sB	KN
𐄇	*047*-002-061	#113.a	4sB	MA/P
Possible alternative reading: 𐄇	*073*-002-061			
𐄀𐄁𐄃><	047-049-*013* ><	**#312.γ**	**4sP**	XIDA
𐄇	047-053	#065.a	4sB	KN
𐄀𐄉 ><	047-070 ><	**#286.β**	**4sP**	MA
𐄇𐄈𐄊	047-070-031	#058.b	4sB	KN
𐄁𐄋 ><	049-016 ><	**P.TSK06/145**[87]	**1fS** (*Petschaft*)	PE
𐄁𐄌𐄍 ><	049-*019*-023 ><	#046.a	medallion	KN
𐄁𐄎𐄇	049-021-061	#050.d	4sB	KN
𐄁𐄏[	049-038[	#113.a	4sB	MA/P
𐄁𐄐𐄑𐄒	049-041-006-025	#316	Chamaizi vase	MA/M
𐄁𐄐𐄑𐄓	049-041-006-*057*	#327	Chamaizi vase	MA/P
𐄁𐄔	049-042	#329	Chamaizi vase base	MA/V
𐄁𐄕[	049-*049*[	**#269.β**	**3sP**	LASITHI
𐄁𐄕[𐄖]][	049-049[[*028*]] [	#011.γ	crescent	KN
𐄁𐄗𐄂[•] ><	049-052-*044*-[•] ><	**PE I 01**[88]	**impression** (direct sealing) from 3sP?	PE
𐄁𐄘• ><	049-056-• ><	#016.γ	crescent	KN

[85] The 'formula' is accompanied by a supplementary sign interpreted by *CHIC* as '*Décoration non signifiante évidente – explétive*' –, namely the spider {{𐄇}}.
[86] The sequence is accompanied by the bird (𐄁{{𐄀}}𐄂), interpreted by *CHIC* as the category '*Décoration éventuellement signifiante non évidente*' ('*représentations autres que de signes*').
[87] Krzyszkowska 2012: 148–50, fig. 4. [88] Tsipopoulou and Hallager 2010: 166–7 (PE 028), 178–81.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
	049-070-070 ><	**#167**	**impression** (direct sealing) from 4sP	KN
	049-072 ><	**VRY S (4/4) 01.γ**[89]	**4sP**	VRY
	050-007-018	**#314.γ**	**8sP**	NEAPOLIS
	050-011	**#267.γ**	**3sP**	KY
	050-016	#032.a	medallion	KN
	050-019 ><	**#297.α**	**4sP**	CR
	050-031-034	**#314.α**	**8sP**	NEAPOLIS
	050-057-056	#119.*r*., #120.*v*.B	tablets	MA/P
 Possible alternative reading: 	050-070-•-•-019 050-070-*023*-*013*-019	#113.b1	4sB	MA/P
	050-070-*013*-063-038	#112.c	4sB	MA/P
	051-031-005	**#290.γ**	**3sP**	SITIA
	051-051-051-041	#089.b	2sL	MA/M
 Possible alternative reading: 	*051*-092-092 > *037*-092-092 ><	#318	plate	MA/M
	052-050-054 ><	**#306.α**	**4sP**	MA
	052-054-*038* 0	**#130**	**impression** (*nodulus*) from 1fS	MA/M
	052-056-049-034	#031.a	medallion	KN
	053-008 ><	**#187**	**1fS** (figural seal, jug)	MA
	*053*-034-031-070	#001.γ	crescent	KN
	053-038-039 ><	**#296.β**	**4sP**	CR (S)
	053-053-077	#047.a	medallion	KN
	054-005-050 ><	**#273.α**	**3sP**	MIRABELO
	054-010 ><	**#155**	**impression** (one-hole hanging nodule) from 4sP	HT
	054-010-054	**#267.α**	**3sP**	KY

[89] Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5; Del Freo 2017: 8–9.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
	054-044 ><	**#152**	**impression** (flat-based nodule) from 3sP	ZA
	054-061-013[	#034.a	medallion	KN
	055-070-049[	#022.γ	crescent	KN
	056-005	PE Hh 016a[90]	4sB	PE
	056-013-058	**#283.β**	**4sP**	CR
	056-*023*	#039.a	medallion	KN
o	056-025-029-011 o	**#182**	**1fS** (*Petschaft*	CR (?)
	056-031	PE He 007a	medallion	PE
	056-047-031	#032.a	medallion	KN
	056-047-031	**#166**	**impression** (crescent) from 4sP	KN
	056-050	**#180**	**1fS** (*Petschaft*)	CR
><	056-059 ><	**#242.α**	**3sP**	CR
	056-070	#118.a	4sB	MA/P
	056-070-040	**#298.α**	**4sP**	CR
	056-070-070	#061.e	4sB	KN
	057-013-049	#038.b	medallion	KN
		#054.a	4sB	KN
	057-016	#003.δ1	crescent	KN
><	057-018-050 ><	**#306.δ**	**4sP**	MA
	057-023	#049.b	4sB	KN
><	057-023 ><	**#243.γ**	**3sP**	CR
	057-023-042-063-060	#113.d	4sB	MA/P
	057-023-*051*	#039.b	medallion	KN
	057-023-070-018	#324	Chamaizi vase	MA/N
	057-025-034[	#027.δ	crescent	KN
Possible alternative reading: plus	057-034-044-049 > 057-034 + 044-049 ><	**#302.α**	**4sP**	CR (?)
	057-034-056	**#173**	**impression** (direct sealing) from 4sP	MA/M

[90] Tsipopoulou and Hallager 2010: 161, 178–81.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
		#238.α	**3sP**	MOHLOS
		#244.*β*, **#260.γ**	**3sP**	CR (?)
		#248.β	**3sP**	PK
		P.TSK05/259.δ[91]	**3sP**	PE
		#281.*β*	**4sP**	MA
		#295.*γ*, **#296.δ,**	**4sP**	CR
		#310.α	**4sP**	SITIA
	057-047-061	#032.b	medallion	KN
	057-069	#050.b	4sB	KN
	057-069-070	#038.b	medallion	KN
	057-070-061-005-019	#112.a	4sB	MA/P
	057-092-061	#052.b	4sB	KN
	058-*002*	#053.e	4sB	KN
	059-054-031	#017.γ	crescent	KN
-|	059-057-*014*-041-019-047-070-	**#294.β(1)**	**4sP**	CR
	060-*013*	#059.bA	4sB	KN
><	060-044-056 ><	**#271.γ**	**3sP**	**MA**
	060-070-•	#029.γ	crescent	KN
[•]	*061*-013-[•][92]	PE He 011a	medallion	PE
	061-062-042	#095.b	4sB	MA/M
	062-013-057-041	PE Hh 016a[93]	4sB	PE
	062-020-028	**#303.α**	**4sP**	CR (?)
-	*062*-034-002-056-070-	#328(1)	libation table	MA
><	062-040 ><	**#127**	**impression** (*nodulus*) from 1fS	MA/M
		#171	**impression** (*nodulus*) from 4sP	MA/M
><	063-031 ><	**#141°** ({{}})[94]	**impression** (crescent) from 3sP	KN
	063-047-061-031	#052.a	4sB	KN
•[	064-096-•[	#087.a	2sL	MA/M
><	*068*-009-011 ><	**#225.α?**	**3sP**	CR (?)
	068-009-056-050-070	#119.*v*	tablet	MA/P

[91] Krzyszkowska 2012: 151–2, fig. 6 and n. 24; Del Freo 2017: 7, PE S (3/4) 01.δ.
[92] Tsipopoulou and Hallager 1996a: 39–42, fig. 2; Tsipopoulou and Hallager 2010: 158, 178–81.
[93] Ibid.: 161, 178–81.
[94] The sequence is accompanied by the sign ({{}}), interpreted by *CHIC* as the category '*Décoration éventuellement signifiante non évidente*' ('*représentations autres que de signes*').

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
><	*068*-010-011-020 ><	**#272.γ**	**3sP**	MIRABELO
[	068-*016*[	#086.a	2sL	MA/M
	068-031	#040.b2	medallion	KN
>?	*068-046-019* >?	#030.a	medallion	KN
	068-061	#085.a	2sL	MA/M
><	068-*077*-015 ><	#079.a	medallion	MA/M
•	069-047-041-•	#041.a	medallion	KN
><	070-005-050 ><	**#273.γ**	**3sP**	MIRABELO
><	070-019 ><	**#133*bis***[95]	**impression** (vase handle) from ?sP	PYR
	070-019-*009*	#061.c	4sB	KN
>?	070-028-031 >?	**#307.b?**	**4sP**	<MA>
o	070-028-041 o	**#133°** (+{{}})[96]	**impression** (vase handle) from 1fS	PYR
	070-031-019	#054.e, #056.aA	4sB	KN
[	070-031-034[	#091.b	2sL	MA/M
><	070-031-056 ><	**#307.c?**	**4sP**	<MA>
><	070-038 ><	**#270.α?**	**3sP**	LASITHI
	070-047-047	#043.b1	medallion	KN
><	070-056-057-011 ><	**#185**	**1fS** (*Petschaft*)	<CR (?)>
	070-061-019-045-070	**#298.β**	**4sP**	CR
><	070-061-069 ><	**#287.β**	**3sP**	CR (?)
><	070-073 ><	**#198**	**1fS** (half-ovoid)	MIRABELO
[•]	072-025[•]	He 012a[97]	medallion	PE
	072-039	#040.a	medallion	KN
	072-049	#034.b	medallion	KN
		#059.dA, #065.d	4sB	KN
	072-049-071-050-005-063	#065.a	4sB	KN
	073-049-013	#119.*r*., #120.*r*.A	tablets	MA/P
	073-090	#113.b2	4sB	MA/P
	076-013	**#312.δ**	**4sP**	XIDA
><	076-013-031 ><	**#304.δ**	**4sP**	CR (?)

95 *CMS* II.6, no. 230; Del Freo 2008: 200.

96 The sequence is accompanied by the sign (+{{}}), interpreted by *CHIC* as the category '*Décoration éventuellement signifiante non évidente*' ('*représentations autres que de signes*').

97 Tsipopoulou and Hallager 2010: 161, 178–81.

CH phonetic sequence	Transnumeration	Document number	Document format	Find spot
><	077-016-033 ><	**#290.δ**	**3sP**	SITIA
><	077-016-033-049 ><	**P.TSK06/145**[98]	**1fS** (*Petschaft*)	PE
><	*077*-038 ><	**#293.α**	**4sP**	ADROMILI
><	077-*051* ><	**P.TSK12/1249.β**[99]	**3sP**	PE
	078-032-034	#058.b	4sB	KN
	078-032-070-*023-045*	#058.d	4sB	KN
	079-032-013	#057.b	4sB	KN
•[><	083-*047*-019-•[><	#078.a	medallion	MA/M
Possible alternative readings:				
•[><	*011-047*-019-•[><			
•[><	*082-047*-019-•[><			
•[><	083-*005*-019-•[><			
•	085-011-•-001	#041.b	medallion	KN
	088-003	#049.d	4sB	KN
	089-044	#047.b	medallion	KN
><	092-019-013 ><	**#277.β**	**3sP**	ZIROS
	092-019-044-050-019-028-056	**#294.β (2)**	**4sP**	CR
	092-031	#065.b, #067.c	4sB	KN
[	092-036[	#059.dA	4sB	KN
(•?)(•?) ><	092-057(•?)034(•?) 016-056 ><	**#294.δ?**	**4sP**	CR
><	092-058 ><	**#123**	**impression** (crescent) from 1fS	KN
	092-067-032	#027.γ	crescent	KN
[	*092-073*[	**#207.α**	**2fS** (wedge-shape seal)	MA/N
•	*094-036*-•	**#241.α?**	**3sP**	SITIA
><	*094-038* ><	**#251.γ?**	**3sP** (gable-shaped prism)	ARKH

98 Krzyszkowska 2012: 148–50, fig. 4; Del Freo 2017: 7, PE S (1/1) 01.

99 Krzyszkowska 2017: 151, fig. 6; Del Freo 2017: 8, PE S (2/3) 01.

INDEXES

MATILDE CIVITILLO

Index I Typological Index of Cretan Hieroglyphic Documents

1) Sequences attested on Cretan Hieroglyphic seals

	Seals *CHIC* no.	*CHIC* terminology	Inscribed faces	*CMS* terminology	Total *CHIC*	Post-*CHIC* findings	Total post-*CHIC*
1-face seals (tot: 23)	#180–193	*Cachets ronds*	1/1	*Petschafte*	14	P.TSK06/145[1]	1
	#194–198	*Cachets elliptiques*	1/1	Half-ovoid seals	5	—	—
	#199–200	*Demi-cylindres*	1/1	Half cylinders – concave	2	—	—
	#201	*Cylindres*	1/1	Cylinder	1		
2-face seals (tot: 6)	#202–203	*Discoïdes*	2/2	Discoid seals	2 —	— —	—
	#204	*Amygdaloïdes*	1/2	Amygdaloid seals	1	—	—
	#205–206	*Cylindres aplatis*	1/2 and 2/2	Cushion seals	2	—	—
	#207		2/2	Wedge-shape seals	1	—	—
3-sided prisms (tot: 74)	#208–241	*Sceaux à 3 faces*	1/3	3-sided prisms	34	P.TSK14/2604[2]; P.TSK13/1485[3]; MA/V S (1/3) 02[4]	3
	#242–250		2/3		9	P.TSK12/1249[5]	1

[1] Krzyszkowska 2012: 148–50, fig. 4.
[2] Krzyszkowska 2017: 149–50, fig. 5; Del Freo 2017: 8, PE S (1/3) 02.
[3] Krzyszkowska 2017: 149–50, fig. 5; Del Freo 2017: 8, PE S (1/3) 01 and n. 31.
[4] Del Freo 2012: 6. [5] Krzyszkowska 2017: 151, fig. 6; Del Freo 2017: 8, PE S (2/3) 01.

	Seals *CHIC* no.	*CHIC* terminology	Inscribed faces	*CMS* terminology	Total *CHIC*	Post-*CHIC* findings	Total post-*CHIC*
	#251–252	*Sceaux à 3 faces*	faces 3/3	Gable-shaped prisms	27	—	—
	#253–277		faces 3/3	3-sided prisms		—	—
4-sided prisms (tot: 38)	#278–282	*Sceaux à 4 faces*	faces 1/4		5	—	—
	#283–286		faces 2/4	4-sided prisms	4	—	—
	#287–291		faces 3/4		5	P.TSK05/259[6]	1
	#292–312		faces 4/4	4-sided prisms	21	VRY S (4/4) 01[7]	1
	—		faces 3 or 4?	4-sided prisms	—	P.TSK05/291[8]	1
Varia	#313		faces 2/4	Cubes	3	—	—
	#314		faces 8/8	8-sided prisms		—	—
	#315		2 or 3/14	Triple-stacked cube		—	—
			Inscribed faces 4/4	Irregular cushion with four unequal engraved sides	—	KN S (4/4) 01[9]	1
					136 **Tot. seals: 145**		**9**
Total of CH sequences (two or more signs) attested: **286** Total of *different* sequences attested (*each counted once*): **143**							

2) Sequences attested on Cretan Hieroglyphic sealings

Given that there is no universally accepted typology for sealings and a standardised terminology has not been developed, in the fourth column, next to *CHIC* terminology, we indicate the definitions given to sealing types by Hallager 1996 and Tsipopoulou and Hallager 2010.

[6] Krzyszkowska 2012: 151–2, fig. 6 and n. 24; Del Freo 2017: 7, PE S (3/4) 01.
[7] Hallager, Papadopoulou and Tzachili 2011: 65–70, figs. 4–5; Del Freo 2017: 8–9.
[8] Krzyszkowska 2012: 152–3, nn. 30, 31 and fig. 7; Del Freo 2017: 7–8, PE S (3/4) 02.
[9] Kanta 2018 cat. 305; Kanta, Palaima and Perna 2023.

	Sealings *CHIC* no.		*CHIC* terminology	Hallager 1996, Tsipopoulou and Hallager 2010 terminology	Total *CHIC*	Post-*CHIC* findings	Total post-*CHIC*
Impressions	#123–124	Impressions from 1-face seals	*Nodules*	Crescent	2	—	—
	#125		*Scellés*	Direct sealing	1	—	—
	#126–131		*Boulettes*	*Nodulus*	6	—	—
	#132–133		*Anse de vase*	Vase handle	2	—	—
	#134	Impressions from 2-face seals	*Pendule*	Two-hole hanging nodule	1	—	—
	#135–136		*Rondelle*	Roundel	2	—	—
	#137		*Boulettes*	*Nodulus*	1	#137*bis*[10]	1
	#138		*Scellés*	Flat-based nodule	1	—	—
	#139; 148	Impressions from 3-sided prisms	*Boulettes*	*Nodulus*	2	—	—
	#140–147; #149		*Nodules*	Crescent	9	—	—
	#150		*Anse de vase*	Vase handle	1	#150*bis*[11]	1
	#151		*Scellés*	Direct sealing	1	—	—
	#152–153		*Scellés*	Flat-based nodule	2	—	—
	#154	Impressions from 3-/4-sided prisms	*Pastille*	Flat-based nodule	1	—	—
Impressions	#155	Impressions from 4-sided prisms	*Pendule*	One-hole hanging nodule	1	—	—
	#156; 171		*Boulettes*	*Nodulus*	2	—	—
	#157; #169–170		*Scellés*	Direct sealing	3	—	—
	#164		*Scellés*	Flat-based nodule	1	—	—
	#158–163; #165–166; #168; 172		*Nodules*	Crescent	10	—	—
	#167		*Nodules*		1	—	—
	#173		*Scellé conique*	Direct sealing	1	—	—
	#174		*Peson discoïde*	Spindle whorl	1	—	—
	#175		*Anse de vase*	Vase handle	1	—	—

[10] Olivier 2010: 290, n. 13; Del Freo 2008: 201. [11] CMS V Suppl. 1B, 329; Olivier 1999: 420.

Sealings *CHIC* no.		*CHIC* terminology	Hallager 1996, Tsipopoulou and Hallager 2010 terminology	Total *CHIC*	Post-*CHIC* findings	Total post-*CHIC*
#176		*Nodules*	Crescent	1	—	—
#177		*Boulettes*	*Nodulus*	1	—	—
#178–179		*Scellés*	Flat-based nodule	2	—	—
	Impressions from ?-sided prisms		Direct sealing	—	PE I 02, 03[12]	2
			Combination nodule	—	PE I 04, 05[13]	2
			Crescent?	—	PE I 06[14]	1
			Vase handle		#133*bis*[15]	1
				57		**8**
				Tot. seal impressions: 65		

Total of CH sequences attested: **57**
Total of *different* sequences attested (each counted once): **40**

3) Sequences attested on Cretan Hieroglyphic clay documents

Documents *CHIC* no.	*CHIC* terminology	Hallager 1996, Tsipopoulou and Hallager 2010 terminology	Total *CHIC*	Post-*CHIC* findings	Total post-*CHIC*
#001–029; #097 (Ha)	*Nodules*	Crescent-shaped nodules	30	PE Ha 003–005[16]	3
#030–047; #072–084; #098–104 (He)	Médaillons	Medallions	33	PE He 006–015[17]	10
#085–094; #105–#110 (Hf)	Lames à 2 faces	2-sided lames	16	SY Hf 01[18]	1
#049–067; #095–096; #111–118; #121 (Hh)	Barres à 4 faces	4-sided bars	30	PE Hh 016–017[19]	2
#068–069; #119–120; #122 (Hi)	Tablettes	Tablets	5	—	—
#070–071	Cones	Cones	2	—	—
—	—	Roundels		PE Hc 002[20]	1
			116		17
			Tot. clay documents: 133		

Total of CH sequences (two or more signs) attested: **270**
Total of *different* sequences attested (*each counted once*): **248**

[12] Tsipopoulou and Hallager 2010: 166–7. [13] Ibid. [14] Ibid.: 166–7.
[15] *CMS* II.6, no. 230; Del Freo 2008: 200. [16] Tsipopoulou and Hallager 2010: 155–6.
[17] Ibid.: 158–61. [18] Lebessi, Muhly and Olivier 1995.
[19] Tsipopoulou and Hallager 2010: 161, 165. [20] Ibid.: 157.

4) Sequences attested on Cretan Hieroglyphic inscriptions on other writing supports

			Total *CHIC*	Post-*CHIC* findings	Total post-*CHIC*
Pottery	*CHIC* #316; 322; 324; 327; 329; 331	Chamaizi vases	6	KATALIMATA Yb 01[21]	1
	CHIC #317	Pithos	1	—	—
	CHIC #318	Plate	1	—	—
	CHIC #319; 323	Pithos lid	1	—	—
	CHIC #320	Vase base	1	—	—
	CHIC #321	Vase fragment	1	—	—
	CHIC #330	Amphora handle	1	#330*bis*[22]	1
	CHIC #328	Libation table	1	—	—
	—	Vase	—	MA/V Yb 04[23]	1
	—	Potter's wheel	—	GO Yb 01[24]	1
			13		**4**
			Tot. inscriptions on other writing supports: 17		

Total of CH sequences attested: **19**
Total of *different* sequences attested (each counted once): **19**

Index II Complete Index of Cretan Hieroglyphic Phonetic Sequences of Two or More Signs According to Writing Supports

1) Cretan Hieroglyphic sequences attested on clay documents

a) Crescent-shaped nodules

	CH sequence	Transnumeration	Document number	Provenance
1	[•] [•]	[•]-031-*039*-[•]	PE Ha 003.δ (Cr1)[25]	PE
2	] • ><	]•-038-011 ><	#025.γ	KN
3	•	•-062-011-056	#013.γ	KN
4	] [><	]011-056[><	#015.γ	KN
5	] ><	]*019*-055 ><	#029.δ	KN
6	] ><	]*038*-019-061 ><	#028.γ*	KN
7	] [>< (or] •[><)	]047-092[>< (or]047-092-•[><)	#005.γ	KN
8	] >?	]050-016 >?	#002.δ	KN
9	] [><	]*062*-019-061 ><	#028.γ	KN
10	] ><	]065-063 ><	#009.γ	KN
11		009-056-061	#018.β	KN

[21] Del Freo 2017: 6.
[22] Schoep 1995: 63–77. [23] Pomadère 2009: 637, fig. 4; Del Freo 2012: 5–6; 2017: 6. [24] Ibid.: 4.
[25] Tsipopoulou and Hallager 2010: 155, 178–81.

	CH sequence	Transnumeration	Document number	Provenance
12		009-077-013-020	#003.γ	KN
13		011-056	#024.γ	KN
14		011-092	#026.γ	KN
15		*013*-056-068	#002.γ	KN
16		016-054	#003.β	KN
17		019-038-059	#004.γ	KN
18		020-047	#018.γ	KN
19		*025-046* ⟦•⟧[><	#019.γ	KN
20		028-038-032[	#008.γ	KN
21		028-049[	#012.γ	KN
22		038-017-049-034	#021.γ	KN
	(or)	(or 038-017-034-049)		
23		039-070-068	PE Ha 003.β[26]	PE
24		040-070-038	#097.γ	MA/P
25		042-016-050	#003.δ2	KN
26		042-023-011	PE Ha 003.γ (Cr1)[27]	PE
27		042-041-011	#027.β	KN
28		042-*045*-029	#023.γ	KN
29		044-005	#018.γ	KN
30		049-049⟦*028*⟧ [	#011.γ	KN
31		049-056-• ><	#016.γ	KN
32		*053*-034-031-070	#001.γ	KN
33		055-070-049[	#022.γ	KN
34		057-016	#003.δ1	KN
35		057-025-034[	#027.δ	KN
36		059-054-031	#017.γ	KN
37		*060-070*-•	#029.γ	KN
38		092-067-032	#027.γ	KN

b) Medallions

	CH sequence	Transnumeration	Document number	Provenance
1	[•] (or)	[•]-*072-019*-070 (or *18-072-019*-070)	PE He 009.a (Me4)[28]	PE
2	⟦•⟧ ><	⟦•⟧060-009 ><	#075.a	MA/M
3	] • ><	]•-042-061 ><	#035.a	KN
4	•	•-*072*-038-007-016	#098.a	MA/P
5	] ><	]038-010-068 ><	#044.a	KN
6	] ><	]049-060-•[><	#099.a	MA/P

[26] Ibid.: 155. [27] Ibid.: 155, 178–81.
[28] Tsipopoulou and Hallager 2010: 162, 178–81.

	CH sequence	Transnumeration	Document number	Provenance
7		]*050*-019-038-•[><	#033.a	KN
8		]070-055-057-*056*[><	#103.a	MA/P
9		]086.[ ]042 ><	#035.b	KN
10		007-010-006-023 >?	#043.a1	KN
11		011-077-034	#045.a	KN
12		011-092	#026.γ	KN
13		012-*031*-082 ><	#080.a	MA/M
	(or: )	(or 012-*031*-*083* ><)		
14		017-039	#037.b	KN
15		019-070-061	#040.a	KN
16		019-077-029	#038.a	KN
17		020-016-041 ><	#082.a	MA/M
18		020-077	#039.a	KN
19		023-*061*-019-057	#036.a	KN
20		024-050	#043.a2	KN
21		025-010	#043.a2	KN
22		027-034-070 ><	#073.a	MA/M
23		028-041[><	#102.a	MA/P
24		028-070 ><	#081.a	MA/M
25		030-034 ><	#083.a	MA/M
26		*031*-055-081 ><	#077.a	MA/M
27		032-009-056	#104.a	MA/P
28		037-011-029	#042.a	KN
29		042-017	#039.b	KN
30		042-*023*-049	PE He 006.a (Me1)[29]	PE
31		042-033-011	PE He 001[30]	PE
32		042-041-049 >?	#101.a	MA/P
33		042-054-061	#037.a	KN
34		042-070-060-044 ><	#074.a	MA/M
35		043-070	#039.a, #042.a	KN
36		044-049	#040.b1, #042.b1	KN
37		049-*019*-023 ><	#046.a	KN
38		050-016	#032.a	KN
39		052-056-049-034	#031.a	KN
40		053-053-077	#047.a	KN
41		054-061-013[	#034.a	KN
42		056-*023*	#039.a	KN
43		056-031	PE He 007a	PE
44		056-047-031	#032.a	KN
45		057-013-049	#038.b	KN
46		057-023-*051*	#039.b	KN
47		057-047-061	#032.b	KN

[29] Ibid.: 158, 178–81. [30] Ibid.: 178–81.

	CH sequence	Transnumeration	Document number	Provenance
48		057-069-070	#038.b	KN
49		*061*-013-[•][31]	PE He 011a	PE
50		068-031	#040.b2	KN
51	 >?	*068-046-019* >?	#030.a	KN
52	 ><	068-*077*-015 ><	#079.a	MA/M
53		069-047-041-•	#041.a	KN
54		070-047-047	#043.b1	KN
55		072-025[•]	He 012a[32]	PE
56		072-039	#040.a	KN
57		072-049	#034.b	KN
58	 >< (or:  ><	083-*047*-019-•[>< (or *011-047*-019-•[><; *082-047*-019-•[><; 083-*005*-019-•[><)	#078.a	MA/M
59		085-011-•-001	#041.b	KN
60		089-044	#047.b	KN

c) 2-sided lames

	CH sequence	Transnumeration	Document number	Provenance
1		]•-013-035	#105.aB	MA/P
2		]•-016-038	#105.aA	MA/P
3		]013-049	#106.a	MA/P
4		]031-041	#088.a	MA/M
5	 >< (or:  ><	]061-080-032[><; (or:]061-*046*-032[><;]061-*057*-032[><)	#092.a	MA/M
6		016-038-007-051	#090.a	MA/M
7		019-034	#109.a	MA/P
8		034-041-084	#089.b	MA/M
9		036-092[	#109.b	MA/P
10		042-013-009[	#091.a	MA/M
11		044-040[	#110.a	MA/P
12		044-049-023	#089.a	MA/M
13		051-051-051-041	#089.b	MA/M
14		064-096-•[	#087.a	MA/M
15		068-*016*[	#086.a	MA/M
16		068-061	#085.a	MA/M
17		070-031-034[	#091.b	MA/M

[31] Tsipopoulou and Hallager 1996a: 39–42, fig. 2; Tsipopoulou and Hallager 2010: 158, 178–81.

[32] Ibid.: 161, 178–81.

d) 4-sided bars

	CH sequence	Transnumeration	Document number	Provenance
1	[ ]  ><	[ ]049-061 ><	#063.b1	KN
2	[•] 	[•]-029-049	PE Hh 016.b (CB1)[33]	PE
3	[•]	[•]-*080*-*057*-070	PE Hh 017a (CB2)[34]	PE
4	]•• [>< (or:]•  [>< or]• [><)	]•-•-057-*023*[>< (or:]•-*030*-057-*023*[>< or:]•-*040*-057-*023*[><)	#114.d	MA/P
5	]• 	]•-013-060	#115.b	MA/P
6	]• 	]•-034-056	#061.b	KN
7	] •	]•-042-049-016-016-077	#112.a	MA/P
8	] • 	]•-056-077	#113.b2	MA/P
9	] • 	]•-058-031-056	#053.aB	KN
10	] ••  [><	]•-070-007-•[><	#114.a	MA/P
11	] 	]*002*-061	#112.c	MA/P
12	] 	]005-063	#066.c	KN
13	]  ><	]006-057-092 ><	#063.a1	KN
14	]	]023-032	#061.a	KN
15	] 	]*029*-049	#054.d	KN
16	] 	]*029*-070	#052.d	KN
17	]	]031-021-061	#059.cB	KN
18	]  [>< (or:]  [><)	]*033*-018-070[>< (or:]*033*-018-070-•[><)	#055.a	KN
19	]  >?	]035-053-034 >?	#115.a	MA/P
20	]	]040-013	#113.cB	MA/P
21	] 	]041-006	#063.a2	KN
22	] 	]*042*-054-061	#062.cB, #062.*dB*	KN
23	]	]042-056-031	#061.a	KN
24	] 	]042-061	#054.a	KN
25	] 	]042-063-060	#112.d	MA/P
26	] [><	]053-006[><	#063.d2	KN
27	] 	]*054*-061	#062.a	KN
28	]  ><	]055-*020*[ ]011-*040* ><	#117.a	MA/P
29	]  (or:] )	]*057*-*023*[(or:]*057*)	#114.c	MA/P
30	]  ><	]*057*-053 ><	#063.b1	KN
31	]  [><	]070-013-•[><	#114.b	MA/P
32	] [ ] ><	]*070*-058[ ] ><	#055.b	KN
33	] 	]077-042-049-016-016-056-077	#112.b	MA/P
34	] 	]*092*-049	#061.d	KN
35		008-070-060	#112.d	MA/P
36	 [	008-070[	#113.d	MA/P

[33] Tsipopoulou and Hallager 2010: 161, 178–81. [34] Ibid.: 162, 178–81.

	CH sequence	Transnumeration	Document number	Provenance
37		*009*-054-061-•[	#060.c	KN
38		*010*-070-005	#058.c	KN
39		011-006-092-033	PE Hh 016c (CB1)[35]	PE
40		011-029-037	#057.d	KN
41		012-050	#113cA	MA/P
42		016-057-*013*-074-075	#053.c	KN
43		019-040-061	#049.c	KN
44		022-056-070-061	#059.*dB**	KN
	(or: [ ])	(or: [ ]056-070-061)		
45		025-056-005	PE Hh 016d (CB1)[36]	
46		026-061	#056.c	KN
47		028-•-*049*	#049.a	KN
48		028-029-002	#059.bA	KN
49		028-038-002	#058.d	KN
50		028-040-004	#049.d	KN
51		028-049-*007*-042[	#059.dB	KN
52		028-049-041-003	#053.aA	KN
53		028-049-041-003[	#060.a	KN
54		028-049-049	#059.aA	KN
55		033-047	#065.c	KN
56		034-*002*	#058.c	KN
57		034-056	#049.c	KN
58		034-056-019-049	#061.d	KN
59		*036*-031	#112.d	MA/P
60		037-011-029	#061.b	KN
61		038-*054*-034	#057.c	KN
62		038-071-066-070	#059.aB	KN
63		039-070-086	PE Hh 016b (CB1)[37]	PE
64		040-029-*078*[•]	PE Hh 016c.2[38]	PE
65		040-057	#118.b	MA/P
66		042-023-041	PE Hh 016a (CB1)[39]	PE
67		042-029-032-011	#057.a	KN
68		042-034-049	#062.a	KN
69		042-049-016-016[	#113.cA	MA/P
70		042-054-061	#050.a, #058.a	KN
71		042-056-031	#061.a	KN
72		042-057-038	#056.dA	KN
73		042-057-070	#056.b	KN
74		042-066-077-042	#095.a	MA/M
75		044-005	#059.aA	KN

[35] Ibid.: 161, 178–81. [36] Tsipopoulou and Hallager 2010: 161, 178–81.
[37] Ibid. [38] Ibid. [39] Ibid.

	CH sequence	Transnumeration	Document number	Provenance
76		044-049	#049.a, #049.b, #050.c, #056.aA, #056.<aB>*, #056.b-e, #056.dB, #059.dA	KN
77		044-049[	#059.cB, #063.a2	KN
78		*046*-063	#049.a	KN
79	(or:)	*047*-002-061 (or: *073*-002-061)	#113.a	MA/P
80		047-053	#065.a	KN
81		047-070-031	#058.b	KN
82		049-021-061	#050.d	KN
83		049-038[	#113.a	MA/P
84	 (or:)	050-070-•-•-019 (or: 050-070-*023-013*-019)	#113.b1	MA/P
85		050-070-*013*-063-038	#112.c	MA/P
86		056-005	PE Hh 016a[40]	PE
87		056-070	#118.a	MA/P
88		056-070-070	#061.e	KN
89		057-013-049	#054.a	KN
90		057-023	#049.b	KN
91		057-023-042-063-060	#113.d	MA/P
92		057-069	#050.b	KN
93		057-070-061-005-019	#112.a	MA/P
94		057-092-061	#052.b	KN
95		058-*002*	#053.e	KN
96		060-*013*	#059.bA	KN
97		061-062-042	#095.b	MA/M
98		062-013-057-041	PE Hh 016a[41]	PE
99		063-047-061-031	#052.a	KN
100		070-019-*009*	#061.c	KN
101		070-031-019	#054.e, #056.aA	KN
102		072-049	#059.dA, #065.d	KN
103		072-049-071-050-005-063	#065.a	KN
104		073-090	#113.b2	MA/P
105		078-032-034	#058.b	KN
106		078-032-070-*023-045*	#058.d	KN
107		079-032-013	#057.b	KN
108		088-003	#049.d	KN
109		092-031	#065.b, #067.c	KN
110		092-036[	#059.dA	KN

[40] Tsipopoulou and Hallager 2010: 161, 178–81.

[41] Ibid.

e) Tablets

	CH sequence	Transnumeration	Document number	Provenance
1	] 𐄁𐄐[><	]*073*-070[><	#069.*r*.2	KN
2	𐄇𐄈𐄂	008-019-013	#120.*v*.A	MA/P
3	𐄃𐄉𐄋𐄁[(or: 𐄃𐄉𐄋)	038-031-025-*073*[(or: 038-031-025)	#120.*r*.B	MA/P
4	𐄃𐄁𐄁	038-*047*-*047*	#122.*r*.1	PH
5	𐄌𐄎𐄏	042-056-035	#119.*l.i.*	MA/P
6	𐄍𐄊𐄎	050-057-056	#119.*r*., #120.*v*.B	MA/P
7	𐄋𐄎𐄍𐄐	068-009-056-050-070	#119.*v*.	MA/P
8	𐄁𐄍𐄂	073-049-013	#119.*r*., #120.*r*.A	MA/P

f) Cones

	CH sequence	Transnumeration	Document number	Provenance
1	𐄋𐄎𐄐𐄑	022-056-070-061	#071	MA/M
2	𐄌𐄒𐄔𐄓 o	042-034-*007*-040 o	#070	MA/M

2) Cretan Hieroglyphic sequences attested on seals

a) 1-face seals

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
1	] 𐄆𐄉[><	]042-*054*[><	#189	1fS (*Petschaft*)	MA/M
2	𐄀𐄃 o	016-019-056 o	#193	1fS (*Petschaft*)	ZIROS
3	𐄁𐄅𐄇 o	019-013-040 o	#192	1fS (*Petschaft*)	<NEAPOLIS>
4	𐄁𐄈𐄉 ><	*019*-057-029 ><	#190	1fS (*Petschaft*)	MESARA
5	𐄁𐄑	019-061	#196° (𐄁{{𐄊}})	1fS (half-ovoid)	GORTIS
6	𐄊𐄑𐄍𐄉 o	028-061-049-047 o	#186	1fS (*Petschaft*)	KALO HORIO
7	𐄉𐄋𐄌𐄎>< (or: 𐄉𐄋𐄌𐄎><)	029-041-056-038-*077* >< (or: 029-041-056-*077*-038 ><)	#200	1fS (half-cylinder concave)	MA
8	𐄈𐄀𐄑	031-021-061	#197	1fS (half-ovoid)	MA/M
9	𐄃𐄅𐄍[	036-040-*049*[	#191	1fS (*Petschaft*)	MOHLOS
10	𐄆𐄐	038-010	#181	1fS (*Petschaft*)	CR (?)
11	𐄆𐄐𐄈	038-010-031	#195	1fS (half-ovoid)	CR (?)
12	𐄆𐄒𐄊 ><	038-070-011 ><	#183	1fS (*Petschaft*)	CR (?)

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
13	 (or:)	042-019-•-• (or: 042-019-*019-095*)	#201	1fS (cylinder seal)	CR (?)
14		044-005	#194	1fS (half-ovoid)	CR
15	 ><	044-*013*-070 ><	#184	1fS (*Petschaft*)	CR (?)
16		044-049	#180	1fS (*Petschaft*)	CR
17		044-*049*[	#188	1fS (*Petschaft*)	MA/M
18	 ><	049-016 ><	P.TSK06/145	1fS (*Petschaft*)	PE
19		053-008 ><	#187	1fS (figural seal, jug)	MA
20	o	056-025-029-011 o	#182	1fS (*Petschaft*)	CR (?)
21		056-050	#180	1fS (*Petschaft*)	CR
22	 ><	070-056-057-011 ><	#185	1fS (*Petschaft*)	<CR (?)>
23	 ><	070-073 ><	#198	1fS (half-ovoid)	MIRABELO
24	 ><	077-016-033-049 ><	P.TSK06/145	1fS (*Petschaft*)	PE

b) 2-face seals

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
1		042-019-019-095-052	#202.α-*β*	2fS (discoid)	ARKH
			#203.α-β	2fS (discoid)	KN
			#205.α1-*2*	2fS (cushion seal)	CR
2		044-049	#207.β	2fS (wedge-shape seal)	MA/N
3		*092-073*[	#207.α	2fS (wedge-shape seal)	MA/N

c) 3- and 4-sided prisms

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
1	><	]•-•-•-*056*-011-• ><	#289.β	4sP	PK
2	] [ ] [><	]•-*062*[ ]*034-010*[><	#289.δ	4sP	PK
3	] [><	]•-092-056-034-•[><	#289.γ	4sP	PK
4		•-056-*061-077*	#294.γ1?	4sP	CR
5	] ><	]042-038 ><	#224.α	3sP	CR (?)
6	] [><	]044-*049*[><	#285.β	4sP	CR (?)

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
7	 (?)	004-050 (?)	P.TSK05/291.α	4sP	PE
8	 ><	006-041 ><	#246.β	3sP	KRITSA
9	 o	006-057-092 o	#243.β	3sP	CR
10	 ><	006-062-012 ><	#302.γ	4sP	CR (?)
11	 ><	006-070 ><	#268.γ	3sP	LAKONIA
12	 ><	008-*019-036* ><	#282.α°	4sP	PYR
	Possible alternative reading:  ><	008-*011-036* ><			
13		010-031	#254.α	3sP	CR
14		011-*010* ><	#304.γ	4sP	CR (?)
15	 ><	011-056 ><	#297.γ	4sP	CR
16	 ><	012-016-*062*-018 ><	#271.α	3sP	MA
17		012-070-048	#236.α	3sP	MA/V
18		013-050	#264.α	3sP	IRAKLIO
	Possible alternative reading: 	013-050-004			
19	 ><	014-050 ><	#300.d	4sP	CR (?)
20		016-045-056	P.TSK05/291.β	4sP	PE
21	 ><	*017*-050 ><	#234.α	3sP	MA/M
			#310.β° ({})	4sP	SITIA
22		018-046	#301.γ	4sP	CR (?)
23		019-*013*-049	#307.a	4sP	<MA/S>
24	 ><	019-031-061 ><	#273.β	3sP	MIRABELO
25	 ><	*019*-039-*038*-031 ><	#303.γ	4sP	CR (?)
26		025-025-•-•	#294.γ2?	4sP	CR
27	 (•?)(•?)	025-049(•?)040(•?)	#294.α?	4sP	CR
28		028-007-018 ><	#296.α	4sP	CR
29	><	028-049-042-031-056-036 ><	#255.β	4sP	CR
30		029-014-•[	#245.γ	3sP	CR (?)
31		029-077-049	#295.β	4sP	CR
32	 ><	031-006-034 ><	#276.β	3sP	PINAKIANO
33		031-021-061	P.TSK05/291.δ	4sP	PE
34	 ><	034-007 ><	#308.β	4sP	PK
35	 ><	036-010 ><	#297.β2	4sP	CR
36	 ><	036-013 ><	#304.β	4sP	CR (?)
37	 ><	036-038-*076* ><	#306.β	4sP	MA

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
38		036-092	#288.δ	3sP	MA/V
			#229.α	3sP	MA
			#263.α	3sP	CR (?)
			#265.γ	3sP	KASTELI
			#267.β	3sP	KY
			#299.γ	4sP	CR (?)
39		036-092-031	#254.γ, #257.β,	3sP	CR
			#258.β	3sP	CR
			#262.α°	3sP	CR?
			#272.β	3sP	MIRABELO
			#308.α	4sP	PK
			#309.δ	4sP	PYR
			#312.β	4sP	XIDA
			P.TSK05/259.β	4sP	PE
			#314.ζ	8sP	NEAPOLIS
40		038-008 ><	#297.β1	4sP	CR
41		038-010	#212.α, #214.α,	3sP	CR
			#253.α° ({}),	3sP	CR
			#258.α,	3sP	CR
			#260.β° ({})	3sP	CR?
			#228.b	3sP	<MA>
			#249.a	3sP	<SITIA>
			#265.α	3sP	KASTELI
			#268.β° ({})	3sP	LAKONIA
			#275.a ({{}})	3sP	<MIRABELO>
			#286.α	4sP	MA
			#288.α°	4sP	MA/V
			#311.α	4sP	SITIA
42		038-010-031	#218.γ, #261.β,	3sP	CR (?)
			#262.β°, #263.β	3sP	CR (?)
			#242.β,	3sP	CR
			#254.<α>*, #257.α	3sP	CR
			#248.α	3sP	PK
			#250.γ	3sP	ZA
			#269.α	3sP	LASITHI
			#272.α, #274.γ	3sP	MIRABELO
			#279.γ, #284.β,	4sP	CR (?)
			#299.δ, #300.b,	4sP	CR (?)
			#302.δ	4sP	CR (?)
			#293.β	4sP	ADROMILI
			#298.γ	4sP	CR

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
			#309.γ	4sP	PYR
			P.TSK05/259.γ	4sP	PE
			#312.α	4sP	XIDA
43	 ><	038-*010-034* ><	#239.α	3sP	PRESOS
	Possible alternative reading:				
	 ><	038-*036-034* ><			
44	 ><	038-031-010-061 ><	#270.γ?	3sP	LASITHI
45	 o	038-043-049 o	#256.α-β-γ	3sP	CR
46	 ><	039-013 ><	#304.α° ( {{}}><)	4sP	CR (?)
47	 ><	039-056-*014* ><	#306.γ	4sP	MA
	Possible alternative reading:				
	 ><	039-056-*013* ><			
48		041-*025-065* ><	P.TSK13/1485.γ	3sP	PE
	Possible alternative reading:				
		041-*025*			
49	 ><	041-*031*-011 ><	#271.β	3sP	MA
50	 ><	041-031-044 ><	#307.d?	4sP	<MA>
51		042-019-019-095-052	#251.β-*α*, #252.β-*α*	3sP (gable-shaped prisms)	ARKH
			#292.α-*γ*	4sP (stepped prism)	GOUVES
52		042-019-031	#301.δ	4sP	CR (?)
53	 ><	042-019-070-009 ><	#222.b	3sP	<CR (?)>
	Possible alternative reading:				
	 ><	042-019-009-070 ><			
54	 ><	042-028-005 ><	#280.α	4sP	MA
55	 ><	042-038 ><	#276.α	3sP	PINAKIANO
			#310.δ	4sP	SITIA
56		042-*038*	VRY S (4/4) 01.δ	4sP	VRY
	Possible alternative reading:				
		042-•			
57		042-040-053-041	#309.β	4sP	PYR

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
58		042-054-061	#293.γ	4sP	ADROMILI
			#303.β	4sP	CR (?)
59	 ><	042-066-016-062 ><	#305.α	4sP	LASTROS
60	 >?	043-009 >?	#265.β	3sP	KASTELLI
61		044-005	#246.α	3sP	KRITSA
			#247.γ° ({{}}x)	3sP	MA
			#250.α	3sP	ZA
			#253.γ, #254.β,	3sP	CR
			#283.α1	3sP	CR
			#259.β-γ,	3sP	CR (?)
			#261.α, #262.γ°	3sP	CR (?)
			({}),	3sP	
			#263.γ, #287.δ	3sP	CR (?)
			#264.γ°	3sP	IRAKLIO
			({})	3sP	
			#266.a	3sP	<KORDIKAKIA>
			#268.α° ({})	3sP	LAKONIA
			#274.β	3sP	MIRABELO
			#276.γ1*	3sP	PINAKIANO
			#277.α	3sP	ZIROS
			#288.β° ({})	3sP	MA/V
			#295.δ	4sP	CR
			({{}}),		
			#297.δ2°	4sP	CR
			({}), #298.δ1	4sP	CR
			#299.β, #301.β	4sP	CR (?)
			#305.γ	4sP	LASTROS
			#308.δ	4sP	PK
			#309.α	4sP	PYR
			#311.γ	4sP	SITIA
62		044-*005*	VRY S (4/4) 01.α	4sP	VRY
	Possible alternative readings:				
		044-*073*			
		044-•			
63	><	044-025-049 ><	#266.b	3sP	<KORDAKIA>
64		044-036-018	#255.α	4sP	CR
			#300.c	4sP	CR (?)
			P.TSK12/1249.α	3sP	PE
65		044-036-*018*	P.TSK14/2604.β	3sP	PE

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
66	𐄁𐄑	044-049	#208.α	3sP	AVDOU
			#209.α, #210.α,	3sP	CR
			#211.α, #213.α,	3sP	CR
			#253.β, #258.γ	3sP	CR
			#215.α, #216.α,	3sP	CR (?)
			#217.β, #219.β,	3sP	CR (?)
			#220.α, #221.β,	3sP	CR (?)
			#223.γ, #244.α,	3sP	CR (?)
			#259.β-α?, #260.α,	3sP	CR (?)
			#261.γ	3sP	CR (?)
			#226.α, #270.β?	3sP	LASITHI
			#227.α	3sP	LITHINES
			#231.α, #233.α,	3sP	MA/M
			#235.α	3sP	MA/M
			#237.α, #274.α° ({𐄖}𐄁𐄑)	3sP	MIRABELO
			#230.a° ({𐄇}𐄁𐄑),	3sP	MA
			#247.β	3sP	MA
			#240.α° ({𐄐}𐄁𐄑),	3sP	SITIA
			#249.b	3sP	SITIA
			#264.β°	3sP	IRAKLIO
			#266.c	3sP	<KORDAKIA>
			#276.γ2*	3sP	PINAKIANO
			#277.γ	3sP	ZIROS
			MA/V S (1/3) 02	3sP	MA/V
			#283.α2, #295.α,	4sP	CR
			#296.γ, #297.δ1,	4sP	CR
			#298.δ2	4sP	CR
			#278.γ° (𐄁{𐄉}𐄑),	4sP	CR (?)
			#284.α, #287.α,	4sP	CR (?)
			#299.α, #300.a,	4sP	CR (?)
			#301.α, #302.α*,	4sP	CR (?)
			#303.δ	4sP	CR (?)
			#290.β, #311.δ	4sP	SITIA
			#293.δ	4sP	ADROMILI
			#305.β	4sP	LASTROS
			#308.γ° (𐄁𐄑{𐄝})	4sP	PK
			VRY S (4/4) 01.β	4sP	VRY
67	𐄃𐄁	046-044	#255.γ, #257.γ	3sP	CR
			#269.γ	3sP	LASITHI
			#275.b	3sP	<MIRABELO>
			#302.β	3sP	CR (?)
			#310.γ (𐄃𐄁{{𐄞}})	4sP	SITIA

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
68		047-049-*013* ><	#312.γ	4sP	XIDA
69		047-070 ><	#286.β	4sP	MA
70		049-*049*[	#269.β	3sP	LASITHI
71		049-072 ><	VRY S (4/4) 01.γ	4sP	VRY
72		050-011	#267.γ	3sP	KY
73		050-019 ><	#297.α	4sP	CR
74		051-031-005	#290.γ	3sP	SITIA
75		052-050-054 ><	#306.α	4sP	MA
76		053-038-039 ><	#296.β	4sP	CR (S)
77		054-005-050 ><	#273.α	3sP	MIRABELO
78		054-010-054	#267.α	3sP	KY
79		056-013-058	#283.β	4sP	CR
80		056-059 ><	#242.α	3sP	CR
81		056-070-040	#298.α	4sP	CR
82		057-018-050 ><	#306.δ	4sP	MA
83		057-023 ><	#243.γ	3sP	CR
84	 Possible alternative reading: plus 	057-034-044-049 > 057-034 + 044-049><	#302.α	4sP	CR (?)
85		057-034-056	#238.α	3sP	MOHLOS
			#244.*β*, #260.γ	3sP	CR (?)
			#248.β	3sP	PK
			P.TSK05/259.δ	3sP	PE
			#281.*β*	4sP	MA
			#295.*γ*, #296.δ	4sP	CR
			#310.α	4sP	SITIA
86		059-057-*014*-041-019-047-070-	#294.β(1)	4sP	CR
87		060-044-056 ><	#271.γ	3sP	MA
88		062-020-028	#303.α	4sP	CR (?)
89		*068*-009-011 ><	#225.α?	3sP	CR (?)
90		*068*-010-011-020 ><	#272.γ	3sP	MIRABELO
91		070-005-050 ><	#273.γ	3sP	MIRABELO
92		070-028-031 >?	#307.b?	4sP	<MA>
93		070-031-056 ><	#307.c?	4sP	<MA>
94		070-038 ><	#270.α?	3sP	LASITHI
95		070-061-019-045-070	#298.β	4sP	CR
96		070-061-069 ><	#287.β	3sP	CR (?)
97		076-013	#312.δ	4sP	XIDA

	CH sequence	Transnumeration	Document number	Seal typology	Provenance
98	 ><	076-013-031 ><	#304.δ	4sP	CR (?)
99	 ><	077-016-033 ><	#290.δ	3sP	SITIA
100	 ><	*077*-038 ><	#293.α	4sP	ADROMILI
101	 ><	077-*051* ><	P.TSK12/1249.β	3sP	PE
102	 ><	092-019-013 ><	#277.β	3sP	ZIROS
103		092-019-044-050-019-028-056	#294.β (2)	4sP	CR
104	><	092-057(•?)034(•?)016-056 ><	#294.δ?	4sP	CR
105		*094-036*-•	#241.α?	3sP	SITIA
106	 ><	*094-038* ><	#251.γ?	3sP (gable-shaped prism)	ARKH

d) Other seals (*varia*)

	CH sequence	Transnumeration	Document number	Document format	Provenance
1		018-043	#314.*η*2, #314.θ1	8sP	NEAPOLIS
2		036-092-031	#314.ζ	8sP	NEAPOLIS
3		038-010-031	#314.ε	8sP	NEAPOLIS
4		042-019-019-095-052	#313.α-*β* #315.I-*H* KN S (4/4) 01	4fS (cube) 6fS (4-sided bar) 4fS (irregular cushion)	MONI OD. ARKH KN
5		044-005	#314.<θ2>	8SP	NEAPOLIS
6		044-049	#314.β, #314.η1	8sP	NEAPOLIS
7		046-044	#314.δ° ({{}})	8sP	NEAPOLIS
8		050-007-018	#314.γ	8sP	NEAPOLIS
9		050-031-034	#314.α	8sP	NEAPOLIS

3) Cretan Hieroglyphic sequences attested on seal impressions

	CH sequence	Transnumeration	Document number	Document format	Provenance
1	] ><	]*028*-020-041 ><	#160	impression (crescent) from 4sP	KN
2	] [0	]042-*049-050*[0	#178	impression (flat-based nodule) from ?sP	KN
3	0	*008*-053-017 0	#128	impression (*nodulus*) from 1fS	MA/M

	CH sequence	Transnumeration	Document number	Document format	Provenance
4		008-056-070 0	#132	impression (vase handle) from 1fS	MA/M
5		009-056-061	#156	impression (*nodulus*) from 4sP	KN
6		009-077-013-020	#139	impression (*nodulus*) from 3sP	KN
7		010-092-028 ><	#172	impression (crescent) from 4sP	MA/M
8		011-038-016 ><	#148	impression (*nodulus*) from 3sP	MA/M
9		018-039-005 0	#142	impression (crescent) from 3sP	KN
10		019-047[	#176	impression (crescent) from ?sP	KN
11		031-021-061	#149	impression (crescent) from 3sP	MA/M
12		036-047-009-056-062 ><	#126	impression (*nodulus*) from 1fS	MA/M
13		036-092	#131	impression (*nodulus*) from 1fS	MA/M
			#150*bis*	impression (amphora handle) from 3sP	PE
14		038-010-031	#162	impression (crescent) from 4sP	KN
			#169	impression (direct sealing) from 4sP	KN
15		038-049-*013-077* ><	#164	impression (flat-based nodule) from 4sP	KN
16		040-029-029 ><	#124	impression (crescent) from 1fS	KN
17		042-019	#134	impression (two-hole hanging nodule) from 2fS (cushion seal)	KN
			#135, #136	impressions (roundels) from 2fS (cushion seals)	SAM
			#137	impression (*nodulus*) from 2fS (cushion seal)	SAM
18		*042*-019	#137*bis*	impression (*nodulus*) from 2fS (cushion seal)	SAM
19		042-019-019-*095*[	#179	impression (flat-based nodule) from ?fS	KN

	CH sequence	Transnumeration	Document number	Document format	Provenance
20	 Possible alternative reading:	042-*020* > 042-• ><	#143	impression (crescent) from 3sP	KN
21		042-038 ><	#154	impression (flat-based *nodulus*) from 3/4sP	MA/P
22	 o	042-040-049 o	#129	impression (*nodulus*) from 1fS	MA/M
23	o	042-052-*034*-045 o	#125	impression (direct sealing) from 1fS	KN
24		042-053 ><	#151?	impression (direct sealing) from 3sP	PH
25		042-070-038 ><	#163	impression (crescent) from 4sP	KN
26		042-070[><	#168	impression (crescent) from 4sP	KN
27		044-005	#138° ()	impression (flat-based nodule) from 2fS	ZA
			#140° (),	impression (crescent) from 3sP	KN
			#144, #145° (),	*idem*	KN
			#147° (),	*idem*	KN
			#158° (), #165	*idem*	KN
			#174° ()	impression (spindle whorl) from 4sP	PK
28		044-049	#150	impression (amphora handle) from 3sP	MA/M
			#157° ()	impression (direct sealing) from 4sP	KN
			#159, #161	impressions (crescents) from 4sP	KN
			#170	Impression (direct sealing) from 3sP	KN
29		049-052-*044*-[•] ><	PE I 01	impression (direct sealing) from 3sP?	PE
30		049-070-070 ><	#167	impression (direct sealing) from 4sP	KN
31	o	052-054-*038* o	#130	impression (*nodulus*) from 1fS	MA/M

	CH sequence	Transnumeration	Document number	Document format	Provenance
32		054-010 ><	#155	impression (one-hole hanging nodule) from 4sP	HT
33		054-044 ><	#152	impression (flat-based nodule) from 3sP	ZA
34		056-047-031	#166	impression (crescent) from 4sP	KN
35		057-034-056	#173	impression (direct sealing) from 4sP	MA/M
36		062-040 ><	#127	impression (*nodulus*) from 1fS	MA/M
			#171	impression (*nodulus*) from 4sP	MA/M
37		063-031 ><	#141° ()	impression (crescent) from 3sP	KN
38		070-019 ><	#133*bis*	impression (vase handle) from ?sP	PYR
39	o	070-028-041 o	#133° ()	impression (vase handle) from 1fS	PYR
40		092-058 ><	#123	impression (crescent) from 1fS	KN

4) Cretan Hieroglyphic sequences attested on other writing supports

	CH sequence	Transnumeration	Document number	Document format	Provenance
1		•[ ]-*010*-049	KATALIMATA Yb 01	Chamaizi vase	KATALIMATA
2		]029-064-•[><	#330	vase handle	MA/V
3		]042-028[	#330*bis*	amphora handle	MA
4		]056-070 ><	#321	vase fragment	MA/M
5		]*088*-087-070-027 ><	#319	pithos lid	MA/M
6	Possible alternative reading: 	*008*-068 *096*-068	#322	Chamaizi vase	MA/M
7		023-025-003[	MA/V Yb 04	vase	MA
8		-025-019-051-070-094-	#328 (2)	libation table	MA

	CH sequence	Transnumeration	Document number	Document format	Provenance
9		-034-056-077-049-038-029	#328 (3)	libation table	MA
10		041-059-025 >?	#320	vase base	MA/M
11		042-003[	GO Yb 01	potter's wheel	MA
12	Possible alternative readings:	042-057-*010*-034-028-*093-065* ><	#317	pithos	MA/M
	or	042-057-*010*-034-028-*031-065* ><			
	or	042-057-*010*-034-028-*049-065* ><			
		042-057-*088*-034-028-*093-065* ><			
13		049-041-006-025	#316	Chamaizi vase	MA/M
14		049-041-006-*057*	#327	Chamaizi vase	MA/P
15		049-042	#329	Chamaizi vase base	MA/V
16	Possible alternative reading:	*051*-092-092 ><	#318	plate	MA/M
		037-092-092 ><			
17		057-023-070-018	#324	Chamaizi vase	MA/N
18		*062*-034-002-056-070-	#328(1)	libation table	MA
19		042-091	#331	Chamaizi vase	<PRODR.>

Index III Cretan Hieroglyphic Sequences Attested More Than Two Times on Different Media

Legend: CR (crescent-shaped nodule); MED (medallion); 2sL (2-sided lame); 4sB (4-sided bar); TAB (tablet); 1 or 2fS (1- or 2-face seal); 3, 4 or 8sP (3-, 4- or 8-sided prism).

a) 'Formulae' (attested more than five times)

	Clay documents				Impressions from:					1- and 2-face seals		Prisms		*Varia*
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1IF	2IF	3F	4F	
 (Evans 18-3; *CHIC* 044-049; Poursat formula n. 1) 'trowel-arrow'		#040. b1#042. b1		#049.a #049.b #050.c #056.aA #056.<aB>* #056.b-e #056.dB #059.dA #059.cB? #063.a2?		-	-	#150	#157 #159 #161 #170	#180 #188	#207.β	#208.α #209.α #210.α #211.α #213.α #215.α #216.α #217.β #219.β #220.α #221.β #223.γ #226.α #227.α #230.a #231.α #233.α #235.α #237.α #240.α #244.α #247.α #249.b #253.β #258.γ #259.β-α #260.α #261.γ #264.β #266.c #270.β #274.α #276.γ2 #277.γ MA/V S (1/3) 02	#278.γ #283. α2 #284.α #285.β #287.α #290.β #293.δ #295.α #296.γ #297. δ1 #298. δ2 #299.α #300.a #301.α #303.δ #305.β #308.γ #311.δ VRY S (4/4) 01.β	#314.β, #314. η1
Tot. attest.: 76	**-**	**(2)**	**-**	**(10)**	**-**	**-**	**-**	**(1)**	**(4)**	**(2)**	**(1)**	**(35)**	**(19)**	**(2)**

	Clay documents					Impressions from:				1- and 2-face seals		Prisms		*Varia*
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1IF	2IF	3F	4F	
(Evans 18-5; *CHIC* 044-005; Poursat formula n. 2) 'trowel-eye'	#018.γ	-	-	#059.aA	-	-	#138	#140 #144 #145 #147	#158 #165 #174	#194	-	#246.α #247.γ #250.α #253.γ #254.β #259.β-γ #261.α #262.γ #263.γ #264.γ #266.a #268.α #274.β #276. γ1 #277.α	#283.α1 #287.δ #288.β #295.δ #297. δ2 #298.δ1 #299.β #301.β #305.γ #308.δ #309.α #311.γ VRY S (4/4) 01.α	#314. <θ2>
Tot. attest.: 40	**(1)**	**-**	**-**	**(1)**	**-**	**-**	**(1)**	**(4)**	**(3)**	**(1)**	**-**	**(15)**	**(13)**	**(1)**

	Clay documents					Impressions from:				1- and 2-face seals		Prisms		*Varia*
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1IF	2IF	3F	4F	
𐄁 (Evans 41-11; *CHIC* 038-010; Poursat formula n. 3a) 'gate-leg'	-	-	-	-	-	-	-	-	-	#181	-	#212.α #214.α #228.b? #249.a #253.α #258.α #260.β #265.α #268.β #275.a	#286.a #288.a #311.*a*	-
Tot. attest.: 14	-	-	-	-	-	-	-	-	-	**(1)**	-	**(10)**	**(3)**	-
𐄁𐄐 'gate-leg-flower' (Evans 41-11-92; *CHIC* 038-010-031; Poursat formula n. 3b)	-	-	-	-	-	-	-	-	#162 #169	#195	-	#218.γ #242.β #248.α #250.γ #257.α #261.β #262.β #263.β #269.α #272.α #274.γ	#279.γ #284.β #293.β #298.γ #299.δ #300.b #302.δ #309.γ #312.α P.TSK05/259.γ	#314.ε
Tot. attest.: 25	-	-	-	-	-	-	-	-	**(2)**	**(1)**	-	**(11)**	**(10)**	**(1)**

	Clay documents					Impressions from:				1- and 2-face seals		Prisms		*Varia*
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1IF	2IF	3F	4F	
 ‘throne-horn’ (Evans 19-30; *CHIC* 036-092 Poursat formula n. 4a)	-	-	#109.b	-	-	#131	-	#150 *bis*	-	-	-	#229 #263.α #265.γ #267.β #288.δ	#299.γ	
Tot. attest.: 9	-	-	**(1)**	-	-	**(1)**	-	**(1)**	-	-	-	**(5)**	**(1)**	-
 ‘throne-horn-flower’ (Evans 19-30-92; *CHIC* 036-092-031; Poursat formula n. 4b)	-	-	-	-	-	-	-	-	-	-	-	#254.γ #257.β #258.β #262.α #272.β	#308.α #309.δ #312.β P.TSK05/259.β	#314.ζ
Tot. attest.: 10	-	-	-	-	-	-	-	-	-	-	-	**(5)**	**(4)**	(1)

	Clay documents					Impressions from:				1- and 2-face seals		Prisms		*Varia*
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1IF	2IF	3F	4F	
 (*CHIC* 057-034-056; Poursat formula n. 5)						-	-	-	#173	-	-	#238.α #244.β #248.β #260.γ	#281.β #295.γ #296.δ #310.α	
Tot. attest.: 9	-	-	-	-	-	-	-	-	**(1)**	-	-	**(4)**	**(4)**	-

	Clay documents					Impressions from:				1- and 2-face seals		Prisms		*Varia*
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1IF	2IF	3F	4F	
 'adze-trowel' (Evans 21-18; *CHIC* 046-044; Poursat formula n. 6)	-	-	-	-	-	-	-	-	-	-	-	#255.γ #257.γ #269.γ #275.b	#302.β #310.γ	#314.δ
Tot. attest.: 7						-	-	-	-	-	-	**(4)**	**(2)**	(1)

	Clay documents					Impressions from:				1- and 2-face seals		Prisms		*Varia*
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1IF	2IF	3F	4F	
(*CHIC* 042-054-061; Poursat formula n. 7)	-	#037.a	-	#050.a #058.a	-	-	-	-	-	-	-	-	#293.γ #303.β	-
Tot. attest.: 5	**-**	**(1)**	**-**	**(2)**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**(2)**	**-**
(*CHIC* 042-038; Poursat formula n. 8)	-	-	-	-	-	#154	-	-	-	-	-	#224.α? #276.α	#310.δ VRY S (4/4) 01.δ	-
Tot. attest.: 5	**-**	**-**	**-**	**-**	**-**	**(1)**	**-**	**-**	**-**	**-**	**-**	**(2)**	**(2)**	**-**
(*CHIC* 042-019-019-095-052; Archanes formula)						-	#134 #135 #136 #137 #137*bis*	#179	-	-	#202.α-β, #203.α-β, #205α1-2	#251.β-α #252.β-α (gable-shaped prisms)	#292.α-*γ* (stepped prism)	#313.α-*β*, #315.I-*H*, KN S (4/4) 01
Tot. attest.: 15						**-**	**(5)**	**(1)**	**-**	**-**	**(3)**	**(2)**	**(1)**	**(3)**

b) Other sequences attested two times or more

	Clay documents					Impressions from:				1- and 2-face seals		Prisms	
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1FS	2FS	3F	4F
 031-021-061	-	-	-	#059.cB	-	-	-	#149	-	#197	-	-	P.TSK05/291
Tot. attest.: 4	-	-	-	(1)	-	-	-	(1)	-	(1)	-	-	(1)
044-036-018												P.TSK12/1249.α P.TSK14/2604.β? #255.α	#300.c
Tot. attest.: 4	-	-	-	-	-	-	-	-	-	-	-	**(3)**	(1)
011-056 ><	#024.γ #015.γ?		-		-	-	-	-	-	-	-		#297.γ
Tot. attest.: 3	**(2)**	-	-	-	-	-	-	-	-	-	-	-	(1)
 006-057-092	-	-	-	#063.a1	-	-	-	-	-	-	-	#243.β	-
Tot. attest.: 2	-	-	-	(1)	-	-	-	-	-	-	-	(1)	-
009-056-061	#018.β								#156				
Tot. attest.: 2	(1)	-	-	-	-	-	-	-	(1)	-	-	-	-

	Clay documents					Impressions from:				1- and 2-face seals		Prisms	
	CR	MED	2sL	4sB	TAB	1FS	2FS	3FS	4FS	1FS	2FS	3F	4F
 009-077-013-020	#003.γ							#139					
Tot. attest.: 2	**(1)**	-	-	-	-	-	-	**(1)**	-	-	-	-	-
 057-023				#049.b								#243.γ	
Tot. attest.: 2	-	-	-	**(1)**	-	-	-	-	-	-	-	**(1)**	-
 056-047-031	-	#032.a	-	-	-	-	-	-	#166	-	-	-	-
Tot. attest.: 2	-	**(1)**	-	-	-	-	-	-	**(1)**	-	-	-	-
 028-049-041-003				#053. aA #060.a									
Tot. attest.: 2				**(2)**									

Index IV Sketch of Cretan Hieroglyphic Sequence Typologies of Two or More Signs on Seals[42]: Formulae and Non-Formulaic Sign Groups (Disregarding Face Numeration and the Relative Position of the Sequences on Prism Faces)

Legend: I.F. = inscribed faces; D.M. = decorative motive; Arch.f. = Archanes formula; *h* = *hapax*; bold* = non-formulaic sequence attested two or more times.

Seal	I.F.	Sequence n. 1	Sequence n. 2	Sequence n. 3	Sequence n. 4
#181	1/1	formula (𐄁)			
#188	1/1	formula (𐄁)			
#194	1/1	formula (𐄁)			
#195	1/1	formula (𐄁)			
#201	1/1	Arch.f. (𐄁)			
#180	1/1	formula (𐄁)	non-formulaic (*h*)		
#197	1/1	**non-formulaic (*)**[43]			
#182	1/1	non-formulaic (*h*)			
#183	1/1	non-formulaic (*h*)			
#184	1/1	non-formulaic (*h*)			
#185	1/1	non-formulaic (*h*)			
#186	1/1	non-formulaic (*h*)			
#187	1/1	non-formulaic (*h*)			
#189	1/1	non-formulaic (*h*)			
#190	1/1	non-formulaic (*h*)			
#191	1/1	non-formulaic (*h*)			
#192	1/1	non-formulaic (*h*)			
#193	1/1	non-formulaic (*h*)			
#196	1/1	non-formulaic (*h*)			
#198	1/1	non-formulaic (*h*)			
#200	1/1	non-formulaic (*h*)			
P.TSK06/145	1/1	non-formulaic (*h*)			
#202	2/2	Arch.f. (𐄁)	𐄁)		
#203	2/2	Arch.f. (𐄁)	𐄁)		
#205	2/2	Arch.f. (𐄁)	D.M.		
#207	2/2	formula (𐄁)	non-formulaic (*h*)		
#204	2/2	non-formulaic (*h*)	?		
#208	1/3	formula (𐄁)	D.M.	D.M.	
#209	1/3	formula (𐄁)	D.M.	D.M.	

[42] #206 (cushion seal) and #291 (stepped 4-sided prism), inscribed with klasmatograms and logograms only, are not included.

[43] 𐄁 (031-021-061), attested on #149 (impression from 3sP on crescent from MA/M), on P.TSK05/291.δ (4sP from Petras) and on #059.cB (4sB from Knossos).

Seal	I.F.	Sequence n. 1	Sequence n. 2	Sequence n. 3	Sequence n. 4
#210	1/3	formula ()	D.M.	D.M.	
#211	1/3	formula ()	D.M.	D.M.	
#213	1/3	formula ()	D.M.	D.M.	
#215	1/3	formula ()	D.M.	D.M.	
#216	1/3	formula ()	D.M.	D.M.	
#217	1/3	formula ()	D.M.	D.M.	
#219	1/3	formula ()	D.M.	D.M.	
#220	1/3	formula ()	D.M.	D.M.	
#221	1/3	formula ()	D.M.	D.M.	
#223	1/3	formula ()	D.M.	D.M.	
#226	1/3	formula ()	D.M.	D.M.	
#227	1/3	formula ()	D.M.	D.M.	
#230	1/3	formula ()	D.M.	D.M.	
#231	1/3	formula ()	D.M.	D.M.	
#237	1/3	formula ()	D.M.	D.M.	
#240	1/3	formula ()	D.M.	D.M.	
#233	1/3	formula ()	D.M.	anepigraph	
#235	1/3	formula ()	?	D.M.	
MA/V S (1/3) 02	1/3	formula ()	?	?	
#212	1/3	formula ()	D.M.	D.M.	
#214	1/3	formula ()	D.M.	D.M.	
#228	1/3	formula ()	D.M.	D.M.	
#218	1/3	formula ()	D.M.	D.M.	
#229	1/3	formula ()	D.M.	D.M.	
#238	1/3	formula ()	D.M.	D.M.	
#234	1/3	**non-formulaic (*)**[44]	D.M.	anepigraph	
P.TSK14/2604	1/3	**non-formulaic (*)**[45]	D.M.	D.M.	
#224	1/3	non-formulaic (*h*)	D.M.	D.M.	
#225	1/3	non-formulaic (*h*)	D.M.	D.M.	
#236	1/3	non-formulaic (*h*)	D.M.	D.M.	
#239	1/3	non-formulaic (*h*)	D.M.	D.M.	
#241	1/3	non-formulaic (*h*)	D.M.	D.M.	
#222	1/3?	non-formulaic (*h*)	D.M.	?	
P.TSK13/1485	1/3	non-formulaic	D.M.	D.M.	
#246	2/3	formula ()	non-formulaic (*h*)	D.M.	
#242	2/3	formula ()	non-formulaic (*h*)	D.M.	
#247	2/3	formula ()	formula ()	D.M.	
#249	2/3	formula ()	formula ()	D.M.	

[44]  (017-050 ><), possibly attested on #310.β, 4sP from Sitia, as well ({}).

[45]  (044-036-018), attested on #255.α and #300.c, 4sP from Crete and on P.TSK12/1249.α, 3sP from Petras.

Seal	I.F.	Sequence n. 1	Sequence n. 2	Sequence n. 3	Sequence n. 4
#244	2/3	formula (…)	formula (…)	D.M.	
#250	2/3	formula (…)	formula (…)	D.M.	
#248	2/3	formula (…)	formula (…)	D.M.	
P.TSK12/1249	2/3	**non-formulaic (*)**[46]	non-formulaic (*h*)	D.M.	
#243	2/3	**non-formulaic (*)**[47]	non-formulaic (*h*)	D.M.	
#245	2/3	non-formulaic (*h*)	D.M.	?	
#251	*3/3*	Arch.f. (…	…)	non-formulaic (*h*)	
#252	*3/3*	Arch.f. (…	…)	non-formulaic (*h*)?	
#256	3/3	non-formulaic (*h*)			
#270	3/3	formula (…)	non-formulaic (*h*)	non-formulaic (*h*)	
#267	3/3	formula (…)	non-formulaic (*h*)	non-formulaic (*h*)	
#255	3/3	formula (…)	**non-formulaic (*)**[48]	non-formulaic (*h*)	
#259	3/3	formula (…	…	…)	
#266	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#277	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#264	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#268	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#254	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#272	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#269	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#265	3/3	formula (…)	formula (…)	non-formulaic (*h*)	
#275	3/3	formula (…)	formula (…)	non-formulaic?	
#274	3/3	formula (…)	formula (…)	formula (…)	
#261	3/3	formula (…)	formula (…)	formula (…)	
#253	3/3	formula (…)	formula (…)	formula (…)	
#260	3/3	formula (…)	formula (…)	formula (…)	
#258	3/3	formula (…)	formula (…)	formula (…)	
#257	3/3	formula (…)	formula (…)	formula (…)	
#263	3/3	formula (…)	formula (…)	formula (…)	
#262	3/3	formula (…)	formula (…)	formula (…)	
#276	3/3	formulae (…)	formula (…)	non-formulaic (*h*)	
#271	3/3	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)	
#273	3/3	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)	
#278	1/4	formula (…)	D.M.	anepigraph	anepigraph
#279	1/4	formula (…)	D.M.	D.M.	D.M.
#281	1/4	formula (…)	D.M.	D.M.	D.M.
#280	1/4	non-formulaic (*h*)	D.M.	D.M.	D.M.

46 … (044-036-018); cf. n. 45.

47 … >< (057-023 ><), attested on a 4sB from Knossos (#049.b).

48 … (044-036-018); cf. n. 45.

Seal	I.F.	Sequence n. 1	Sequence n. 2	Sequence n. 3	Sequence n. 4
#282	1/4	non-formulaic (*h*)	D.M.	D.M.	D.M.
#285	2/4	formula (𐄀𐄁)	non-formulaic (*h*)	anepigraph	anepigraph
#286	2/4	formula (𐄃)	non-formulaic (*h*)	D.M.	D.M.
#284	2/4	formula (𐄀𐄁)	formula (𐄃𐄂)	D.M.	D.M.
#283	2/4	formulae (𐄀𐄁 𐄀𐄅)	non-formulaic (*h*)	D.M.	D.M.
#290	3/4	formula (𐄀𐄁)	non-formulaic (*h*)	non-formulaic (*h*)	D.M.
#287	3/4	formula (𐄀𐄁)	formula (𐄀𐄅)	non-formulaic	D.M.
#288	3/4	formula (𐄃)	formula (𐄀𐄅)	formula (𐄇𐄈)	D.M.
P.TSK05/259	3/4	formula (𐄃𐄂)	formula (𐄇𐄈𐄂)	formula (𐄉𐄊𐄋)	D.M.
#289	3/4	D.M.	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)
#292	4/4	Arch.f. (𐄌𐄍)	𐄎𐄏)	klasmatograms	klasmatograms
KN S (4/4) 01	4/4	Arch.f. (𐄌𐄍𐄎𐄏)	klasmatograms	klasmatograms	isolated signs
#297	4/4	formulae (𐄀𐄁 𐄀𐄅)	non-formulaic (*h*) + non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)
#301	4/4	formula (𐄀𐄁)	formula (𐄀𐄅)	non-formulaic (*h*)	non-formulaic (*h*)
VRY S (4/4) 01	4/4	formula (𐄀𐄁)	formula (𐄀𐄅)	non-formulaic (*h*)	**non-formulaic (*)**[49]
#305	4/4	formula (𐄀𐄁)	formula (𐄀𐄅)	non-formulaic (*h*)	klasmatograms
#300	4/4	formula (𐄀𐄁)	formula (𐄃𐄂)	**non-formulaic (*)**[50]	non-formulaic (*h*)
#303	4/4	formula (𐄀𐄁)	formula (𐄌𐄐𐄑)	non-formulaic (*h*)	non-formulaic (*h*)
#296	4/4	formula (𐄀𐄁)	formula (𐄉𐄊𐄋)	non-formulaic (*h*)	non-formulaic (*h*)
#312	4/4	formula (𐄃𐄂)	formula (𐄇𐄈𐄂)	non-formulaic (*h*)	non-formulaic (*h*)
#311	4/4	formula (𐄀𐄁)	formula (𐄀𐄅)	formula (𐄃)	?
#308	4/4	formula (𐄀𐄁)	formula (𐄀𐄅)	formula (𐄇𐄈𐄂)	non-formulaic (*h*)
#295	4/4	formula (𐄀𐄁)	formula (𐄀𐄅)	formula (𐄉𐄊𐄋)	non-formulaic (*h*)
#309	4/4	formula (𐄀𐄅)	formula (𐄃𐄂)	formula (𐄇𐄈𐄂)	non-formulaic (*h*)
#293	4/4	formula (𐄀𐄁)	formula (𐄃𐄂)	formula (𐄌𐄐𐄑)	non-formulaic (*h*)
#310	4/4	formula (𐄉𐄊𐄋)	formula (𐄍𐄀)	formula (𐄌𐄓)	**non-formulaic (*)**[51]
#302	4/4	formula (𐄉𐄊𐄋)	formula (𐄍𐄀)	formula (𐄃𐄂)	non-formulaic (*h*)
#298	4/4	formulae (𐄀𐄅 𐄀𐄁)	formula (𐄃𐄂)	non-formulaic (*h*)	non-formulaic (*h*)
#299	4/4	formula (𐄀𐄁)	formula (𐄀𐄅)	formula (𐄇𐄈)	formula (𐄃𐄂)

[49] 𐄌𐄓 >< (042-038 ><), attested on #154 (impression on flat-based *nodulus* from 3/4sP), from MA/P; #276.α, 3sP from Pinakiano and #310.δ, 4sP from Sitia.

[50] 𐄀𐄇𐄔 (044-036-018); cf. n. 45. [51] Cf. n. 44.

Seal	I.F.	Sequence n. 1	Sequence n. 2	Sequence n. 3	Sequence n. 4
P.TSK05/291	3 or 4/4	non-formulaic? (*h*)	non-formulaic (*h*)	non-formulaic (*h*)	**non-formulaic (*)**[52]
#304	4/4	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)
#306	4/4	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)
#307	4/4	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)	non-formulaic (*h*)

52 (031-021-061); cf. n. 43.

CONCORDANCES

CHIC and CMS Seals and Sealings Editions

List of CH seals and sealings according to *CHIC*

CHIC edition	*CMS* edition	Find-spot	*CMS* stylistic datation	Material
CHIC #123 [1] KN I (1/1) 01	*CMS* II.8, 90	Knossos (Palace)	MM II	Clay (impression)
CHIC #124 [2] KN I (1/1) 02	*CMS* II.8, 89	Unknown	MM II	Clay (impression)
CHIC #125 [3] KN I (1/1) 03	*CMS* II.8, 84	Knossos (Little Palace)	MM II	Clay (impression)
CHIC #126 [4] MA/M I (1/1) 01	*CMS* II.6, 180	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #127 [5] MA/M I (1/1) 02	*CMS* II.6, 177	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #128 [6] MA/M I (1/1) 03	*CMS* II.6, 182	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #129 [7] MA/M I (1/1) 04	*CMS* II.6, 176	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #130 [8] MA/M I (1/1) 05	*CMS* II.6, 181	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #131 [9] MA/M I (1/1) 06	*CMS* II.6, 179	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #132 [10] MA/M I (1/1) 07	-	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #133 [11] PYR I (1/1) 01	*CMS* II.6, 229	Pyrgos	MM II	Clay (impression)
CHIC #134 [1] KN I (1/2) 01	*CMS* II.8, 56	Knossos (Palace)	MM I–MM II	Clay (impression)
CHIC #135 [2] SAM I (1/2) 01	*CMS* VS1B, 326	Samothrace	MM II	Clay (impression)
CHIC #136 [3] SAM I (1/2) 02	*CMS* VS1B, 325	Samothrace	MM II	Clay (impression)
CHIC #137 [4] SAM I (1/2) 03	*CMS* VS1B, 327	Samothrace	MM II	Clay (impression)
CHIC #138 [5] ZA I (1/2) 01	*CMS* II.7, 215	Zakros	MM II–MM III	Clay (impression)
CHIC #139 [1] KN I (1/3) 01	*CMS* II.8, 80	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #140 [2] KN I (1/3) 02	*CMS* II.8, 64	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #141 [3] KN I (1/3) 03	*CMS* II.8, 86	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #142 [4] KN I (1/3) 04	*CMS* II.8, 75	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #143 [5] KN I (1/3) 05	*CMS* II.8, 81	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #144 [6] KN I (1/3) 06	*CMS* II.8, 77	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)

CHIC edition	*CMS* edition	Find-spot	*CMS* stylistic datation	Material
CHIC #145 [7] KN I (1/3) 07	*CMS* II.8, 78	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #146 [8] KN I (1/3) 08	*CMS* II.8, 87	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #147 [9] KN I (1/3) 09	*CMS* II.8, 88	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #148 [10] MA/M I (1/3) 01	*CMS* II.6, 187	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #149 [11] MA/M I (1/3) 02	*CMS* II.6, 188	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #150 [12] MA/M I (1/3) 03	*CMS* II.6, 189	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #151 [13] PH I (1/3) 01	*CMS* II.5, 239	Phaistos	MM II	Clay (impression)
CHIC #152 [14] ZA I (1/3) 01	*CMS* II.7, 213	Zakros	MM II	Clay (impression)
CHIC #153 [15] ZA I (1/3) 02	*CMS* II.7, 214	Zakros	MM II	Clay (impression)
CHIC #154 [1] MA/P I (1/3–4) 01	*CMS* II.6, 168	Malia (Palace)	MM II	Clay (impression)
CHIC #155 [1] HT I (1/4) 01	*CMS* II.6, 143	Ayia Triada	MM II	Clay (impression)
CHIC #156 [2] KN I (1/4) 01	*CMS* II.8, 74	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #157 [3] KN I (1/4) 02	*CMS* II.8, 82	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #158 [4] KN I (1/4) 03	*CMS* II.8, 65	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #159 [5] KN I (1/4) 04	*CMS* II.8, 63	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #160 [6] KN I (1/4) 05	*CMS* II.8, 62	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #161 [7] KN I (1/4) 06	*CMS* II.8, 83	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #162 [8] KN I (1/4) 07	*CMS* II.8, 67	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #163 [9] KN I (1/4) 08	*CMS* II.8, 68	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #164 [10] KN I (1/4) 09	*CMS* II.8, 79	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #165 [11] KN I (1/4) 10	*CMS* II.8, 76	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #166 [12] KN I (1/4) 11	*CMS* II.8, 73	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #167 [13] KN I (1/4) 12	*CMS* II.8, 71	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #168 [14] KN I (1/4) 13	*CMS* II.8, 72	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #169 [15] KN I (1/4) 14	*CMS* II.8, 69	Knossos (Palace)	MM II	Clay (impression)
CHIC #170 [16] KN I (1/4) 15	*CMS* II.8, 70	Knossos	MM II	Clay (impression)
CHIC #171 [17] MA/M I (1/4) 01	*CMS* II.6, 178	Malia (*Quartier Mu*)	MM II	Clay (impression)

CHIC edition	*CMS* edition	Find-spot	*CMS* stylistic datation	Material
CHIC #172 [18] MA/M I (1/4) 02	*CMS* II.6, 184	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #173 [19] MA/M I (1/4) 03	*CMS* II.6, 183	Malia (*Quartier Mu*)	MM II	Clay (impression)
CHIC #174 [20] PK I (1/4) 01	*CMS* II.6, 245	Palaikastro	MM II	Clay (impression)
CHIC #175 [21] PYR I (1/4) 01	*CMS* II.6, 231	Pyrgos	MM II	Clay (impression)
CHIC #176 [1] KN I (1/?) 01	*CMS* II.8, 66	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CHIC #177 [2] KN I (1/?) 02	*CMS* II.8, 120	Knossos (Palace)	TM I?	Clay (impression)
CHIC #178 [3] KN I (1/?) 03	*CMS* II.8, 57	Knossos (Palace)	MM II	Clay (impression)
CHIC #179 [4] KN I (1/?) 04	*CMS* II.8, 29	Knossos	MM II	Clay (impression)
CHIC #180 [1] CR S (1/1) 01	*CMS* III, 103	Unknown	MM II	Steatite
CHIC #181 [2] CR (?) S (1/1) 02	*CMS* VII, 255	Unknown	MM II	Jasper
CHIC #182 [3] CR (?) S (1/1) 03	*CMS* X, 53	Unknown	MM II	Metal
CHIC #183 [4] CR (?) S (1/1) 04	*CMS* XII, 101	Unknown	MM II	Jasper
CHIC #184 [5] CR (?) S (1/1) 05	*CMS* XII, 102	Unknown	MM II	Jasper
CHIC #185 [6] <CR (?) S (1/1) 06>	-	Unknown	MM II	Jasper
CHIC #186 [7] KALO HORIO S (1/1) 01	*CMS* VI, 125	Kalo Chorio	MM II	Cornelian
CHIC #187 [8] MA S (1/1) 01	*CMS* III, 27	Malia	MM II	Rock crystal
CHIC #188 [9] MA/M S (1/1) 01	-	Malia (*Quartier Mu*)	MM II	Steatite
CHIC #189 [10] MA/M S (1/1) 02	-	Malia (*Quartier Mu*)	MM II	Steatite
CHIC #190 [11] MESARA S (1/1) 01	*CMS* IV, 131	Messara	MM II	Stone
CHIC #191 [12] MOHLOS S (1/1) 01	*CMS* II.2, 249	Mochlos	MM II	Chalcedony
CHIC #192 [13] <NEAPOLIS> S (1/1) 01	*CMS* VI, 126	Neapolis	MM II	Metal
CHIC #193 [14] ZIROS S (1/1) 01	*CMS* VI,124	Ziros	MM II	Jasper
CHIC #194 [1] CR S (1/1) 01	*CMS* VI, 146	Pressos, Sitia	MM II	Chalcedony
CHIC #195 [2] CR (?) S (1/1) 02	*CMS* VII, 41	Unknown	MM II	Jasper
CHIC #196 [3] GORTIS (1/1) 01	*CMS* VI, 145	Gortys	MM II	Chalcedony
CHIC #197 [4] MA/M S (1/1) 01	-	Malia (*Quartier Mu*)	MM II	Steatite
CHIC #198 [5] MIRABELO S (1/1) 01	-	Mirabelo	MM II	Chalcedony
CHIC #199 [1] MA/M S (1/1) 01	*CMS* II.2, 112	Malia (*Quartier Mu*)	MM II	Ivory
CHIC #200 [1] MA S (1/1) 02	*CMS* II.2, 227	Malia	MM II	Sardonyx
CHIC #201 [1] CR (?) S (1/1) 01	*CMS* XI, 73	Unknown	MM II	Steatite
CHIC #202 [1] ARKH S (2/2) 01	*CMS* II.1, 394a–b	Archanes	AM III–MM IA	Ivory
CHIC #203 [2] KN S (2/2) 01	*CMS* VI, 13a–b	Knossos	AM III–MM IA	Steatite
CHIC #204 [1] MA/M S (1/2) 01	*CMS* II.3, 151a–b	Malia (*Quartier Mu*)	TM I?	Steatite
CHIC #205 [1] CR S (1/2) 01	*CMS* VII, 35a–b	Unknown	MM II–MM III	Agate
CHIC #206 [2] CR S (2/2) 01	*CMS* III, 149a–b	Malia	MM II	Onyx
CHIC #207 [3] MA/N S (2/2) 01	*CMS* II.1, 420a–b	Malia	MM II	Ivory
CHIC #208 [1] AVDOU S (1/3) 01	*CMS* II.2, 220a–c	Avdou	MM II	Steatite
CHIC #209 [2] CR S (1/3) 01	*CMS* III, 233a–c	Unknown	MM II	Steatite

CHIC edition	*CMS* edition	Find-spot	*CMS* stylistic datation	Material
CHIC #210 [3] CR S (1/3) 02	-	Unknown	MM II	Steatite
CHIC #211 [4] CR S (1/3) 03	*CMS* III, 232a–c	Unknown	MM II	Steatite
CHIC #212 [5] CR S (1/3) 04	*CMS* VI, 30a–c	Unknown	MM II	Steatite
CHIC #213 [6] CR S (1/3) 05	*CMS* VI, 26a–c	Sitia?	MM II	Steatite
CHIC #214 [7] CR S (1/3) 06	*CMS* XI, 299a–c	Unknown	MM II	Steatite
CHIC #215 [8] CR (?) S (1/3) 07	*CMS* VI, 29a–c	Unknown	MM II	Steatite
CHIC #216 [9] CR (?) S (1/3) 08	*CMS* VII, 28a–c	Unknown	MM II	Steatite
CHIC #217 [10] CR (?) S (1/3) 09	*CMS* IX, 22a–c	Unknown	MM II	Steatite
CHIC #218 [11] CR (?) S (1/3) 10	*CMS* IX, 23a–c	Unknown	MM II	Steatite
CHIC #219 [12] CR (?) S (1/3) 11	*CMS* XI, 10a–c	Unknown	MM II	Steatite
CHIC #220 [13] CR (?) S (1/3) 12	*CMS* XI, 11a–c	Unknown	MM II	Steatite
CHIC #221 [14] CR (?) S (1/3) 13	*CMS* XI, 81a–c	Unknown	MM II	Steatite
CHIC #222 [15] CR (?) S (1/3) 14	*CMS* XI, 331a–c	Unknown	MM II	Stone
CHIC #223 [16] CR (?) S (1/3) 15	*CMS* XII, 83a–c	Unknown	MM II	Steatite
CHIC #224 [17] CR (?) S (1/3) 16	*CMS* XII, 84a–c	Unknown	MM II	Steatite
CHIC #225 [18] CR (?) S (1/3) 17	*CMS* XII, 93a–c	Unknown	MM II	Agate
CHIC #226 [19] LASITHI S (1/3) 01	*CMS* VI, 88a–c	Lasithi	MM II	Steatite
CHIC #227 [20] LITHINES S (1/3) 01	*CMS* II.2, 277a–c	Lithines	MM II	Steatite
CHIC #228 [21] <MA S (1/3) 01>	-	Malia	?	Steatite
CHIC #229 [22] MA S (1/3) 02	*CMS* II.2, 230a–c	Malia	MM II	Onyx
CHIC #230 [23] <MA S (1/3) 0>	-	Malia	?	Steatite
CHIC #231 [24] MA/M S (1/3) 01	*CMS* II.2, 100a–c	Malia (*Quartier Mu*)	MM II	Steatite
CHIC #232 [25] MA/M S (1/3) 02	*CMS* II.2, 103	Malia	MM II	Steatite
CHIC #233 [26] MA/M S (1/3) 03	*CMS* II.2, 116a–b	Malia (*Quartier Mu*)	MM II	Steatite
CHIC #234 [27] MA/M S (1/3) 04	*CMS* II.2, 168a–b	Malia (*Quartier Mu*)	MM II	Conglomerate
CHIC #235 [28] MA/M S (1/3) 05	-	Malia (*Quartier Mu*)	MM II	Steatite
CHIC #236 [29] MA/V S (1/3) 01	*CMS* II.2, 78a–c	Malia	MM II	Steatite
CHIC #237 [30] MIRABELO S (1/3) 01	*CMS* II.2, 269a–c	Mirabello	MM II	Steatite
CHIC #238 [31] MOHLOS S (1/3) 01	*CMS* V, 25a–c	Mochlos	MM II	Steatite
CHIC #239 [32] PRESOS S (1/3) 01	*CMS* VI, 87a–c	Pressos	MM II	Steatite
CHIC #240 [33] SITIA S (1/3) 01	*CMS* III, 230a–c	Sitia	MM II	Chalcedony
CHIC #241 [34] SITIA S (1/3) 02	*CMS* VI, 96a–c	Sitia	MM II	Cornelian
CHIC #242 [1] CR S (2/3) 01	*CMS* III, 227a–c	Lasithi?	MM II	Rock crystal
CHIC #243 [2] CR S (2/3) 02	*CMS* XI, 12a–c	Unknown	MM II	Jasper
CHIC #244 [3] CR (?) S (2/3) 03	*CMS* XII, 72a–c	Unknown	MM II	Steatite
CHIC #245 [4] CR (?) S (2/3) 04	*CMS* XII, 115a–c	Unknown	MM II	Rock crystal
CHIC #246 [5] KRITSA S (2/3) 01	*CMS* VI, 27a–c	Kritsa	MM II	Steatite
CHIC #247 [6] MA S (2/3) 01	*CMS* IV, 156a–c	Malia	MM II	Jasper
CHIC #248 [7] PK S (2/3) 01	*CMS* II.2, 259a–c	Palaikastro	MM II	Steatite
CHIC #249 [8] <SITIA S (2/3) 01>	-	Sitia	?	Jasper
CHIC #250 [9] ZA S (2/3) 01	-	Zakros	MM II	Steatite
CHIC #251 [1] ARKH S (3/3) 01	*CMS* VI, 14a–c	Archanes	MM I	Steatite
CHIC #252 [2] ARKH S (3/3) 02	*CMS* II.1, 393a–c	Archanes	AM III–MM IA	Ivory
CHIC #253 [3] CR S (3/3) 01	*CMS* II.2, 296a–c	Unknown	MM II	Onyx

CHIC edition	*CMS* edition	Find-spot	*CMS* stylistic datation	Material
CHIC #254 [4] CR S (3/3) 02	*CMS* IV, 137a–c	Unknown	MM II	Jasper
CHIC #255 [5] CR S (3/3) 03	*CMS* VI, 91a–c	Unknown	MM II	Cornelian
CHIC #256 [6] CR S (3/3) 04	*CMS* VI, 95a–c	East Crete?	MM II	Cornelian
CHIC #257 [7] CR S (3/3) 05	*CMS* VI, 93a–c	Lasithiou?	MM II	Cornelian
CHIC #258 [8] CR S (3/3) 06	*CMS* XI, 13a–c	Unknown	MM II	Cornelian
CHIC #259 [9] CR (?) S (3/3) 07	*CMS* VI, 28a–c	Unknown	MM II	Steatite
CHIC #260 [10] CR (?) S (3/3) 08	*CMS* XII, 89	Unknown	MM II	Jasper
CHIC #261 [11] CR (?) S (3/3) 09	*CMS* XII, 110a–c	Unknown	MM II	Agate
CHIC #262 [12] CR (?) S (3/3) 10	*CMS* XII, 117a–c	Unknown	MM II	Basalt
CHIC #263 [13] CR (?) S (3/3) 11	*CMS* XII, D010a–c	Unknown	MM II	Jasper
CHIC #264 [14] IRAKLIO S (3/3) 01	*CMS* VI, 92a–c	Iraklion	MM II	Jasper
CHIC #265 [15] KASTELLI S (3/3) 01	*CMS* VI, 94a–c	Unknown	MM II	Cornelian
CHIC #266 [16] <KORDAKIA S (3/3) 01>	-	Kordakia	MM II	Jasper
CHIC #267 [17] KY S (3/3) 01	*CMS* VII, 36a–c	Kythera	MM II	Agate
CHIC #268 [18] LAKONIA S (3/3) 01	*CMS* III, 229a–c	Lakonia, Mirabelou	MM II	Jasper
CHIC #269 [19] LASITHI S (3/3) 01	*CMS* III, 228a–c	Lasithi?	MM II	Chalcedony
CHIC #270 [20] LASITHI S (3/3) 02	*CMS* IV, D027a–c	Lasithi?	MM II	Rock crystal
CHIC #271 [21] MA S (3/3) 01	*CMS* II.2, 244a–c	Malia	MM II	Steatite
CHIC #272 [22] MIRABELO S (3/3) 01	*CMS* IX, D021a–c	Mirabello?	MM II	Jasper
CHIC #273 [23] MIRABELO S (3/3) 02	*CMS* X, 312a–c	Mirabello	MM II	Jasper
CHIC #274 [24] MIRABELO S (3/3) 03	*CMS* XII, 105a–c	Unknown	MM II	Agate
CHIC #275 [25] <MIRABELO S (3/3) 04>	-	Mirabelo	MM II	Jasper
CHIC #276 [26] PINAKIANO S (3/3) 01	*CMS* IV, 135a–c	Pinakiano	MM II	Steatite
CHIC #277 [27] ZIROS S (3/3) 01	*CMS* IV, D029a–c	Ziros	MM II	Jasper
CHIC #278 [1] CR (?) S (1/4) 01	*CMS* XII, 111a–d	Unknown	MM II	Chalcedony
CHIC #279 [2] CR (?) S (1/4) 02	-	Unknown	MM II	Steatite
CHIC #280 [3] MA S (1/4) 01	*CMS* III, 237a–d	Malia	MM II	Chalcedony
CHIC #281 [4] MA S (1/4) 02	*CMS* IV, 128a–d	Malia	MM II	Steatite
CHIC #282 [5] PYR S (1/4) 01	-	Pyrgos	MM II	Unknown
CHIC #283 [1] CR S (2/4) 01	*CMS* VI, 100a–d	Iraklion?	MM II	Jasper
CHIC #284 [2] CR (?) S (2/4) 02	*CMS* XII, 70a–d	Unknown	MM II	Steatite
CHIC #285 [3] CR (?) S (2/4) 03	*CMS* XII, 87a–b	Unknown	MM II	Steatite
CHIC #286 [4] MA S (2/4) 01	*CMS* III, 235a–d	Malia	MM II	Jasper
CHIC #287 [1] CR (?) S (3/4) 01	*CMS* XII, 112a–d	Unknown	MM II	Cornelian
CHIC #288 [2] MA/V S (3/4) 01	-	Malia	MM II	Steatite
CHIC #289 [3] PK S (3/4) 01	*CMS* VS1B, 337a–d	Palaikastro	MM II	Steatite
CHIC #290 [4] SITIA (?) S (3/4) 01	*CMS* I, 73a–d	Sitia	MM II	Jasper
CHIC #291 [5] CR S (3/4) 01	*CMS* II.2, 315a–d	Unknown	MM II	Steatite
CHIC #292 [1] GOUVES S (4/4) 01	*CMS* II.2, 217a–d	Gouves	MM II	Marble
CHIC #293 [2] ADROMILI S (4/4) 01	*CMS* II.2, 256a–d	Andromylos	MM II	Jasper
CHIC #294 [3] CR S (4/4) 01	-	Unknown	MM II	Steatite
CHIC #295 [4] CR S (4/4) 02	*CMS* II.2, 316a–d	Unknown	MM II	Jasper
CHIC #296 [5] CR S (4/4) 03	*CMS* VI, 104a–d	Unknown	MM II	Cornelian
CHIC #297 [6] CR S (4/4) 04	*CMS* VI, 101a–d	Central Crete	MM II	Cornelian
CHIC #298 [7] CR S (4/4) 05	*CMS* XI, 14a–d	Unknown	MM II	Cornelian
CHIC #299 [8] CR (?) S (4/4) 06	*CMS* VII, 40a–d	Unknown	MM II	Jasper
CHIC #300 [9] CR (?) S (4/4) 07	*CMS* X, 52a–d	Unknown	MM II	Steatite

CHIC edition	*CMS* edition	Find-spot	*CMS* stylistic datation	Material
CHIC #301 [10] CR (?) S (4/4) 08	*CMS* XII, 106a–d	Unknown	MM II	Agate
CHIC #302 [11] CR (?) S (4/4) 09	*CMS* XII, 107a–d	Unknown	MM II	Chalcedony
CHIC #303 [12] CR (?) S (4/4) 10	*CMS* XII, 109a–d	Unknown	MM II	Chalcedony
CHIC #304 [13] CR (?) S (4/4) 11	*CMS* XII, 113a–d	Unknown	MM II	Jasper
CHIC #305 [14] LASTROS S (4/4) 01	*CMS* IV, 136a–d	Lastros	MM II	Jasper
CHIC #306 [15] MA S (4/4) 01	*CMS* III, 234a–d	Malia	MM II	Gold
CHIC #307 [16] <MA S (4/4) 02>	-	Malia	MM ?	Steatite
CHIC #308 [17] PK S (4/4) 01	*CMS* VI, 103a–d	Palaikastro	MM II	Jasper
CHIC #309 [18] PYR S (4/4) 01	-	Pyrgos	MM II	Jasper
CHIC #310 [19] SITIA S (4/4) 01	*CMS* I, 425a–d	Sitia	MM II	Cornelian
CHIC #311 [20] SITIA S (4/4) 02	*CMS* IV, 138a–d	Sitia	MM II	Marble
CHIC #312 [21] XIDA S (4/4) 01	*CMS* VI, 105a–d	Lyttos	MM II	Jasper
CHIC #313 [1] MONI OD. S (2/6) 01	-	Moni Odigitria	MM II	Ivory
CHIC #314 [1] NEAPOLIS S (8/8) 01 = *CMS* VI no. 102	-	Neapolis		Agate
CHIC #315 [1] ARKH S (2/14) 01	*CMS* II.1, 391A-N	Archanes	AM III–MMIA	Ivory

List of CH seals and sealings according to *CMS*

CMS edition	*CHIC* edition	Find-spot	*CMS* stylistic datation	Material
-	*CHIC* #132 [10] MA/M I (1/1) 07	Malia (*Quartier Mu*)	MM II	Clay (impression)
-	*CHIC* #185 [6] <CR (?) S (1/1) 06>	Unknown	MM II	Jasper
-	*CHIC* #198 [5] MIRABELO S (1/1) 01	Mirabelo	MM II	Chalcedony
-	*CHIC* #210 [3] CR S (1/3) 02	Unknown	MM II	Steatite
-	*CHIC* #228 [21] <MA S (1/3) 01>	Malia	?	Steatite
-	*CHIC* #230 [23] <MA S (1/3) 0>	Malia	?	Steatite
-	*CHIC* #249 [8] <SITIA S (2/3) 01>	Sitia	?	Jasper
-	*CHIC* #250 [9] ZA S (2/3) 01	Zakros	MM II	Steatite
-	*CHIC* #266 [16] <KORDAKIA S (3/3) 01>	Kordakia	MM II	Jasper
-	*CHIC* #275 [25] <MIRABELO S (3/3) 04>	Mirabelo	MM II	Jasper
-	*CHIC* #279 [2] CR (?) S (1/4) 02	Unknown	MM II	Steatite
-	*CHIC* #294 [3] CR S (4/4) 01	Unknown	MM II	Steatite
-	*CHIC* #307 [16] <MA S (4/4) 02>	Malia	MM ?	Steatite
-	*CHIC* #314 [1] NEAPOLIS S (8/8) 01 = *CMS* VI no. 102	Neapolis		Agate
CMS I, 73a–d	*CHIC* #290 [4] SITIA (?) S (3/4) 01	Sitia	MM II	Jasper
CMS I, 425a–d	*CHIC* #310 [19] SITIA S (4/4) 01	Sitia	MM II	Cornelian
CMS II.1, 391A-N	*CHIC* #315 [1] ARKH S (2/14) 01	Archanes	AM III–MMIA	Ivory
CMS II.1, 393a–c	*CHIC* #252 [2] ARKH S (3/3) 02	Archanes	AM III–MM IA	Ivory

CMS edition	*CHIC* edition	Find-spot	*CMS* stylistic datation	Material
CMS II.1, 394a–b	*CHIC* #202 [1] ARKH S (2/2) 01	Archanes	AM III–MM IA	Ivory
CMS II.1, 420a–b	*CHIC* #207 [3] MA/N S (2/2) 01	Malia	MM II	Ivory
CMS II.2, 78a–c	*CHIC* #236 [29] MA/V S (1/3) 01	Malia	MM II	Steatite
CMS II.2, 100a–c	*CHIC* #231 [24] MA/M S (1/3) 01	Malia (*Quartier Mu*)	MM II	Steatite
CMS II.2, 103	*CHIC* #232 [25] MA/M S (1/3) 02	Malia	MM II	Steatite
CMS II.2, 112	*CHIC* #199 [1] MA/M S (1/1) 01	Malia (*Quartier Mu*)	MM II	Ivory
CMS II.2, 116a–b	*CHIC* #233 [26] MA/M S (1/3) 03	Malia (*Quartier Mu*)	MM II	Steatite
CMS II.2, 168a–b	*CHIC* #234 [27] MA/M S (1/3) 04	Malia (*Quartier Mu*)	MM II	Conglomerate
CMS II.2, 217a–d	*CHIC* #292 [1] GOUVES S (4/4) 01	Gouves	MM II	Marble
CMS II.2, 220a–c	*CHIC* #208 [1] AVDOU S (1/3) 01	Avdou	MM II	Steatite
CMS II.2, 227	*CHIC* #200 [1] MA S (1/1) 02	Malia	MM II	Sardonyx
CMS II.2, 230a–c	*CHIC* #229 [22] MA S (1/3) 02	Malia	MM II	Onyx
CMS II.2, 244a–c	*CHIC* #271 [21] MA S (3/3) 01	Malia	MM II	Steatite
CMS II.2, 249	*CHIC* #191 [12] MOHLOS S (1/1) 01	Mochlos	MM II	Chalcedony
CMS II.2, 256a–d	*CHIC* #293 [2] ADROMILI S (4/4) 01	Andromylos	MM II	Jasper
CMS II.2, 259a–c	*CHIC* #248 [7] PK S (2/3) 01	Palaikastro	MM II	Steatite
CMS II.2, 269a–c	*CHIC* #237 [30] MIRABELO S (1/3) 01	Mirabello	MM II	Steatite
CMS II.2, 277a–c	*CHIC* #227 [20] LITHINES S (1/3) 01	Lithines	MM II	Steatite
CMS II.2, 296a–c	*CHIC* #253 [3] CR S (3/3) 01	Unknown	MM II	Onyx
CMS II.2, 315a–d	*CHIC* #291 [5] CR S (3/4) 01	Unknown	MM II	Steatite
CMS II.2, 316a–d	*CHIC* #295 [4] CR S (4/4) 02	Unknown	MM II	Jasper
CMS II.3, 151a–b	*CHIC* #204 [1] MA/M S (1/2) 01	Malia (*Quartier Mu*)	TM I?	Steatite
CMS II.5, 239	*CHIC* #151 [13] PH I (1/3) 01	Phaistos	MM II	Clay (impression)
CMS II.6, 143	*CHIC* #155 [1] HT I (1/4) 01	Ayia Triada	MM II	Clay (impression)
CMS II6, 168	*CHIC* #154 [1] MA/P I (1/3–4) 01	Malia (Palace)	MM II	Clay (impression)
CMS II.6, 176	*CHIC* #129 [7] MA/M I (1/1) 04	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 177	*CHIC* #127 [5] MA/M I (1/1) 02	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 178	*CHIC* #171 [17] MA/M I (1/4) 01	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 179	*CHIC* #131 [9] MA/M I (1/1) 06	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 180	*CHIC* #126 [4] MA/M I (1/1) 01	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 181	*CHIC* #130 [8] MA/M I (1/1) 05	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 182	*CHIC* #128 [6] MA/M I (1/1) 03	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 183	*CHIC* #173 [19] MA/M I (1/4) 03	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 184	*CHIC* #172 [18] MA/M I (1/4) 02	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 187	*CHIC* #148 [10] MA/M I (1/3) 01	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 188	*CHIC* #149 [11] MA/M I (1/3) 02	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 189	*CHIC* #150 [12] MA/M I (1/3) 03	Malia (*Quartier Mu*)	MM II	Clay (impression)
CMS II.6, 229	*CHIC* #133 [11] PYR I (1/1) 01	Pyrgos	MM II	Clay (impression)
CMS II.6, 231	*CHIC* #175 [21] PYR I (1/4) 01	Pyrgos	MM II	Clay (impression)
CMS II.6, 245	*CHIC* #174 [20] PK I (1/4) 01	Palaikastro	MM II	Clay (impression)
CMS II.7, 213	*CHIC* #152 [14] ZA I (1/3) 01	Zakros	MM II	Clay (impression)
CMS II.7, 214	*CHIC* #153 [15] ZA I (1/3) 02	Zakros	MM II	Clay (impression)
CMS II.7, 215	*CHIC* #138 [5] ZA I (1/2) 01	Zakros	MM II–MM III	Clay (impression)
CMS II.8, 29	*CHIC* #179 [4] KN I (1/?) 04	Knossos	MM II	Clay (impression)

CMS edition	*CHIC* edition	Find-spot	*CMS* stylistic datation	Material
CMS II.8, 56	*CHIC* #134 [1] KN I (1/2) 01	Knossos (Palace)	MM I–MM II	Clay (impression)
CMS II.8, 57	*CHIC* #178 [3] KN I (1/?) 03	Knossos (Palace)	MM II	Clay (impression)
CMS II.8, 62	*CHIC* #160 [6] KN I (1/4) 05	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 63	*CHIC* #159 [5] KN I (1/4) 04	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 64	*CHIC* #140 [2] KN I (1/3) 02	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 65	*CHIC* #158 [4] KN I (1/4) 03	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 66	*CHIC* #176 [1] KN I (1/?) 01	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 67	*CHIC* #162 [8] KN I (1/4) 07	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 68	*CHIC* #163 [9] KN I (1/4) 08	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 69	*CHIC* #169 [15] KN I (1/4) 14	Knossos (Palace)	MM II	Clay (impression)
CMS II.8, 70	*CHIC* #170 [16] KN I (1/4) 15	Knossos	MM II	Clay (impression)
CMS II.8, 71	*CHIC* #167 [13] KN I (1/4) 12	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 72	*CHIC* #168 [14] KN I (1/4) 13	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 73	*CHIC* #166 [12] KN I (1/4) 11	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 74	*CHIC* #156 [2] KN I (1/4) 01	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 75	*CHIC* #142 [4] KN I (1/3) 04	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 76	*CHIC* #165 [11] KN I (1/4) 10	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 77	*CHIC* #144 [6] KN I (1/3) 06	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 78	*CHIC* #145 [7] KN I (1/3) 07	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 79	*CHIC* #164 [10] KN I (1/4) 09	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 80	*CHIC* #139 [1] KN I (1/3) 01	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 81	*CHIC* #143 [5] KN I (1/3) 05	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 82	*CHIC* #157 [3] KN I (1/4) 02	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 83	*CHIC* #161 [7] KN I (1/4) 06	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)

CMS edition	*CHIC* edition	Find-spot	*CMS* stylistic datation	Material
CMS II.8, 84	*CHIC* #125 [3] KN I (1/1) 03	Knossos (Little Palace)	MM II	Clay (impression)
CMS II.8, 86	*CHIC* #141 [3] KN I (1/3) 03	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 87	*CHIC* #146 [8] KN I (1/3) 08	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 88	*CHIC* #147 [9] KN I (1/3) 09	Knossos (Hieroglyphic Deposit)	MM II	Clay (impression)
CMS II.8, 89	*CHIC* #124 [2] KN I (1/1) 02	Unknown	MM II	Clay (impression)
CMS II.8, 90	*CHIC* #123 [1] KN I (1/1) 01	Knossos (Palace)	MM II	Clay (impression)
CMS II.8, 120	*CHIC* #177 [2] KN I (1/?) 02	Knossos (Palace)	TM I?	Clay (impression)
CMS III, 27	*CHIC* #187 [8] MA S (1/1) 01	Malia	MM II	Rock crystal
CMS III, 103	*CHIC* #180 [1] CR S (1/1) 01	Unknown	MM II	Steatite
CMS III, 149a–b	*CHIC* #206 [2] CR S (2/2) 01	Malia	MM II	Onyx
CMS III, 227a–c	*CHIC* #242 [1] CR S (2/3) 01	Lasithi?	MM II	Rock crystal
CMS III, 228a–c	*CHIC* #269 [19] LASITHI S (3/3) 01	Lasithi?	MM II	Chalcedony
CMS III, 229a–c	*CHIC* #268 [18] LAKONIA S (3/3) 01	Lakonia, Mirabelou	MM II	Jasper
CMS III, 230a–c	*CHIC* #240 [33] SITIA S (1/3) 01	Sitia	MM II	Chalcedony
CMS III, 232a–c	*CHIC* #211 [4] CR S (1/3) 03	Unknown	MM II	Steatite
CMS III, 233a–c	*CHIC* #209 [2] CR S (1/3) 01	Unknown	MM II	Steatite
CMS III. 234a–d	*CHIC* #306 [15] MA S (4/4) 01	Malia	MM II	Gold
CMS III, 235a–d	*CHIC* #286 [4] MA S (2/4) 01	Malia	MM II	Jasper
CMS III, 237a–d	*CHIC* #280 [3] MA S (1/4) 01	Malia	MM II	Chalcedony
CMS IV, 128a–d	*CHIC* #281 [4] MA S (1/4) 02	Malia	MM II	Steatite
CMS IV, 131	*CHIC* #190 [11] MESARA S (1/1) 01	Messara	MM II	Stone
CMS IV, 135a–c	*CHIC* #276 [26] PINAKIANO S (3/3) 01	Pinakiano	MM II	Steatite
CMS IV, 136a–d	*CHIC* #305 [14] LASTROS S (4/4) 01	Lastros	MM II	Jasper
CMS IV, 137a–c	*CHIC* #254 [4] CR S (3/3) 02	Unknown	MM II	Jasper
CMS IV, 138a–d	*CHIC* #311 [20] SITIA S (4/4) 02	Sitia	MM II	Marble
CMS IV, 156a–c	*CHIC* #247 [6] MA S (2/3) 01	Malia	MM II	Jasper
CMS IV, D027a–c	*CHIC* #270 [20] LASITHI S (3/3) 02	Lasithi?	MM II	Rock crystal
CMS IV, D029a–c	*CHIC* #277 [27] ZIROS S (3/3) 01	Ziros	MM II	Jasper
CMS IX, 22a–c	*CHIC* #217 [10] CR (?) S (1/3) 09	Unknown	MM II	Steatite
CMS IX, 23a–c	*CHIC* #218 [11] CR (?) S (1/3) 10	Unknown	MM II	Steatite
CMS IX, D021a–c	*CHIC* #272 [22] MIRABELO S (3/3) 01	Mirabello?	MM II	Jasper
CMS V, 25a–c	*CHIC* #238 [31] MOHLOS S (1/3) 01	Mochlos	MM II	Steatite
CMS VI, 13a–b	*CHIC* #203 [2] KN S (2/2) 01	Knossos	AM III–MM IA	Steatite
CMS VI, 14a–c	*CHIC* #251 [1] ARKH S (3/3) 01	Archanes	MM I	Steatite
CMS VI, 26a–c	*CHIC* #213 [6] CR S (1/3) 05	Sitia?	MM II	Steatite
CMS VI, 27a–c	*CHIC* #246 [5] KRITSA S (2/3) 01	Kritsa	MM II	Steatite
CMS VI, 28a–c	*CHIC* #259 [9] CR (?) S (3/3) 07	Unknown	MM II	Steatite
CMS VI, 29a–c	*CHIC* #215 [8] CR (?) S (1/3) 07	Unknown	MM II	Steatite
CMS VI, 30a–c	*CHIC* #212 [5] CR S (1/3) 04	Unknown	MM II	Steatite
CMS VI, 87a–c	*CHIC* #239 [32] PRESOS S (1/3) 01	Pressos	MM II	Steatite
CMS VI, 88a–c	*CHIC* #226 [19] LASITHI S (1/3) 01	Lasithi	MM II	Steatite
CMS VI, 91a–c	*CHIC* #255 [5] CR S (3/3) 03	Unknown	MM II	Cornelian

CMS edition	*CHIC* edition	Find-spot	*CMS* stylistic datation	Material
CMS VI, 92a–c	*CHIC* #264 [14] IRAKLIO S (3/3) 01	Iraklion	MM II	Jasper
CMS VI, 93a–c	*CHIC* #257 [7] CR S (3/3) 05	Lasithiou?	MM II	Cornelian
CMS VI, 94a–c	*CHIC* #265 [15] KASTELLI S (3/3) 01	Unknown	MM II	Cornelian
CMS VI, 95a–c	*CHIC* #256 [6] CR S (3/3) 04	East Crete?	MM II	Cornelian
CMS VI, 96a–c	*CHIC* #241 [34] SITIA S (1/3) 02	Sitia	MM II	Cornelian
CMS VI, 100a–d	*CHIC* #283 [1] CR S (2/4) 01	Iraklion?	MM II	Jasper
CMS VI, 101a–d	*CHIC* #297 [6] CR S (4/4) 04	Central Crete	MM II	Cornelian
CMS VI, 103a–d	*CHIC* #308 [17] PK S (4/4) 01	Palaikastro	MM II	Jasper
CMS VI, 104a–d	*CHIC* #296 [5] CR S (4/4) 03	Unknown	MM II	Cornelian
CMS VI, 105a–d	*CHIC* #312 [21] XIDA S (4/4) 01	Lyttos	MM II	Jasper
CMS VI, 124	*CHIC* #193 [14] ZIROS S (1/1) 01	Ziros	MM II	Jasper
CMS VI, 125	*CHIC* #186 [7] KALO HORIO S (1/1) 01	Kalo Chorio	MM II	Cornelian
CMS VI, 126	*CHIC* #192 [13] <NEAPOLIS> S (1/1) 01	Neapolis	MM II	Metal
CMS VI, 145	*CHIC* #196 [3] GORTIS (1/1) 01	Gortys	MM II	Chalcedony
CMS VI, 146	*CHIC* #194 [1] CR S (1/1) 01	Pressos, Sitia	MM II	Chalcedony
CMS VII, 28a–c	*CHIC* #216 [9] CR (?) S (1/3) 08	Unknown	MM II	Steatite
CMS VII, 35a–b	*CHIC* #205 [1] CR S (1/2) 01	Unknown	MM II–MM III	Agate
CMS VII, 36a–c	*CHIC* #267 [17] KY S (3/3) 01	Kythera	MM II	Agate
CMS VII, 40a–d	*CHIC* #299 [8] CR (?) S (4/4) 06	Unknown	MM II	Jasper
CMS VII, 41	*CHIC* #195 [2] CR (?) S (1/1) 02	Unknown	MM II	Jasper
CMS VII, 255	*CHIC* #181 [2] CR (?) S (1/1) 02	Unknown	MM II	Jasper
CMS VS1B, 325	*CHIC* #136 [3] SAM I (1/2) 02	Samothrace	MM II	Clay (impression)
CMS VS1B, 326	*CHIC* #135 [2] SAM I (1/2) 01	Samothrace	MM II	Clay (impression)
CMS VS1B, 327	*CHIC* #137 [4] SAM I (1/2) 03	Samothrace	MM II	Clay (impression)
CMS VS1B, 337a–d	*CHIC* #289 [3] PK S (3/4) 01	Palaikastro	MM II	Steatite
CMS X, 312a–c	*CHIC* #273 [23] MIRABELO S (3/3) 02	Mirabello	MM II	Jasper
CMS X, 52a–d	*CHIC* #300 [9] CR (?) S (4/4) 07	Unknown	MM II	Steatite
CMS X, 53	*CHIC* #182 [3] CR (?) S (1/1) 03	Unknown	MM II	Metal
CMS XI, 10a–c	*CHIC* #219 [12] CR (?) S (1/3) 11	Unknown	MM II	Steatite
CMS XI, 11a–c	*CHIC* #220 [13] CR (?) S (1/3) 12	Unknown	MM II	Steatite
CMS XI, 12a–c	*CHIC* #243 [2] CR S (2/3) 02	Unknown	MM II	Jasper
CMS XI, 13a–c	*CHIC* #258 [8] CR S (3/3) 06	Unknown	MM II	Cornelian
CMS XI, 14a–d	*CHIC* #298 [7] CR S (4/4) 05	Unknown	MM II	Cornelian
CMS XI, 73	*CHIC* #201 [1] CR (?) S (1/1) 01	Unknown	MM II	Steatite
CMS XI, 81a–c	*CHIC* #221 [14] CR (?) S (1/3) 13	Unknown	MM II	Steatite
CMS XI, 299a–c	*CHIC* #214 [7] CR S (1/3) 06	Unknown	MM II	Steatite
CMS XI, 331a–c	*CHIC* #222 [15] CR (?) S (1/3) 14	Unknown	MM II	Stone
CMS XII, 70a–d	*CHIC* #284 [2] CR (?) S (2/4) 02	Unknown	MM II	Steatite
CMS XII, 72a–c	*CHIC* #244 [3] CR (?) S (2/3) 03	Unknown	MM II	Steatite
CMS XII, 83a–c	*CHIC* #223 [16] CR (?) S (1/3) 15	Unknown	MM II	Steatite
CMS XII, 84a–c	*CHIC* #224 [17] CR (?) S (1/3) 16	Unknown	MM II	Steatite
CMS XII, 87a–b	*CHIC* #285 [3] CR (?) S (2/4) 03	Unknown	MM II	Steatite
CMS XII, 89	*CHIC* #260 [10] CR (?) S (3/3) 08	Unknown	MM II	Jasper
CMS XII, 93a–c	*CHIC* #225 [18] CR (?) S (1/3) 17	Unknown	MM II	Agate
CMS XII, 101	*CHIC* #183 [4] CR (?) S (1/1) 04	Unknown	MM II	Jasper
CMS XII, 102	*CHIC* #184 [5] CR (?) S (1/1) 05	Unknown	MM II	Jasper

CMS edition	*CHIC* edition	Find-spot	*CMS* stylistic datation	Material
CMS XII, 105a–c	*CHIC* #274 [24] MIRABELO S (3/3) 03	Unknown	MM II	Agate
CMS XII, 106a–d	*CHIC* #301 [10] CR (?) S (4/4) 08	Unknown	MM II	Agate
CMS XII, 107a–d	*CHIC* #302 [11] CR (?) S (4/4) 09	Unknown	MM II	Chalcedony
CMS XII, 109a–d	*CHIC* #303 [12] CR (?) S (4/4) 10	Unknown	MM II	Chalcedony
CMS XII, 110a–c	*CHIC* #261 [11] CR (?) S (3/3) 09	Unknown	MM II	Agate
CMS XII, 111a–d	*CHIC* #278 [1] CR (?) S (1/4) 01	Unknown	MM II	Chalcedony
CMS XII, 112a–d	*CHIC* #287 [1] CR (?) S (3/4) 01	Unknown	MM II	Cornelian
CMS XII, 113a–d	*CHIC* #304 [13] CR (?) S (4/4) 11	Unknown	MM II	Jasper
CMS XII, 115a–c	*CHIC* #245 [4] CR (?) S (2/3) 04	Unknown	MM II	Rock crystal
CMS XII, 117a–c	*CHIC* #262 [12] CR (?) S (3/3) 10	Unknown	MM II	Basalt
CMS XII, Do10a–c	*CHIC* #263 [13] CR (?) S (3/3) 11	Unknown	MM II	Jasper

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