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The Making of a Script: Cretan Hieroglyphic and the Quest for its Origins

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The Making of a Script: Cretan Hieroglyphic and the Quest for its Origins

Abstract

What is the origin of the earliest script in Europe? Is it invented locally or borrowed from an external template? How can we go about addressing this problem? A common view is that the script in question, Cretan Hieroglyphic, is locally created but externally inspired, probably through an influence from Egypt. But this appreciation should be the result of a full examination of the evidence, rather than a superficial appraisal of the script signs. This article reframes this approach, starting with generic assessments on origin and stimulus, and so opens a new avenue that takes into account the following aspects: 1. The establishment of a methodology for cross-comparisons between the Egyptian and Cretan scripts; 2. The situated context of the Egyptian and Cretan scripts in the mid-third to late third millennium B.C.E.; 3. The local Cretan seal imagery; and 4. Case studies of sign shapes, representing physical and immaterial referents across the Egyptian Hieroglyphic and Cretan repertoires. Only from this broad, multi-centric framework, which has input from archaeology, epigraphy, iconography and paleography, can we establish a solid method to address the origin of Cretan Hieroglyphic.

1. The Making of a Script

1.1 The Quest for Origins

The earliest writing system in Europe, at least as far as our present knowledge allows, comes from the island of Crete. Still undeciphered today, it was called Cretan Hieroglyphic by its discoverer, Sir Arthur Evans, more than a century ago. The name has stuck, evoking as it does a blueprint of Egyptian origins, a strong iconic character, and, more important of all, the idea that Crete did not invent writing from scratch, but, instead, borrowed it. But borrowing a

writing system implies a clear and direct transfer of data from one culture to another, it presupposes, in a word, a direct template that provides the foundation for a new script. Yet, since Evans' first assessment, a thorough sign-to-sign investigation of the two scripts, Cretan and Egyptian hieroglyphic, has never been undertaken. No scholar has attempted to address the question of origins with a view to establishing if the Cretans adopted all, some or none of the Egyptian signs and values, or whether they created, instead, a script *ex novo* via an exposure, albeit vague, to a script template from Egypt.

This article lays out a new methodology aimed at addressing this underexplored question through a multi-pronged assessment-strategy that will encompass data from archaeology, paleography, iconography and material culture. First, it will consider the potential setting for a direct borrowing from the Egyptian script, the only attested iconic writing system in use in the Eastern Mediterranean during the second half of the third millennium B.C.E. Second, it will consider the Egyptian and Cretan script repertoires, by contrasting their typologies. Third, it will delve into the methodological standpoint for cross-comparisons between two scripts. Fourth, it will assess crucial case studies of specific sign-shapes from the Cretan Hieroglyphic inventory as a testing-ground for a potential influence from Egyptian, the pre-existing local iconography attested by seal designs, and local material culture. Finally, it will compare the numerical systems as a further avenue into potential indebtedness.

For each case study, the degree or amount of local and external inputs should be examined through cross comparisons of sign-shapes and by distinguishing different possible processes for the development of signs. Here, though, we will not undertake a comprehensive analysis of the Cretan Hieroglyphic signs, one by one, but through selected examples will set out instead methodological avenues aimed at explaining the script's formation. The stratified

methodology we have adopted can help build the foundation for a novel approach to origins by considering the raw data and hard evidence, and so produce a better understanding of the earliest script in Europe.

Cretan Hieroglyphic (CH) signs and inscriptions will be referred to by number, according to the current standard classification (fig. 1) (Olivier and Godart 1996). Numbers referring to signs accepted there as logograms will be preceded by an asterisk (*), while inscription numbers will be preceded by a hashtag (#). Egyptian hieroglyphic signs will be mentioned following Gardiner's (1957) classification.

[Fig. 1]

1.2 Where From?

The discoverer of the Cretan Hieroglyphic script, Evans (1894: 302–15; 1909: 181–233), was also the first to attempt a preliminary classification of its signs. In doing that, he stressed their high level of iconicity and therefore named this graphic system “pictographic”. Despite this definition, Evans (1909: 247) deduced from the small number of signs that they should be predominantly phonetic, and not “ideographic”. He also noticed a vague similarity of some of them to Egyptian hieroglyphs (Evans 1894: 302–15; 1909: 238–41). Initially, Evans (1894, 316) ruled out that Cretan Hieroglyphic represented a confused imitation of the Egyptian script. Subsequently, however, he became persuaded that a number of Cretan Hieroglyphic signs were directly imported from Egypt. On the whole, however, he concluded that “the Minoan Hieroglyphic system is essentially of home growth” (Evans 1909: 241-43).¹

Ventris and Chadwick (1973: 29) agreed with Evans in assessing that, as regards their shapes, the Cretan Hieroglyphic signs showed some influence from Egyptian models. They stressed, however, that few signs look similar or nearly identical, and thus it would be misguided to suppose that actual principles of Egyptian writing were uncritically adopted by the Cretans.

Gradually, consensus built up around the idea that only a vague influence from Egyptian should be accepted, not a one-to-one wholesale adoption of the sign-shapes (see, among others, Watrous 1998: 23; Powell 2009, 109; Perna 2014: 252; Ferrara 2015: 16; Karnava 2015: 141; 2016: 64). Olivier (1986: 378), for one, has argued that the Cretans merely borrowed the idea of writing from Egypt, and, inspired by that, they created an original and astonishingly uncomplicated system. His exact words are worth quoting, because they encapsulate the common view in recent times:





“We do know that it [Cretan Hieroglyphic Script] has nothing to do with hieroglyphic Egyptian. This applies equally to the origin of its signs—this is absolutely certain—and to the nature of the language it represented—this is not yet completely demonstrable, but nevertheless is highly probable” (Olivier 1989: 41).²



Olivier (1996: 103–4) also considered, albeit briefly, the Egyptian hieratic script, and not the hieroglyphs, as a blueprint, but eventually his conclusions ended up along the same lines: Cretan Hieroglyphic was not a direct emanation of Egyptian. Godart (2000: 76) joined the fray, and explained the similarity of some signs as coincidence.





The supposed role played by Egyptian in influencing a local Cretan script applies also to the very earliest attestations of writing on the island, represented by the so-called “Archanes

Script” (Yule 1980: 170).³ This is a problematic issue, because the Archanes attestations do not produce a full repertoire of signs (rather than a “script”, Archanes is a “formula”) and because scholars are still debating the status of these inscriptions: are they forerunners of Linear A and Cretan Hieroglyphic (Schoep 1999, especially 266, 270–73)? Or of Cretan Hieroglyphic specifically (see, among others, Sbonias 1995: 108, Olivier and Godart 1996: 18 n. 59, Younger 1996-1997 [1998]: 380–81, Perna 2014, 252; Karnava 2016: 81)? Or of Linear A (Godart 1999; Anastasiadou 2016: 177–82)? Or do they form a separate, distinct, albeit incomplete script, with some connection to Cretan Hieroglyphic (Decorte 2018a)?

Flouda (2013: 144–55) takes a more nuanced position. She sees the creation of the Cretan Hieroglyphic as the result of different inputs. The combination of signs with a decorative character and proper script signs on the seals of the “Archanes Group” may be the result of a successful emulation of imported Egyptian scarabs (Aruz 2000: 2–3; Phillips 2010: 309, 313; fig. 3, Flouda 2013: 152–53). And the Minoan seal repertoire crucially moves towards adopting iconic seal designs at the end of the Prepalatial period, possibly triggered by Egyptian influences (Flouda 2013: 148, 154). Since in chronological terms this transformation also coincides with the first attestation of Minoan writing, Egypt might have also influenced ‘writing’ on seals and the creation of the first script in Crete. However, Flouda (2013: 154–55) also stresses the long tradition of pictorial and symbolic representation found on local seals, that points to a local invention.

Karnava (2015) recently suggested that the use of minute pictures of animate and inanimate objects in writing could be seen as an aspect of a local miniaturization process, namely as witnessed in clay pots, animals and humans. She compares votive clay human body parts with CH signs 007 , 008 , 009 , and 010 , and clay figurines with triangular lower body

part with CH 002  and 003 . Her conclusion is that votive figurines and limbs in miniature may have served as prototypes for some Cretan Hieroglyphic signs.

The most recent step in the search for a local input was taken by Decorte (2018b: 40–2, fig. 13), who claims to have detected an EM II-MM IB semiotic system that he defines as “early glyptic vocabulary”. This would have provided the material ingredient upon which the writing system was autonomously created on Crete, since, it is claimed, signs belonging to this iconographic repertoire would reappear as logograms or semantic determinatives and klasmatograms in the first Aegean scripts. Nevertheless, as Decorte’s sample is made up of geometrical patterns (such as horizontal, vertical, oblique, crossed and curved lines), the relationship with the more iconic Cretan Hieroglyphic signs is not fully explained, beyond geometric configurations. Moreover, this trajectory of formation does not encompass all geometrical writing signs: the zig-zag (CH 061 ), the pins (CH 062  and 065 ), the cross “*pommée*” (CH 070 ) and others do not have forerunners, being more elaborate than the geometrical patterns considered.

In summary, with all the difficulties involved in reconstructing the Cretan tradition from internal sources (Archanes, Cretan Hieroglyphic and Linear A), the prospect of supporting a direct and complete derivation from the Egyptian writing system is even more complicated. And if some scholars argue for a local, largely autonomous development at the end of the Prepalatial period, the idea of an indirect “stimulus diffusion” from Egypt still persists, accepted uncritically and without a full explanation.⁴ Today, a thorough assessment of the evidence is required, to explain how, when and why writing was created on Crete, whether any clear evidence points to direct sign correspondences with Egyptian hieroglyphic. Or whether local strategies were enacted autonomously. The main issue is to investigate the hard

data at our disposal, to address how the Cretan graphic repertoire, in effect, came into being. In the following section we will review the situated contexts and local settings, both on Crete and Egypt, and the contacts between the two cultures when the potentially significant stimulus diffusion may have played out.

2. Situated Context: Crete and Egypt

2.1 The Extent of Diffusion

Reconstructing the setting for the creation of the Cretan Hieroglyphic requires that we turn to a broad historical and archaeological review of the preceding centuries, from the late third millennium B.C.E. to the beginning of the second, a timespan before the inception of writing on the island in the MM IA period, i.e. ca. 2000 B.C.E (Sbonias 1995, 58–9). The timeframe needs to be broad, because we cannot infer how much earlier the writing system may have been created, before becoming visible around 2000 B.C.E. Relying on the earliest available attestations makes us inevitably dependent on the vagaries of the archaeological record and accidental circumstances, rather than allowing us a peek into the very point of origin (Ferrara 2015: 15).

A characteristic feature of the Cretan Hieroglyphic repertoire is its low degree of standardization. A wide range of graphic variants is observable even in the “golden age” of the script, i.e. during the MM II-III periods.⁵ This phenomenon not only complicates the task of establishing a proper repertoire (addressed here in Section 3), but also suggests that the writing system was not created all at once within a short period, and then transmitted according to specific accepted standards. Rather, it could very well be the result of a gradual, cumulative process started in the Prepalatial period.

In this early period, only small-scale trade contacts of high-value materials with Egypt can be observed (Ben-Tor 2006). Possibly from the EM IIA period onward, and certainly from the EM IIB onwards (peaking in EM III-MM IA), there is clear evidence on Crete of Egyptian imports and their local imitations, in particular of stone vases and scarab-shaped seals (Warren 1995: 12; Colburn 2008; Phillips 2008; Wiener 2013). Scarabs are imported to Crete too, as seen in the cemeteries at Archanes, Ayia Triada, and Lendas, which date as early as the beginning of the Middle Kingdom and certainly cover the late 11th Dynasty, roughly corresponding to the EM III-MM IA periods on Crete (Phillips 2008, vol I: 123).

The interaction of Crete with Egypt during Prepalatial times is further supported by “Egyptianizing” amulets and stamp seals. The latter were first introduced into Crete in the EM III period and are carved employing Egyptian imagery, such as crouching baboons, a zoomorphic form of the god of writing Thoth, and lions (Aruz 2000: 3–4; Phillips 2010: 314; Flouda 2013: 154, fig. 9). Since some scarabs may have arrived on Crete as half-finished products and have had the motifs engraved locally, it has been suggested that Cretan scarabs could provide evidence for a direct borrowing around 2000 B.C.E. (Pini 2000: 111-112). Other scholars, however, stress that scarabs are a type of stamp seal, a format that was already common on Crete, long before the Egyptians employed it, and thus scarabs were harnessed into a long-standing tradition (Phillips 2008, vol. I: 124). Also, there is reason to believe some types of stamp seals may have been imported to Crete from Anatolia.⁶ Thus, the transmission of material goods into Crete could have accompanied also ideological and technological exchanges (Warren 2000: 24, 27–8).

Indeed, it is remarkable that one of the earliest Egyptian imported scarabs, which is uninscribed (*CMS* II.1 395), comes from Burial Building 6 at Phourni Archanes, where three

“Archanes formula” seals (#202, #252, #315) were also found. Moreover, as already stressed by Evans (1909: 264), the combination of writing and decorative elements, which one can observe on Cretan Hieroglyphic seals, is also recognizable in the design of Middle Kingdom scarabs.

The evidence summarized above suggests that the Cretans of the second half of the third millennium were exposed to Egyptian hieroglyphs used on scarabs and perhaps on other stone objects. However, we cannot test for any direct knowledge or understanding on the part of the Cretans: the extent to which they were able to read the short inscriptions on the scarabs remains a moot point. Indeed, the imported scarabs found in Cretan Prepalatial contexts mainly contain the *nfr* (goodness, beauty) and *nh* (life) signs, papyrus motifs, the Taweret genius, and schematic or plant decorations. In other words, they are mostly uninscribed and by all appearances apotropaic. Understanding these codes requires only an impressionistic knowledge of the hieroglyphs. Also, given that the Egyptian writing system was the prerogative of the upper echelons of society, a high level of diffusion beyond Egypt is unlikely (Gardiner 1957: 1). Thus, we cannot conclude that the Cretans, even though exposed to Egyptian writing, could have learned the script unilaterally, just as we cannot infer that some Egyptian scribes transmitted the basics of their writing system directly to foreigners.

2.2 Contrasting Script Typologies





Egyptian writing has a long and complex history. In posing the question whether it was an influence to some extent, thought must be taken about its structure and commonly-used repertoire before the Cretan Hieroglyphic script appears. The earliest writing system of Egypt, continuing in use from ca. 3100 B.C.E. right down to the first centuries of our era, is the hieroglyphic. It consists of iconic signs whose shapes depict human or anthropomorphic

figures, animals and their body parts, heavenly bodies, landscape features, tools, furniture and buildings, etc. In the period that could have provided a template for Cretan Hieroglyphic, namely from the mid-third to late third millennium B.C.E. (corresponding to the Old Kingdom, First Intermediate Period and the beginning of the Middle Kingdom), the Egyptian script employed between 750 and 1000 signs. Functionally, the graphemes comprise logographs, semantic determinatives and consonantal phonograms. The latter have uni-, bi- and tri-consonantal values (Loprieno 1995: 11–12).

The script was used mainly for monumental purposes and seals, but also on papyrus. Indeed, from at least the Old Kingdom onwards a cursive version of the script called “hieratic” developed which was inscribed with reed-pens or rush brushes and ink. Thus, hieratic sign shapes are more schematic, and have lost a great deal of their iconicity (Möller 1927). This reduction of the figurative aspect rules out any possible parallel with the earliest Cretan Hieroglyphic.

The above, brief introduction to the Egyptian script was necessary before considering the issue of whether Cretan Hieroglyphic is a local development or a borrowing. It is worth remembering that when a writing system is created, three elements of it can be either innovated or adapted from another script that serves as a model: (1) the functional *typology of signs* as a system (whether they are syllabic, consonantal, alphabetic, or alpha-syllabic, and with or without sets of logograms or determinatives); (2) the *shapes of signs* (graphic repertoire); and (3) the precise (logographic, determinative or phonetic) *values of signs*. While Cretan Hieroglyphic is still undeciphered, scholars have good reason to consider it as most probably of the logo-syllabic type. This can be inferred from the number of individual signs attested, which so far is around 120 in about 400 inscriptions.⁷ Moreover, this is in line

with the fact that all scripts whose signs are newly created and iconic, as attested (Sumerian cuneiform, Chinese, Maya, Anatolian Hieroglyphic and Nahuatl or Aztec), are logo-syllabic—with the exception of Egyptian, as we have seen.

The typology of a script inevitably constrains what the precise value of its signs will be. However, the existence of a logo-syllabic type does not automatically point to its having been invented. That Cretan Hieroglyphic signs were almost certainly syllabic, whereas Egyptian was a consonantal script, does not mean that the values of the former could not have been adapted from the latter. It must be noted that already during the Old Kingdom, Egyptian scribes developed a particular convention called “group writing”, which they used for spelling foreign names and words (particularly Semitic ones) in the so-called execration texts. Until the second millennium B.C.E., this strategy involved the use of single or grouped consonantal signs to transcribe CV or CVC syllables: for example,   (*z* + *w*) spelling the syllable *lu*, or   (*šz*) spelling the syllable *šal* (Hoch 1994, 487–504). The assumption is purely theoretical, but there may be reason to suggest that the Egyptian script could have been the model for a syllabic writing system.



Since we do not know the phonetic values of the Cretan Hieroglyphic signs, ultimately it is only their graphic shapes upon which invention or adaptation can be diagnosed and analyzed. Therefore, these will play a key role in our approach to the problem at hand: proving instead of just assuming that the Egyptian script did not provide a precise model for Cretan writing. We will consider also potential evidence for an autonomous path based mainly on the local pre-existing iconography, especially seal imagery.

3. Methodology for Cross-Comparisons

The goal of establishing the degree of influence from both external sources and a trajectory of local innovation in the creation of Cretan Hieroglyphic evidently involves a comparative approach. Setting out a methodology suited for this matter requires us to consider the range of possible paths Early Bronze Age Cretans followed in developing the script. To this end, we envisage five possible scenarios: 1) a Cretan Hieroglyphic sign looks diagnostic and identical, with no other parallel, to an Egyptian sign, likely suggesting an Egyptian direct borrowing; 2) a Cretan Hieroglyphic sign finds a unique parallel within the local iconographic designs, suggesting an autonomous development; 3) a Cretan Hieroglyphic sign might be comparable with both, suggesting that the sign developed locally, even if perhaps transmitted from Egyptian as a decorative motif; 4) a Cretan Hieroglyphic sign might be a depiction of a material object already in use on Early Minoan Crete, suggesting that the sign developed locally; 5) a Cretan Hieroglyphic sign has no identifiable parallels in either graphic or material repertoires, but to an immaterial referent (e.g. a human gesture not attested in the iconographic evidence available thus far).

Quantifying similarity, however, is always a problematic endeavor. As a first cautionary note, any comparative study of the sign repertoire of Cretan Hieroglyphic is constrained by our current state of knowledge. In particular, discussion is ongoing as to about whether certain iconic symbols are part of the sign repertoire or merely decorative motifs (Decorte 2017). For this reason, here we will exclude from analysis signs whose identification is still disputed and have not been included by Olivier and Godart in their corpus. Moreover, some signs in the current reference repertoire (Olivier and Godart 1996) might be mere variants of other signs, whereas others which are considered variants might be separate signs (Jasink 2009, especially 159). This means that for each Cretan Hieroglyphic sign that potentially raises issues of allography (either because it is a sign at present under debate by scholars, or because it is a

grapheme that upon closer scrutiny will reveal a need to be reassessed), we should take such issues into consideration before attempting to explain their origin.

Secondly, one should be wary of comparisons entailing similarities that might be accidental. This applies especially to signs that are more schematic, with fewer segments (be they strokes or curves). One such example would be a comparison between CH 035  and the Egyptian hieroglyph O4  *h*. Therefore, the more complex the sign and its *comparandum*, the more diagnostic traits it will have, regardless of what they represent. However, even close similarity between two relatively complex shapes belonging to two different scripts is not proof of direct derivation. Newly-created iconic scripts all contain signs depicting physical objects, so we are bound to find in different scripts, perhaps even from different geographical and chronological contexts, signs that are similar because they represent the same kinds of objects. This is true not just of Egyptian, archaic Sumerian cuneiform and the Mesoamerican scripts, but also Anatolian Hieroglyphic (Ferrara 2017: 11–2, with references) and even the earliest Chinese writing (Boltz 1994: 31–4). Thus, it is important to focus on paleographical traits that signal meaningful differences between signs that come from relatable regions and time periods.

Moving to the comparisons with iconography, this review should be undertaken with motifs that are comparable with the Cretan Hieroglyphic signs in terms of the depicted object, similar conventions of depiction, and chronological proximity. The chronology of iconographic material needs special attention, as the artistic conceptualization of imagery (even imagery not yet attested on Prepalatial seals) may potentially have influenced the design of the script (Decorte 2018b, 39–40), or, conversely, the invention of writing could have preceded the figurative motifs on seals and, as a result, may have constituted the actual



trigger for specific “cognitive perceptions and conventions” (Karnava 2015: 153). A third possibility is that the designs and styles on seals developed in parallel with the image-based script on Crete. Unfortunately, the precise dating of early Minoan decorative and inscribed seals is fraught with problems, since they mainly come from tombs with a wide chronological use. According to the stylistic classification suggested in *CMS*, the Prepalatial decorative repertoire is mainly made up of geometrical patterns, whereas figurative decorations have been mostly dated to the Protopalatial period (especially MM II). However, since the earliest attestation of writing can be placed from the MM IA onwards, the fact that some figurative motifs have been dated to EM III-MM IA may lead us to find possible precursors therein for iconic signs of writing. The latter would in turn allow us to investigate the paleographic development of iconic writing signs vis-à-vis the development of the iconographic repertoire, in order to check how they are connected.

In the following section, we will investigate five possible scenarios of origins envisaged above by means of specific study cases of Cretan Hieroglyphic signs. We have chosen the signs to be analyzed according to criteria that address the methodological caveats. One: to consider the current open questions surrounding the establishment of the Cretan Hieroglyphic signary, we have discounted signs excluded from the reference corpus as suspected of being decorative symbols, as well as *hapax graphomena* (signs attested only once), which could turn out to be allographs and, in any case, are less informative. Two: to avoid the issue of accidental similarities in comparisons, we have excluded more schematic signs, consisting of abstract or geometric patterns; instead, we have focused on signs whose shape is highly iconic and recognizable—without shying away, however, from signs whose identification is still debated. Finally, among the group of signs matching these criteria, we selected the most

suitable for investigating each of the five possibilities, as will be explained below on a case-by-case basis.

4. Sign Comparisons






4.1 Study Case 1 (*Sign with Correspondent in the Egyptian Script*)

The first case has a direct referent in the Egyptian sign repertoire: CH *156  clearly resembles the Egyptian vine hieroglyph M43  (fig. 2). Its shape is also very similar to that of the Linear A and B logogram *131a/VINa: more iconic in Cretan Hieroglyphic (fig. 3), more schematic in Linear A and B (fig. 4) (Olivier and Godart 1996: 19; Jasink 2009: 93).⁸

[Fig. 2]

[Fig. 3]

[Fig. 4]

Given the similarity in all scripts, we surmise a similar meaning across the board.⁹ On administrative records, in fact, CH *156 is either followed by numbers (e.g. #047.b, #065.c, #067.a, #068.r.A, #118.c), or used in isolation (e.g. #007.δ, #177), and this perfectly fits with a logogram representing a commodity. On seals, however, its use is less clear. On #206.b it occurs along with the logogram for figs (CH *155 ) , while on the opposite face we find four fraction signs (CH *302 , *307 , *308 , *309 ). The easiest explanation is that the logograms and fraction signs functioned precisely as such and, as a consequence, that this seal was created for stamping or sealing fig and wine containers of different measures belonging to the same group.¹⁰ Moreover, this design may hint at the business of the seal's

owner, who would have overseen transactions of figs and wine (Olivier 2002: 92; Jasink 2009: 93, 152).

On a face of the three-sided seal from Mirabello (#274.α), sign CH *156 is placed before (or after, depending on the reading direction) CH 044, which is in turn followed by CH 049. Sign group 044-049 is the most attested on seals (63 times).¹¹ On the same seal's face it might appear either in isolation (as for example on #284.α), or along with other signs of equal size (as for example on #157, #180, and #276.γ), and/or with other smaller motifs (many examples, including #274.α, where we find a cross and a dot with three outgoing elements placed between CH 044 and 049). Olivier reads 044-049 as a syllabic sequence of complete meaning and suggests that *156 might be either a filling motif or a determinative sign aimed at clarifying the business of the seal's owner (Olivier 2002: 92–3; Jasink 2009: 93).

Both the Egyptian and Cretan signs depict a vine on trellises oriented either to the right or to the left. The three-beam trellis in #047, #177, and #206, and the trellis with two dots representing grapes in #274 are so comparable to the Egyptian variant shown to the right in Figure 2, that they rule out the possibility, suggested by other scholars (Palmer 1995: 273), that the similarity entirely depends on the fact that the physical referent was the same, i.e. a vine. It is the way in which Egyptians and Cretans decided to represent the vine, i.e. the iconographic convention, that is so very similar.

Rather counter-intuitively, Bennett suggested that the Egyptian sign was derived from the Aegean one (Bennett 2002: 83-84). More specifically, he suggested that before the invention of writing in Egypt, somewhere in the north-eastern Mediterranean, a sign was created to stamp a mark on clay stoppers of wine jars, which was later incorporated in the Aegean and

Egyptian writing systems. To the best of our knowledge, no designs comparable to our sign are known in the Eastern Mediterranean before the invention of writing in Egypt, i.e. the second half of the 4th millennium B.C.E. (Baines 2004: 153). Moreover, the evidence for wine production in Egypt starts only from the beginning of the 1st Dynasty in about 3000 B.C.E. and the first attestations of the vine hieroglyph date back to the 2nd Dynasty, for instance on the cylinder seal impression of King Khasekhemwy (ca. 2650 B.C.E.) (James 1995: 198-99, Fig. 13.1), whereas the first attestations on Crete date back to MM II (i.e. around the end of the 18th century B.C.E.). Therefore, there is no evidence for the borrowing of the sign by Egypt from the Aegean.

Conversely, scholars claim the Cretan wine sign cannot have been inspired by the Egyptian one, because the Egyptian period of use would have antedated Minoan scripts by some hundreds of years (Neumann 1977: 124; Palmer 1995: 273; Olivier 2002: 88). Nevertheless, this piece of information proves incorrect, since Egyptian hieroglyph M43 is still used as the determinative for the word *irp* ‘wine’ in Beni Hassan tomb no. 2, which dates to the reign of Senusret I of the early 12th Dynasty (ca. 1950 B.C.E.) (Griffith 1896: 14, Pl. III.28 and XVII; James 1995: 212). Therefore, the vine hieroglyph was in continuous use till around the time writing was created on Crete.

With regard to the function of the Egyptian vine hieroglyph M43, it was mainly used as a determinative for marking the semantic category of various words connected with grapes, such as ‘vine’ and ‘wine’, ‘gardener’ and fruit names, including ‘figs’ (Gardiner 1957: 484). It is also attested as the logogram for wine on seal impressions on wine-jar clay stoppers dated to the late 2nd Dynasty and 3rd Dynasty (around the middle of the third millennium B.C.E.). The lack of comparable attestations for the following periods is not due to the loss of

the logographic potential of M43, but to a general scarcity of evidence for wine storage until the New Kingdom (James 1995: 199, 201–2, 207, figs. 13.1, 13.4; Kahl 1994: 579). Although it remains problematic, the use of the Egyptian vine hieroglyph on wine jar stoppers, which were mobile objects, could point to the Cretans having been exposed to the Egyptian writing system, while entailing no precise understanding of it on their part.

The hypothesis that the Cretan Hieroglyphic logogram for wine CH *156 derives from the Egyptian vine hieroglyph M43 is deeply grounded in the overall evidence at our disposal. By contrast, the possibility that the Egyptian hieroglyph first entered Crete as a decorative sign and only later was incorporated in the Cretan Hieroglyphic repertoire, when it was already part of the Cretan imagery, does not find any support in the available evidence for Prepalatial iconography.

4.2 Study Case 2 (Sign with Correspondences in Pre- and Protopalatial Cretan Iconography)

As an example of a sign with origins in the local iconography of Crete, we have selected CH 018 𐀓. Its shape is highly iconic and its frequency consistent, with twelve occurrences in different media (fig. 5).

[Fig. 5]

Evans described this sign (his no. 73) as a “wolf’s head with protruding tongue”, though in a particular instance (his no. 70, in inscription #142) he saw a different animal, “probably to be interpreted as the fore-part of a galloping boar”. Since the publication of Olivier and Godart’s corpus of Cretan Hieroglyphic, it is accepted that these are all instances of the same sign,

which is identified as a dog or wolf's head (Jasink 2009: 122; Krzyszkowska 2012: 147). However, during the Protopalatial period other occurrences of the animal's head in isolation are attested on seals that are not included in the corpus, introducing doubts about its status as a proper sign as opposed to a decorative motif (tab. 1 and fig. 6) (Jasink 2009: 121–23). The two possibilities are not, however, mutually exclusive, and there is evidence that at least in some cases the solitary head can represent an actual sign. Thus, in seal impressions *CMS* VI 127 and VIII 103 the head sign is accompanied by an S-shaped motif consistent with sign CH 309 (𐤠); likewise, in seal impression *CMS* II.8 38, it is found alongside the Cretan Hieroglyphic X stiktogram. These combinations with signs accepted in the repertoire of Cretan Hieroglyphic strongly imply that such cases are also instances of writing.

[Fig. 6]

In addressing the issue of origin, we can first observe that, based on the shape, CH 018 does not appear to be a borrowing from Egypt. Certain Egyptian hieroglyphs depict full body canines (E14 𐦩, E15 𐦩, E17 𐦩, E20 𐦩, E21 𐦩) and full-length or head-only felines (E13 𐦩, E22 𐦩, E23 𐦩, E24 𐦩, F4 𐦩, F9 𐦩), but none has a protruding tongue. Comparable seal imagery of Pre- and Protopalatial Crete proves more instructive for the origins of this sign than external influences.¹²




Some authors have suggested that certain examples of these solitary heads of a beast represent a different animal, namely a feline (Yule 1981: 127; Krzyszkowska 2012: 150). However, regardless of the animal species represented, the presence of the protruding tongue is to be taken as the characteristic feature of CH 018 (Jasink 2009: 121–2). In fact, this feature together with the teeth on display are not seen in any other Cretan Hieroglyphic

animal signs. Hence, they must have been relevant for, and diagnostic of, the sign's meaning, so perhaps emphasis should be put on the poise rather than the species. If we follow that path, we notice that CH 018 has straightforward counterparts in full-length depictions of quadrupeds with protruding tongues on seal-stones and impressions from the EM through the MM II periods (*CMS* VS3 16b, II.5 279 and XI 122c, and possibly also *CMS* I.1 408 and VS3 16b).



If we look at these representations, however, we will see that even where a mane is present, it is still hard to decide between a lion, a wolf or a dog. Perhaps it would be less problematic to refer to the motif and sign simply as “beast with protruding tongue”, while stressing that the iconographic motif is found on seal imagery coeval or predating the earliest Cretan writing. In fact, the motif may have been related to a wider series of glyptic depictions of animals variously identified as dogs, lions, or hesitantly as one of these two, showing an open mouth (though no tongue), perhaps in a gaping, defiant or menacing posture. These representations are numerous on seals dated stylistically to MM II, and therefore would appear to be merely coetaneous with Cretan Hieroglyphic writing, but there are four specimens that may date to either EM or MM IA (*CMS* VS1A 43a, II.1 427c, II.1 295b, II.5 282).¹³ In conclusion, CH 018 has no truly comparable sign in the Egyptian script, but finds a good parallel on imagery that is contemporary with (MM IA), if not earlier than the first attested Cretan writing.

4.3 Study Case 3 (Sign with Possible Correspondence in Egyptian Writing and Minoan Iconography)

The third case involves the possibility that some Cretan hieroglyphic signs may be comparable with both Egyptian hieroglyphs and Minoan iconography, suggesting that they developed locally, but were borrowed from Egypt as decorative symbols in the Prepalatial

period. To check whether this possibility fits with any of the Cretan Hieroglyphic signs, CH 020  and 021  /  have been selected, since some scholars consider them as loans from Egypt (Evans 1909: 212-13, 240 Table XVI; Woudhuizen 1997: 105–6). A closer observation, however, reveals differences in the ways in which these insects are depicted in the Egyptian and Cretan scripts.

The images are attested on both seals and accounting documents dated to MM II and III. On relatively well-preserved documents, CH 020 never appears in isolation and occupies different positions in sequences. On the string nodule #003.γ, it is the last sign of the sequence CH 009-077-013-020, which can be also read on the seal impression #139, while on other attestations it is placed before or after signs that are always different. CH 021 is attested as the middle sign in a recurring sequence along with CH 031 and 061 (#059, #149, and #197), and in a similar sequence featuring sign CH 049 instead of CH 031 (#050). These sequences are usually not interrupted by smaller motifs or stiktograms.¹⁴ These observations slightly favor their interpretation as phonograms rather than logograms.

Since CH 020 represents a bee or a wasp, and CH 021 a fly, they have been compared with the Egyptian bee and fly hieroglyphs, respectively L2  and L3 . Nevertheless, many differences can be easily detected. As far as sign CH 020 is concerned, its paleographical variants show a rather wide range of variability (fig. 7), a fact that does not fit the hypothesis that Cretans copied or simplified a template sign. Not only can the insect be oriented either to the right or to the left, but in a couple of instances (clay bars from Malia #107.a and #117.a) it is also hard to recognize it either as a bee or a wasp. Moreover, it is usually represented with two, sometimes perhaps three or four legs, and flying (except perhaps for #107 and #117). By contrast, in the Egyptian hieroglyph the bee is usually depicted with three or four legs, and

not in motion (fig. 8). Finally, the Cretan sign often separates the thorax from the abdomen with a line, whereas the Egyptian hieroglyph does not. A significant difference from the Cretan fly is that the Egyptian has a body shorter than the wings, whereas the Cretan's is proportional in size to the wings. Moreover, Egyptian hieroglyph L2 was mainly used as a logogram, and L3 was a scarcely attested determinative for the word for 'fly' (Gardiner 1957: 477; Kahl 1994: 554-5), making it unlikely that the Cretans deliberately chose this sign shape to represent one of their phonograms.

[Fig. 7]

[Fig. 8]

Moving to Cretan soil, one immediately recognizes that bees or wasps are well represented on Minoan seals as decorative motifs (e.g. *CMS* II.2 225b, II.5 314–316, VS3 148b, VII 086). The earliest example is carved on a seal found in an EM III-MM IA context in Tholos Tomb B at Koumasa (fig. 9) (*CMS* II.1 159). This is already a very schematic depiction, indeed more schematic than the writing sign CH 020 on later seals (#139, #262,¹⁵ #303). Together with the many graphic variants of the sign that exist, this aspect makes it very difficult not only to trace all these depictions back to a common Egyptian ancestor, but also to prove that a bee depiction was firstly codified as a decorative symbol and then incorporated into the Cretan Hieroglyphic repertoire. On the evidence at our disposal, therefore, sign CH 020 seems to have directly stemmed from the physical referent on the island.

[Fig. 9]

Concerning CH 021, it is remarkable that it is the only animate object displayed from above in the entire Cretan Hieroglyphic repertoire.¹⁶ In the depiction of human and animal beings, the general preference is for profiles, both in the Minoan writing signs and visual art (Karnava 2015: 143, with references), but we also have some Cretan Hieroglyphic signs displayed in frontal view (e.g. bovine head CH 011 and possibly crossed arms 006) and rarely too in a combination of frontal and profile view (human busts CH 002 and 003, and woman CH 004). The representation of human beings from different viewpoints appears in Egyptian art from as early as the Old Kingdom (Walberg 1986: 116), and also in the script itself (namely the human head, arms and feet in profile and bust in frontal view). Rarer, but not absent, are signs seen from an aerial vantage-point, mostly used with animals. Among the latter we find the fly sign L3.

In general, the choice of perspective must be considered deliberate and aimed at making easy the identification. It is thus possible that the Cretans adopted iconographic conventions that had already been codified in the Egyptian tradition. This means that, even though they did not borrow either the writing or the decorative signs for bee and fly, they might have adopted the Egyptian style of depicting a bee from a profile view and a fly from the aerial view for easy recognition.


Depictions of flies, however, can be hardly detected at all in Pre- and Protopalatial visual art and seal iconography. One of the few certain instances is a tridimensional fly-shaped seal from Funerary Building 6 at Archanes Phourni (*CMS* II.1 379; fig. 10), where three inscribed Cretan seals (#202, #252, #315) and an imported Egyptian scarab (*CMS* II.1 395) were also found. All these items have been dated to the EM III–MM IA. Zoomorphic seals and amulets first occur on Crete in the late Prepalatial period and some of them, such as the squatting

baboons and monkeys, show an Egyptian influence, although no zoomorphic seal imported from Egypt (apart from scarabs) has been ever found in the Aegean so far (Aruz, 2000, 3-4). The fly stamp seal found at Archanes is thought to be locally inspired (Phillips 2008, vol. II: 34). Therefore, all told, it does not seem probable that the design of the fly sign CH 021 derived from earlier Egyptian influenced iconography, rather it can be seen as an entirely original product of the Cretan creativity.



[Fig. 10]

To sum up, the likelihood that, in the Prepalatial Period, some Egyptian graphic shapes might have been introduced into the Cretan artistic tropes and then developed in the writing system has not been confirmed by the comparative analysis of signs CH 020 and 021. Although their shapes can be associated with representations of bees/wasps and flies attested both in Egypt and Crete since the end of the third millennium, a closer look reveals that they differ in many details, suggesting that they directly originated from the physical referents, i.e. the insects they depict. This latter possibility will be investigated in the next section.

4.4 Study Case 4 (Sign with Correspondence in Minoan Material Culture)

Some Cretan Hieroglyphic signs have no formal *comparanda* in either the Egyptian script or even the local iconography, and can rather be argued to be direct depictions of material objects. These material referents may be archaeologically attested: such would be the case in the recently proposed interpretation of the widely attested sign CH 044  as representing not a sort of trowel or chisel used in construction (Evans 1894, 305), but rather a *Petschaft* or loop signet seal (Ferrara and Cristiani 2016). However, the referent for a sign can also be

absent from the archaeological record altogether, especially if some or all of its components were made of perishable materials.

The sign we selected for discussion, CH 057  / , may be representative of this development. Its basic, most frequent form corresponds to a V or Y shape with a further lateral or crossing T-shaped trait. Olivier and Godart (Olivier and Godart 1996, 411–12) have defined this sign by persuasively merging what Evans had judged to be two independent signs, one representing a plow and the other a musical instrument, such as a harp or a sistrum (fig. 11) (Evans 1909: 190–1).

[Fig. 11]

Evans' old idea that at least some variants of CH 057 represent a sistrum has often been supported in recent literature (Younger 1998: 80; Mikrakis 2000: 268; Jasink 2009: 98; Flouda 2013, *passim*). Yet, a close look at the instruments of this kind attested in the late third and early second millennia B.C.E., both in Crete and Egypt, raises doubts. The sistrum (from Greek σείστρον, 'that which is shaken'; Liddell and Scott 1940) is a percussion instrument, composed of a handle and an inverted U-shaped frame containing crossbars with moveable small rings or loops of thin metal or clay. In addition to iconographic depictions of sistra, such as the one on the famous Harvester Vase from Ayia Triada, we have several specimens of this instrument made of clay and bronze from Bronze Age Crete (Brogan 2012: 15–16, fig. 3.1; Soles 2011). Worth highlighting is a clay sistrum from Tomb 9 at Archanes Phourni, which dates to MM IA (fig. 12) (Sakellarakis and Sakellaraki 1991: 184–7, figs. 15–18; Sakellarakis and Sakellaraki 1997: 351–6). Although this type of musical instrument is likely imported from Egypt, where it is well attested in a variety of forms,¹⁷ all examples of

sistra from Bronze Age Crete appear to have been manufactured on the island (Brogan 2012: 21).


[Fig. 12]

Conclusively, the shape of CH 057 cannot represent a sistrum. Three of the most iconic and detailed examples of the sign (#243.β, #243.γ, #295.γ) feature two or three horizontal strokes that might represent the crossbars found in instruments of the type, but none of them ever features the expected inverted U-shaped element corresponding to the frame.¹⁸ As we have seen, CH 057 has alternatively been interpreted as a string instrument. In this scenario, the horizontal lines are taken to be strings, whereas the T-like feature aligned at the same height might depict a tuning peg or key (Younger 1998: 80), or a plectrum attached to the instrument (Evans 1909: 191, followed by Jasink 2009: 98). Despite the likelihood, we have not been able to locate ancient string instruments that match, as a whole, the graphic traits of CH 057, especially its protruding vertical stroke at the bottom.





In fact, there is indication that a more plausible identification of the referent of CH 057 would be a plow, as also entertained since Evans. The sign compares very closely with ancient Mesopotamian and Egyptian plows as reconstructed based on iconographic evidence (fig. 13).¹⁹ The two convergent lines of the sign's V shape compare well with the two handles; the projecting line at the bottom is consistent with the plowshare; the T-shaped appendix evokes the yoke and the yoke-beam; and, finally, the horizontal lines seen in #243 and #295.γ match the braces for the handles, as in the certain depictions of plows from ancient Egypt (fig. 14).


[Fig. 13]

[Fig. 14]


The identification is therefore convincing. But then the question arises as to whether the sign was inspired by actual plows or borrowed from the Egyptian hieroglyphic script. We know of no early archaeological examples of plows in the Aegean, but the existence of this tool can be inferred by indirect evidence, such as Early Bronze Age clay figurines of yoked oxen (Pullen 1992). As for the Egyptian script, it possessed a plow hieroglyph, U13 , which was used as a determinative for *hb* ‘plow’ and *pṛt* ‘seed’, and as phonographic *hb* and *šn* ‘ (Gardiner 1957: 517). Nevertheless, a comparison of this hieroglyph with CH 057 reveals some meaningful differences between the two signs. In the Egyptian hieroglyph the handles of the plow are represented as two parallel strokes, without connecting braces of the kind presumably seen in the three examples of CH 057 discussed above; the yoke and beam of the plow are drawn as a circle at the edge of an oblique stroke, in the place where the Cretan sign features the side T-shaped trait; and, finally, it is the beam and share that are depicted with a V-like form, moreover with a connecting stroke representing the strap of the plow, which is wholly absent from CH 057. Therefore, it is likely that the Cretan sign originated locally as a new figurative representation of the object.

4.5 Study Case 5 (Sign with Correspondent in Minoan Gestures)

The last example relates to the development of a sign locally by drawing upon an intangible or immaterial referent, particularly a gesture, and turning it into a sign. As far as Cretan Hieroglyphic is concerned, we have seen that signs possibly based on gestures have been investigated by Karnava (but see already Evans 1894: 300, 303). She stresses the parallel between the emphasis on prominent and curved thumbs in some instances of the signs that depict hands (CH 006 , 007 , 008  and perhaps 009 ) and the presence of the same feature in MM II votive limbs, and argues that the figurines inspired the graphemes.

However, not all instances of the signs exhibit the “emphatic” thumb, suggesting it was not a diagnostic trait, but rather an aspect that was applied to signs of writing only on occasion, and thus perhaps not integral to the repertoire from the very beginning. Therefore, rather than focusing on the trait of a sign, a full sign is more enlightening. For instance, CH 006 , the representation of crossed arms with the palms of the hands facing outwards, is the depiction of a specific gesture (fig. 15) (Olivier and Godart 1996: 338).

[Fig. 15]

As conventions, gestures may be peculiar to certain geographical and social contexts, and it should be emphasized that not even the contemporary Egyptian script contains an analogous sign. Hieroglyphs D28 through D35 all feature two arms in different positions, but in no case are the arms crossed (Gardiner 1957: 453–4).²⁰ Thus, CH 006 is a good candidate for a graphic sign that captures a gesture typical of Minoan Crete. Of course, we cannot affirm with confidence whether the sign was the first graphic rendering of the gesture, or whether it was previously depicted as an iconic motif that was later redeployed as a writing sign (as in case study 2). Especially as CH 006 —like many Cretan Hieroglyphic signs—is not attested in dated inscriptions earlier than the MM II. What we can say is that there is currently no evidence that the sign had an iconographic precursor, while stressing that, in any event, we are faced with yet another type of local development.

5 The Question of Numerals

Another potential indicator of an influence from Egypt that needs to be considered is the numerical system. This comes with a caveat: it must be borne in mind that numerical

notations can lead an independent life from writing systems. Many scripts have no specific numerical notations, for instance Proto-Sinaitic. Also, some numerical systems can historically co-habit with more than one script, for example our own Western numerals of Indo-Arabic origin. Finally, a script can be used with more than one numerical system of notation, and specialize depending upon context (again, our Western numerals and their co-existence with Roman numbers provide an example) (Chrisomalis 2010: 21). Thus, while numerical notations may not point towards a definitive conclusion, comparing the graphic nature of the two, Egyptian and Cretan, may shed some light. In this article, we limit our discussion to a few basic features, with the intent of expanding on them in a separate future treatment.

The Egyptian numerical system is a decimal one: it comprises a series of signs for whole and fractional quantities. For the first, a vertical stroke was used for the units (|), an arch for the tens (⌒) and five more iconic signs for the powers of ten.²¹ Fractions were expressed in different ways (Gardiner 1957, 191–9). The commonest hieroglyphic method was by the use of the word for ‘part’ (⌒), below which was written the number described in English as denominator, as for example five strokes in order to represent 1/5. Nevertheless, for 1/2 the word for ‘side’ (⌒) was used and in the hieratic script 1/3 (arrow-shaped sign) and 1/4 (cross-shaped sign) also had their own specific signs. Moreover, in some mathematical texts, like the Rhind Papyrus (Second Intermediate Period) and the Akhmim wooden tablets from Cairo (12th Dynasty), the signs for fractions 1/2, 1/4, 1/8, 1/16, 1/32, 1/64 are shaped as components of the Eye of Horus symbol, which in its complete version indicates the Egyptian grain unit *ḥkꜣt* (Robins and Shute 1987: 14).

The Cretan Hieroglyphic repertoire includes signs for units, tens, hundreds, thousands, and fractions: these are geometric in form and schematic, comprising vertical and oblique strokes, dots, circles, crosses, hooks, etc. (Evans 1909: 256–9; Olivier and Godart 1996: 17; Karnava 2001; see fig. 1). Since the Egyptian numerical system is also decimal and includes signs for fractions, the hypothesis was put forward long ago that the Minoan system might have originated from or, at least, been influenced by it (Bennett 1950: 205–10, with references). Nevertheless, as Bennett (1999: 164–75) showed, neither hieroglyphic nor hieratic signs for numbers and fractions are truly comparable to Cretan Hieroglyphic or Linear A signs in terms of graphic shape. The only exceptions might be the vertical stroke, used in both in the Aegean and Egypt for units, and the cross, used in the hieratic script for $1/4$ and in Cretan Hieroglyphic for a fraction of unknown value. They cannot be considered diagnostic though, since the vertical stroke is a common solution for representing units, especially in the Mediterranean (Chrisomalis 2010: 57), and the cross is shaped differently in the two contexts, the Egyptian one being a St. Andrew cross (x), whereas the Cretan one is a Greek cross (+).

Not only do most of the shapes of individual signs for numbers in the two regions differ, but also the Cretan system of fractions is not related to, nor dependent upon, the system of numerals, as opposed to the case of the most common Egyptian fractional system. In other words, the Cretan Hieroglyphic signs for fractions are not mechanically constructed by using signs from the system for whole numbers, namely units, as was the case in Egypt. Thus, at least in part the Cretan Hieroglyphic fractional system is also conceptually autonomous in its development. It remains an open possibility that the Cretan fractional signs had the same mathematical values represented in the Egyptian one ($1/2$, $1/3$, $1/4$, etc.), because the Cretan are still to be ascertained.²² Thus, the Aegean system might still have been the product of a conceptual input from Egypt, even if the solution for representing it graphically was achieved

locally and independently. To confirm or refute this possibility, future research will first need to achieve a full decipherment of the Cretan Hieroglyphic fractional signs.



6. Stimuli of Invention






The notion that Cretan Hieroglyphic is not a simple adaptation of an external template, in particular the Egyptian script, is nowadays well recognized. However, the acceptance has generated no systematic investigation into the origins of the earliest writing on Crete.

Previous studies, in fact, pivoted on the general idea of “stimulus diffusion”, a term used to define the import of ideas from a culture deemed to be more complex and advanced, or more powerful ideologically. In this view, the Cretans borrowed the concept of writing from Egypt and redeployed it to create their own script. This thinking implies that a graphic template was autonomously created on Crete, on the strength of largely local input and inspiration. With such a scenario in mind, what this process of creation entailed and what specific resources were used has not been fully explained, but rather it has been the case that only one (or another) avenue has been explored by which certain signs may have been created.

Here we instead contend that a clearer and more thorough picture of how the repertoire of the Cretan Hieroglyphic script came into being can be achieved through a systematic scrutiny of the signs and their shapes, and their possible sources. For study cases we analyzed we conclude that borrowing from the Egyptian script was never involved except for the wine sign. Since we do not accept a wholesale borrowing from an Egyptian template, it is evident that we cannot address its creation purely as an adaptive process. This search for original stimuli is not limited to Cretan Hieroglyphic only. All scripts of secondary formation need to be mapped from a theoretical perspective (Ferrara 2017). How does a culture create a script,

in the absence of a clear and present template, from the different strands of inspiration available to be fed into its formation?

Nuanced perspectives need to be called into the analysis. As indicated by the case studies above, the spectrum of input involved in the formation of the Cretan Hieroglyphic includes direct borrowing (CH *156 the wine logogram), local development from local iconographic motifs (CH 018 the beast with protruding tongue), local development not from graphic models, but from physical referents (CH 020 the bee, 021 the fly, 057 the plow) and immaterial ones such as gestures (CH 007 the crossed arms sign). Our search for signs developed from local iconography, but inspired by Egyptian hieroglyphs, found no considerable evidence. Even so, this possibility will be ruled out, only when the entire corpus is analyzed along the same lines, as for instance, CH 040  vis-à-vis hieroglyph P2 . Finally, one might legitimately wonder whether there are Cretan Hieroglyphic signs inspired by Aegean seal iconography, that in turn was borrowed from Egyptian imagery (e.g. goats/antelopes and squatting anthropomorphs), but this line of inquiry requires a separate treatment.

We might therefore speak of the existence of “stimuli for invention”: a process that is demonstrably autonomous and original, and which integrates both external inputs and local developments. At one end of the spectrum, we have seen that at least one clear case of adaptation from the Egyptian script, the wine logogram, can be established, but paradoxically that example also emphasizes the absence of any systematic borrowing. Thus, no other agricultural commodity logogram—such as *153 , *154 , , *155  /  and *158 , likely representing common Aegean staples also attested in Linear A and B (respectively cereals, olives, figs, olive oil)²³—proves to be lifted from Egyptian into Cretan Hieroglyphic. In fact,

there were no specific Egyptian logograms or determinatives representing these goods.²⁴ CH *156 𐀓𐀓 as the product of diffusion, therefore appears less as an example of a wider tendency than as an isolated case. A thorough probe into why this is so is beyond the scope of this article, but we can very tentatively point out that even though there is no archaeological evidence for wine imports from Egypt at the time Cretan Hieroglyphic was developed (Hamilakis 1999: 45), this may have been the case – which would account for the adoption of the sign.

Identifying the precise components underlying the script repertoire is a pursuit beset by snares. Borrowed, intangible or abstract signs, icons and symbols, decorative motifs, unrecognizable shapes can all fall prey to arbitrary interpretations. However, we can aim to curb subjectivity by adopting a more rigorous, systematic, and comprehensive approach to the graphic evidence. Through a detailed analysis of the shapes of signs, we can hope with a certain degree of confidence to shed light on their formation, and to show how a script can be devised.

The birth of the Cretan Hieroglyphic script can thus be seen as a cumulative, gradual and multi-modal outcome, the result of different forces, influences, and inspiration. Overall, our preliminary research points in the direction of a largely autonomous formation. In this respect, local iconography and local material culture appear to have played a fundamental role in shaping script signs, to a greater and much more detectible degree than any other form of external involvement, such as a direct Egyptian participation. This conclusion is reached through a close cross-referencing of Cretan imagery on seals and other indigenous material culture against the signs of the script. Close examination into the specificities of the Egyptian

repertoire has, nevertheless, indicated that a contribution from that quarter, albeit minimal, in terms of specific signs and iconographic stylistic trends should be recognized.

This article is by no means a definitive answer, or marks a task fully accomplished. It aspires to develop a methodology, namely a multi-centric approach to scripts whose origins remain largely unexplored or poorly understood. It is thus intended as an operational manifesto for approaching all scripts, not just the Cretan Hieroglyphic, whose geneses lie in the darkness of time past, and as a way to explain those questions that relate to the origins, the influences, and the stimuli that make writing possible.

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Table 1.

No.	Type	Description of motif	Provenance	Dating
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				EM I-MM IA
<i>CMS</i> II.1 408	Conoid	Full body, protruding tongue(?)	Krassi	(contextual) MM I-II (stylistic)
<i>CMS</i> VS3 16b	Three-sided prism	Full body, protruding tongue(?)	Evraiki, near Larnax 1	EM III-MM IIB
<i>CMS</i> II.5 279	Impression	Full body, protruding tongue	Phaistos, Room 25	MM I-II (contextual)
<i>CMS</i> II.5 300	Impression	Head, teeth and protruding tongue	Phaistos, Room 25	MM I-II (contextual)
<i>CMS</i> I 419c	Three-sided prism	Full body, protruding tongue	Unknown	MM II (stylistic)
<i>CMS</i> XI 122c	Three-sided prism	Full body, protruding tongue	Unknown	MM II (stylistic)
P.TSK05/499	Three-sided prism	Full body, protruding tongue	Petras, House Tomb 2, Room 3	MM II (stylistic)
<i>CMS</i> VI 127	<i>Petschaft</i>	Head, teeth and protruding tongue + CH 309	Kedri?	MM II (stylistic)
<i>CMS</i> VIII 103	<i>Petschaft</i>	Head, teeth and protruding tongue + CH 309	Unknown	MM II (stylistic)
<i>CMS</i> II.8 37	Impression	Head, teeth and protruding tongue	Unknown	MM II (stylistic)

<i>CMS</i> II.8 38	Impression	Head, teeth and protruding tongue + stiktogram X	Knossos, Eastern Temple Repository	MM II (contextual)
P.TSU06/104	<i>Petschaft</i>	Head, teeth and protruding tongue	Petras Rock Shelter	MM II (stylistic)
<i>CMS</i> VIII 104	Discoid	Full body, protruding tongue	Unknown	MM II-III (stylistic)

Figure captions

Fig. 1. Cretan Hieroglyphic sign repertoire (after Olivier and Godart 1996: 17).

Fig. 2. Paleographical variants of sign CH *156 (after Olivier and Godart 1996: 424).

Fig. 3. Instances of sign AB 131a (Linear A above, Linear B below, respectively after *GORILA* I and *CoMIK* I).

Fig. 4. Instances of Egyptian hieroglyph M43 (after James 1995: 201, fig. 13.3).

Fig. 5. Paleographical variants of sign CH 018 (Olivier and Godart 1996: 392).

Fig. 6. Pre- and Protopalatial seals depicting beasts with protruding tongue, including likely instances of CH 018 by itself (after *CMS* and Krzyszkowska 2012; not to scale).

Fig. 7. Paleographical variants of sign CH 020 (Olivier and Godart 1996: 393).

Fig. 8. Egyptian hieroglyph L2 (adapted from Kaplony 1964: pl. 95, 369).

Fig. 9. EM III-MM IA seal from Koumasa depicting bees (*CMS* II.1 159).

Fig. 10. EM III-MM IA fly-shaped seal from Archanes (*CMS* II.1 379).

Fig. 11. Paleographical variants of sign CH 057 (after Olivier and Godart 1996: 411-12).

Fig. 12. EM III-MM IA clay loop-sistrum from Arkhanes Phourni (adapted from Mikrakis 2000: 267, fig. 265).

Fig. 13. Reconstruction of a Bronze Age plow.

Fig. 14. New Kingdom Egyptian plowing scene from the tomb of Nakht (adapted from Davies 1917: pl. XXI).

Fig. 15. Paleographical variants of sign CH 006 (after Olivier and Godart 1996: 388).

Table captions:

Table 1. List of Pre- and Protopalatial seals and seal impressions depicting beasts with protruding tongue, including likely instances of CH 018 in isolation (data according to *CMS* and Krzyszkowska 2012).

¹ Sundwall's (1920) view was even more radical. He believed that Cretan scribes copied most of their signs from Egyptian prototypes, adding sounds such as vowels.

² The same opinion is expressed also in Olivier (2007: 20).

³ This is a group of seals and seal impressions, found at different places (Arkhanes Phourni, Moni Odigitria, Samothrace, etc.) linked by the occurrence on them of a "Formula" made up of five syllabic signs + possible decorative/symbolic signs. The earliest attestations date back to MM IA (see references and discussion in Decorte 2018a: 363–64, 2018b: 35–6).

⁴ This view has already entered the handbooks (Karnava 2016: 64).

⁵ Attribution of documents to MM II or III is often debated, as for example the ones found in the so-called "Hieroglyphic deposit" at Knossos. This question has been recently summarized by Decorte (2018b: 31, with references).

⁶ For Middle Bronze Age Anatolian stamp seals, see Boehmer and Güterbock (1987: pl. 1).

⁷ Excluding punctuation, numerical and metrological signs, but including rare signs and signs attested only once (*hapax graphomena*), some of which may well be just allographs (Olivier and Godart 1996: 17; see also Tomas 2010: 343 and Karnava 2016: 79). The total amount does not change dramatically if we add about fifteen signs,

as suggested by Jasink (2009: 159–63), which are classified as paleographic variants or considered decorative rather than writing signs by Olivier and Godart.

⁸ Indeed, the graphic resemblance with the Egyptian vine hieroglyph M43, along with its association with units for measuring liquid commodities in Linear B documents, enabled the sign to be identified as the logogram for wine (Bennett 2002: 81–3).

⁹ This was first suggested by Sundwall (1943: 12–13, fig. 17) and then reported in Evans (1952: 11). Both contributions, however, are focused on the Linear B and Linear A signs only, and thus do not include Cretan Hieroglyphic. Evans had previously turned the Cretan hieroglyphic sign upside down and interpreted it as the forepart of a ship (Evans 1909: 225).

¹⁰ The hypothesis that, among a group of jars containing different commodities, one or all of them might have been sealed with an inscribed seal referring to the entire batch finds a comparison in the Linear A inscription KN Zb 35, which is incised on the rim of a *pithos*, but records two different commodities, namely olive oil and figs, in amounts which do not fit with the *pithos*' volume (Christakis 2010: 52).

¹¹ Cretan Hieroglyphic recurring sign groups have been baptized “formulas” by Evans (1909: 270), who interpreted them as logographic compositions. Nevertheless, the small number of Cretan Hieroglyphic signs make it plausible that each sign was phonetic in value and, as a consequence, that each sign group corresponds to a word and/or root. Calling these recurring sign groups “formulas” might be therefore misleading, since “formula” entails a fixed set of words. For a recent discussion of the Cretan Hieroglyphic “formulas” and their patterns, see Civitillo (2016: 31–2, 86–100, with references).


¹² Evans (1909: 209) noticed the close resemblance between CH 018 and the Anatolian Hieroglyphic sign L112 LINGERE, *za*₄, but the comparison is *strictly typological* as there is a considerable time gap between the two scripts.



¹³ Following Krzyszkowska (2012: 147, n. 7, with refs.), it is also worth mentioning one seal impression from Phaistos (CMS II.5: no. 299), dated stylistically to MM II, which depicts the head of an animal with an open mouth, but not showing teeth or tongue, by itself. Curiously, the shape of the head and snout is more suggestive of a lioness, in sharp contrast with sign CH 018, whose snout is consistently elongated like that of a wolf or dog.

¹⁴ So far, only sequence 031-021-061 shows a filler motif between signs 061 and 021 in one of its four attestations, namely on PE S (3/4) 02.



¹⁵ On this seal the bee sign precedes the frequently attested sequence CH 044-005 and, for this reason, is not considered as a writing sign by Olivier and Godart 1996.

¹⁶ On seals we also find a spider-shaped sign displayed in aerial view, but its recognition as a proper writing sign is doubtful and it is not included in the current standard sign list (Olivier and Godart 1996: 17), although it is considered as a true writing sign by Evans (1909: 212) and Jasink (2009: 31–2, 139). Last possible instance of an insect depicted in aerial view is sign CH 022, but this interpretation is subjective.



¹⁷ Among the Egyptian attestations of *sistra*, we can mention hieroglyph Y8 , which however represents the naos-type of *sistrum*, not attested on Crete.

¹⁸ Ironically, if there is any sign from a Bronze Age Aegean script that can be plausibly identified as the representation of a *sistrum*, it is not one from the Cretan Hieroglyphic repertoire. Rather, it is Linear A sign *321  that fits the bill (Brogan 2012: 16, with references). The fact that this is a rare sign even in Linear A (attested on documents TY 3a.1, IO Za 7, HT 6a.3, ZA 18a.1) without any counterpart in Cretan Hieroglyphic—as far as current evidence goes—strongly suggests that this is an innovation of Linear A, and, in fact, its shape is sufficiently distinct from the Egyptian *sistrum* hieroglyph Y8  to dismiss the possibility of borrowing.

¹⁹ See e.g. Ward's (1910: 132–6) study of the iconography of Mesopotamian plows on cylinder seals and the New Kingdom wall paintings from the tomb of Nakht, in Thebes (Davies 1917).

²⁰ It is also worthwhile mentioning that CH 006  is to an extent similar to the Anatolian hieroglyphic sign L31 . Yet not only is this similarity not absolute (in the Anatolian sign the hands are closed fists), but furthermore it cannot be explained as the result of a direct loan. According to current knowledge the Anatolian Hieroglyphic script was consolidated towards the fourteenth century B.C.E., evidently too late to be a model for early Cretan writing (see, however, Hawkins 1986, who argues for a common origin of the two scripts based on typological commonalities).

²¹ Of several numbers we also know the names because they were occasionally written out (Gardiner 1957: 191–2).

²² While mathematical values may be suggested for some Cretan Hieroglyphic fraction signs (see the full repertoire in fig. 1, nos. 301–309), based on possible formal correspondences with Linear A ones, the fact remains that there are currently very few Cretan Hieroglyphic inscriptions containing such signs. As a result, the evidence for their internal functioning is difficult to infer and, in any case, insufficient to support a direct backwards transfer of values from one script to the other. In fact, there are potential contradictions. For instance, assuming that Cretan Hieroglyphic sequences of fractional signs are inscribed in descending order and amount to a value smaller than '1' (as in Linear A), we deduce from the attested sequence  (inscription #066.a) that  >

𐀀 and 𐀁 + 𐀀 < '1'. By logic, this means in turn that CH 302 𐀀 is smaller than 1/2, therefore contrasting with its presumable Linear A counterpart, fraction J = 1/2.

²³ See Olivier and Godart (1996: 19) for the identification, based on the Linear B counterparts of these logograms (for which see also Ventris and Chadwick 1973: 50). In the case of CH *158, Olivier and Godart propose as its counterpart Linear A sign 303 = Linear B 125 CYP 'nut grass or nut sedge (*Cyperus rotundus* or *esculentus*)?', but the shapes of these signs are not as straightforward *comparanda* as that of Linear A 302 = Linear B 130 OLE 'olive oil'.

²⁴ The specialized Egyptian terms *k3w* 'sycamore figs' and *nq'wt* 'notched sycamore figs' were spelled out phonetically, whereas the generic word *d3b(w)* 'figs' was actually written with phonetic signs and the vine determinative M43 𓄿 (Gardiner 1981: 484; Faulkner 1981: 141, 283, 309). The Egyptian script further used the oil determinative W1 𓏏 (sealed oil-jar) for spelling the words 'unguent' and 'ointment', which is not comparable to CH *158, and had no specific sign for 'olive oil'.