CHAPTER 3

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

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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*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.

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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.

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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.

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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.

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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.

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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.

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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.

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