Kazimierz Lewartowski

LEFT HAND, RIGHT HAND IN THE BRONZE AGE AEGEAN GLYPTIC: THE ARTISTS AND REPRESENTATIONS OF HANDEDNESS

Abstract: Aegean Bronze Age artists quite consistently depicted people as right-handed. However, glyptic artists faced a problem unknown to other art genres, which was the impressing of their products in clay giving a mirror image of the composition from the seal. The article examines how artists dealt with this issue. Since the glyptists belonged to the same cultural milieu as other Aegean artists, it can be expected that they were equally aware of the occurrence of handedness. Analysis of 282 seals with various figurative compositions shows that seal makers developed several important formal tricks and conventions. Indeed, the analysis of those representations shows that handedness was not indifferent to the seal makers.

Our sources indicate that only some seals were made with the appearance of impressions in mind (reversed handedness), and in turn impressed those whose authors apparently did not think about the appearance of impressions perhaps did not know that they would be used for this purpose. Similarly, users quite often impressed such seals obtaining the inverted handedness of the figures depicted. This leads to the conclusion that the old discussion of the "correct" view of Aegean seals is pointless, since apparently for the people of the time this was not a significant problem and they were used to seeing the seals both as originals and as impressions, which meant that the image was always "incorrect" on one of them.

Keywords: Bronze Age, Aegean archaeology, seals, seal impressions, image reversal, handedness, correct view

Introduction

Pondering the issue of handedness in Aegean Bronze Age iconography,[1] I left glyptic art for a separate study, due to the problem of image reversal and uncertainty about the "correct view".[2] Aegean seals in the broad sense of this term[3] and their impressions in clay, if only interpreted correctly are an extremely rich source of information on a number of issues, including Minoan and Mycenaean cults, rituals, some habits, way of life, gender roles, symbols. In this article I will

---

be less concerned with interpretation of representations, but I will focus instead more on their makers and specifically on the handedness of characters imagined by them in their compositions. This way I hope to present more emic approach recently advocated on the grounds of Aegean archaeology by Diamantis Panagiotopoulos.[4]

There are several questions concerning artists depicting handedness on seals. Firstly, did they reproduce this human trait consciously in a rational mode or intuitively, out of habit resulting from seeing right-handed people around them every day. Secondly, what problems with showing the handedness did they experience, if any?[5] Thirdly, did they know what would be the use of seals made by them, in other words, whether they would be used for making impressions or to be admired in the original? Did they care to show the real handedness on impressions or on the originals?

The last question has to be commented here because is complicated by the fact that probably not always and not all seals were made to be impressed, some were used as objects of prestige or symbols of ranks.[6] A similar situation is with seals presumably made by Minoan masters from Crete for Mycenaean use, such as the so-called Pylos Combat Agate (PCA) or the Battle in the Glen intaglio ring [Fig. 2.1–2]. While sealing practices were widespread on the island at this time, they were unknown in Mainland Greece[7] — we therefore cannot know whether their makers knew that those seals would not be used for imprinting.

Representations of handedness on Aegean seals has never been subject of a separate study but it had been used as an argument in the discussion on the "correct view", that is whether the stamps were made to be viewed in the original or as the impression. The earliest to raise this issue were Adolf Furtwängler and Georg Loeschcke who thought that golden signet-rings were to be seen in originals[8] and Axel W. Persson with exactly the opposite view.[9] The most comprehensive studies of the issue of the "correct view" were written by Hagen Biesantz concluding that seals should be inspected in the originals[10] and Ingo Pini arguing that there were no strict rules.[11] All these archaeologists concentrated mostly on scenes of hunting and warfare in contrary to Evangelos Kyriakidis who analyzed signet-rings with cultic scenes, introducing the term "primary viewing surface" and who considered handedness irrelevant to its assessment; he concluded that both originals and their impressions were important.[12] Several other authors expressed their opinions on the "correct view" with the dominating one for signet-rings being that they were made mostly for seeing as originals,[13] while there were others who considered that seals were made primarily for impressing.[14] A third view was that of John G. Younger, who suggested that some seals were easier to inspect as originals, while others as impressions.[15]

Materials and methods

Due to the lack of written sources this study concerns only archaeological evidence. This study is based on examination of a set of 282 seals (both originals or their impressions — there is no single case of both preserved [Table A]) comes mostly from Crete, fewer from Mainland Greece, a few from Aegean islands and some from unknown places of finding, they are mostly

---

[4] Panagiotopoulos 2020, p. 386.
[5] Cf. Jørgensen 2013, p. 93.
[6] E.g. Younger 1977, *passim*; Krzyszkowska 2005, pp. 21–23; Poursat 2014, p. 50.
[7] Krzyszkowska 2005, p. 279.
[8] Furtwängler, Loeschcke 1886, p. 78.
[9] Persson 1942, p. 30.

[10] Biesantz 1954, esp. pp. 8–11.
[11] Pini 1989, *passim*.
[12] Kyriakidis 2012, p. 386.
[13] Kyrieleis 1968, pp. 8–14; Pini 1981, p. 137; Niemeier 1988, p. 240.
[14] Cain 1997, p. 135, n. 14; Bennet 2004, p. 101.
[15] Younger 1988a, p. XVI; 1995, p. 335 and n. 26.

to be found in the *Corpus der Minoischen und Mykenischen Siegel* (CMS),[16] but also some were published elsewhere (see Appendix A). They share one common feature: they represent activities engaging human beings, or Minoan Genii — creatures using hands like humans[17] and apes, all shown in actions in which handedness is manifested. The set comprises only well-preserved pieces or preserved in a state allowing recognition of one character at least and his/her/its action. All representations showing activities difficult to understand or badly preserved were left aside. The set of representations on seals that passed the selection has been divided into three groups depending on the character of the handedness. The first group contains skilled unimanual actions such as hunting or fighting with a sword, dagger or knife, throwing a spear, using a knife in an offering scene, operating a goad or whip by chariot drivers, and two bimanual skilled actions, that is bow shooting and operating a spear which are actions in which the role of each hand is handedness dependent (54 sure cases + 12 disputable). The second group contains mostly gesturing, but also carrying bimanually a vessel and less clear cases including leading a creature on a leash with one hand (137 sure cases + 43 disputable). The third group consists of the most dubious cases of activities which are not necessarily involving handedness: carrying on shoulders different objects and animal and human victims, or holding them by the hand; men fronting large vessels; holding a goat or ram by the horns (34 + 1?). I will discuss these three groups in turn, then in a more general, statistical way, the representation of handedness on seals of different forms, the problem of the far and near hand, and finally briefly the changes over time. I do not discuss Mycenaean and Minoan seals separately because of the serious problems in establishing criteria for distinguishing the styles of these cultures.[18] For this reason, I apply a very simplified chronological system for the sake of this article (see Appendix B). Almost all drawings of seals I am using here come from the CMS and originally they represented the impression view of all items, also those preserved as original seals. Because I am interested first of all in the artists and their view, I present those drawings in mirror view with the kind permission of CMS Heidelberg, and I also describe the compositions in this view also. Because drawings, especially those of impressions, are always interpretations, and can contain errors,[19] I studied all seals also in photographs showing enlarged images, which are available in the digital version of the CMS on the Arachne platform.[20] The illustrations only include drawings, as photographs, especially in small format, would be difficult to read.

Table A. Number of seals by types

	Total	Signet-rings	Prisms	Amygdaloids	Cushion	Cylinder	Lentoid	Other
Total	282	94	36	31	10	9	92	10
Originals	218	53	36	25	7	9	80	8
Impressions	64	41	0	6	3	0	12	2
As percentage								
Originals	77%	56%	100%	81%	70%	100%	87%	80%
Impressions	23%	44%	0%	19%	30%	0%	13%	20%

[16] *Corpus der Minoischen und Mykenischen Siegel* has 13 volumes, some with supplements, it had been printed in years 1964-1974 in Berlin and Mainz; the database containing the illustrations and all the data is available on the platform Arachne: https://arachne.dainst.org/project/corpusminmyk. Seals from the Corpus are referenced as: CMS with volume number and catalogue number.

[17] Chryssoulaki 1999, pp. 114–115.
[18] Betts, Younger 1982, pp. 105–109; Tamvaki 1989, pp. 266–267; Boardman 2001, pp. 55–57; Poursat 2014, pp. 51–53; Crowley 2020, p. 34; Knappett 2020, pp. 89–90.
[19] Krzyszkowska 2005, pp. 7–10.
[20] https://arachne.dainst.org/project/corpusminmyk.

The categories of „emic" and „etic" approaches had been initially introduced in linguistics then adopted by anthropology,[21] and other sciences, archaeology among them.[22] For each discipline those terms do not mean exactly the same, even applications of those approaches in archaeology have different variations, but generally "etic" means an outside view on ancient cultures described, analyzed, typologized, interpreted in present ways of thinking, while "emic" means seeing things in categories represented by the minds of members of ancient communities. The authors of works referenced above had usually ethnographic or written sources helping them to build their emic approaches. In case of the Bronze Age Aegean cultures, we do not have such a support, which means that we have to begin with an etic approach and then attempting to reach the emic one as the result of our research. This is not a particularly original idea, I think many researchers in the field of Aegean archaeology have essentially proceeded in this way, even if they did not use the etic/emic terminology. However, its use obliges the author to make efforts to really get close to the conceptual world of the ancients.

The study of depictions of handedness on seals is hampered by the inversion of the image, which also changes the handedness of the figures depicted. Such a phenomenon does not actually occur in other media,[23] so one can refer to the practices and methods used there. There are, of course, many differences, such as the intaglio technique, the small size of the seals, formal or thematic differences between the seals and other Aegean art.[24] However, there are also close relations — the iconography from the seals shares much with other media that may have been modelled on them;[25] on the other hand, the scenes on the seals may even have been taken from compositions on wall paintings or metal vessels.[26] Thus, I make the assumption, unfortunately unverifiable, that with all the obvious differences between genres of art, there were general tendencies or conventions that united artists working in different media. If an activity is consistently depicted in the same way in different fields of art, we can assume that glyptists did likewise. I will draw here on the results of my earlier research, briefly presented in the next paragraph, where I tried to systematically examine this problem for other types of Aegean art.[27] Let us add that the issue of handedness in Aegean iconography is additionally related to the phenomenon of the "near" or "far" hand: if a figure faces to the right from the point of view of the viewer, the figure's right hand (real right) will be the near one, and the left hand (real left) will be the far one (similarly with a shoulder, side, hip or foot). This feature of the images has an important advantage over handedness: while the right hand on the seal becomes the left hand on its impression, the far hand, will be the far hand both on the seal and on the impression. Below, I briefly recapitulate the results of the author's earlier work where there is also more on the handedness issue.

Aegean artists very consistently showed people playing instruments such as phorminx or kithara and archers as right-handed, similarly, they surprisingly identically showed the hand arrangement of people carrying a large vessel: the right hand holds the handle, the left hand

[21] Harris 1976, *passim*; Mostowlansky, Rota 2020, *passim*.

[22] For early discussions on those categories in archaeology e.g. Hayden 1984; Hutson and Markens 2002; recent application of emic approach in archaeology e.g. Keimer, Thomas 2020; Nol 2021.

[23] The stone mould from Mycenae for making beads with scenes involving Minoan Genii would be a rare case – Gill 1970, p. 406 no. 56.

[24] Poursat 1977, pp. 193–225; Tamvaki 1989, p. 262; Chryssoulaki 1999, pp. 112–113; Galanakis 2005, pp. 59, 77.

[25] Crowley 2020, pp. 41–42.

[26] E.g. Blakolmer 2010a; 2012; 2018, pp. 143–151; 2021, pp. 28, 41–43; Cain 2001, p. 28; Günkel-Maschek 2012, p. 117; Hiller 1999, pp. 323–324; Younger 1995, esp. pp. 339–341; rather than from large compositions: Biesantz 1954, p. 25; Lewartowski 2019b, pp. 78–79.

[27] Lewartowski 2019a, *passim*; similar results were obtained in a study analyzing those problems on statistical level, not published yet: Lewartowski in print.

[28] Cf. Biesantz 1954, p. 9.

supports the bottom. Hunters or warriors using swords or spears mostly do so with their right hands, sometimes, however, we have exceptions usually caused by the subordination of realism to the symmetry of the scene. The scabbards of swords or daggers are also usually depicted in the typical right-handed position. Chariot drivers hold whips or goads in their right hands. Also, ritual gestures with asymmetrical hand positions almost always show the right hand as active, or higher raised than the left.[28] *Kourotrophoi* hold children to the left breast, which is consistent with reality and widespread in the art of many cultures and eras (this is not a handedness-related activity, but complements the issue of showing laterality). Most deviations are found in vase paintings and on terracotta sarcophagi (in fighting and hunting scenes). On the other hand, carrying spears or other long objects on one's shoulders is subject to the "principle of the near arm" — with great consistency this is how this activity is depicted. It is also noticeable that active arms are much more often shown as near, which means that more figures are oriented to the right (it is difficult to say what is the effect and what is the cause here — the orientation of the scene or the nearness of the active hand). The large preponderance of depictions of right-handed people is probably due to the fact that from the earliest times, right-handers have greatly predominated, corresponding to a range between 77.4% to 96.6% of members of all populations[29] with the mean at 85%,[30] hence probably the important function of the right hand in ritual activities, where convention decides and not the natural handedness.[31] Also related to this may be the commonly held dualism in seeing the world, where what is on the right is good, bright, male, connected with life, and on the left is the opposite[32] which also probably did not go unnoticed in the composition of paintings by Aegean artists. Generalizing, it can be said that handedness is depicted by them in accordance with the predominant right-handedness, even if it is true that there are more people with artistic talents among the left-handed,[33] so this may have been the case among Bronze Age artists as well.

The reversal of the image, which is a fundamental feature of seals, is not a trivial action. For it involves two phenomena. The first, to which I mainly devote space here, is the reversal of the handedness of the figures depicted. The second, which may be even more important, is the reversal of the composition and its orientation, which can change the meaning of the composition and affect the viewer's perception. The issue of orientation I hope to address elsewhere, but the two cannot be completely ignored here. Orientation can be related to the aforementioned meaning of left and right. If the imagined procession was intended by the glyptist or patron to head to the world of the dead, i.e. to the left, then when the image is reversed the original meaning of this representation is changed to a march towards life, and so the symbolism contained in the representation completely changes. The reversal of a composition can affect its reception, since, regardless of the symbolism, we perceive the right and left sides differently, and attach a different meaning to the objects or figures shown from each side. These issues have been studied many times. I will cite below the results of several studies, but it should be remembered that they mostly concern art of a much later date, with the use of perspective and depth, usually of a much larger format than seals, and even photographs,[34] and the participants in the experiments carried out, sometimes also with abstract compositions,[35] were modern educated people with very different experiences in contact with images than the ancients. The work closest to

[29] Uomini, Ruck 2018, p. 297.
[30] Balter 2009; Papadatou-Pastou *et alii* 2020, p. 483 with 9.3% to 18.1% of left-handers depending on the definition of left/right-handedness.
[31] See McManus 2002, pp. 22–40, 254–258 on the culturally conditioned significance of the left and right hands.

[32] Hertz 1960, pp. 89–116; Mallory 1989, pp. 140–141; McManus 2002, pp. 20–35; Needham 1967, *passim*; 1973, *passim.*
[33] Singg, Martin 2016, *passim.*
[34] Adair 1958, p. 28; Pérez González 2012, *passim.*
[35] Winner *et alii* 1987, *passsim.*

our research needs was on techniques that aim to reverse the image, such as woodcutting or lithography. The conclusion of this research is that the reversal of an image is not indifferent to the viewer whose perception of the characters and their importance, the space depicted, and sometimes the meaning of the scene changes. This is due to the fact that we first look at the left side of an image and what is on the left seems more important and heavier.[36] Mercedes Gaffron even introduced the term "glance curve", which is a refinement of these general observations and indicates the eye movement by which we learn about a composition, starting from the lower left corner.[37] An interesting discourse on the phenomenon of imprinting and copying in the Aegean art against a wide background of theoretical research is to be found in Carl Knappett's work but it is devoted mostly to the following issues: the cultural and magical role of imprinting, the act of imprinting as a gesture, the meanings the impressions could produce.[38]

The direction of a scene and the order in which it is composed is also supposed to be influenced by motricity, with left-handers tending to draw from right to left and right-handers from left to right.[39] According to some theories, handedness, is supposed to be influenced by the direction of reading and writing (RWD).[40] In the case, however, of the Bronze Age this factor is unlikely to be relevant due to the arguably, very limited knowledge of the script, although the "Archanes Script" and the Cretan Hieroglyphic Script[41] or Linear A script (as on CMS II.3, no. 38) may not have been unfamiliar to glyptists. On the other hand, when perceiving a composition, we also tend to laterality and aesthetic judgments derived from it. This may have a neurological rationale in asymmetry of our brain hemispheres;[42] one also considers the influence of RWD on process of "reading" an image.[43]

The second interesting thread here is what attitude the artists themselves had to reversing an image. It turned out that it often didn't matter to them that the image in print would be reversed, even when the lithograph was a reproduction of some well-known work, e.g. northern artists reproduced paintings inverted on prints, while Italian artists kept the original composition,[44] apparently the recipients didn't mind either, and it was only in the eighteenth century that they started to attach importance to it.[45] There were also ordinary mistakes of which Vincent van Gogh is a famous example, who forgot that the print would be inverted in relation to the plate when he created the lithograph "Potato eaters".[46]

The experience of modern artists and the recipients of their art can help study Aegean glyptic art to a limited extent. For example, the "glance curve" is virtually inapplicable when viewing small-scale compositions on seals and their impressions, as they can be encompassed by a single glance. Admittedly, in order to get into the details, we use enlarged photographs and drawings, where the order of learning the elements of the composition can be important, but this is relevant to us, not to the ancients, so any conclusions drawn from such studies are the result of an etic approach. But the phenomena related to the other effects of reversal of an image are common to ancient and later artists, which does not mean that they had the same attitude to them and whether they perceived them as an issue at all. However, it should be noted that Gaffron's concepts and

---

[36] Arnheim 1974; after Winner *et alii* 1987, pp. 1–2; McManus 2002, p. 326.

[37] Gaffron 1950, p. 317, here also older bibliography and review of older research.

[38] Knappett 2020, pp. 68–97.

[39] Boiteau, Smith, and Almor 2020, pp. 165–167.

[40] Pérez González 2012; Uhrbrock 1973; Vaid 2011, pp. 252–253 with review of theories and earlier research; against role of RWD e.g. Paracchini 2021; Williams 2022.

[41] But see Younger 1995, p. 335, n. 26 on the ambivalent reading direction of hieroglyphic seals; Krzyszkowska 2005, pp. 70–71, 95–98.

[42] For a review of neuroaesthetics see Jacobsen 2010.

[43] E.g. Maass, Pagani, Berta 2007, *passim*; Chahboun *et alii* 2017, *passim*.

[44] Gaffron 1950, pp. 329–330.

[45] de Bosio 2018, p. 71–72.

[46] McManus 2002, pp. 274–275.

observations were used by H. Biesantz[47] for his reflections on "correct view", considering that the reversal of an image is not neutral to its perception in the case of glyptic art, either. We have to note that the image reversal is not the only effect of making impressions — there is large difference between the image seen on a stone or gold seal and on its impression in clay because of the nature of the raw materials but also because the impression is a convex relief and the seal — a concave *intaglio*.[48]

Analysis and Results

The criterion of handedness for evaluating the "correct" view in glyptic art was addressed in his study on the subject by I. Pini,[49] where he analyzed depictions of fighting and hunting, that is, those actions in which handedness plays an important role, and they belong to our first group, which I will now deal with. In some of the cases, determining the handedness of the depicted figures was not a simple task, with most of the identifications I fully agree, with only some cases requiring comment. Let us note that E. Kyriakidis assesses handedness as a detail of secondary importance for the creators of battle scenes, since it was the battle and the fighting that were important there.[50] A very significant achievement of Pini's work is the introduction of the "contrappostal" scheme ("'kontrapostisches' Schema"), in which the back leg and the working hand are on the same side[51] which means that both are near or far ones [Fig. 1.1]. With very few exceptions, this scheme works, and I will use it here. It has obvious physical sense because such a posture helps to make stronger blows with weapons.

The majority of represented figures were shown in conventional posture with upper body in frontal view.[52] However, a few of them seem to be represented in the rear view, which is important for the assessment of their handedness. This issue had also been already addressed by Pini.[53] Outside of the world of glyptic art, the rear view is extremely rare and connected with relief art but lacking on wall paintings.[54] Certainly, there is a man on a fragment of a rhyton from Knossos;[55] Pini suggested that the sistrum player on the Harvesters' Vase was also showing his back.[56] The warrior with a long lance from the Stele IV from the Grave Circle A at Mycenae[57] should be in the rear view if he is not left-handed. It is also possible that the hunter with a long spear on the ivory pyxis from Katsambas on Crete[58] is shown in the rear view because otherwise his posture would look strange. In several cases of battle scenes warriors represented on seals seem to be shown in the rear view. The most prominent and beyond any discussion is the fallen warrior on the PCA [Fig. 2.1], but other cases are not so clear and it is not easy to distinguish breasts from backs on several seals. Pini observed that on CMS I no. 12 [Fig. 2.3], an agate amygdaloid with a duel scene composed vertically, the dominating warrior had his nipples delicately marked with two small dots.[59] His opponent is holding the victor's sword blade with his bare hand in what appears to be a gesture of begging for mercy, his other hand is down and empty, his weapon is not shown. The victor's hand handling the sword is the right, near hand on the seal, and since both protagonists are in the "contrapposto" even if the unfortunate one is standing

[47] Cf. Biesantz 1954, pp. 14–19; Wohlfeil 2000, p. 338.
[48] Kyriakidis 2012, p. 351.
[49] Pini 1989, *passim*.
[50] Kyriakidis 2012, p. 385.
[51] Esp. Pini 1989, p. 202.
[52] Tamvaki 1989, p. 259.
[53] Pini 1989; 2015, pp. 320–323.
[54] Cameron 1976, p. 50.

[55] Heraklion Museum no. 256 – Kaiser 1976, Fig. 19b; Koehl 2006, no. 768.
[56] Pini 2015, p. 323.
[57] Heurtley 1921, p. 131.
[58] Alexiou 1967, pp. 55–56, pls. 30–33; Lewartowski 2019a, p. 190.
[59] Pini 1989, p. 4; clearly marked nipples are on the victor's chest on the PCA, Stocker Davis 2017, p. 594.
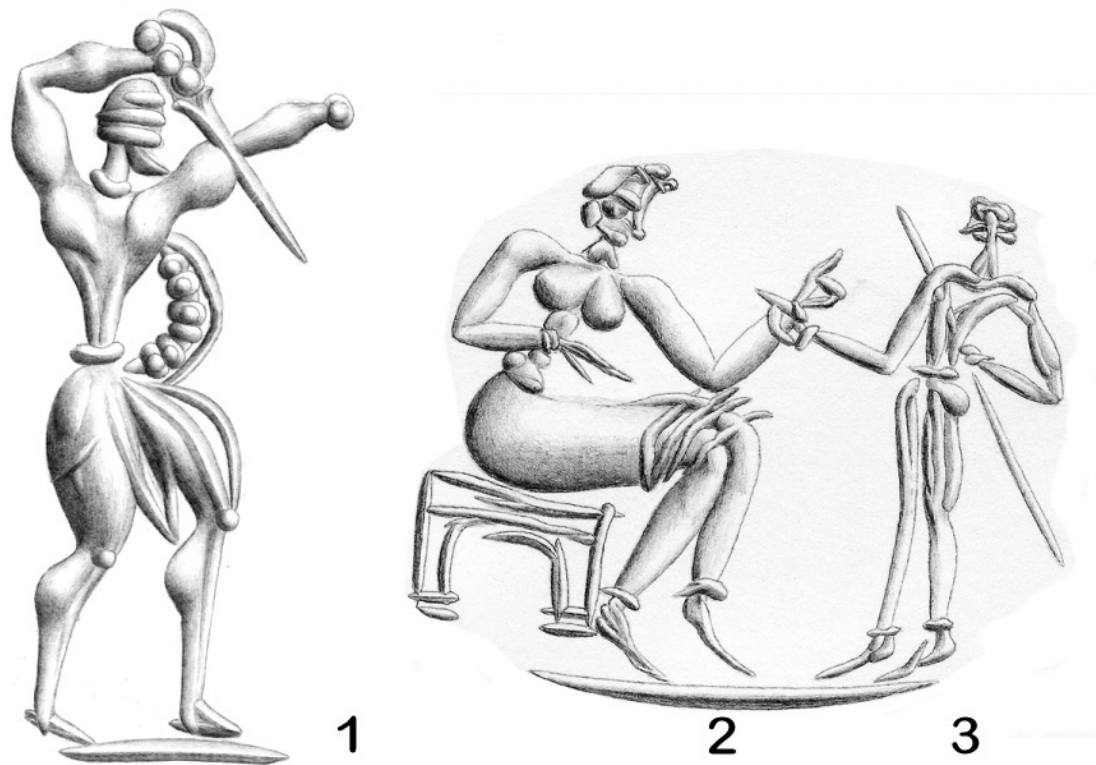
Figure 1. Examples of "contrapposto" and "anti-contrapposto":
1. A man in "contrapposto" from CMS I no. 12; 2.–3. A couple in "anti-contrapposto" from CMS I no. 101 (elaborated by the author).

on slightly bent legs, his right hand must be the far one, thus he is in the rear view. There are two figure-of-eight shields behind the warriors, thus one is on the wrong side, but none of them is actually using them, so they are a kind of a background, probably with symbolic meaning. The author of the Battle in the Glen (CMS I no. 16 [Fig. 2.2]) had a real problem depicting the losing warrior as a right-hander thus his posture is somewhat artificial. Pini believed that the victor was in the rear view and used his right hand to grab the opponents hair.[60] I think that both main protagonists on the ring are shown as right-handers,[61] holding their swords in their right hands, which is also confirmed by the "contrappostal" scheme and which also means that the losing warrior is in the rear view. The master has undertaken yet another ambitious task — to show the shielded warrior still fighting but trying to escape from the battlefield at the same time. He is looking backwards and engaging his long lance against the enemy, but his leg shows that his body, hidden behind the tower-shield is oriented in the opposite direction. The only visible hand should be the right one but because of the shield it is impossible to tell which one it actually is. He looks even less natural and shows, how those great artists struggled to overcome the limitations of their traditions, conventions, and esthetic habits of their times to reach desired results. Both fighting warriors on the PCA are in a "contrapposto" stance, which means that the victor holds a sword in his right, near hand and that his opponent, covered by his figure-of-eight shield, holds his lance close to the butt with his right, far hand. Because we can see his right shoulder and a small fragment of what is below it, it seems clear that he is also represented in the rear view. Less expertly is shown the warrior with figure-of-eight shield on a golden cushion

[60] PINI 1989, p. 203.
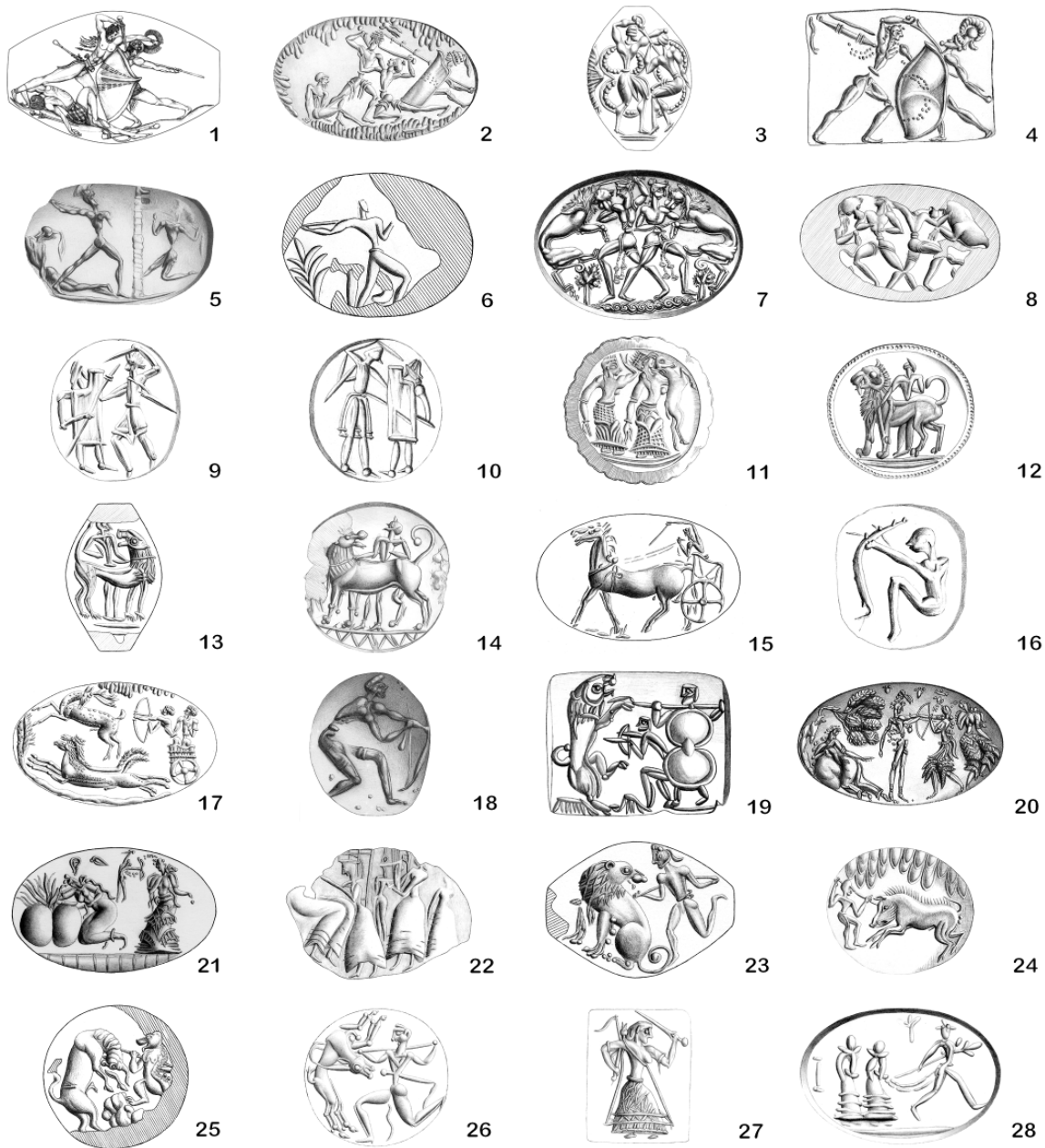
[61] Cf. STÜRMER 1982, p. 111.

Figure 2. 1. Pylos Combat Agate (drawing courtesy University of Cincinnati); 2. CMS I no. 16; 3. CMS I no. 12; 4. CMS I no. 11; 5. CMS II.6 no. 17; 6. CMS II.7 no. 19; 7. CMS XI no. 272; 8. CMS I no. 307; 9. CMS VII no. 129; 10. CMS XII no. 292; 11. CMS I no. 220; 12. CMS II.3 no. 13; m. CMS VS1B no. 77; 14. CMS X no 135; 15. CMS VS3 no. 244; 16. CMS IV no. D17a; 17. CMS I no. 15; 18. CMS II.6 no. 21; 19. CMS IX no. D7; 20. CMS XI no. 29; 21. CMS VI no. 278; 22. CMS I no. 361; 23. CMS I no. 112; 24. CMS I no. 277; 25. CMS I no. 227; 26. CMS VII no. 131; 27. CMS II.3 no. 16; 28. CMS V no. 173. Except 1. drawings courtesy CMS Heidelberg. Not to scale.

from Mycenae (CMS I no. 11 [Fig. 2.4]). His posture is similar to the one from the PCA thus, logically, he should be being shown in the rear view although the shoulder we see looks like the left near one which is impossible because he has the shield on the same side. Another case of the rear view are the sealings from Haghia Triadha and Kato Zakro in Crete (CMS II.6 no. 17 and CMS II.7 no. 19 [Fig. 2.5-6]) each with a spearman aiming his weapon at an enemy or prey with his hand raised up and held back. If the "contrappostal" scheme is involved also here, the hand is the far one which means that we see the backs of the warriors.[62] The authors of the aforementioned seals made them to be seen primarily as originals, they were much more limited in their decisions by the demands of the compositions and didn't have much choice about the frontal or rear view, but the maker of the Haghia Triadha composition was free to choose the view and decided on the rear one, which means that there was a special aim behind doing this. We have two possible artist's intentions. One is that both protagonists were left-handers on the signet ring, but the orientation of the hero to the viewer's right would be proper for victors.[63] The second one is that both warriors were to be viewed on the impression as right-handers in which case the orientation of the victor would be reversed. Whatever that intention was, the seal represents an original idea of its maker. The Danicourt Ring (CMS XI no. 272 [Fig. 2.7]) confronted its maker with similar problem, although this time we have a lion hunt involving two swordsmen standing back-to-back. The composition represents a real *horror vacui*, all the details are densely packed, and the artist did not leave space for more flexible modelling of the postures. Evidently the handedness was important and in order to let the subjects hold swords in their right near hands (on the ring) one of them had to be shown in the rear view.[64] There are similar compositions on signet-ring impressions from Pylos (CMS I no. 307 [Fig.2.8])[65] and on both ones the warriors are shown in the rear view. It is interesting to note that they are right-handed on the impressions in contrary to the Danicourt Ring.

Two similar seals represent two warriors each (CMS VII no. 129 and CMS XII no. 292 [Fig. 2.9-10]) probably fighting[66] in which the victor using sword is right-handed in the impression but his opponent, partly hidden behind his tower shield is shown in a way that is strange and impossible in reality, suggesting that he is using his spear with his left hand. The quality of both seals is not high, they could have one common model or one was modelled after the other;[67] probably their makers were not very skilled and had problems with depicting handedness of the opponents.

Outside of the realm of fighting and hunting the rear view is extremely rare, but the two muscular, half-naked women on a chalcedony seal from Vapheio (CMS I no. 220 [Fig. 2.11]) carrying a goat also look as they were shown in the rear view[68] but in this case it is difficult to guess what was the engraver's purpose. In some cases, we can have more doubts about the view. One candidate for the rear view is a man from the lentoid from Knossos (CMS II.3 no. 24 [Fig. 2.12]) standing behind a lion.[69] His near hand is on the near side of the lion and the far hand is partly hidden behind the man's body. Such a posture would be impossible in real world unless he was shown in the rear view. But why represent this man dominating over the lion in rear view with his back towards this dangerous animal? I think that this is a case of some incompetence of the maker, or maybe a result of changing the intention during the work. The makers of CMS VS1B no. 77 and CMS X no. 135 [Fig. 2.13-14] didn't have such problems and the dominant figures are clearly in the frontal view.

[62] Pini 1989, pp. 208, 214–215.
[63] Luschey 2002, p. 62; Blakolmer 2007, p. 219; Stocker, Davis 2017, p. 598.
[64] Pini 1989, pp. 209–210.
[65] Pini 1989, pp. 211–212; and CMS IS no. 173, Pini *et alii* 1997, p. 12.

[66] Cf. Pini 1989, pp. 206–207, where he says they are not fighting.
[67] Pini 1989, p. 207.
[68] Boardman 2001, p. 104.
[69] See Younger 1988a, p. XVI for terminology.

Among activities belonging to the first group are driving chariots and bow shooting. There are 10 seals with 11 chariots, but only six of them show whips or goads held by the drivers in a way allowing recognition the handedness. Among them are four original seals (including two cylinder seals) and only on one of them, a signet-ring from Aidonia (CMS VS3 no. 244 [Fig. 2.15]) is the driver right-handed which means that all the others were made probably to be impressed. On two preserved impressions, the drivers are also right-handed which agrees with this observation. The hands gripping whips or goads are shown as the far ones. It is a similar situation in the case of bow-shooting represented on nine seals (out of which six are Protopalatial prisms), where rendering is very schematic and only one hand is represented giving no indication of handedness (CMS IV no. D17a [Fig. 2.16] is different and if it is a bowman, he is represented as a right-hander on the original seal but it is not sure if it is genuine and the bow is rather strange, it could be that a musical instrument was represented rather than a bow). Bow shooting is shown on three seals in a more realistic way (CMS: I no. 15, II.6 no. 21, IX no. D7 [Fig. 2.17–19]) and on two of them except the *gemma dubitanda* where the bowman is pictured in a way difficult to interpret precisely, all both female and male shooters are right-handed. A very strange action takes place on the Berliner Ring CMS XI no. 29 [Fig. 2.20] where we see a woman in classical pose of a left-handed (right- in the impression view) bow shooter but a man fronting her puts his hand through the bow making it useless as a weapon.[70] Probably we should understand this as a symbolic action. On a signet-ring from Chania in Crete (CMS VI no. 278 [Fig. 2.21]), a floating male figurine is holding a bow in his outstretched hand but not in shooting position. There are also two fighting men on a Pre- or Protopalatial ring seal who grasp their bows but do not use them for shooting; this piece didn't pass the selection here because it does not help with the question of handedness offering an almost symmetrical composition.[71] In both categories of activities, the number of those seals is statistically not important and does not allow more generalized conclusions. One more image which could belong to the first group is a woman with a phorminx in a procession[72] on a badly preserved impression of a signet-ring from Pylos (CMS I no. 361 [Fig. 2.22]): Pini thought that the woman was playing the instrument[73] but according to John Younger she was just carrying it[74] and I accept this last view — one hand should be shown much higher if she was playing, but there is no such hand.

Another issue important for recognition of handedness is partial hiding of weapons or tools behind heads or bodies of their users. Three similar compositions, one on an amygdaloid from Mycenae (CMS I no, 112 [Fig. 2.23]), a lentoid from Vapheio (CMS I no. 227 [Fig. 2.24]) and the impression of a lentoid from Kato Zakro (CMS II.7 no. 31 [Fig. 2.25]) represent a human hunter or Minoan Genius bimanually stubbing their spear into a lion, a boar, or a bull respectively. In these compositions the spear disappears behind the body or head of a hunter. If it was naturalistic art, all hunters were in rear view but we can see the breasts of the Genius and it would be against the "contrappostal" scheme at the same time. It seems that this scheme was a very strong convention repeated on many seals, thus probably it was applied here too, and if this was the case, both hunters were depicted in the frontal view.[75] A good argument for this interpretation is another similar scene on a lentoid of unknown origin from the British Museum (CMS VII no. 131 [Fig.2.26]): its clear rendering undoubtedly allowing recognition of the frontal view, although the spear is also hidden behind the hunter's body. There are many examples of such partial hiding of weapons in fighting and hunting scenes but also of a large poppy head or "thyrsus" and spear in ritual scenes (CMS: II.3 no. 16, V no. 173, I no. 101 [Fig. 2.27–28;

[70] Cf. Poole 2020, p. 92.
[71] Rupp 2012, p. 285.
[72] German 2005, p. 67.

[73] Pini 1997, p. 2.
[74] Younger 1988b, p. 79.
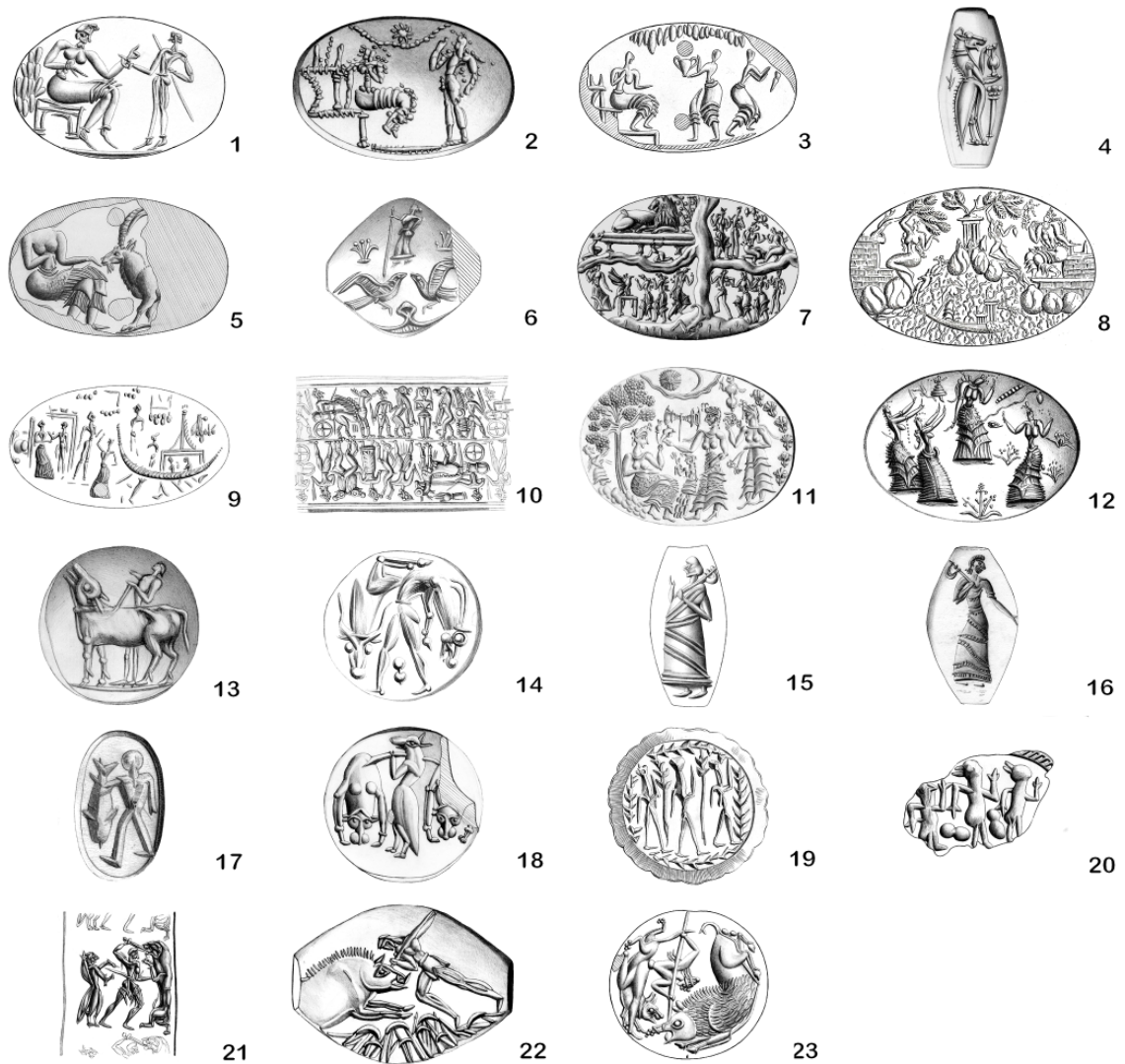[75] Non-naturalistic art on seals: Tamvaki 1989, p. 261.

Figure 3. 1. CMS I no. 10 1; 2. CMS V no. 199; 3. CMS II.8 no. 268; 4. CMS V no. 440; 5. CMS II.6 no. 30; 6. CMS II.8 no. 257; 7. CMS VI no. 277; 8. the Ring of Minos (based on Evans 1935, p. 950, fig. 917); 9. CMS I no. 180; 10. CMS II.3 no. 199; 11. CMS I no 17; 12. CMS II.3 no. 51; 13. CMS VS1A no. 173; 14. CMS VII 123; 15. CMS I no. 225; 16. CMS II.3 no. 198; 17. CMS II.2 no. 174a; 18. CMS XI no. 37; 19. CMS I 42; 20. CMS I 369; 21. CMS XI no. 208; 22. CMS XI no. 32; 23. CMS I no. 294. Except no. 8 drawings courtesy CMS Heidelberg. Not to scale.

Fig. 3.1]) or a leash tied to a lion's neck and held in both hands on mentioned above CMS VS1B no. 77 [Fig. 2.13].

The second group, comprising mostly gestures is also important for the question of handedness representations. Pini didn't use gestures in his analysis of "correct view" although he mentioned such a possibility.[76] On closer examination this group reveals a very interesting feature which is the "anti-contrappostal" scheme [Fig. 1.3] like on e.g. signet-ring CMS V no. 199 [Fig. 3.2] — this time the active hand and the leading leg are on the same side and the back leg is on opposite side together with the lowered or passive hand.[77] This holds true for a large majority of individuals

[76] PINI 1989, p. 215. [77] For definition see BENSON 2000, p. 94.

of both sexes involved in cultic or ritual scenes and in scenes of carrying vases. With the exception of a signet-ring impression from Knossos (CMS II.8 no. 268 [Fig. 3.3]) where a woman is carrying a double-handled jug towards a sitting woman and a Minoan Genius on a amygdaloid from Karpophora (CMS V no. 440 [Fig. 3.4]) carrying his libation jug in the same way, all other scenes show Minoan Genii with libation jugs[78] in processions or individually. In this case the back leg is the same as the hand supporting the vessel's bottom, and from other media we know that this is the left hand and that the scheme there is identical.[79]

There is of course a problem with female characters clad in long skirts that in many cases make it impossible to judge the legs position, even if the feet are visible. But we have several examples showing that the scheme applies to women as well. And not only to standing ones but also to many seated figures which are usually rendered in a way exposing the position of legs and again the back foot is the one on the same side as the lowered hand [Fig. 1.2]. We can observe the same scheme in scenes of feeding a goat, presenting a spear or a stick (e.g. CMS: II.6 no. 30, II.8 no. 257 [Fig. 3.5–6]). It is interesting that this scheme was popular already on Proto-palatial prisms. It seems that both schemes were of great importance to the artists. As an aside on the issue of "anti-contrapposto", we can note that on the Ring of Nestor (CMS VI no. 277 [Fig. 3.7]), only two of the people making the asymmetrical gesture are in "anti-contrapposto", while the other six are not, which could be an argument in a possible further discussion on the originality of the signet-ring.[80] Similarly, both schemes can be arguments in assessment of the authenticity of the Ring of Minos (Appendix B [Fig. 3.8]), where the seated gesturing female is in "anti-contrapposto" and three others involved in physical actions in the regular "contrapposto".

It seems important that only a few seals show both right- and left-handed people, 23 pieces altogether, all original items including 16 signet-rings, two cylinders and four lentoids. The domination of signet rings is understandable because the compositions represented on these seals belong mostly to cultic or ritual and processional scenes, frequently with interaction between the represented characters.[81] On some of them, like the Ring of Nestor, the Farewell Ring (CMS I no. 180 [Fig. 3.9]) or the cylinder from Astrakous there are many figures involved in the action (CMS II.3 no. 199 [Fig. 3.10]). I think that the compositional/aesthetic factors could influence such inconsistency of handedness, especially in the case of those multi-subject scenes making them to look more alive or natural. Among the subjects represented are seated women or central female or male figures (VIPs[82]) and floating figures, the last ones according to Kyriakidis[83] have more consistent orientation than other figures. The handedness of VIPs could be meaningful. In a case when the intention of an artist was to show them right-handed, the others of less importance would be left-handed. But it seems equally probable that the mortals in order to show their full respect for the VIPs had to execute appropriate gestures in the conventional way using the right hand as the most active one and the VIPs use left hands because they belong a different sphere. Saying this, I suggest that in case of ritual, cult scenes, the artists had more control over the handedness of their subjects then in hunting and war scenes where this aspect was obvious and represented in customary way. A very good example of such compositions is the golden signet-ring from the Ramp House at Mycenae (CMS I no. 17 [Fig. 3.11]). When looking at the ring we see on the left a woman sitting under a tree holding three poppies in her raised left far hand. Two women are approaching her, the first one raises her right far hand towards the poppies, the second one holds in her right far hand two short lilies and a plant(?) and in her lower left, two

[78] Rehak 1995, pp. 217–219.
[79] Lewartowski 2019a, pp. 196–198.
[80] To the bibliography collected in CMS we can add Marinatos 2015, pp. 194–195 – forgery; Vlachopoulos 2020, pp. 223–228 – authentic.

[81] On procession scenes see Wedde 2004.
[82] I use the term in the sense given to it by Crowley 2008, p. 77.
[83] Kyriakidis 2012, p. 383.

long lilies. Directly in front of the sitting woman there is a small figure, probably a girl also holding flowers(?) in her raised right far hand. There is also a girl behind the tree, but raising both her hands, and a floating creature in the shape of a figure-of-eight shield presenting a spear[84] with its raised far hand, probably the right one. Above the scene there are the sun and the moon in the first quarter. All three adult women are in the regular "anti-contrapposto". The author has clearly thought carefully about the entire composition with its many details and probably the handedness also. The seated woman is the main actress of the scene, a power being[85] maybe even a goddess.[86] She is the only one on the ring using the left hand, while on the impression all the other figures would be left-handed, which would conflict with the traditional important role of the right hand in performing ritual gestures. Therefore, I believe that the signet-ring maker intended the proper handedness to be shown on the original seal and deliberately made the VIP left-handed. An ivory pyxis lid from Mochlos with a similar but less complex scene supports this interpretation.[87] As always, there is still the possibility that compositional considerations decided, because as it stands there is an apparent harmony in this image, while the goddess's use of the right near hand would somewhat disrupt this harmony and the image clarity. Intentional left handedness of the VIP looks probable in scenes of the type just described but in such cases like the Isopata Ring (CMS II.3 no. 51 [Fig. 3.12]) where three women are gesturing towards the central one using both hands symmetrically and only the VIP (and the floating figurine) executes her gesture of Michael Wedde's type G4[88] with one raised hand it is more difficult to decide if she was represented as right- or left-handed.

Among seals included in the second group are compositions showing men and women leading bulls, lions, griffins, and a dog on leashes held in one hand (eight seals and one impression, e.g., CMS VS1A no. 173 [Fig. 3.13]). We can assume that in most cases, the master or mistress had to use a lot of strength and she/he was using the stronger hand which is usually the right one (but naturally, we, humble mortals, what do we know about the real behavior of griffins?). On four seals and on the impression it is the left hand, in five cases the far one. This activity had to be mentioned, but it is not a strong case of handedness and therefore adds little to the discussion.

The third group of activities comprises mostly scenes of carrying victims, sticks, staffs, axes on one shoulder or in hand (e.g. CMS: VII no. 123, I no. 225 [Fig. 3.14–15]). The handedness does not seem to be important here but the problem of near and far hand/shoulder/leg is. When it came to depicting actions done with the near or far hand, the artists were much more forceful than with handedness. Almost three times as many characters depicted in glyptic art use the far hand than the near hand. Only in the first group of activities does the near hand have a clear majority, the greater the majority of the far hand in the other groups. This is especially clear in group two, which is primarily the performance of gestures. Among them is the „commanding gesture" G8 — presentation of a spear, stick, or staff held vertically with horizontally outstretched hand. In all cases on seals this is the far hand, and an almost equal number of them is the right one on original seals as well as on impressions. We have an indication from other media that in reality this should be the right hand, although not necessarily the far one, but examples are really few.[89]

In the third group there is an interesting situation, because objects carried on the shoulder, such as labryses, axes or maces are carried on the near shoulder, as are spears, sticks or other such objects in other media, with one exception — the amygdaloid from Vathia (CMS II.3

[84] Boardman 2001, p. 104.

[85] Crowley 1995, p. 484.

[86] Poursat 2014, p. 111; for problems with identifying gods and goddesses: Chryssoulaki 1999, pp. 113–114; Blakolmer 2010b with bibliography.

[87] Recently Jones 2023 with bibliography.

[88] Wedde 1999, p. 914.

[89] Lewartowski 2019a, p. 196.

no. 198 [Fig. 3.16]), but the bearer's body is twisted backwards so although the impression is that it is the near shoulder, it is clear from the arrangement of the feet that it is the far one. In contrast, carrying sticks or sticks with something attached to them on the shoulder involves far and near shoulders as well, which in turn differentiates seals from other media. In both types of activities there is one example of hiding the object with the shoulder. Carrying the victim on the shoulder, on the other hand, is done on the far shoulder for obvious reasons, since the carried animal or human would obscure the head of the Genius, the Minotaur or the carrying man. It is interesting that the one-handed holding of a goat by the horns[90] or carrying the animal is done with the far hand, the right hand on the seal even on the earliest item in our set (CMS II.2 no. 174a [Fig. 3.17], Protopalatial). There is one interesting example of carrying of two lions-victims attached to each end of a pole by a Minoan Genius (CMS XI no. 37 [Fig. 3.18]). The pole disappears behind the neck of the Genius suggesting the far shoulder, but he secures it with his near hand, the other one is not visible. It looks that in this case it is not a case of hiding but an amalgam of a victim carrying on the far shoulder and carrying sticks or other narrow objects on the near shoulder. Although in this case the victims do not obscure the view of the Genius anyway, the artist, perhaps used to typical scenes of victims carrying preferred to place the pole on the far shoulder.

Speaking in general, statistical terms: there is an almost equal number of left- and right-handed persons on impressions and original seals (Table B) but when we take into account only well preserved impressions where all represented individuals are visible, there are proportionally many more left-handers (1:1.42). This can be the result of the state of preservation but the ratio of right- to left-handers on well preserved originals is similar (1:1.37). In compositions with one only figure, where there are no factors that could influence the handedness, like interaction between the subjects, the ratio of left- to right-handers on impressions is even higher (1:1.56) but on the original intaglios the prevalence of right-handers is this time much lesser (1:1.15). We can add to this picture statistics showing the ratios on completely preserved impressions and originals depicting only left- or only right-handed individuals (Table C). The result shows a similar tendency: there are more impressions with left-handers than those with right-handers (1.5:1) and more right-handers than left-handers on the original seals although the ratio is lower (1.2:1). The data suggest that more seals were made by the artists to be viewed as originals. Since I assumed in the Introduction that I was primarily interested in the point of view of the artists, let's try for the sake of experimentation to suppose that we have preserved originals from which impressions were made. Keeping in mind that the left-hander on the impression was a right-hander on the original, and adding the numbers from the second column of Table B accordingly, we get 199 right-handers versus 72 left-handers (a ratio of 2.76:1), so a huge predominance for the characters with correct handedness in the artist view. However, a similar operation carried out on the data in Table C, which contains the number of seals, gives results similar to those presented above: there are 124 originals with right-handers only versus 99 with left-handers only (ratio 1.25:1). Methodologically, such an exercise is not justified, since the impressions are the result of a certain selection made in antiquity, and the contexts and circumstances in which the originals and impressions survived were also different; nevertheless, the first result shows a significant tendency for artists to depict right-handed people in group scenes in the artist view which does not contradict the other calculations.

---

[90] In the set there is only a selection of the motive of "priestess with rampant caprid" – c.f. Pini 2010, p. 335; Rupp, Tsipopoulou 2012, pp. 309–314.

Table B. Number of left- and right-handers on originals and impressions

	All	**Well preserved (255)**	**Well preserved with only one person depicted (146)**
No. of right-handers on impressions	40	19	9
No. of left-handers on impressions	42	27	14
No. of right-handers on originals	173	172	61
No of left-handers on originals	127	126	53

Table C. Number of well-preserved originals/impressions with only left- or right-handers depicted (223)

Impressions with right-handers only	14
Impressions with left-handers only	21
Originals with right-handers only	103
Originals with left-handers only	85

Because of the small number of early and late seals I divide our set into three phases for statistical purposes: Pre- and Protopalatial, then Neopalatial from MB III-LB I, and finally late Neo- and Postpalatial from LB II-LB III. As concerns original seals, we have in the first phase strong prevalence of right-handed individuals (27:12; ratio 2.25:1), in the second one a much smaller (99:72; ratio 1.28:1), and equal ratio in the third one (49:47; ratio 1.04:1). We may note that already on Prepalatial prisms and cylindrical stamps there are left- as well as right-handers.[91] The number of impressions in the first phase is very small, just two left-handed individuals; in the second phase the data correspond with those from originals: 40 left-handers against 25 right-handers (1.6:1) but differ in the third one: 5 left- against 14 right-handers (0.35:1). From these data, a trend is emerging of more and more seals being made for viewing as an impression. However, a surprisingly high proportion of seals made presumably for viewing in the original were impressed in phase two. The latest group of impressions comes mainly from Pylos, one from Mycenae, and they were mostly made with seals earlier than their find contexts[92] except the sealing from Knossos, which means that there was no direct contact between their users and the makers, thus we do not know what the artist knew about the primary purpose of the seals they were making. We can only suggest that those users did not care much about the consequences of image reversal.

Soft-stone seals belonging to the Mainland Popular Group often apparently not intended to be impressed[93] do not provide much information because there are very few depictions of people, and these are very simplified. On two of them there are symmetrical compositions, and on lentoid from Mycenae (CMS I no. 42 [Fig.3.19]) the men are gesturing with their upraised right hands, similarly to two men on the impression from Pylos (CMS I no. 369 [Fig.3.20]) which suggests that the last impression derives from a seal made intentionally for impressing. Taking into account all seals made of soft stones,[94] right-handers prevail over left-handers in the proportion of 57:41 (1.39:1).

[91] On those seals: GOODISON 2018, p. 288.
[92] TAMVAKI 1985, pp. 268–269; BOARDMAN 2001, p. 62.
[93] DICKERS 2001, esp. pp. 40–41; KRZYSZKOWSKA 2005, pp. 271–273.

Similarly, the evidence from the cylinder seals (impressions made in form of rollings [Rollsiegeln]) do not contribute much, although they depict activities from groups 1 and 2. There are few of them, only nine. Surprisingly, on as many as four of the originals, we have people using only the right hand, and on two we have the use of both hands. Overall, there are clearly more right-handers on the originals (11:5), although one would rather expect the reverse ratio. Of particular interest is the case of an agate cylinder from the tolos at Kakovatos uniquely designed to be turned vertically (CMS XI no. 208 [Fig. 3.21]). The strong veining, and the form of the cylinder, do not allow the scene on the seal to be properly viewed, in addition, if worn on a wrist, the string was parallel to the long axis of the scene, which also did not facilitate viewing. But it is, however, on the seal that the warrior holds the sword in his right hand[95] and the scabbard is at his left side. He also attacks to the right, which seems to be the correct orientation of the victor (see above).

The signet-rings, preserved in the original, seem to have been made primarily for viewing them in the original, for which, of all types of Aegean seals, they are best suited together with golden cushions (Table D.1). On the preserved originals, the right-handers have a significant advantage (1.7:1): in the first group 3:1, in the third 2:1. However, in the second group the situation is not so clear (1.6:1), and since it is much more numerous than the others it has a definite impact on the overall statistics. The situation is completely different on the impressions, where on average the right-handers are slightly more numerous (1.07:1), with them dominating by far in the first group (2.7:1), in the second there is a balance while in the third, very small, they are clearly fewer (1:1.7). Thus, it appears that the artists making signet-rings with scenes from groups one and three (and presumably the people commissioning them) were aware of what they would be used for, and that it was much less common to imprint those not conceived for that purpose. In contrast, the use of signet-rings from group two was apparently not obvious at the time they were made; many were made with an impression in mind, while a lot of those made for viewing in the original were also impressed.

Among other forms of seals (Table D.2-3) the most numerous are lentoids (92), then amygdaloids (31), and cushions (10, including three made of gold). The majority of them belongs to the second group of activities. I treat them together, as they present similar trends. It is evident that on these seal forms there are clearly more left-handers on the originals, especially on amygdaloids, except for the third group on lentoids. However, this is not confirmed on the impressions, where left-handers also predominate. It is obvious that more such seals than of other forms were made for viewing as impressions, but it is difficult to explain that the impressions were made of seals created to be viewed as originals. However, impressions are relatively few, so this can be coincidental.

Table D. Number of left- and right-handers on seals of three shapes by groups of activities

	Total	Group 1.	Group 2.	Group 3.
1. Signet-rings				
No. of right-handers on impressions	30	8	19	3
No. of left-handers on impressions	28	3	20	5
No. of right-handers on originals	67	6	59	2
No. of left-handers on originals	40	2	37	1

---

[94] See PINI 2010 for analysis of this group.   [95] PINI 1989, p. 211.

	Total	Group 1.	Group 2.	Group 3.
2. Lentoid seals				
No. of right-handers on impressions	3	1	2	0
No. of left-handers on impressions	10	5	3	2
No. of right-handers on originals	47	8	30	9
No. of left-handers on originals	51	11	34	6
3. Amygdaloid seals				
No. of right-handers on impressions	5	3	1	1
No. of left-handers on impressions	5	4	1	0
No. of right-handers on originals	10	4	5	1
No. of left-handers on originals	15	5	7	3
4. Cushions				
No. of right-handers on impressions	1	0	1	0
No. of left-handers on impressions	3	1	2	0
No. of right-handers on originals	5	3	2	0
No. of left-handers on originals	6	4	2	0

John Younger observed many years ago that string-holes could be bored with the way the seals were planned to be used in mind: those with horizontal string-holes were suited especially for necklaces and those with vertical ones for bracelets. Archaeological evidence shows that the actual use could be different from the planned one.[96] Because of almost equal number of left- and right-handers on seals with vertical as well as horizontal string-holes it seems that this factor did not affect the composition.

Discussion

All the data and observations cited above demonstrate that the Aegean glyptists often showed inverted handedness of the figures, which indicates that handedness was considered by them when composing the scenes on the seals. In doing so, they used a variety of ways to adjust the image so that the depicted figures had the correct body arrangement. Since other Aegean artists depicted mostly right-handed people, so the same is to be expected from seal makers, as I assumed in the Introduction.

The depiction of figures in rear view was mainly associated with representations of combat. These are characterized by the opposing positioning of figures performing activities strongly related to handedness, so presumably the artists were also strongly motivated to show it correctly, whether in the original or in the impression, according to everyday experience. But depicting the same handedness of all the figures involved in the scene posed serious compositional difficulties, hence, as one might assume, a rear view was created, which was a novel idea, in contrast to the generally accepted convention of showing human torsos frontally. This didn't quite solve the problems created by the fight scenes, some of the characters of the losing warriors came out awkwardly, in artificial poses, but at least they all had the correct handedness, and the winners were portrayed flawlessly. The fact that it was the creators of these tiny pictures who used such

[96] YOUNGER 1977, pp. 153–157.

an advanced means of expression may have been due to the peculiarities of this medium, namely the reversal of images. Being aware of the laws governing such an operation and experienced in image manipulation, they were probably more open-minded in their search for a means to accomplish their intended purpose.

Partial hiding of some objects behind the bodies of the characters using/carrying them, mostly in scenes of hunting and fighting, is a kind of an artistic trick and fits well with the view of Aegean art as non-realistic. It is very difficult to say why the artists actually used this trick, since the hidden objects are thin and would not obstruct the view of their owners. Perhaps, some artists were concerned that having to draw lines against the head or body could damage the image, but on the other hand, there is no lack of depictions of various details against the background of the figure, such as elements of clothing or jewelry, in the third group various objects are carried on the shoulder without hiding, and we even have scenes of fighting or hunting without obscuring (e.g. CMS XI no. 32) or CMS XI no. 294 [Fig.3.22–23]). Even in such similar images as the PCA and the Battle in the Glen [Fig. 2.1–2], in the former the tip of the sword is against the arm, and in the latter the artist hid it behind the shoulder of the victor. Both artists created images of great class, so the latter reached for hiding not because of technical weaknesses in his craft. However, the result was an artificial solution that deviated from reality. This reminds us that the functions of the image in antiquity differed sharply from the role images play today, and what was important was the processing of the world, the message, talking by means of symbols "in the process of meaning-making".[97]

Among the formal devices used in Aegean glyptic art, one must include the "contrappostal" scheme found in fighting and hunting scenes and the "anti-contrappostal" scheme widely used in ritual scenes [Fig. 1]. While the former seems to reinforce the impression of the force put into a blow and is related to the motricity of the human body, the latter probably has a cultural, customary character, but also represents some kind of convention for showing ritual gestures. This is clear in the processional scenes, where the figures are probably in motion, so the positioning of the legs would be dynamic in reality, but on the seals the entire pose of the figure is strictly defined and repetitive in numerous representations. It seems to me that artists acted in a more calculated way, as far as gesture in cultic, religious scenes is concerned, especially since the representation of gesture is already very conventional, as it is usually only one moment (though probably somehow the most characteristic) out of a whole range of hand movements performed in the real world in three dimensions. The artists didn't take the easy way out here, because apparently there was a catalogue of such gestures, and they recur in numerous depictions in various media. Above, I suggested that the artists depicted many of the VIPs with left handedness, whether to distinguish them from ordinary ceremony attendees and indicate their higher nature, or for compositional reasons. These considerations dictated that the far hand was more often chosen so that the working hand did not obscure the figure, just as various items carried or used were partially hidden behind the bodies of their bearers, which could also be done for technical reasons. But also, some objects, such as axes, were generally shown on the near shoulder, which was probably dictated by custom or convention. Both schemes, together with the application of rear view and partial hiding, demonstrate the wide possibilities of glyptists to invent and use very different formal means that allow for the effective shaping of images and including the appropriate message in them. The first three are directly related to the representation of handedness, which reinforces the impression that the artists approached the issue of

---

[97] KNAPPETT 2020, p. 194; BOROWICZ 2021, esp. pp. 165–200 and BOROWICZ in print, both with vast literature; WEINGARTEN 2005, p. 356; PIERINI, PALAIMA 2021 §96.2,3; CHAPIN 2020 on emotions in Aegean art; concept of icon, see CROWLEY 2013, pp. 15–17.

depicting it consciously. This is also seen in the reversed handedness of the VIPs in relation to the other participants in the scenes.

The general statistics cited above give rise mainly to a discussion of "correct" view and artists view, while one must keep in mind the randomness of the finds, which almost certainly do not constitute a statistical sample. They show that artists produced both seals showing right- and left-handed figures, also on impressions we have a similar situation, so at least in some cases they were intended to be viewed as an impression. Originals and impressions must be considered separately, because in the first case we are dealing both with the artist and the patron, while over the use of the seals the artist no longer had control, especially since some of these objects had rich biographies and passed from hand to hand.[98] We don't know the modus operandi of seal makers, how they received commissions, or whether patrons always informed artists how they intended to use the new seals. In many cases, the makers understood that they were working on seals that were meant to be impressed, and they took care about how they would look in reverse image form. This is particularly evident with the signet-rings in group one, where both the impressions and the originals are dominated by right-handed persons. Artists worked with a similar consciousness when producing amygdaloid and lentoid seals, most often intended for imprinting. It is difficult to understand the case of the agate cylinder (CMS XI no. 208 [Fig. 3.21]) discussed above, where clearly the correct arrangement is present on the seal, although it is inherently unsuitable for viewing in this way. Thus, it appears that the craftsperson, in creating this seal, gave absolutely no thought to what the impression would look like. On the other hand, we have many impressions of seals of all types on which the handedness is reversed. From our point of view, these objects were not prepared to make an impression, but some of them were used for this purpose anyway. It is possible that their owners or their successors changed their minds and used for impressions the seals originally commissioned for being viewed in the original. At this point, it is worth referring to the observation of the discoverers of the PCA that this masterpiece was made to be admired in the original, but the creator also paid attention to the impression's appearance.[99] It is as well possible that they used them both for admiring the originals and making their impressions. In many cases, esp. of Cretan Neopalatial seals, the quality of impressions was not important, they were made carelessly and what one could see on sealings was far from the appearance of the originals, sometimes they were even hardly legible.[100]

This certain ambivalence of seal use suggests that perhaps the term "correct view" used in the literature is not apposite. The term "primary view" inspired by Kyriakidis' "primary viewing surface"[101] is a better expression of the situation, and in my understanding should be understood above all as reflecting the artist's concept of the seal and of its intended use. Most probably the "secondary view" was not considered to be incorrect, at most it represented a slight deviation from everyday experience (in the context of handedness, use of weapons, gesturing). I am convinced that often all these details and correctness mattered more for the makers than for the users or recipients, given the small size (on average in the set used here the longest dimension of a seal is 2.3 cm), the often poor legibility of the seal due to veining, often poor quality of impressions. In other media, more legible, where we have a dominance of right-handedness, we also have numerous exceptions. We can probably assume that in some cases, especially for signet ring makers, the right handedness really mattered, in other cases it was quite unimportant. The research on the reversal of images, cited above in the introduction, shows that in the past, the attitude towards representations of handedness and the correct orientation of scenes was much

---

[98] On seals as hairlooms see Krzyszkowska 2005, *passim*.

[99] Stocker and Davis 2017, pp. 597–598.

[100] Krzyszkowska 2005, pp. 126, 155.

[101] Kyriakidis 2012, p. 380.

more relaxed. In fact, until the 19th century AD, no serious thought was given to this issue.[102] The seals were unlikely to act as illustrated instructions for fighting or hunting or performing rituals, so for the public there was no difference in value accorded to reversed versions and the "correct" ones. On the other hand, the maker of such a work would presumably have usually been committed to the best possible execution and have had the ambition to achieve a perfect result, regardless of the attitude of the recipients towards this matter. It can be assumed that the authors of these tiny works of art in the Bronze Age were not very different from later artists in this regard.

Conclusions

I assumed in the introductory part of this text that the creators of Aegean seals mostly, like other Bronze Age Greece artists, depicted people and creatures using their hands as right-handed. Consistently, therefore, we must assume that the handedness of the figures is an important criterion for us (etic) to recognize the creators'/patrons' intended (emic) way of viewing the finished seals. However, we have seen that the reality of the Bronze Age was not so simple. It seems unquestionable that the glyptists indeed considered the handedness of the depicted figures in their compositions and used various procedures like both "contrappostal" schemes or rear view to show this handedness well. At the same time, it is both a natural handedness, resulting from our genes, and a cultural one, evident in ceremonial and ritual behavior. Sometimes they also inverted this handedness, probably adapting the seals to be viewed as impressions, since it is difficult to find any other explanation for this operation. Based on the material we have, it is impossible to assess to what extent handedness played a role here. Judging by the many impressions with depictions of left-handed people, the seal makers may often not have known what use would be made of their creations, some may not have wanted to reverse the handed-ness, or may not have seen any problem here at all, or may have been interested only in the aestethic view of the image. It seems that artists placed more importance on the handedness of the figures than their clients did. This would not be surprising, since the maker of an image is inevitably forced to analyze all details in greater depth, even when it is not the artist's goal to realistically reflect reality.

The seal made and handed over to the patron lived a life of its own, not necessarily used as envisioned by its creator and passing from hand to hand, sometimes for a long time. Users were free to do whatever they wanted to with their seals, and we saw that they apparently didn't mind obtaining impressions that depicted left-handed people or an incorrect orientation of the scene. In all likelihood, the "correct view" for them did not exist or was not an important aspect of the appearance of the seal, especially its impression, since the quality of the impression was often not given much importance either. For the seal bearer, there is always an "incorrect view", whether on the original or its impression, because that is the nature of the product, so they were also used to both views. All this leads one to believe that for both makers and users of seals, the message contained in them, the symbolic or magical meaning, was important. The user knew what this message was and did not necessarily have to "read" it in the image, the mere aware-ness of it was enough, an awareness of the intention inherent in the seal and its impression, the perception of which did not require diligent study of its details.

---

[102] McManus 2002, p. 203.

Appendix A. Objects not included into CMS:

HM — Heraklion Archaeological Museum inventory numbers; all other markings are excavations inventories numbers.

Archanes Cult Ring[103]
Archanes Griffin Ring[104]
The Ring of Minos[105]
The Sacred Conversation Ring[106]
The Runner's Ring[107]

Finds from the Grave of the Griffin Warrior at Pylos:
    the Combat Agate[108]
    gold rings 2–4[109]
    agate lentoid[110]

Finds from Petras:
    PO5/941[111]
    PO7/13[112]
    PTSK14.2242a[113]

Sellopoulo Ring[114]
Lentoid Seal from Galatas[115]

Appendix B. Aegean chronology.

Absolute chronology (years BC)	Relative chronology
3100-2650	EB I Prepalatial
2650-2000	EB II
2200-2100/2050	EB III
2100/2050-1875/50	MB I
1875/50-1750	MB II Protopalatial
1750-1700/1675	MB III Neopalatial
1700/1675-1550/1525	LB IA
1550/1525-1470/60	LB IB
1470/60-1420/10	LB II Late Neopalatial

[103] HM 989, Sakellarakis, Sapouna-Sakellaraki 1997, pp. 654–650.
[104] HM 1017, Sakellarakis, Sapouna-Sakellaraki 1997, pp. 650–654.
[105] HM 1700, Evans 1935, pp. 947–956; Dimopoulou, Rethemiotakis 2004, *passim*.
[106] HM 1692, Dimopoulou, Rethemiotakis 2000, *passim*.
[107] HM 1629, Lebessi, Muhly, Papasavvas 2004, *passim*.
[108] SN18-112, Stocker, Davis 2017, *passim*.
[109] SN24-30, SN 24-702, SN24-736, Davis, Stocker 2018, pp. 637–646.
[110] SN24-105, Stocker, Davis 2020, p. 29.
[111] Rupp 2012, *passim*.
[112] Rupp , Tsipopoulou 2012, pp. 305–311.
[113] Krzyszkowska 2017, pp. 147–148.
[114] Sell J8, Popham, Catling, Catling 1974, pp. 217–219.
[115] HMS 3668 Dimopoulou, Rethemiotakis 2000, pp. 44–45.

Absolute chronology (years BC)	Relative chronology
1420/10-1330/15	LB IIIA
1330/15-1200/1190	LB IIIB Postpalatial
1200/1190-1075/50	LB IIIC

EB — Early Bronze Age; MB — Middle Bronze Age; LB — Late Bronze Age
The oldest seals from Crete in this set are dated to EB III-MB I the oldest from the mainland are dated to LB I and the youngest from both areas to LB IIIB. I am using in the text the terminology based on developments in Cretan palaces for all seals because the majority of them was found in Crete and many of those found elsewhere were probably of Cretan production.[116]

Bibliography

ADAIR 1958
H. J. ADAIR, *Phenomenal differences between the left and right in photographed scenes* (diss. Dept. of Psychology, Michigan State University of Agriculture and Applied Sciences).

ALEXIOU 1967
S. ALEXIOU, *Ysterominoikoí táfoi liménos Knosoú (Katsampá)*, [Late Minoan tombs in port of Knossos (Katsamba)], Athens.

ARNHEIM 1974
R. ARNHEIM, *Art and Visual Perception: A Psychology of the Creative Eye*, second edition, Berkeley.

BALTER 2009
M. BALTER, "The Origins of Handedness", https://blogs.sciencemag.org/origins/2009/08/the-origins-of-handedness.html (access 5.05.2023).

BENNET 2004
J. BENNET, "Iconographies of value. Words, people and things in the Late Bronze Age Aegean", [in:] *The Emergence of Civilisation Revisited*, eds. J. C. BARRETT, P. HALSTEAD (= *Sheffield Studies in Aegean Archaeology* 6), Oxford, pp. 90–106.

BENSON 2000
J. L. BENSON, *Greek Sculpture and the Four Elements*, https://scholarworks.umass.edu/art_jbgs/ (access 2.03.2023).

BETTS, YOUNGER 1982
J. H. BETTS, J. G. YOUNGER, "Aegean seals of the Late Bronze Age: masters and workshops", *Kadmos* 21, pp. 104–121.

BIESANTZ 1954
H. BIESANTZ, *Kretisch-Mykenische Siegelbilder. Stilgeschichtliche und Chronologische Untersuchungen*, Marburg.

BLAKOLMER 2007
F. BLAKOLMER, "The Silver Battle Krater from Shaft Grave IV at Mycenae", [in:] *EPOS. Reconsidering Greek Epic and Aegean Bronze Age Archaeology. Proceedings of the 11th International Aegean Conference, Los Angeles, UCLA – The J. Paul Getty Villa, 20-23 April 2006*, eds. S. P. MORRIS, R. LAFFINEUR (= *Aegaeum* 28), Liège – Austin, pp. 213–224.

BLAKOLMER 2010a
F. BLAKOLMER, "Small is beautiful. The significance of Aegean glyptic for the study of wall paintings, relief frescoes and minor relief arts", [in:] *Die Bedeutung der minoischen und mykenischen Glyptik. VI Internationales Siegel-Symposium aus Anlass des 50 jährigen Bestehens des CMS Marburg, 9.-12. Oktober 2008*, ed. W. MÜLLER (= *CMS Beiheft* 8), Berlin, pp. 91–108.

BLAKOLMER 2010b
F. BLAKOLMER, "A Pantheon without attributes? Goddesses and gods in Minoan and Mycenean iconography", [in:] *Divine Images and Human*

[116] The absolute chronology based on: MANNING 2010, Table 2.2; low chronology of the end of EB IA follows: PEARSON *et alii* 2018, esp. pp. 4–7; 2020, esp. pp. 948–949.

Imaginations in Ancient Greece and Rome, ed. J. MYLONOPOULOS, Leiden – Boston, pp. 21–62.

BLAKOLMER 2012 F. BLAKOLMER, "Image and architecture: Reflections of mural iconography in seal images and other art forms of Minoan Crete", [in:] *Minoan Realities: Approaches to Images, Architecture and Society in the Aegean Bronze Age*, eds. D. PANAGIOTOPOULOS, U. GÜNKEL-MASCHEK (= *Aegis* 5), Louvain, pp. 83–114.

BLAKOLMER 2018 F. BLAKOLMER, "Sculpted with the paintbrush? On the interrelation of relief art and painting in Minoan Crete and Thera", [in:] *ΧΡΩΣΤΗΡΕΣ / PAINTBRUSHES Wall-painting and Vase-Painting of the Second Millennium BC in Dialogue: Proceedings of the International Conference on Aegean Iconography Held at Akrotiri, Thera, 24-26 May 2013*, ed. A. G. VLACHOPOULOS, Athens, pp. 143–151.

BLAKOLMER 2021 F. BLAKOLMER, "Regionalism, centre and periphery in Mycenaean palatial arts. On the thematic spectrum of Mycenaean mural paintings and other artistic media", [in:] *3rd International Interdisciplinary Colloquium The Periphery of the Mycenaean World. Recent Discoveries and Research Results 18-21 May, Lamia 2018*, ed. E. KARANTZALI, Athens, pp. 37–50.

BOARDMAN 2001 J. BOARDMAN, J. *Greek Gems and Finger Rings. From Bronze Age to Late Classical*, new expanded edition., London.

BOITEAU, SMITH, ALMOR 2020 T. W. BOITEAU, C. SMITH, A. ALMOR, "Rightward directional bias in art produced by cultures without a written language", *Laterality* 25, pp. 165–176.

BOROWICZ 2021 S. BOROWICZ,. *Reliefy rozmazane: Rzeczy i obrazy w kulturze dawnej Grecji*, Kraków.

BOROWICZ in print S. BOROWICZ, "Sensory heritage and visual environment in pre-philosophical societies", [in:] *Interdisciplinary Dialogues and Cultural Heritage. An Integrated Approach* (*Culture – Environment – Society: Humanities and beyond*), eds. J. GODLEWICZ-ADAMIEC, P. PISZCZATOWSKI.

DE BOSIO 2018 S. DE BOSIO, "Formes de la dissemination. L'image inversée dans les recueils gravés au XVIIIe siècle", [in:] *Wiederholung/Répétition. Wiederkehr, Variation und Übersetzung in der Kunst*, eds. A. BEYER, J. ETIENNE, R. MARKUS (= *Passagen/Passages* 56), Berlin, München, pp. 67–79.

CAIN 1997 C. D. CAIN, *The Question of Narrative in Aegean Bronze Aegean Art* (diss. Univerity of Toronto).

CAIN 2001 C. D. CAIN, "Dancing in the dark: Deconstructing a narrative of epiphany on the Isopata Ring", *American Journal of Archaeology* 105, pp. 27–49.

CAMERON 1976 M. A. S. CAMERON, "On theoretic principles in Aegean Bronze Age mural decoration", *Temple University. Aegean Symposium* 1, pp. 20–41.

CHAHBOUN et alii 2017 S. A. CHAHBOUN, A. FLUMINI, C. PÉREZ GONZÁLEZ, I. C. MCMANUS, J. SANTIAGO, "Reading and writing direction effects on the aesthetic appreciation of photographs", *Laterality* 22, pp. 313–339.

CHAPIN 2020 A.P. CHAPIN, "Iconography in context: the visual elements of Aegean Art", [in:] *Current Approaches and New Perspectives in Aegean Iconography*, ed. F. BLAKOLMER (= *Aegis* 18), Louvain, pp. 369–384.

CHRYSSOULAKI 1999 S. CHRYSSOULAKI, "A new approach to Minoan iconography – an introduction: the case of Minoan Genii", [in:] *Meletemata: Studies in Aegean Archaeology Presented to Malcolm H. Wiener as He Enters his 65th Year*, eds. P. P. BETANCOURT, V. KARAGEORGHIS, R. LAFFINEUR, W. D. NIEMEIER (= *Aegaeum* 20), Liège – Austin, pp. 111–118.

CROWLEY 1995 J. L. CROWLEY, "Images of power in the Bronze Age Aegean", [in:] *Politeia. Society and State in the Aegean Bronze Age. Proceedings of the 5th International Aegean Conference, University of Heidelberg,*

Archäologisches Institut 10-13 April 1994, eds. R. LAFFINEUR, W. D. NIE-MEIER (= *Aegaeum* 12), Liège – Austin, pp. 475–491.

CROWLEY 2008   J. L. CROWLEY, "In honour of the gods – but which gods? Identifying deities in Aegean Glyptic", [in:] *DAIS. The Aegean Feast. Proceedings of the 12th International Aegean Conference/12e Rencontre égéenne internationale, University of Melbourne, Centre for Classics and Archaeology, 25-29 March 2008*, eds. L.A HITCHCOCK, R. LAFFINEUR, J. CROWLEY (=*Aegaeum* 29), Liège – Austin.

CROWLEY 2013   J. L. CROWLEY, *The Iconography of Aegean Seals* (= *Aegaeum* 34), Liège – Austin.

CROWLEY 2020   J. L. CROWLEY, "Reading the Phaistos sealings: taking the textbook approach of iconographic analysis", [in:] *Current Approaches and New Perspectives in Aegean Iconography*, ed. F. BLAKOLMER (= *Aegis* 18), Louvain, pp. 19–43.

DAVIS, STOCKER 2018   J. L. DAVIS, S. R. STOCKER, "The Lord of the Gold Rings: The Griffin Warrior of Pylos", *Hesperia* 85, pp. 627–655.

DICKERS 2001   A. DICKERS, *Die Spätmykenischen Siegel aus Weichem Stein: Untersuchungen zur Spätbronzezeitlichen Glyptik auf dem Griechischen Festland und in der Ägäis*, Rahden/Westf.

DIMOPOULOU,
RETHEMIOTAKIS 2000   N. DIMOPOULOU, G. RETHEMIOTAKIS, "The 'Sacred Conversation' Ring from Poros", [in:] *Minoisch-Mykenische Glyptik. Stil, Ikonographie, Funktion*, ed. W. MÜLLER (= *CMS Beiheft* 6), Berlin, pp. 39–56.

DIMOPOULOU,
RETHEMIOTAKIS 2004   N. DIMOPOULOU, G. RETHEMIOTAKIS, *The Ring of Minos and Gold Minoan Rings. The Epiphany Cycle*, Athens.

EVANS 1935   EVANS, A. 1935. *The Palace of Minos at Knossos Vol. 4.2.*, Lonodon

FURTWÄNGLER, LOESCHCKE 1886   A. FURTWÄNGLER, G. LOESCHCKE, *Mykenische Vasen: vorhellenische Thongefässe aus dem Gebiete des Mittelmeeres*, Berlin.

GAFFRON 1950   M. GAFFRON, "Laterality in art", *Art Quarterly* 13, pp. 312–331.

GALANAKIS 2005   K. GALANAKIS, *Minoan Glyptic : Typology, Deposits and Iconography from the Early Minoan Period to the Late Minoan IB Destruction in Crete*, Oxford.

GERMAN 2005   S. GERMAN, *Performance, Power and the Art of the Aegean Bronze Age*, Oxford.

GILL 1970   M. A. V. GILL, "Apropos the Minoan 'Genius'" *American Journal of Archaeology* 74, pp. 404–406.

GOODISON 2018   L. GOODISON, "New Evidence and New Narratives from the Mesara-type tombs", [in:] Πεπραγμένα του ΙΑ' Διεθνούς Κρητολογικού Συνεδρίου (Ρέθυμνο, 21-27 Οκτωβρίου 2011) [Pepragména tou IA' Diethnoús Kritologikoú Synedríou (Réthymno, 21-27 Oktovríou 2011)], ed. E. GAVRILAKI, Rethymno, pp. 278–293.

GÜNKEL-MASCHEK 2012   U. GÜNKEL-MASCHEK, "Spiralls, bulls and sacred landscapes: the meaningful appearance of pictorial objects within their spatial and social contexts", [in:] *Minoan Realities: Approaches to Images, Architecture and Society in the Aegean Bronze Age*, eds. D. PANAGIOTOPOULOS, U. GÜNKEL-MASCHEK (= *Aegis* 5), Louvain, pp. 115–140.

HARRIS 1976   M. HARRIS, "History and significance of the emic/etic distinction", *Annual Review of Anthropology* 5, pp. 329–350.

HAYDEN 1984   B. HAYDEN, "Are emic types relevant to archaeology?", *Ethnohistory* 31, pp. 79–92.

HERTZ 1960   R. HERTZ, *Death and the Right Hand*, Glencoe, Illinois.

HEURTLEY 1921   W. A. HEURTLEY, "The grave stelai", *Annual of the British School at Athens* 25, pp. 126–146.

HILLER 1999   S. HILLER, "Scenes of warfare and combat in the arts of Aegean Late Bronze Age. Reflections on typology and development", [in:]

Polemos: Le contexte guerier en Égée à l'âge du Bronze. Actes de la 7e Rencontre égéene internationale, Université de Liège, 14–17 avril 1998, ed. R. LAFFINEUR (= *Aegaeum* 19), Liège – Austin, pp. 320–330.

HUTSON, MARKENS 2002   S. R. HUTSON, R. MARKENS, "Rethinking emic pottery classification", *Kroeber Anthropological Society Papers* 88, pp. 8–27.

JACOBSEN 2010   T. JACOBSEN, "Beauty and the brain: culture, history and individual differences in aesthetic appreciation", *Journal of Anatomy* 216, pp. 184–191.

Jones 2023   B. R. Jones, "The presentation scene on the ivory pyxis lid from Mochlos: a reconstruction and reinterpretation", *American Journal of Archaeology* 127, pp. 481–495.

JØRGENSEN 2013   L. B. JØRGENSEN, "Introduction to part II: technology of practice", [in:] *Embodied Knowledge: Perspectives on Belief and Technology*, eds. M. L. S. SØRENSEN, K. REBAY-SALISBURY, Oxford – Oakville, CT, pp. 91–94.

KAISER 1976   B. KAISER, B. *Untersuchungen zum Minoischen Relief*, Bonn.

KEIMER, THOMAS 2020   K. H. KEIMER, Z. THOMAS, "Etic and emic expressions of power in Ancient Israel: recalibrating a discussion", *Jaarbericht van het Voora-ziatisch-Egyptisch Genootschap "Ex Oriente Lux"* 48, pp. 69–92.

KNAPPETT 2020   C. KNAPPETT, *Aegean Bronze Age Art: Meaning in the Making*, Cambridge.

KOEHL 2006   R. B. KOEHL, *Aegean Bronze Age Rhyta*, Philadelphia, Penn.

KRZYSZKOWSKA 2005   O. KRZYSZKOWSKA, *Aegean Seals. An Introduction*, London.

KRZYSZKOWSKA 2017   O. KRZYSZKOWSKA, "Further seals from the cemetery at Petras", [in:] *Petras, Siteia: the Pre- and Proto-Palatial Cemetery in Context. Acts of Two-Day Conference Held at the Danish Institute at Athens, 14-15 February*, ed. M. TSIPOPOULOU (= *Monographs of the Danish Institute at Athens* 21), Aarhus, pp. 145–170.

KYRIAKIDIS 2012   E. KYRIAKIDIS, "How to see the Minoan signet rings. transformations in Minoan miniature iconography", [in:] *Kosmos. Jewellery, Adornment and Textiles in the Aegean Bronze Age. Proceedings of the 13th International Aegean Conference/13e Rencontre égéenne internationale, University of Copenhagen, Danish National Research Foundation's Centre for Textile Research, 21–26 April 2010*, eds. M. L. NOSCH, R. LAFFINEUR (= *Aegaeum* 33), Liège, pp. 379–387.

KYRIELEIS 1968   H. KYRIELEIS, "Eine Eigenart spätminoischer Reliefarbeiten", *Marburger Winckelmann Programm* 1968, pp. 5–21.

LEBESSI, MUHLY, PAPASAVVAS 2004   A. LEBESSI, P. MUHLY, G. PAPASAVVAS , "The Runner's Ring, a Minoan athlete's dedication at the Syme Sanctuary", *Athenische Mitteilungen* 119, pp. 1–31.

LEWARTOWSKI 2019a   K. LEWARTOWSKI, "Left hand, right hand, near hand, far hand: On handedness in Aegean Art", *Novensia* 30, pp. 183–210.

LEWARTOWSKI 2019b   K. LEWARTOWSKI, "Combat, myths and seals in the Griffin Warrior times", *Studies in Ancient Art and Civilizations* 23, pp. 73–94.

LEWARTOWSKI in print   K. LEWARTOWSKI, "Seal engravers, other Bronze Age Aegean artists and human handedness".

LUSCHEY 2002   H. LUSCHEY, *Links und Rechts. Untersuchungen über Bewegungs-richtung, Seitenordnung und Höhenordnung als Elemente der antiken Bildsprache*, Tübingen – Berlin.

MAASS, PAGANI, BERTA 2007   A. MAASS, D. PAGANI, E. BERTA, "How beautiful is the goal and how violent is the fistfight? Spatial bias in the interpretation of human behavior", *Social Cognition* 25, pp. 833–852.

MALLORY 1989   J. P. MALLORY, *In Search of the Indo-Europeans: Language, Archaeology, and Myth*, London.

Manning 2010　　　　　　　　　S. M. Manning, "Chronology and terminology", [in:] *The Oxford Hand-book of the Bronze Age Aegean (ca. 3000–1000 BC)*, ed. E. H. Cline, Oxford, pp. 11–28.

Marinatos 2015　　　　　　　　N. Marinatos, "On the authenticity of the "Minos Ring": Evidence from Spyridon Marinatos' archives", [in:] *Ein Minoer im Exil. Festschrift für Wolf-Dietrich Niemeier*, eds. D. Panagiotopoulos, I. Kaiser, O. Kouka (= *Universitätsforschungen zur prähistorischen Archäologie* 270), Bonn, pp. 189–198.

McManus 2002　　　　　　　　I. C. McManus, *Right Hand, Left Hand: The Origins of Asymmetry in Brains, Bodies, Atoms, and Cultures*, London.

Mostowlansky, Rota 2020　　T. Mostowlansky, A. Rota, "Emic and Etic" http://doi.org/10.29164/20emicetic (access 7.03.2023).

Needham 1967　　　　　　　　R. Needham, "Right and left in Nyoro symbolic classification", *Africa* 34, pp. 425–452.

Needham 1973　　　　　　　　R. Needham, "Introduction", [in:] *Right and Left. Essays on Dual Symbolic Classification*, ed. R. Needham, Chicago – London, pp. XI–XXXIX.

Niemeier 1988　　　　　　　　W. D. Niemeier, "The 'Priest King' fresco from Knossos. A new reconstruction and interpretation", [in:] *Problems in Greek Prehistory: Papers Presented at the Centenary Conference of the British School of Archaeology at Athens, Manchester, April 1986*, eds. E. B. French, K. A. Wardle, Bristol, pp. 235–244.

Nol 2021　　　　　　　　　　H. Nol, "Defining cities and non-cities through emic and etic perspectives: A case study from Israel/Palestine during Early Islam", *Journal of Urban Archaeology* 4, pp. 193–220.

Panagiotopoulos 2020　　　Panagiotopoulos, D. 2020. "The 'death of a painter'. Towards a radical archaeology of (Minoan) images", [in:] *Current Approaches and New Perspectives in Aegean Iconography*, ed. F. Blakolmer (= *Aegis* 18), Louvain, pp. 385–486.

Papadatou-Pastou *et alii* 2020　M. Papadatou-Pastou, E. Ntolka, J. Schmitz, M. Martin, M. R. Munafò, S. Ocklenburg, S. Paracchini, "Human handedness: a meta-analysis", *Psychological Bulletin* 146, pp. 481–524.

Paracchini 2021　　　　　　　S. Paracchini, "Recent advances in handedness genetics", *Symmetry* 13, p. 1792.

Pearson *et alii* 2018　　　　C. L. Pearson, P. W. Brewer, D. Brown, T. J. Heaton, G. W. L. Hodgins, A. J. T. Jull, T. Lange, M. W. Salzer, "Annual radiocarbon record indicates 16th century BCE date for the Thera eruption", *Science Advances* 4, source: https://repository.arizona.edu/bitstream/handle/10150/631220/eaar8241.full.pdf?sequence=1&isAllowed=y.

Pearson *et alii* 2020　　　　C. Pearson, L. Wacker, A. Bayliss, D. Brown, M. Salzer, P. Brewer, S. Bollhalder, G. Boswijk, G. Hodgins, "Annual variation in atmospheric 14C between 1700 BC and 1480 BC", *Radiocarbon* 62, pp. 939–952.

Pérez González 2012　　　　C. Pérez González, "Lateral organisation in nineteenth-century studio photographs is influenced by the direction of writing: a comparison of Iranian and Spanish photographs", *Laterality* 17, pp. 515–532.

Persson 1942　　　　　　　　A. W. Persson, *The Religion of Greece in Prehistoric Times*, Berkeley – Los Angeles.

Pierini, Palaima 2021　　　R. Pierini, T. Palaima, "MASt@CHS – Summer Seminar 2021 (Friday, July 23): summaries of presentations and discussion" https://classical-inquiries.chs.harvard.edu/mastchs-summer-seminar-2021-friday-july-23-summaries-of-presentations-and-discussion/ (access 17.02.2023).

Pini 1981　　　　　　　　　　I. Pini, "Echt oder falsch? – einige Fälle", [in:] *Studien zur minoischen und helladischen Glyptik: Beiträge zum 2. Marburger Siegel-Symposium 26.-30. September 1978*, ed. W. D. Niemeier (= *CMS Beiheft* 1), Berlin, pp. 135–157.

PINI 1989   I. PINI, "Zur <richtigen> Ansicht minoisch-mykenischer Siegel und Ringdarstellungen", [in:] *Fragen und Probleme der bronzezeitlichen ägäischen Glyptik: Beiträge zum 3. Internationalen Marburger Siegel-Symposium 5–7 September 1985*, ed. W. MÜLLER (= *CMS Beiheft* 3), Berlin, pp. 201–208.

PINI 2010   I. PINI, "Soft stone versus hard stone seals in Aegean glyptic: some observations on style and iconography", [in:] *Die Bedeutung der minoischen und mykenischen Glyptik. VI Internationales Siegel-Symposium aus Anlass des 50 jährigen Bestehens des CMS Marburg, 9.-12. Oktober 2008*, ed. W. MÜLLER (= *CMS Beiheft* 8), Mainz am Rhein, pp. 325–339.

PINI 2015   I. PINI, "Bemerkungen zu figürlichen Darstellungen in der minoisch-mykenischen Flächenkunst", [in:] *Ein Minoer im Exil. Festschrift für Wolf-Dietrich Niemeier*, eds. D. PANAGIOTOPOULOS, I. KAISER, O. KOUKA (= *Universitätsforschungen zur prähistorischen Archäologie, aus dem Institut für Archäologie der Universität Heidelberg,* 270), Bonn, pp. 319–327.

PINI *et alii*   I. PINI, W. MÜLLER, J.-P. OLIVIER, A. SAKELLARIOU, *Die Tonplomben aus dem Nestorpalast von Pylos*, Mainz am Rhein.

POOLE 2020   S.E. POOLE, *A Consideration of Gender Roles and Relations in the Aegean Bronze Age Interpreted from Gestures and Proxemix in Art* (= *BAR International Series*, 2980), Oxford.

POPHAM, CATLING, CATLING 1974   M. R. POPHAM, E. A. CATLING, H. W. CATLING, "Sellopoulo Tombs 3 and 4, two Late Minoan graves near Knossos", *Annual of the British School at Athens* 69, pp. 195–257.

POURSAT 1977   J.-C. POURSAT, *Les ivoires mycénien: essai sur la formation d'un art mycénien*, Paris.

POURSAT 2014   J.-C. POURSAT *L'art égéen 2. Mycènes et le monde mycénien*, Paris.

REHAK 1995   P. REHAK, "The 'Genius' in Late Bronze Age glyptic: the later evolution of an Aegean cult figure", [in:] *Sceaux minoens et mycéniens, IV symposium international, 10–12 septembre 1992, Clermont-Ferrand*, ed. W. MÜLLER (= *CMS Beiheft* 5), Berlin, pp. 215–231.

RUPP 2012   D. RUPP, "Death in Petras: two men fighting on a LM IA lentoid seal", [in:] *Petras, Siteia – 25 Years of Excavations and Studies. Acts of a Two-day Conference Held at the Danish Institute at Athens, 9–10 October 2010*, ed. M. TSIPOPOULOU (= *Monographs of the Danish Institute at Athen* 16), Athens – Aarhus, pp. 277–290.

RUPP, TSIPOPOULOU 2012   D. RUPP, M. TSIPOPOULOU, "Pristess at work: a LM IA chlorite schist lentoid seal from the Neopalatial settlement of Petras", [in:] *Petras, Siteia – 25 Years of Excavations and Studies. Acts of a Two-day Conference Held at the Danish Institute at Athens, 9–10 October 2010*, ed. M. TSIPOPOULOU (= *Monographs of the Danish Institute at Athens* 16), Athens – Aarhus, pp. 305–314.

SAKELLARAKIS, SAPOUNA-SAKELLARAKI 1997   Y. SAKELLARAKIS, E. SAPOUNA-SAKELLARAKI, *Archanes. Minoan Crete in a New Light*, Athens.

SINGG, MARTIN 2016   S. SINGG, Z. MARTIN 2016. "Left-handedness and artistic abilities: a first look", *Biology and Medicine* 8, pp. 1–3.

STOCKER, DAVIS 2017   S. R. STOCKER, J. L. DAVIS, "The Combat Agate from the Grave of the Griffin Warrior", *Hesperia* 86, pp. 586–605.

STOCKER, DAVIS 2020   S. R. STOCKER, J. L. DAVIS, "An Early Mycenaean wanax at Pylos? On genii and sun-disks from the Grave of the Griffin Warrior", [in:] *Current Approaches and New Perspectives in Aegean Iconography*, ed. F. BLAKOLMER (= *Aegis* 18), Louvain, pp. 293–299.

STÜRMER 1982   V. STÜRMER, "Zur Ikonographie Des Kampfes auf dem Siegelring CMS I, Nr. 16", *Opuscula Atheniensia* 14, pp. 111–118.

Tamvaki 1985   A. Tamvaki, "Minoan and Mycenaean elements in the iconography of the Pylos sealings", [in:] *L'iconographie minoenne : actes de la Table Ronde d'Athènes, 21–22 avril 1983*, eds. P. Darque, J.-C. Poursat (= *BCH Supplement* 11), Athens, pp. 267–292.

Tamvaki 1989   A. Tamvaki, "The human figure in the Aegean glyptic of the Late Bronze Age: some remarks", [in:] *Fragen und Probleme der bronzezeitlichen ägäischen Glyptik: Beiträge zum 3. Internationalen Marburger Siegel-Symposium 5–7 September 1985*, ed. W. Müller (= *CMS Beiheft* 3), Berlin, pp. 259–273.

Uhrbrock 1973   R. S. Uhrbrock, "Laterality in art", *Journal of Aesthetics & Art Criticism* 32, pp. 27–35.

Uomini, Ruck 2018   N. T. Uomini, L. Ruck, "Manual laterality and cognition through evolution: an archeological perspective", *Progress in Brain Research* 238, pp. 295–323.

Vaid 2011   J. Vaid, "Asymmetries in representational drawing: alternatives to a laterality account", [in:] *Spatial Dimensions of Social Thought*, eds. T. W. Schubert, A. Maass (= *Applications in Cognitive Linguistics* 18), Berlin, pp. 231–255.

Vlachopoulos 2020   A. G. Vlachopoulos, "The Ring of Nestor and the quest for authenticity", [in:] *Current Approaches and New Perspectives in Aegean Iconography*, ed. F. Blakolmer (= *Aegis* 18), Louvain, pp. 223–252.

Wedde 1999   M. Wedde, "Talking hands. A study of Minoan and Mycenaean ritual gesture. Some preliminary notes", [in:] *Meletemata: Studies in Aegean Archaeology Presented to Malcolm H. Wiener as He Enters his 65th Year*, eds. P. P. Betancourt, V. Karageorghis, R. Laffineur, W. D. Niemeier (= *Aegaeum* 20), Liège, pp. 911–920.

Wedde 2004   M. Wedde, "On the road to the godhead: Aegean Bronze Age glyptic procession scenes", *Papers of the Norwegian Institute at Athens* 6, pp. 151–186.

Weingarten 2005   J. Weingarten, "Review of O. Krzyszkowska *Aegean Seals. An Introduction*", *Studi Micenei ed Egeo-Anatolici* 2005, pp. 353–359.

Williams 2022   S. M. Williams, "Non-righthandedness", *Academia Letters* January 2022.

Winner *et alii* 1987   E. Winner, J. Dion, E. Rosenblatt, H. Gardner, "Do lateral or vertical reversals affect balance in paintings?", *Visual Arts Research* 13, pp. 1–9.

Wohlfeil 2000   J. Wohlfeil, "Anordnung und Ansicht", [in:] *Minoisch-Mykenische Glyptik. Stil, Ikonographie, Funktion*, ed. W. Müller (= *CMS Beiheft* 6), Berlin, pp. 331–345.

Younger 1977   J. G. Younger, "Non-sphragistic uses of Minoan-Mycenaean sealstones and rings", *Kadmos* 16, pp. 141–159.

Younger 1988a   J. G. Younger, *The Iconography of Late Minoan and Mycenaean Sealstones and Finger Rings*, Bristol.

Younger 1988b   J. G. Younger, *Music in the Aegean Bronze Age*, Jonsered.

Younger 1995   J. G. Younger, "Interactions between Aegean seals and other Minoan-Mycenaean art forms", [in:] *Sceaux minoens et mycéniens. IVe symposium international 10-12 septembre 1992, Clermont-Ferrand*, eds. I. Pini, J.-C. Poursat (= *CMS Beiheft* 5), Berlin, pp. 331–348.

Kazimierz Lewartowski
Faculty of Archaeology, University of Warsaw
ul. Krakowskie Przedmieście 26/28
PL 00-927 Warsaw
k.lewartowski@uw.edu.pl
*https://orcid.org/*0000-0002-2675-9408