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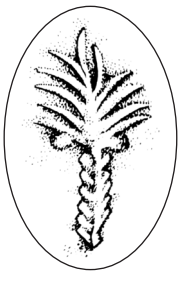

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Michele Cammarosano

THE CUNEIFORM STYLUS

1. *Introduction*[1]

In 1906, within an edition of cuneiform tablets from Nippur, A. Clay published some theories on how the ancient stylus appeared to have been cut and held.[2] Clay based his observations on his own examination of wedge impressions and enlisted the help of the Director of the Department of Physics at Pennsylvania University to take measurements of the inner angles of wedges in twenty-four selected tablets. The same year, Leopold Messerschmidt's detailed study, *Zur Technik des Tontafel-Schreibens,* appeared in the *Orientalistische Litteratur-Zeitung*.[3] In this study, Messerschmidt offered, for the first time, a thorough investigation of the writing technique in the Ancient Near East based on careful examination of wedge impressions as well as his own experimentation in writing cuneiform tablets.

More than a century later, these two works still represent the best studies available on the subject, although new insights and more evidence have since appeared. Marvin Powell and, more recently, Joachim Marzahn, corroborated Messerschmidt's reconstruction of the reed stylus with new evidence, whereas other scholars expressed different views. Iconographic sources, archaeological findings, and numerous observations made by various scholars provided new material for the discussion. Even when available, however, iconographic and archaeological evidence is often faced with the major problem of uncertain interpretation. Therefore, the reconstruction of stylus and writing process will always have to rely principally on wedge impressions.

This paper aims at presenting a comprehensive study on the stylus used to write cuneiform script on clay tablets – henceforth, for the sake of brevity, referred to as "cuneiform stylus".[4] This investigation combines traditional approaches with the possibilities offered by modern, computer-aided analysis of 3D models of cuneiform tablets. The available iconographic and archaeological evidence is reviewed in §§2-3. The reconstruction of various kinds of cuneiform styli, made of reed as well as of other materials, is discussed in §§4-5 respectively, whereas issues related to stylus length and handling are treated in §6. In §7, finally, the study takes advantage of specific algorithms designed for the analysis of cuneiform script, which are being developed at the Technical University of Dortmund within the joint project "3D-Joins und Schriftmetrologie". Here, the relationship between stylus and wedge impression is examined both on the methodological level as well as from a practical point of view.

2. *Iconographic Sources*

The interpretation of iconographic representations of alleged cuneiform styli faces two major problems:

(1) Depictions may represent both form and proportions of the represented object in a distorted manner. Distortion may originate from different factors:

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[1] The research has been carried out within the joint project "3D-Joins und Schriftmetrologie" (University of Würzburg; Technical University of Dortmund; Academy of Sciences and Literature, Mainz). The project is directed by G.G.W. Müller and funded by the German Federal Ministry of Education and Research; more detailed information can be found at the webpage www.cuneiform.de. I wish to express my gratitude towards G.G.W. Müller, as well as to D. Fisseler and F. Weichert, for their constant support and for the passionate and collaborative atmosphere established: nothing of the present research would have been possible without their contribution. This study is further indebted to a number of scholars, colleagues, and friends, who commented on earlier stages of the paper and generously provided me with ideas, suggestions, references and informations. I wish to thank in particular A. Baykal-Seeher, A. Bramanti, R. Czichon, J. Ellison, Z. Földi, M. Geller, H. Gilb, A. Gilibert, S. Köhler, M. Krebernik, G. Jendritzki, M. Luukko, M. Marazzi, J. Marzahn, V. Matoïan, D. Meijer, J. Miller, A. Nunn, S. Panayotov, A. Payne, A. Pohl, C. Roche-Hawley, W. Sallaberger, U. Schoop, A. Schachner, N. Schaller, D. Shehata, D. Schwemer, J. Seeher, C. Steitler, A. Süel, G. van Buylaere, and W. Waal. Abbreviations follow the *Reallexikon der Assyriologie und Vorderasiatischen Archäologie*; for the glyptic evidence: Buchanan 1966, xv-xvii and Pomponio 1978, ii-iii; for Babylonian kudurrus: "BKR" and "Kudurru No. ..." (reference to catalogue numbers in Seidl 1989 and Herles 2006b respectively). If not otherwise stated, drawings and photos are by the author.

[2] Clay 1906, 17-20.

[3] Messerschmidt 1906.

[4] To write cuneiform script on metal other techniques were used, which are currently investigated by G. Jendritzki (see Jendritzki 1997, 240-243; Jendritzki, Marzahn 2003, 84-86). It is interesting to stress that different techniques existed, as examination of the silver tablet VA 9685 compared to the bronze cross VA 5379 shows (information kindly provided by G. Jendritzki). Issues pertaining to cuneiform script on wax are addressed below, §§ 2.1.3, 5.3.

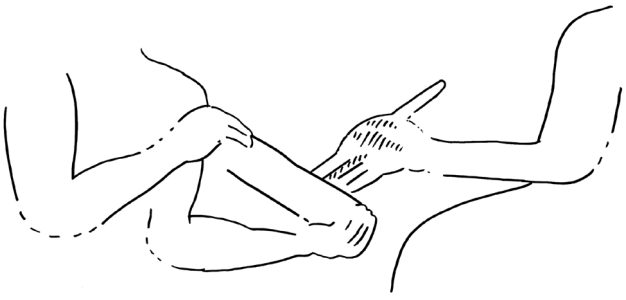

Fig. 1 - Detail from the limestone stela VA 7245.

iconographic conventions, contextual constraints or lack of skill from the artist.

(2) The function of the depicted object may be difficult to identify. That is to say, a trustworthy interpretation of the function of depicted scribal instruments – i.e. in stone reliefs, descriptions, etc. – cannot easily be determined at first glance.

The relevant sources have been subdivided into two groups. The former (§2.1) includes depictions featuring writing scenes, whereas the latter (§2.2) relates to representations of the stylus as symbol of the god Nabu.

2.1 *Babylonian and Assyrian Writing Scenes*

Within this group, depictions of scribes and styli are examined in chronological order. Apart from one extant stela (§2.1.1) and the cult Pedestal of Nusku dating back to Tukulti Ninurta I (§2.1.2), the bulk of attestations consists in Neo-Assyrian sources dating to the eight and seventh century BCE.

2.1.1 *The Limestone Stela VA 7245*

The oldest known representation of a figure in the act of writing is found in the upper register of a limestone stela from Babylon (Fig. 1).

According to D. Opitz, followed by J. Börker-Klähn, the stela likely dates back to the Ur III period.[5] A king or a god, facing left, is shown writing on a tablet, which is presented to him obliquely by another person standing in front of him. The tablet is as long as his forearm and appears rigid enough to be held at the top and bottom without needed support of the entire length, while the main figure sits on a throne and holds the writing implement in his hand. The writing implement is slightly longer than the man's hand; its dimensions, however, might be puposefully oversized (cf. §2.1.4). The stylus has a pencil-like appearance and is handled towards the bottom. Is this a king or a god writing cuneiform on clay? Other possibilities cannot be ruled out; given the ceremonial context and the writer's rank, this may be a tablet made of precious metal on which the writer engraves the characters – Opitz prudently speaks of a "Schreibtafel, vielleicht aus Ton".[6] Surely, the writer is no ordinary scribe, and the way he is writing is no ordinary writing technique. Similarly, in the event that a cuneiform stylus is depicted, one cannot assume that it is an ordinary stylus. Finally and most importantly, the dimensions of the writing tool may be purposefully oversized due to iconographical ground, in order to make it visible and recognisable within the scene (cf. §2.1.4).

2.1.2 *The Pedestal of Nusku*

On the well-known alabaster pedestal of the god Nusku, dated to Tukulti Ninurta I, an object is depicted whose interpretation is debated (Fig. 2). The most accredited interpretations are tablet and sceptre, or tablet and stylus. In his recent reappraisal of the problem, M. Herles argues in favour of the latter.[7] According to him, the theory that this is a sceptre should be rejected on iconographical grounds, despite the qualification of Nusku in the pedestal inscription as "bearer of the just sceptre". On the other hand, interpreting it as a stylus is still problematic. The enigmatic object is depicted as a long and thin instrument, with a pointed end facing up and an expanding shaft pointing down. Now, one would naturally assume that the most important part of the stylus, i.e. the tip, should point up rather than down. This is, in fact, the case for *all* depiction of standing styli on kudurrus, stelae, reliefs and seals: their tips invariably point up (§2.2). The form of the object is also problematic because it would probably be quite uncomfortable to write with such a long implement. Herles adduces the alleged bone stylus from Kish as evidence that "ein Schreibgriffel durchaus ein länglicher Stab gewesen ist",[8] but the Kish stylus is neither pointed nor is its length comparable with the object depicted on the Pedestal of Nusku (§3.4). Moreover, the stylus as a symbol of Nabu is regularly represented as a short, trapezoidal instrument, a fact which makes it even more difficult to interpret this as a stylus. All in all, the object depicted on the Nusku pedestal still escapes secure interpretation.

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[5] Opitz 1930-31, 64; Börker-Klähn 1982, 157 No. 96. Photograph: Marzahn, Schauerte 2008, 338 Fig. 257; Marzahn *apud* Marzahn, Schauerte 2008, 349 Cat. 372. Falkenstein 1936, 6 n. 2, though referring to Opitz, qualifies the relief as "Old Babylonian".

[6] Opitz 1930-31, 63.

[7] Herles 2006. The object cannot be a column divider, as put forward by Franke 2011. The fact that the shaft expands towards the top and that it projects beyond the upper edge of the tablet speak against such an hypothesis.

[8] Herles 2006, 254.

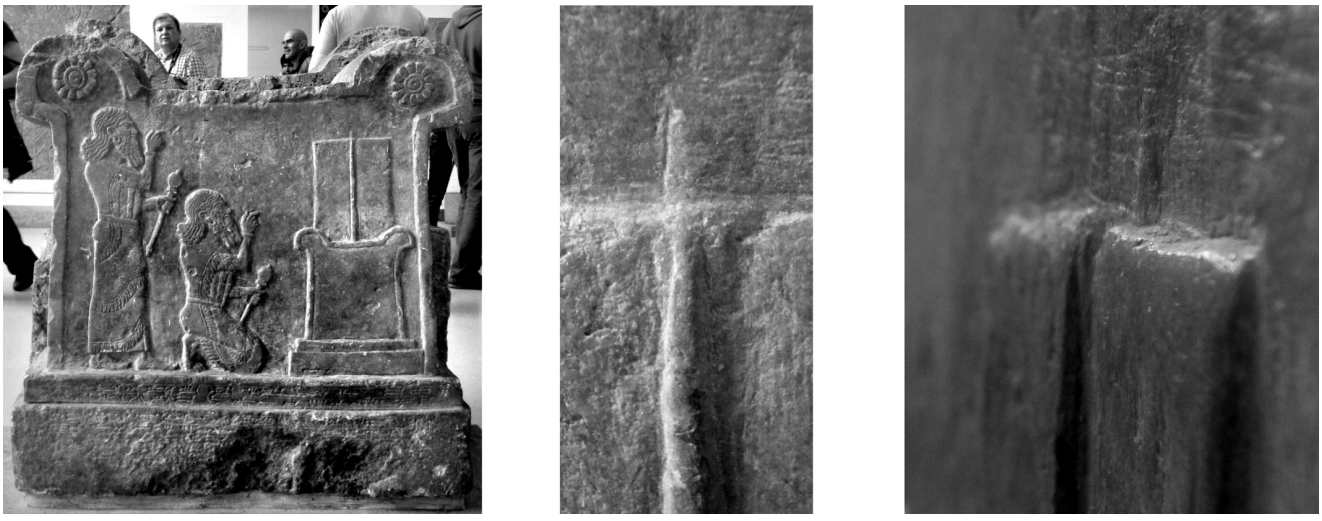

Fig. 2 - The Pedestal of Nusku at the *Vorderasiatisches Museum* in Berlin: front view and details of the top end.

2.1.3 *Waxed Boards and Grooved Styli*

The remaining depictions to be examined date to the Neo-Assyrian Empire and are found on wall slabs from Assyrian royal palaces. All of them are situationally similar: two men next to each other, one with a scroll and one with a tablet or board (rarely are there two scribes of the same kind), are depicted in the act of recording booty. They have long been interpreted as two scribes, one writing in Aramaic on a scroll and another writing in cuneiform Akkadian on a clay tablet (or board-book). However, as proposed by T. Madhloom and argued recently by J. Reade as well, the former is best interpreted as an illustrator, who may also have been able to take notes in Aramaic.[9]

As is evident from the depictions, artists (or scribes) working on scrolls used ink and pens (or brushes). These writing instruments are represented as pencil-like rods, longer than the holder's hand. Their writing tip may be pointed,[10] or slightly larger than the shaft.[11]

With regard to the scribes, two kinds of media are recognizable within the depictions. The former is easily identifiable as board-book: these are represented as a diptych, in front-view, with internal lines rendering the binding. As Reade notes, scribes are regularly shown holding them upright.[12] Another mark exists, i.e. scribes with board-books are regularly shown holding the stylus with index and middle fingers extended.[13] Such board-books are to be interpreted as waxed boards inscribed in cuneiform script. Examples of these objects, made both of ivory and wood, have been recovered in Nimrud;[14] a smaller example comes from Aššur.[15] Two of the fragments from Nimrud still preserve traces of the wax layer inscribed with minute cuneiform signs.[16] Boards also could be written in contemporary, non-cuneiform scripts and with different techniques,[17] but the use of cuneiform script in the context of these depictions is confirmed by the particular kind of stylus employed. Board-book styli, in fact, are right-angled and larger than those used for scrolls. When board-book scribes are left-facing, their styli show an inner groove whose function is still unclear.[18] In the slabs dating to Aššurbanipal, scrolls are completely absent and only board-books occur. Apparently, this king "disliked or at least refused to allow the representation of scrolls in narrative art",[19]

[9] Madhloom 1970, 121-122; Reade 2012, 710-712; see also Seidl 2007, 119. Reade (2012, 712-716) presents a complete catalogue of the known illustrations of Neo-Assyrian scribes.

[10] Reade 2012, Cat. 31, see Barnett *et alii* 1998, Pl. 213.

[11] Reade 2012, Cat. 34, see Fig. 4.1 below.

[12] Reade 2012, 705.

[13] Seidl (2007, 121) corroborates Reade's arguments for interpreting the objects represented in Reade 2012, Cat. 25 as board-books. In Cats. 13 and 29 we are clearly faced with a less precise representation of the fingers. There seems to be a single exception to this pattern, namely Reade 2012, Cat. 20, for which only a drawing is available.

[14] Mallowan 1954, 98-107; Howard 1955; also Mallowan 1966, 149-163.

[15] Klengel-Brandt 1975.

[16] Wiseman 1955.

[17] On writing boards in the Ancient Near East see San Nicolò 1948; Postgate 1986; Symington 1991; Marazzi 1994; Stol 1998, 343f., 347f.; MacGinnis 2002; Waal 2011; all with further bibliography.

[18] According to Seidl 2007, 121, 124, it could possibly release pigment or a wax-softening substance. On the composition of the wax paste used to fill this kind of writing board see Stol 1998, 343f., 347f.

[19] Reade 2012, 706.

whereas he proudly claimed to be able to read and write cuneiform texts[20] and represented himself with his personal grooved stylus fastened to the belt (Fig. 4.2).[21] This further confirms the idea that these board-books were intended for cuneiform script.

As Reade notes, using scrolls or board-books while being on campaign are considerably more advantageous compared to clay tablets.[22] These scribes are not copying tablets in an atelier; rather, they take notes while standing in open air under specific conditions. When speaking of scribes at work in analogous situations, e.g. assisting the king in the celebration of festivals or recording damages or taking notes, Hittite sources explicitly refer to wooden writing boards.[23] Mesopotamian and Assyrian sources, too, generally use the term GIŠ *lē'u* "wooden board" when they refer to analogous contexts.[24]

Form and length of the styli found in connection with board-books are variable. Normally, grooved styli are depicted as a double stab (Figs. 4.1-2). In Neo-Assyrian slabs, the grooved stylus always has a rectangular or slightly trapezoidal form, with the shaft expanding towards the tip. It can be more or less squat or slender — compare e.g. READE 2012, Cat. 13 with READE 2012, Cat. 34. Within Neo-Assyrian stelae and reliefs, too, the grooved stylus normally has a rectangular form and slim shape; there are, however, at least two exceptions. The first one is the dolomite stela of Tiglathpileser III from Iran, where the grooved stylus has a trapezoidal form with a slightly expanding shaft.[25] The second and even more revealing one is the Nahr-al-Kalb relief of Esarhaddon. Here, the stylus has the very same appearance as the (non-grooved) cuneiform stylus in the Saba'a stela of Nergal-ēreš / Adad-Nērāri III (Fig. 5.7), save for the vertical groove in the middle.[26] These examples show that grooved styli for writing on wax were produced in different shapes and dimensions.

2.1.4 *Clay Tablets and Cuneiform Styli*

Whereas board-books are frequent, the other medium occurs more rarely, found only in the following cases: READE 2012, Cat. 2, 3, 4, 6, 10, 16, 17, and 18.[27] They have the appearance of a tablet or board in profile view, lying flat in the hand of the scribe. Since they are shown at a side angle, the absence of visible binding does not say much about their nature.[28] Their shape is rectangular or slightly curved and they are generally taken to be clay tablets impressed with cuneiform script.[29] The styli connected with these tablets or boards, as well as their handling, differ from those used for board-books, a fact which confirms that we are dealing with a different medium. These implements may have a pointed end and are held between the thumb and all other extended fingers, i.e. in a slightly different manner than board-book styli.

As noted, the *communis opinio* favours cuneiform script on clay tablets. According to Reade, a historical development seems to be recognizable; namely, clay tablets falling out of use in the course of the seventh century in favour of board-books.[30] Another option is possible, at least in principle: this could be, in fact, ink writing by means of pens or brushes on (wooden?) boards.[31] However, a closer examination of the relevant cases, especially of those where the writing tip is visible, corroborates the traditional view.

The first source to be examined is the mural painting from Til Barsip (READE 2012, Cat. 3), ascribed to Šalmaneser V and known to us only from a field copy by L. Cavro. Here we see an artist drawing on a scroll and a scribe using a long instrument to write on an object portrayed in profile view. In the copy by Cavro, this object has a red-brown colour, which may indicate clay as well as wood,[32] as shown by the fact that the spears' shafts show that colour as well. The writing implement has black colour, a pointed rear end and a long shaft expanding towards the tip, which is concealed by the fingers of the scribe (Fig. 3).

While the artist drawing on the scroll to the left holds his thin, pen-like implement by securing it in the middle, the scribe to the right holds the stylus by handling its lower part with his fingers, a fact which

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[20] LIVINGSTONE 2007.

[21] SEIDL 2007. This habit itself might have literary ambitions: cf. the imagery found in the Neo- or Late-Babylonian commentary tablet BM 54312, where an unidentified subject ties seven waistbands around his waist, to which, among other objects, "[seven reed] styli to the right, ditto seven reed styli to the left" are fastened (translation after A.R. George). Two more styli are fastened to the front and to the rear of his waist and all these writing styli are named after deities. On this text see GEORGE 2006.

[22] READE 2012, 705.

[23] SYMINGTON 1991, 118-119; WAAL 2011, 25.

[24] CAD L, 157ff.

[25] LEVINE 1973, 76 Pl. 1.

[26] VS 1 Beiheft, Pl. 8 (VAG 31). The stylus on the Kition stela of Sargon (*ibidem*, Pl. 6) may be another example, but the surface is too damaged to decide whether or not there is a groove.

[27] The interpretation of READE 2012, Cat. 1, 9, 12, 15, 19, 21 is uncertain. Since these cases may pertain to board-books, they are irrelevant for the present discussion.

[28] Differently READE 2012, 705.

[29] WISEMAN (1955, 12), however, proposed to identify them with board-books.

[30] READE 2012, 705-706; see already SEIDL 2007, 119-121.

[31] For the use of inked cuneiform script cf. e.g. two colophons in ink from the Kuyunjik archive: K 10100 and DT 273, see READE 1986, 220; a photograph is available online at the CDLI archive (photo no. P399067). On the use of ink on tablets and wooden boards in the Hittite scribal tradition cf. also WAAL 2011, 29 with n. 8, with further references.

[32] *Pace* READE 2012, 705.

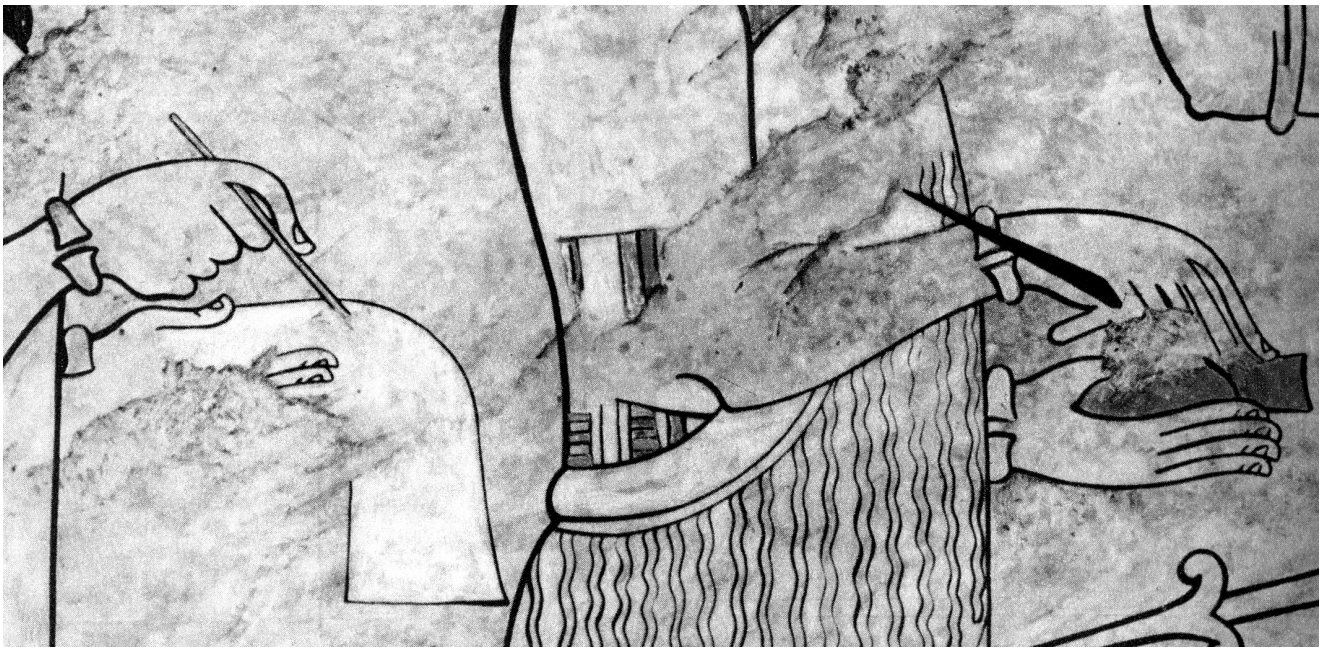

Fig. 3 - Detail of the mural painting from Til Barsip (copy by L. Cavro, after PARROT 1961, 278 Fig. 348).

reminds us of the figure on the Ur III stela. The overall form of the stylus is similar to that of the object found on the Pedestal of Nusku, but this fact does not seem to be significant, according to the discussion above. The difference in the handling of the writing tools seemingly points to a difference in the writing technique, thus suggesting that we are indeed faced with a cuneiform stylus and not with pen or brush used to write with ink on a wooden board. This is the only depiction of a scribe portrayed in the very act of writing. In this respect, it is interesting to note that the hand is in half-supinate position (discussion at §6.2).

The remaining depictions of the alleged tablets and styli, all from Neo-Assyrian slabs, are the following (cf. Fig. 4; reference to catalogue numbers in READE 2012):[33]

Cat. 2 (Fig. 4.3): The scribes holds a rectangular tablet (or board) and a writing implement which thickens towards one end. It is unclear, however, whether the thicker end should be considered the tip, so a reliable interpretation of this object is not possible.

Cat. 4 (Fig. 4.4): Based on the drawing available (the original is now damaged; note that this scribe is incorrectly drawn as beardless), the writing implement is depicted as a long instrument with a right-angled tip and pointed rear end. Indeed, the position of the hand is analogous to that which was found in the Til Barsip mural painting, save for being represented in resting position instead of in the very act of writing. Consequently, the implement is to be interpreted as a stylus used to write cuneiform, not as a pen or brush.

Cat. 6 (Fig. 4.5): Only modern drawings of the original slabs exist wherein the writing implement is depicted as a long instrument with a right-angled tip and pointed rear end; the interpretation is therefore analogous to Cat. 4.

Cat. 10: The scribe with the tablet (or board) has an oblong under his left arm.[34] Such oblongs have been interpreted as pen-and-ink cases, otherwise found in connection with scrolls.[35] Since the writing implement is not visible, one cannot interpret it with certainty; in any case, the presence of the oblong points to a board-book and therefore to a grooved stylus.

Cat. 16: Only modern drawings of the original slabs exist. The scribe with tablet (or board) holds a writing implement, the form of which cannot be further detailed.

Cat. 17: Analogous considerations as Cat. 16.

Cat. 18 (Fig. 4.6): Only modern drawings of the original slabs exist. The scribe with tablet (or board) has a stylus, which is "in mid-air in front of him, thrown at approaching foreigners".[36] Based on the comparison of the two kinds of writing implements

[33] The medium held by the scribe 'A' in READE 2012, Cat. 8 is a board-book and not a tablet (*pace* READE 2012, 713). Therefore, this occurrence is not included in the present list.

[34] *Pace* READE 2012, 713, who assigns the oblong to the scribe with scroll.

[35] READE 2012, 705 and Cat. 12, 18.

[36] READE 2012, 714.

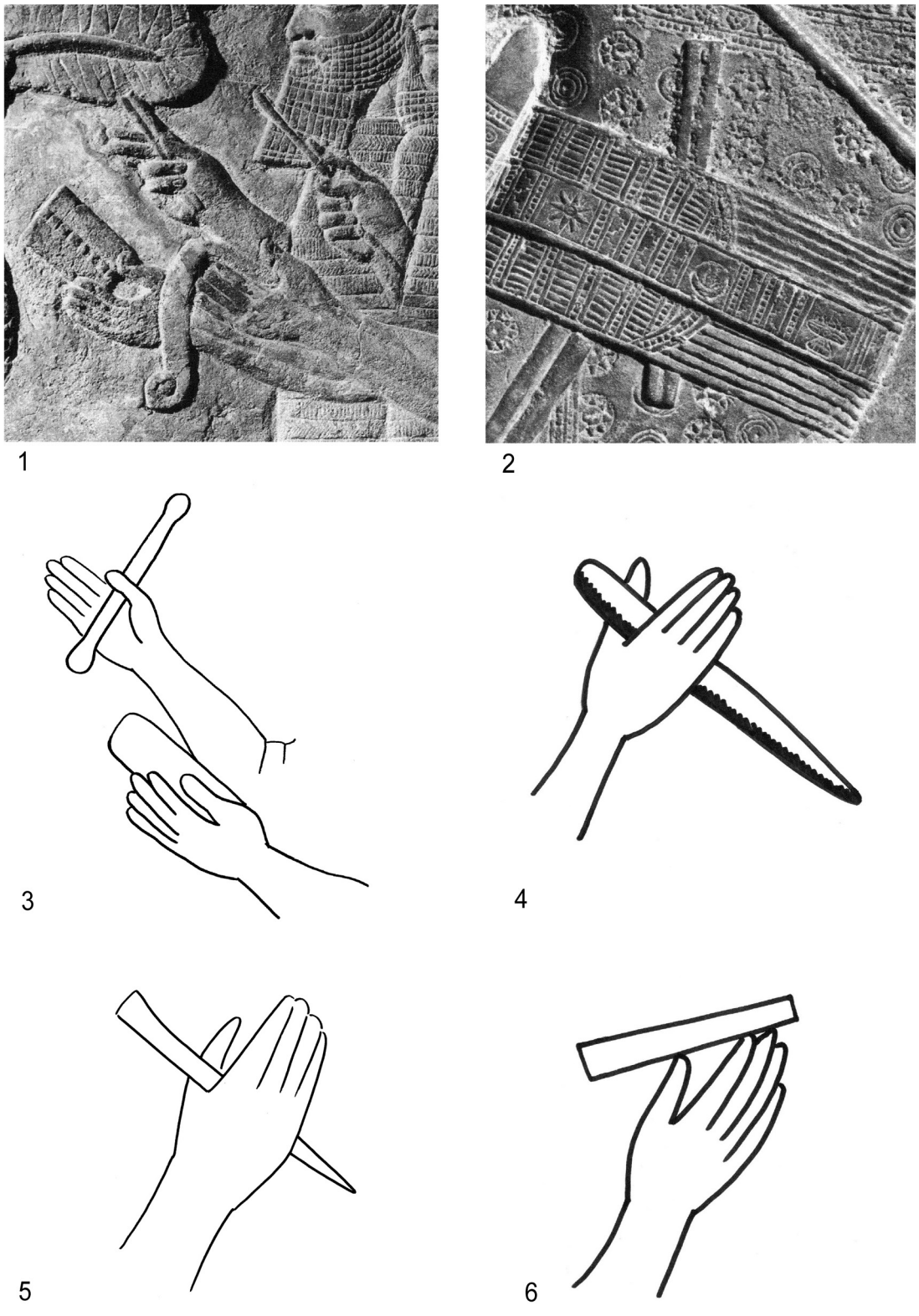

Fig. 4 - Neo-Assyrian styli.

1: [Reade 2012, Cat. 34]: Detail from the slab BM 124955, ascribed to Sinšarriškun. After Barnett *et al.* 1998, Pl. 256.
2: The stylus of Aššurbanipal. Detail from a slab in the North Palace of Aššurbanipal at Nineveh. After Seidl 2007, 121 Fig. 2.
3: [Reade 2012, Cat. 2]: Detail from the slab BM 118882, dated to Tiglathpileser III. Drawing based on the photo in Hrouda 1991, 204f.
4: [Reade 2012, Cat. 4]: Detail of the slab AO 19892, dated to Sargon, now damaged. Drawing based on the drawing of Botta & Flandin, reprinted in Albenda 1986, Pl. 133.
5: [Reade 2012, Cat. 6]: Detail of a lost slab, dated to Sargon. Drawing based on the drawing of Botta & Flandin, reprinted in Albenda 1986, Pl. 137.
6: [Reade 2012, Cat. 18]: Detail of a lost slab, dated to Sennacherib. Drawing based on a modern drawing, reprinted in Barnett *et al.* 1998, Pl. 426.

shown in the drawing, the alleged stylus is slightly shorter and wider than the pen used for the scroll and seems to have a square nib, which would again suggest a cuneiform stylus.

In conclusion, the fact that the writing tip is right-angled shows that these cases pertain to cuneiform script as well, although it must be stressed, too, that all relevant occurrences are documented by modern drawings only. The difference in handling with respect to grooved styli, in turn, suggests that we are indeed faced with cuneiform styli, i.e. used to write cuneiform script on clay tablets.

Within Neo-Assyrian writing scenes, both grooved and non-grooved styli are depicted as quite long implements, i.e. they are depicted as though they were longer than the scribe's hand. This characteristic is particularly evident in the Til Barsip mural painting. At this juncture, the question arises whether this feature reflects accurately the real length of the styli – i.e., the proportions between stylus and hand – or not. In fact, there is iconographical, archaeological, and indirect evidence coherently pointing at the latter option. The only recovered example of cuneiform styli, the Old Babylonian bone styli from Tell ed-Dēr, are just 3 to 5 cm long (§3.1). Representations of cuneiform styli as symbol of the god Nabu, in turn, suggest rather short implements insofar as the proportions of the depicted implements are concerned (§2.2). It is worth stressing that some of these depictions are contemporary with the Neo-Assyrian wall panels. Finally, indirect evidence at the existence of short styli can be drawn from the examination of rulings (§6.1), and from considerations about stylus handling (§6.2). It seems therefore possible that, in depicting writing scenes, the Neo-Assyrian artists exaggerated the dimension of the writing implement on iconographical grounds, namely in order to increase their visibility and recognisability. Indeed, a 5 cm long stylus held within the palm would have been, in fact, practically invisible to the observer.[37] Oversizing the dimensions of specific objects in order to show them more clearly is a well-known iconographical technique; a significant example, found in a Neo-Assyrian slab as well, has been recently identified by J. Novotny and C.E. Watanabe.[38] In this perspective, it is also worth noting that both grooved and non-grooved styli are depicted as being shorter than the pens or brushes used in connection with scrolls. Admittedly, the alleged bronze styli from Late Bronze Age Ugarit (§3.2) would seem to speak against this standpoint: reportedly, they are 6 to 10 inches long. However, the interpretation of these objects remains uncertain as far as they are unpublished. Moreover, they pertain to a specific scribal tradition, which might have followed different standards, whereas, as noted, some of the depictions of short styli on stelae and seal impressions are contemporaneous with the Neo-Assyrian writing scenes.

2.2 *The Stylus as a Symbol of Nabu*

The earliest representations of styli as symbol of the god Nabu are found on Babylonian kudurrus dating back to the late Cassite period. From the 9th century onwards, the motif is found in Neo-Assyrian stelae and reliefs and spreads with increasing frequency in the glyptic over a large area which includes Babylonia and Assyria as well as the Syrian and Levantine regions.[39] Two main kinds of styli are depicted which may also occur together in the same scene: for convenience, I will refer to them here as the "grooved" stylus and the "wedge" stylus. The former represents the kind of stylus which was used to write cuneiform script on wax boards, as convincingly demonstrated by U. Seidl.[40] The "wedge" stylus, in turn, appears in two different phenotypes, both attested from the Cassite period onwards (Figs. 5-6):

(1) "Simple tip" Stylus: this represents the stylus used to write cuneiform on clay tablets. It is attested on kudurrus and on Neo-Assyrian stelae.[41] It is depicted as an elongated trapezoid, rarely as a triangle, and is usually stood up, the larger end (i.e. the writing tip) always pointing to the top. The tip may be right-angled (e.g. kudurrus BKR 32 [Fig. 5.1], 75 [Fig. 5.5], 79 [Fig. 5.10]; Saba'a stela [Fig. 5.7]) or it may slope to one side (e.g. kudurrus BKR 67 [Fig. 5.11], 74 [Fig. 5.3], 100 [Fig. 5.6], Kudurru 119 [Fig. 5.2]; Tell al-Rimaḥ stela [Fig. 5.8]). The variation between square and slanted tip conforms to archaeological findings and observation of wedge impressions which attest the existence of both kinds (§3.1). In some instances, a single or double bar is depicted in the middle part of the instrument (e.g. BKR 100 [Fig. 5.6]; Tell al-Rimaḥ stela [Fig. 5.8]).

(2) "Stylized wedge" Stylus: it may be a hybrid between a "simple tip" stylus and a stylized wedge impression, or a stylized wedge impression *tout court*. Such pseudo-styli have curved or bifurcated tips, which imitate the way cuneiform wedges frequently appear in inscriptions on stone or other hard materials. This type is attested on kudurrus and seals.

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[37] The same argument may apply to the scene in the limestone stela VA 7245 discussed at §2.1.1.

[38] Novotny, Watanabe 2008, 115. I thank G. van Buylaere and M. Luukko for bringing this study to my attention.

[39] Pomponio 1978, 207-217; Seidl 1989, 121-125; Eadem 1998, 24-27; Gilibert 2007, focusing on the gylptic evidence (all with further literature).

[40] Seidl 2007; see also §2.1 above. Since it is coupled with the grooved stylus, the object depicted in BKR 43 (BM 90836) must be a diptych with inscribed paragraph lines, not a clay tablet (cf. Seidl 1989, 122; *pace* Unger 1921, 9).

[41] Attestations and discussion: Seidl 1989, 121-125; Pomponio 1978, 207-213.

Given the nature of the two types, there are cases where the attribution to group 1 ("Simple tip") or 2 ("Stylized wedge") is uncertain. The instrument depicted in Kudurru 122 [Fig. 5.12] might, in principle, produce cuneiform wedges, but it seems more likely to be a hybrid between a stylus and a stylized wedge; the same applies to the seal impression in Collon 2001 No. 255 [Fig. 5.13]. On the contrary, the stylus depicted in BKR 76 [Fig. 5.14] clearly pertains to type 2, since its bifurcated end could not be used to write cuneiform signs.[42] The same applies to pseudo-styli with curved tips, like BKR 84 [Fig. 5.16] and BKR 103 [Fig. 5.17]. The likelihood that these depictions are a hybrid between stylus and wedge impression is demonstrated by the case of BKR 79 [Fig. 5.10], where the middle section of the (right-angled) stylus shows a wedge-like decorative motif, the form of which is identical to the pseudo-stylus found in BKR 84 [Fig. 5.16]. This group also includes the stylus found on the Ḫorsābād bronze door plaque [Fig. 5.19], the composite stylus depicted on the Tell Abta stela [Fig. 5.9], and examples like the seal impression from the Walters Art Gallery, No. 83 [Fig. 5.20]. These styli have rectangular shafts, but with both edges curving close to the tip; they are sometimes decorated with contour lines.

The stylus in the form of a stylized wedge impression occurs most frequently on Neo-Assyrian cylinder seals.[43] In these instances, the stylus often has an extremely bifurcated tip which, as previously mentioned, imitates the way a wedge head was often engraved in inscriptions on hard materials. This is most evident when both this kind of "stylus" and a cuneiform inscription are juxtaposed (e.g. in Collon 2001 No. 256 [Fig. 5.21]). Such a stylization process may produce creative and bizarre results (see Figs. 5.23, 5.27). Sometimes, the stylized wedge is represented as a broken (reduplicated) one; in this case, too, the tip may be curved or bifurcated.[44]

In some instances, it is the god Nabu himself who holds stylus and tablet. Once again, a number of variations are attested: simple wedge with straight (Fig. 6.1) or curved (Fig. 6.3) tip, or double wedge, again with curved (Fig. 6.4) or bifurcated (Fig. 6.5) tip. Such cases make the hybrid nature of this kind of stylus explicit: Nabu could never properly "write" anything with these instruments; rather, he holds a magical stylus, the form of which already represents its outcome.

Since they represent their model in a more faithful manner, depictions of type 1 ("Simple tip" stylus) may be used to gain some information about the appearance of real styli. In these depictions, the stylus is represented either standing or lying down.[45] In the former case, its narrow end always points down with the writing tip pointing up.[46] Sometimes, both "wedge" and "grooved" styli appear together with a tablet or board respectively, whereby the proportion between stylus and medium is not necessarily correlated, as the example of BKR 32 [Fig. 5.1] shows.[47] More reliable data can be drawn from the length-width ratio of the stylus in each depiction, an element which is more likely to reflect the appearance of the model. Within a sample of relevant depictions, the values are as follows (ratio max width : max length): 1:1.7 (Kudurru 119), 1:1.9 (BKR 75), 1:3.7 (BKR 32, Saba'a stela), 1:4.1 (BKR 74), 1:4.4 (BKR 80), 1:4.6 (Tell al-Rimaḥ stela), 1:4.8 (BKR 100), 1:5.6 (BKR 79). Assuming that styli used for clay tablets were seemingly not larger than ca. 1 cm at the tip (cf. §4.3), we can conclude that cuneiform styli are regularly depicted as short implements, never as a long, pen-like rod, as the examples given in Fig. 5.1-13 suggest.[48] True, this is a very speculative deduction, since the model – i.e. the real stylus – could be distorted on iconographical grounds in the representation. However, the fact that the sources extend over a significant chronological and geographical span is significant. The cuneiform stylus, where it is unquestionably featured, is regularly represented as a tapered trapeze, its length ranging from ca. 1.5 to ca. 5.5 times its width. The rare examples of triangular styli, e.g BKR 67 (Fig. 5.11), are comparable to those depicted on Neo-Assyrian slabs, bearing a pointed rear end (§2.1.4).[49] In the latter case however, as has been suggested, the dimensions of the implement might be purposefully oversized.

2.3 *Conclusions*

Iconographical sources bear witness to the existence of two styli used to write cuneiform script, namely the grooved stylus used in connection with waxed boards and the non-grooved stylus used in connection with clay tablets. Apart from the Ur III stela from the *Vorderasiatisches Museum* in Berlin and the so-called Pedestal of Nusku, whose interpretation is unclear, the available evidence comes from writing scenes found in Neo-Assyrian paintings and wall panels, as

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[42] *Pace* Unger 1921, 9, referring to the similar stylus depicted in BKR 68 (here Fig. 5.15).

[43] Pomponio 1978, 213-215; Gilibert 2007, 1. Alleged attestations dating to the 2nd millennium are uncertain, see Seidl 1989, 125 n. 53; Pomponio 1978, 213.

[44] Pomponio (1978, 210), following Unger, proposes that the double wedge might represent a reed stem. But the alleged nodes are often represented by a broken line, not a curved one, a fact which confirms the interpretation as reduplicated wedge.

[45] For attestations see Pomponio 1978, 208-209.

[46] As I said, this fact should raise further doubts on the interpretation of the "rod" of Nusku as writing stylus.

[47] *Pace* Herles 2006, 258.

[48] There is no reason to suspect, as Pomponio (1978, 210) proposed, that some of the most "squat" examples might actually represent chisels rather than styli.

[49] See already Seidl 1989, 124, referring to the Til Barsip mural painting.

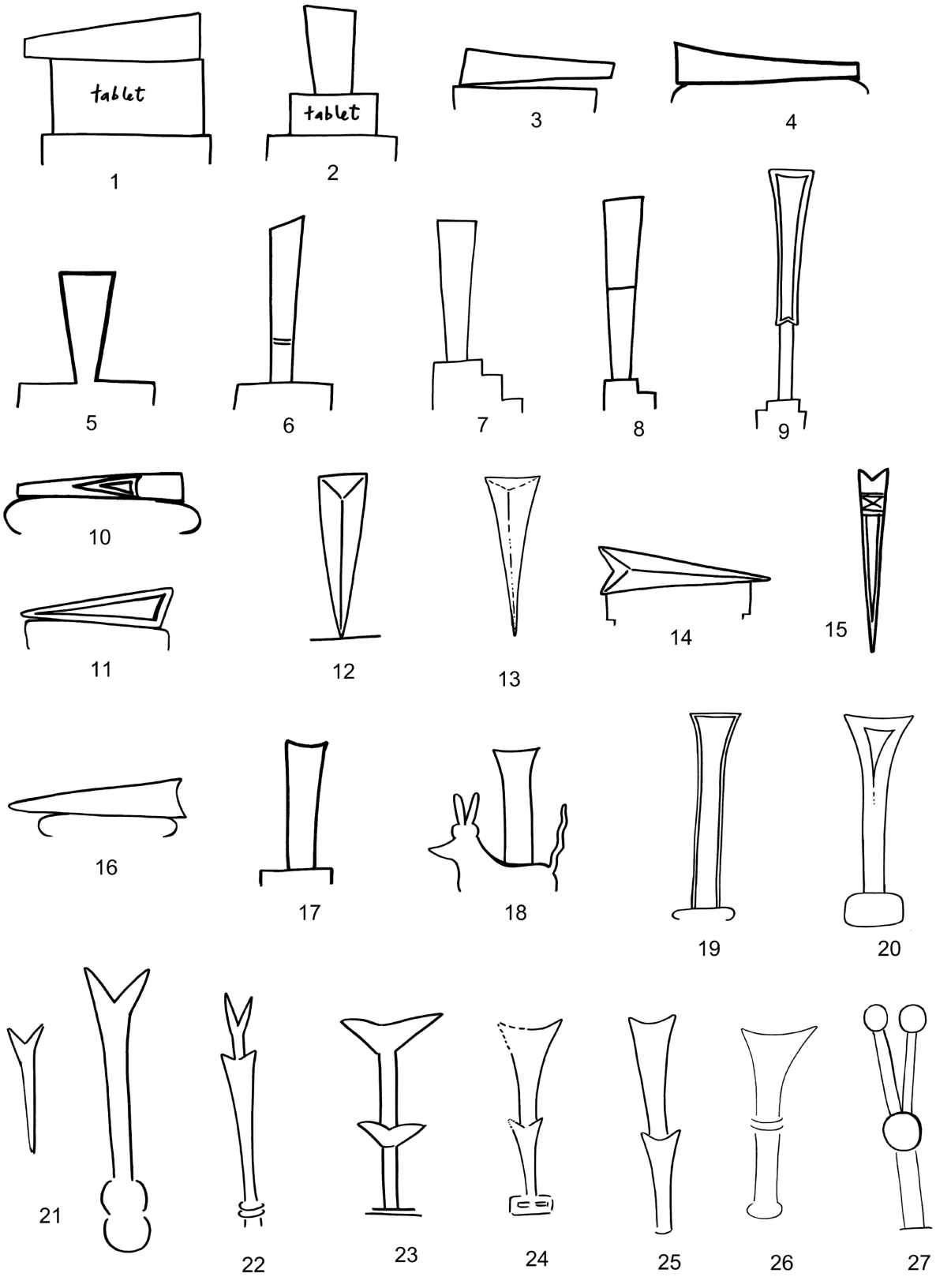

Fig. 5 - Representations of styli, typologically arranged / 1 (All drawings based on photographs).

1: BKR 32
2: Kudurru 119
3: BKR 74
4: BKR 80
5: BKR 75
6: BKR 100
7: Saba'a stela of Nergal-ēreš / Adad-Nērāri III (see UNGER 1916, Pl. 7)
8: Tell al-Rimaḥ stela of Nergal-ēreš / Adad-Nērāri III (see OATES 1968, Pl. 38)
9: Tell Abta stela of Bēl-Ḫarrān-bēlu-uṣur / Šalmaneser IV) (see UNGER 1917, Pl. 1)
10: BKR 79
11: BKR 67
12: Kudurru 122
13: Cylinder seal: COLLON 2001, No. 255
14: BKR 76
15: BKR 68
16: BKR 84
17: BKR 103
18: BKR 63
19: Bronze door plaque fragment from Ḫorsābād: LOUD, ALTMAN 1938, Pl. 50
20: Cylinder seal: WALTERS No. 83
21: Cylinder seal: COLLON 2001, No. 256. The stylus as symbol of Nabu in form of a stylized wedge (right) and the contour of a wedge taken from the cuneiform legenda within that very seal (left)
22: Cylinder seal: COLLON 2001, No. 257
23: Stamp seal impression from Tell Keisan, ca. 700 BCE (KEEL 1990, No. 24 = GILIBERT 2007, No. 20)
24: Cylinder seal: Louvre, No. A602
25: Cylinder seal: CANES I, No. 692
26: Cylinder seal from Al-Mina: BARNETT 1939, Pl. 1
27: Cylinder seal: COLLON 2001, No. 258

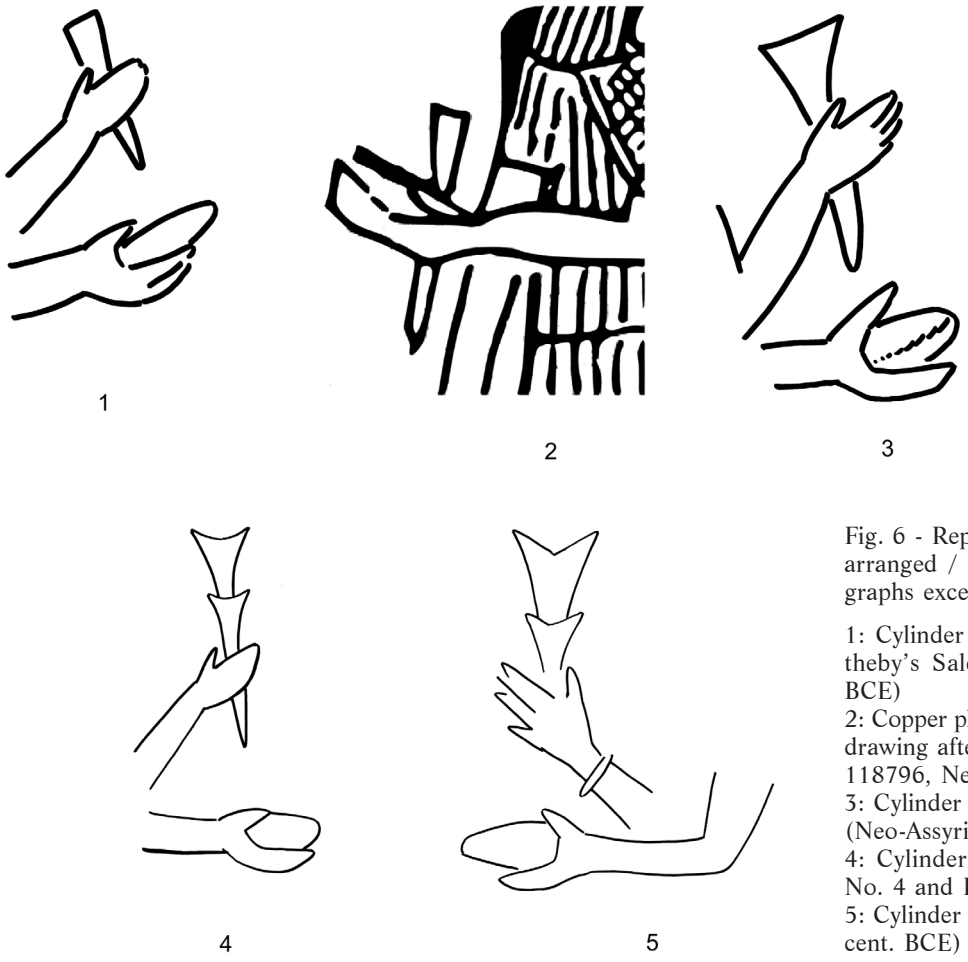

Fig. 6 - Representations of styli, typologically arranged / 2 (All drawings based on photographs except for No. 2).

1: Cylinder seal: Erlenmeyer Collection, Sotheby's Sale, 1992, No. 195 (ca. 800-700 BCE)
2: Copper plaque with incised figures and text, drawing after Postgate 1987, 62 Fig. 1 (BM 118796, Neo-Assyrian)
3: Cylinder seal: Delaporte 1909, 96 No. 24 (Neo-Assyrian)
4: Cylinder seal: Pecorella 1980, 328-330 No. 4 and Pl. 2 (9th cent. BCE)
5: Cylinder seal: CANES I, No. 691 (9th-8th cent. BCE)

well as from kudurrus, seal impressions, stelae and reliefs showing a stylus as symbol of the god Nabu. Within both groups, there is a tendency for grooved styli (for waxed boards) to be represented as double stabs, whereas cuneiform styli (for clay tablets) appear as tapered trapezoids – more rarely as triangles – with a right-angled or slanted tip. Sometimes, however, a grooved stylus has the same shape as a standard non-grooved stylus, thus corroborating the expectation that the two kinds of implement, serving the same script, indeed shared the most basic features. The depictions bear witness, moreover, to a certain degree of variation in the shape of the styli and of their writing tips. As far as the length of the styli is concerned, it has been argued, their dimensions might be purposefully oversized within the Neo-Assyrian writing scenes in order to increase recognisability, a standpoint which will be further argumented in the following paragraphs.

3. *Archaeological finds*

Cuneiform styli could be made of various materials. Apart from reed, for which there is ample evidence from both the texts and the analysis of wedge impressions, there is archaeological evidence for styli made of bone and, possibly, of bronze, as well as philological evidence for styli made of precious metals, although these are likely to be understood as models of styli rather than habitually used instruments. Since reed is heavily prone to degradation, there is little hope of recovering original styli of this kind, but we may expect to find some examples of styli made of bone or metal. In fact, there is only one example of artifacts which can be confidently identified as cuneiform styli, i.e. the well-known Old Babylonian bone styli from Tell ed-Dēr. Some bronze objects from Late Bronze Age Ugarit have been interpreted as cuneiform styli too, but they remain unpublished. Other examples of objects claimed to be cuneiform styli do exist, but none are convincing. The scarcity of findings, in my opinion, should not be attributed solely to the perishable nature of reed (or wood), but also to the fact that an everyday stylus, in all likelihood, often had the appearance of a short, undecorated stick – something which can easily escape our attention, especially if we have another idea of how a stylus should look. It seems, therefore, conceivable that some styli made of bone or metal may still lie

unrecognised among the myriad of "small finds".[50]

3.1 *Sippar-Amnānum (Tell ed-Dēr)*

The bone styli from Sippar-Amnānum (Tell ed-Dēr) were found in the house of Inanna-mansum, level IIIb, locus 22 (Fig. 7). The level IIIb corresponds to a late phase of occupation of the complex, dated to the 18th year of Ammiṣaduqa.[51] Twelve styli were found on the ground, near to tablet lots A 363 and A 369;[52] one more piece, fragmented and identical to D 4085, was found within lot A 359.[53] The instruments are 29 to 52 mm long, 3 to 11 mm wide, and 1.5 to 4 mm thick; the width/length ratio is ca. 1:12 to 1:15 in Nos. 1-7, whereas ca. 1:5 to 1:6 in Nos. 8-12.[54] Within the latter group, therefore, the proportions are similar to those found on the depictions of styli as symbol of Nabu examined in §2.2. The instruments are always bevelled, at least at one end. If the width is less than 5 mm, both ends are bevelled (Nos. 1 to 7; No. 5 is broken); otherwise, only one end is bevelled (Nos. 8 to 12, No. 10 is broken). Since the bevelled end can reasonably be identified with the writing tip, it is likely that, in the former case, both ends were used for writing. The tip is either right-angled or slopes slightly to one side. Generally, the longer face is polished and the shorter one is rough; in some cases, however, both faces are rough (Nos. 4, 6, and 7). L. De Meyer tested the instruments on modeling clay and found that these objects are very suitable to write cuneiform script.[55] Photographs of these tests are not available, nevertheless this assumption may be confirmed by experiments carried out with similar instruments (§5.2). This, and the fact that they were found together with cuneiform tablets, prove that these objects can be safely regarded as cuneiform styli. At first sight, one may assume that the face used to make impressions in the clay was the polished one, but the opposite is likely to be true, since the bevel must face downwards in order to produce proper cuneiform wedges (discussion at §7.2). Consequently, there is no need to assume that the examples with both faces rough would be unfinished pieces.

3.2 *Ugarit*

Allegedly, an unspecified number of bronze cuneiform styli were found in Ugarit, in Room 3 of the Royal Palace, during the excavations of the Western Archives in the 1950 campaign. These objects were found together with fragments of tablets, a fact which supports the theory that Room 3 was a scribal office or secretariat.[56] Whether the tablets – and, hence, the styli – actually fell down from the upper storey during the collapse is unclear;[57] in any case, the styli are likely to date to the last phase of occupation of the complex. Unfortunately, the published information about them is confined to the following statement made by C. Schaeffer (which, as was mentioned, refers to the finds in Room 3 of the Royal Palace): "sur le sol soigneusement lissé parmi des fragments de tablettes, nous avons trouvé plusieurs styles en bronze de la longueur d'une plume à une extrémité aplatie, parfois légèrement inclinée, avec lesquels les signes cunéiformes étaient imprimés dans la pâte encore molle".[58] J. Ellison, who could identify and inspect these bronzes at the Damascus National Museum in the frame of his PhD research, generously provided more detailed information about the pieces. According to him, they are 6-10 inches long, very thin, and all are square or slightly rectangular; most of them do have some bevel. The back end is flattened, almost like an arrow.[59] Admitting that these are indeed cuneiform styli, their length would contrast with that of the styli from Tell ed-Dēr, which happen to be considerably shorter. This, and the differences in shape and form (square/rectangular section, presence/absence of flattened back end) would point to the existence of different traditions in the manufacturing of cuneiform styli across the Ancient Near East; such diversity, moreover, might be related to differences in the

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[50] B. Mofidi-Nasrabadi interpreted as cuneiform styli some stone objects of triangular form found at Haft Tappeh, ca. 20 km south-east of Susa, datable to the Middle Elamite period (Mofidi-Nasrabadi 2012, 752-753 with Fig. 7; based on the photograph, they are ca. 2-2.5 cm long). These objects were found together with tablet fragments in Rooms 1 and 5 of the building excavated in the *Areal I*, a fact which led to the interpretation as cuneiform styli. According to Nasrabadi, the archeologists' "Experiment mit den Steingeräten auf Ton Keilschriftzeichen einzudrücken war erfolgreich. Ihre verschiedenen Ecken konnten bestens zum Abdruck von unterschiedlich großen Keilen und Winkelhaken benutzt werden." Photographs of the experiment results, however, have not been published. The interpretation remains open to debate; a detailed comparison between the edges of these tools and the wedge impressions on the tablets might shed light on this hypothesis.

[51] Gasche 1989, 26-33; Tanret 2002, 3.

[52] Gasche 1989, 102 and Pl. 45 Nos. 1-12.

[53] Gasche 1989, Pl. 45 *ad* No. 10.

[54] Width : length (mm): 48 : 3.5 (No. 1), 46 : 3 (nos. 2-3), 39 : 3 (No. 4), 36 : 3 (No. 6), 37 : 3 (No. 7), 30 : 6 (No. 8), 29 : 5 (No. 9), 52 : 11 (No. 11), 49 : 10 (No. 12). Nos. 5 and 10 are broken.

[55] De Meyer *apud* Gasche 1989, 102.

[56] Van Soldt 1991, 49 with n. 21.

[57] So Schaeffer 1955, XII; Yon 2006, 38; but cf. van Soldt 1991, 50.

[58] Schaeffer 1951, 14.

[59] Pers. comm., July 2014. I'm very grateful to J. Ellison for providing me with these most interesting informations as well as with the appropriate pages from his PhD dissertation (Ellison 2002). J. Ellison will publish the results of his research on how the stylus was held and manipulated in a forthcoming article. There is no dossier on these objects at the archive of the *Mission archéologique de Ras Shamra - Ougarit* in Lyon (courtesy of V. Matoïan, pers. comm.).

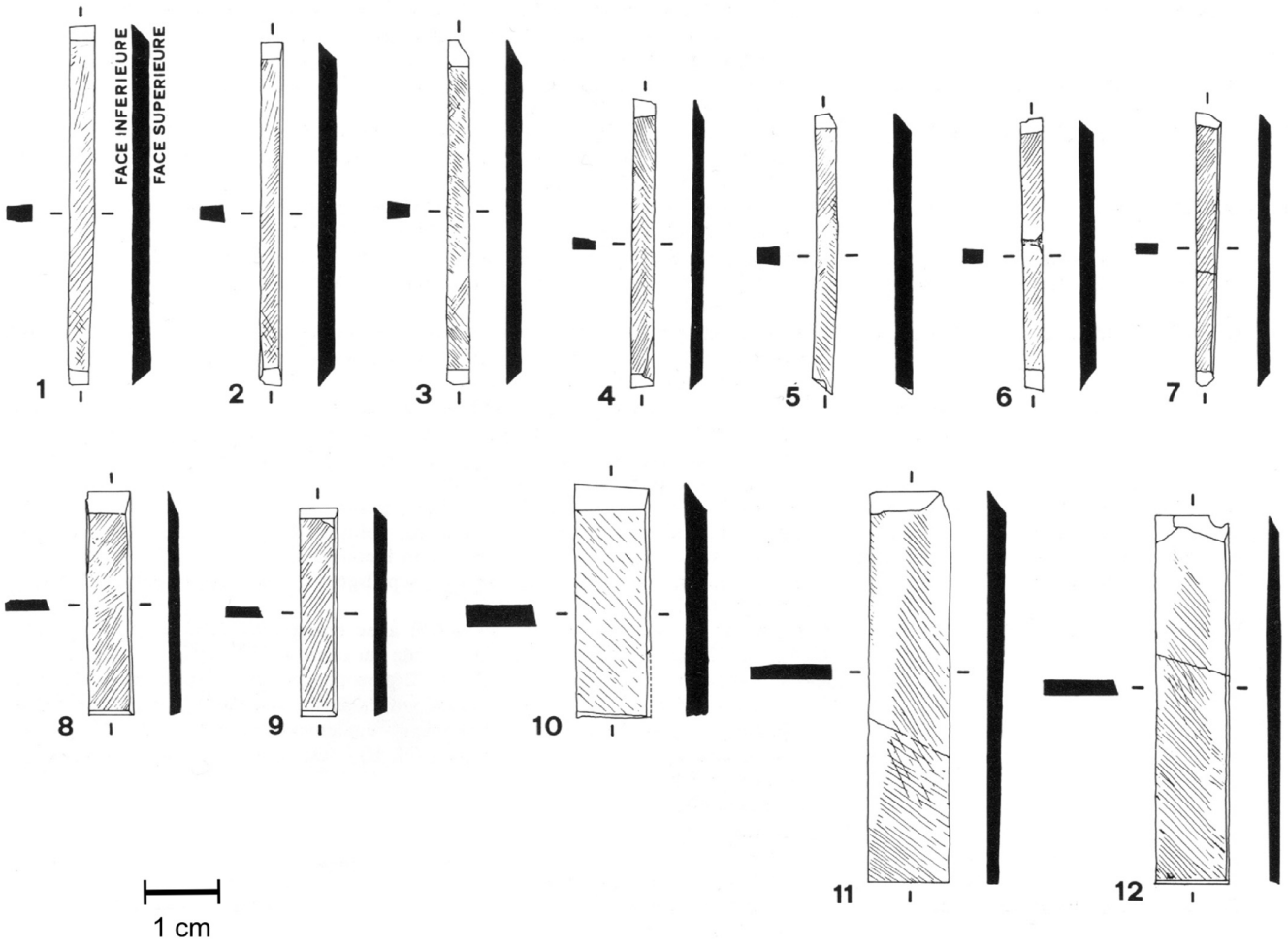

Fig. 7 - The styli from Tell ed-Dēr (after Gasche 1989, Pl. 45).

handling and writing techniques as well (cf. §6.3). As long as a full publication of the alleged Ugarit styli is not available, however, any well-founded discussion on these points is impossible.

3.3 *Tell Hammam al-Turkman*

D. Meijer identified a possible scribal quarter at Tell Hammam al-Turkman, square K24, within the so-called "Administrative Complex", in a phase dating back to the second half of MB I.[60] Here, a basin-like construction and a kneading platform were found. The basin was connected to a water conduit system and the platform was covered with purified lumps of clay; in the immediate nearby fragments of tablets, perhaps in secondary or tertiary locations, were also found. According to Meijer, these facts suggest that this area might be used to prepare clay for tablets. The association between water supply and scribal activities may find parallels in Tell ed-Dēr, Ugarit, Nimrud, and Tell Mozan.[61] The case for a scribal quarter is fortified by archaeological evidence, as a bronze object interpreted by Meijer as a possible cuneiform stylus was discovered – although, as the excavator himself notes, some circular reasoning might play a role here. The implement, which bears the excavation number HMM 98-M5, was found 1 m from the basin and belongs to the same archaeological phase. It is 9.8 cm long, 0.8 cm width, and 0.9 cm thick,[62] and is "slightly flattened at [one] end".[63] Apparently, the object is slightly wider in the proximity of the flattened end, as the available photo shows. According to Meijer, experiments showed that the implement is able to produce regular wedge impressions.

[60] Meijer 2004, 388.
[61] Meijer 2004, 390.
[62] D. Meijer, pers. comm. (23.07.2013).
[63] Meijer 2004, 388, 391 Fig. 3.

3.4 *Problematic Cases*

In this section, I will discuss some cases for alleged styli which are unlikely or impossible to be interpreted as such.

Among the small finds from the 1931-39 and 1952-69 campaigns at Boghazköy, there are two objects which R.M. Boehmer concluded to be cuneiform styli.[64] Both objects, found in the Lower Town and dating to the Karum Kaneš period,[65] are made of horn and are roughly square in section. No. 2044 is 15.7 cm long and No. 2045 is 18 cm long; both are broken at the bottom end, which would represent the alleged writing tip. Their form is that of a stab, narrowing towards the bottom end. I believe that it is problematic to conclude that these implements are styli: although their section is roughly square, the edges are not sharp; moreover, the alleged tip would have been extremely narrow, capable of impressing, if at all, only very minute wedges. Additionally, the considerable length of the objects – particularly of No. 2045 – is problematic (see §§2.2 and 6).

At Ortaköy (Hittite Šapinuwa), a certain number of objects have been recovered, which A. Süel proposes to identify as cuneiform styli.[66] These instruments consist of a bone handle and a short bronze stab, which would represent the writing tip. In some cases, only the alleged writing tip is preserved. Pending publication of the objects and of their archeological context, the option that they might be styli is open. The form of the handle, however, points rather at an instrument used by woodworkers (gouge or similar). Moreover, it is unclear whether the alleged writing tips can indeed be used to impress wedges: the example of which photos are available has a flattened end, which again would point at a gouge rather than at a stylus.[67]

H.H. von der Osten labelled as "styli" some decorated bone objects found at Alishar Höyük. They taper to a point at one end, and date back to the Hittite period.[68] Because of their pointed end, however, such implements cannot be used to write cuneiform wedges. In Alishar, a number of bone "awls" were also found. One of them is square-ended, so, in principle, it could have been used as cuneiform stylus,[69] but its pointed bottom end is more indicative of an awl-like instrument; according to the excavator, furthermore, it is likely to date back to the Iron Age.

In the first volume of his work, *Excavations at Kish*, S. Langdon claimed to have identified a true cuneiform stylus as well as a ruling tracer in two bone implements found at the "city ruins of Western Kish" and possibly dating to the Old Babylonian period.[70] Judging from the available photos, the alleged stylus has the appearance of a pen-like, four-sided stab; one end is flattened, while the other is bevelled and slightly narrowed. Langdon mantains to have discovered its "rather intricate mechanism" after "long practice", and dismisses the reconstructions by Messerschmidt, Clay and others as completely erroneous. In order to obtain cuneiform signs, however, one has to continuously rotate the stylus in hand, as each type of wedge requires that the stylus is turned in a different position. This complicated system is very unlikely ever to have been used by any ancient scribe; furthermore, the stylus edges used to produce the impressions seem to have been consistent for all wedge types (§6.3). Langdon's attempts at reproducing cuneiform script with this tool have been surprisingly called "befriedigend" by Boehmer; Falkenstein, however, was more cautious, and Tanret qualified them more appropriately as "franchement désolants".[71] The alleged ruling tracer is likely to be an awl or needle, especially because of the hole at one end. Theoretically, it also may be used to trace lines on clay, but it would not produce the wedged line heads which are frequently found on the tablets.

E. Bleibtreu interpreted as cuneiform stylus, or as a votive model of a stylus, an unprovenienced stone object found in an anonymous private collection.[72] The flattened end of this implement, however, cannot be used to produce proper wedges, nor is there any evidence that supports the theory of it being used for writing cuneiform script.

At Nimrud, "more than two dozen spatulae mostly in ivory, some in bone [...]" were found in the well NN of the Nortwestern Palace.[73] As Mallowan himself observes, these cannot be interpreted as cuneiform styli, as they would need a more square-ended tip; they might, perhaps, be used "for writing Phoenician or Aramaic upon wax".[74]

4. *The Reed Stylus*

The ancient name of the cuneiform stylus was "tablet-reed" (Sum. GI DUB(-BA), Akk. *qan ṭuppi*, *qan/ṛṭuppu*). This indicates that styli were originally made of reed; of course, however, this doesn't mean that

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[64] BOEHMER 1972, 196-197 and Pl. 63 (Nos. 2044-2045).

[65] BOEHMER 1972, 197.

[66] I wish to thank A. Süel for the informations kindly provided on these objects, and for providing photos of one of them.

[67] Kindly pointed out to me by A. Baykal-Seeher and J. Seeher.

[68] VON DER OSTEN 1937, 237 with Fig. 269 on p. 242.

[69] VON DER OSTEN 1937, 238 Fig. 265 No. e807.

[70] LANGDON 1924, 95-98 with Pls. 29-31.

[71] BOEHMER 1972, 197; FALKENSTEIN 1936, 6 n. 2; TANRET 2002, 26 n. 14.

[72] BLEIBTREU 2003.

[73] MALLOWAN 1966, 138-9 with Figs. 96-98 on pp. 162-163.

[74] *Ibidem*.

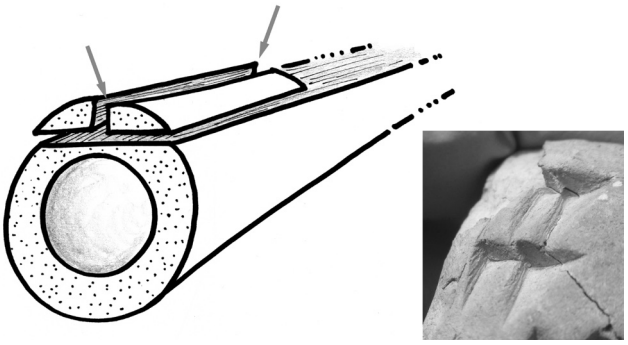

Fig. 8 - Left: The making of a cuneiform stylus from a reed stalk according to the reconstruction of Messerschmidt. The arrows marks the "regular" writing edges. Right: Close-up from the Old Babylonian tablet VAT 8136, with wedges displaying curved right-hand face and fibrous impressions on the left-hand face.

other materials could not have been used at one point or another.[75] Since reed styli have not stood the test of time, reconstructions of their appearance are necessarily based on experimentation and examination of wedge impressions.

4.1 *Cutting Technique*

The first scholar to carry out a systematic analysis of the wedge impressions in order to clarify the cuneiform writing technique was Leopold Messerschmidt.[76] He observed that the wedge impressions on a number of tablets of different provenance and dating regularly show the following pattern: the right-hand face of the wedges is smooth and slightly curved, whereas the left-hand face is flat and displays fibrous impressions running parallel to the wedge axis. In the most favourable cases, one can also observe some porous impressions on the front face of the wedge, which correspond to the cross-section of fibrous capillaries. Both the curvature of the right-hand face and the fibrous traces are often observable to the naked eye and, in some cases, even on photographs.[77]

As Messerschmidt argued, the presence of this pattern suggests that the stylus was obtained from the outer section of a reed stem. He proposed the following reconstruction: the reed was first split longitudinally and the obtained section was again split lengthwise so that two styli were obtained from each section (Fig. 8).

Note that the side resulting from the inner part of the reed stalk can be polished. In this case, the corresponding face(s) of the wedge would hardly display fibrous impressions.[78] This would easily explain why these impressions are not always evident in wedges which, on the other hand, also display the right-hand face curvature which is the peculiar indicator of a reed stylus. If the writing tip is split or damaged, this will be apparent in its impressions. These instances, therefore, provide crucial information about the handling of the stylus (for attestations and discussion see §6.3).

Both Powell and Marzahn corroborated Messerschmidt's analysis with their own experiments, and with new evidence for the appearance of the "reed pattern" in various corpora of tablets.[79] Regarding the cutting process, however, one may note that the "second cut" described by Messerschmidt is not essential in order for wedges to display the observed pattern. Though he appears to accept Messerschmidt's conclusions, A. Falkenstein imagined a stylus which would be somewhat differently cut.[80] This stylus would produce the characteristic reed pattern too. According to Powell, it is unlikely that a stylus like that imagined by Falkenstein ever existed.[81] Indeed, Messerschmidt's stylus seems both simpler to obtain and easier to use, a fact which favours his reconstruction. Nevertheless, other ways to cut a stylus are not necessarily incompatible with the wedge impressions and therefore should not be ruled out (Fig. 9). Wedge impressions from the Early Dynastic period, in particular, do point at cutting techniques which are different from that reconstructed by Messerschmidt.[82]

There is another point for which Messerschmidt's conclusions are called into question. As previously stated, he insisted that the wedge face displaying the curvature is always the right-hand wedge face (for a probable explanation of this regularity see presently,

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[75] *Pace* Messerschmidt 1906, 189. The fact that the stylus was still called "tablet-reed" does not mean that it was always made of reed; no more, at least, than our term "pen" actually means that our "pens" are still made of feather (Latin *penna*).

[76] Messerschmidt 1906.

[77] See e.g. the photo of the tablet K 143, perhaps written by king Aššurbanipal himself, in Livingstone 2007, 112, also online at the CDLI archive (photo P393767); VAT 8136 (Old Babylonian, P373156); cf. also Fig. 8 below. A macroscopical example of fibrous impressions in the left-hand faces of the wedges is AUAM 73.0599 (Old Babylonian, online at the CDLI archive: photo P249677, kindly pointed out to me by Zs. Földi).

[78] In the Royal Palace at Tell Mozan (Akkadian period), implements resembling ax heads made of stone have been found, which may have been stylus sharpeners (Buccellati, Kelly-Buccellati 2000, 145). If so, "they may have been held between thumb and forefinger, and passed slightly along the non rounded sides of the stylus to remove nicks and grooves" (*ibidem*).

[79] Powell 1981, 425-426; Marzahn 2003, 87 Fig. 4.

[80] Falkenstein 1936, 6 Fig. 1.

[81] Powell 1981, 426.

[82] Kindly pointed out to me by A. Bramanti, who is carrying out an investigation on this topic in the frame of his PhD research about "Umma-Zabalam in the Early-Dynastic Period: History, Administration and Palaeography". One of the relevant tablets is A 07554 (CDLI No. P392107), discussed by him in the talk "A Fistful of Clay", University of Jena, July 8, 2014.

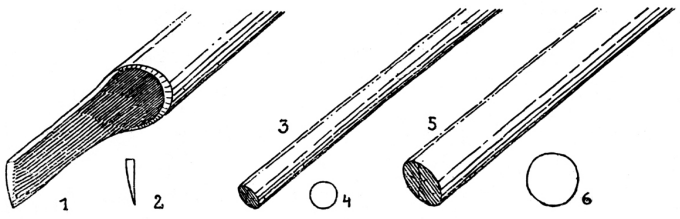

Abb. 1. 1. Schreibgriffel der Archaischen Schicht IV—II. 2. Schreibgriffel in Vorderansicht. 3—4. Griffel zum Schreiben der Einer und Zehner. 5—6. Griffel zum Schreiben der Sechziger und Hunderter.

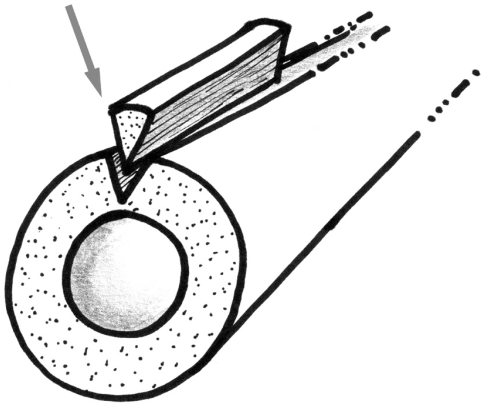

Fig. 9 - Left: Falkenstein's reconstruction of the cuneiform stylus (after FALKENSTEIN 1936, 6 Fig. 1). Right: an alternative solution to obtain a stylus from a reed stalk: wedges resulting from such a stylus would display the same pattern as those originating from Messerschmidt's stylus.

§4.2). That said, it is worth noting that exceptions to this "rule" do exist: in the Nuzi tablet HSS 14, 125 it is the *left-hand* wedge face that is curved.[83]

4.2 *Material and Durability*

The presence of Messerschmidt's pattern in a wedge impression implies that the stylus which produced it was, in fact, a reed; we are then faced with the question of which species of reed might be involved. Messerschmidt used a bamboo stalk with a diameter of 12 cm for his experiments, but, as Powell noted, stalks with a much smaller diameter are sufficient.[84] Moreover, Mesopotamians hardy had bamboo at their disposal – something of which Messerschmidt was well aware.[85] A far as we know, the following species of reed were common in ancient Mesopotamia: *Arundo donax* (giant reed) and *Phragmites australis* (common reed).[86] Interestingly, a recent study on plant remains and molluscs in cuneiform tablets from the British Museum revealed traces of both species in some fragments from Neo-Babylonian Uruk.[87] Although *Arundo donax* and *Phragmites australis* are botanically distinct from one another, their overall appearance is similar, so common usage often denotes both species by means of a single term, e.g. English *reed*, Italian *canna* or Arabic *qaṣab*.[88] In many cases, terminological distinctions in the texts mirror functional differences rather than botanical ones, which does not mean that the Mesopotamians or others who utilised the reeds were not aware of the differences between the various species. This has been observed in the very case of the distinctions between reeds, rushes and sedges by marsh dwellers in modern Iraq[89] and evidently applies to ancient Mesopotamia as well.[90]

Despite being referred to in scholarly literature as the sole *Phragmites australis*, Sumerian GI and Akkadian *qanû* clearly denote both *Arundo* and *Phragmites*, i.e. the "reeds" in general, tall and stout grasses with rigid stalks, as opposed to smaller, herbaceous plants (rushes and sedges) which were usually marked with the determinative Ú.[91] This is not to deny that most

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[83] The 3D model of a cast of this tablet is available online since 2002 at the *Hethitologie Portal Mainz* webpage (http://www.hethport.uni-wuerzburg.de/3d/). For other kinds of curvature in the wedge faces, which have nothing to do with reed, see §7.3. Again, tablets from the Early Dynastic period give witness to much more variation in the positioning of the fibrous impressions as compared to the times following the Ur III period. Interestingly, this variability as compared to later times is also observed in the order of strokes, as pointed out by A. Bramanti and J. Taylor in their lectures at the 60th Rencontre Assyriologique Internationale, University of Warsaw, Juli 23, 2014.

[84] MESSERSCHMIDT 1906, 304 fn. 1; cf. POWELL 1981, 426.

[85] MESSERSCHMIDT 1906, 190.

[86] TOWNSEND, GUEST 1968, 370-374 with Pl. 142-143; HEPPER 1992, 193. For the representation of both species in the Neo-Assyrian reliefs see BLEIBTREU 1980, 177-179, 232-235.

[87] CARTWRIGHT, TAYLOR 2011, 68.

[88] For the use of *qaṣab* see TOWNSEND, GUEST 1968, 372, 374; POSTGATE 1980, 102; STRECK 2009, 183.

[89] OCHSENSCHLAGER 1992, 54.

[90] WAETZOLDT 1992, 129.

[91] For this opposition see LANDSBERGER 1967, 40-41. Landsberger (*ibidem*) identifies Sum. GI with *Phragmites australis*, but as he does not put forward any identification for *Arundo*, this reference does not contradict the idea that GI may denote both plants. On reeds in ancient Mesopotamia see POSTGATE 1980; SALLABERGER 1989; WAETZOLDT 1992; STRECK 2009, 182-189, with further literature. Sallaberger, who identifies GI / *qanû* with *Phragmites australis*, states that, in Mesopotamia, this species could reach the height of ca. 6-7 m, occasionally even 9 m, with stalks of ca. 3-4 cm (SALLABERGER 1989, 313, based on studies by Salim and Westphal-Hellbusch & Westphal

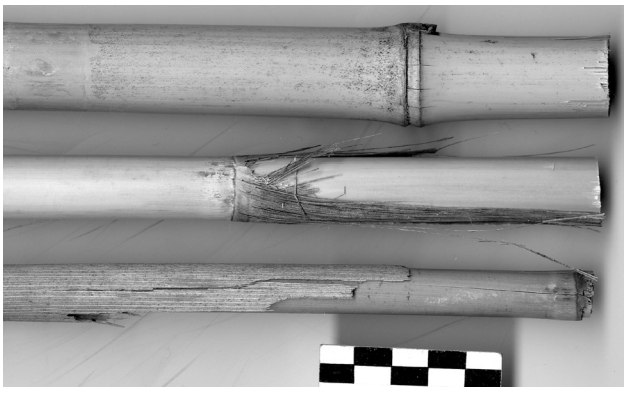

Fig. 10 - Top: stalk of bamboo; middle: stalk of *Arundo donax*; bottom: stalk of *Phragmites australis*. The latter two are from the Büyük Menderes delta.

attestations of GI / *qanû* may well refer to *Phragmites*, of which the typical Mesopotamian marsh consisted. But, as far as the fabrication of writing styli is concerned, *Phragmites* is not a good choice. Experimentation conducted on stalks from Italy, Germany, and on more than 6 m tall specimens from the Büyük Menderes delta in Western Turkey has shown that stalks of *Phragmites australis* are unsuitable for making a stylus, namely because of the smaller diameter (< 1.5 cm) and reduced thickness, and also because they tend to split longitudinally when cut with a saw, even in the case of big and solid specimens. Analogous experimentation on *Arundo donax*, on the contrary, yielded excellent results (see presently). Based on this, and given that *Phragmites* and *Arundo* were both common in ancient Mesopotamia, it seems likely that reed styli were normally obtained from the latter species.

Arundo donax (giant reed) is an invasive, up to ca. 9 m tall perennial grass which thrives in many soil types, from heavy clays to loose lands, and tolerates a wide variety of climatic conditions including high salinity. It had already spread over a large area in ancient times (including the Middle and Near East) and men exploited it from antiquity onwards for its multiple uses. It has robust, bamboo-like stalks with alternate leaves and nodes at intervals of ca. 15-20 cm; the diameter is normally up to ca. 3.5 cm. The outer skin is glossy or slightly grooved, depending on the single exemplars (Fig. 10).[92]

Experiments conducted at the University of Würzburg have shown that styli cut from *Arundo donax* produce wedge impressions displaying the same characteristics observed in original tablets. Styli may be cut from mature or green stalks and both can be immediately used to write. In both cases, cutting a stylus is a very simple process. A portion of the stalk is cut with a saw, which is subsequently split by means of a chisel. The stalk's fibrous texture allows it to be easily split, and no polish work is needed, although the option exists (Fig. 11).

Of course, a reed stylus is susceptible to degradation more than those made from a more durable material such as horn, bone or metal. On the other hand, its tip may periodically be sharpened, as long as the overall length of the implement remains convenient. Things like the average durability of a standard reed stylus and the frequency of it being sharpened are difficult to determine.

The most notable advantage of a reed stylus is the glossy, waterproof quality of its outer skin. This prevents the implement from absorbing humidity and sticking to the clay during the writing process, a problem which would require frequent cleaning and drying, as is necessary, for example, in the case of wooden styli (§5.2). This is likely the reason why the (curved) reed skin was used to construct the broad, right-hand side wedge face: this was the side of the stylus which offered the best results when pressed into the clay.[93]

4.3 *Dimensions*

The three angles of the tip are the stylus' only feature that can be reconstructed with some confidence,

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on modern Iraqi marsh dwellers). These measures, however, are not without problems. SALIM (1962, 104) actually mentions the sole *Phragmites karka*, which remains unattested in ancient Mesopotamia, and speaks of an average stalk diameter "between three and a half and four inches" (more than 10 cm!). WESTPHAL-HELLBUSCH, WESTPHAL (1962, 24), speaking of *Phragmites communis* (= *australis*), observe that this species grows taller in Iraq (up to 6 m and more) than in Europe, but do not give dimensions for the diameter of the stalks. Indeed, various subspecies of *Phragmites australis* may grow to a height of more than 6 m under favourable conditions. The point is, however, that they grow *taller* and not *wider*, so that even in those cases the diameter of the stalks does not exceed the measure of ca. 1.5 cm (cf. also e.g. the passage from W. Thesiger's book on *The Marsh Arabs* quoted in Postgate 1980, 102 n. 9: "An old man sat cross-legged on the ground beside a pile of dry *qaṣab* canes, each about eight feet long and as thick as my middle finger"). Moreover, and quite important for the issue at hand, the stalks tend to split if cut with a saw; that is, it is very difficult if not impossible to gain sharp edges by sawing them. The high phenotipic variation of *Phragmites australis* (see e.g. CLEVERING, LISSNER 1999) and the fact that, as already noted, Arabic *qaṣab* refers to both *Phragmites* and *Arundo* contributed to some confusion in the identification of botanical species in non-botanical literature. For useful information and references about the taxonomy of *Arundo* and *Phragmites,* I am indebted to S. Pilu (University of Milan, Department of Agricultural and Environmental Sciences).

[92] The complex systematics of the genus *Arundo* have been studied extensively in recent years, especially due to its role as promising energy crop. On the botanical characteristics of this genus see HARDION *et alii* 2012; MARIANI *et alii* 2010; on modern exploitation see PERDUE 1958; PILU *et alii* 2012.

[93] Cf. MESSERSCHMIDT 1906, 304; for a partially different explanation cf. DEIMEL 1922, 13.

Fig. 11 - Top: *Phragmites australis* (left) and *Arundo donax* (right) at the Büyük Menderes delta; bottom: splitting the stalk (left), cross-section of two styli obtained from a mature and a green stalk respectively (right).

based on the wedge's inner angles. In doing this, we must remeber that the angles are influenced by the stylus' trajectory and position to the tablet surface (§7). Hypotheses on the dimensions of other parts of the stylus can be drawn only tentatively. In principle, the diameters of the original stalks may be deduced from the curvature of the relevant wedge faces. On the other hand, the woody texture of the reed undergoes a natural relaxation process after the stylus has been cut, so the original diameter of the stalk may have been smaller than it appears from the curvature of the wedge faces.

Since only one edge of the stylus was normally impressed in the clay, width and thickness of the implement primarily served the purpose of sturdiness and convenient handling. Thus, the length of the right/left edge of the stylus can be determined only in the event that the latter was impressed to the point that the former(s) happened to be completely immersed into the clay. According to Messerschmidt, the right and left edges of the stylus which were used for the Old Babylonian cylinder VA 2596 measure ca. 6-7 and 4 mm respectively; in the case of the tablet VAT 1155 the stylus' left edge would have measured 2.5 mm.[94] Interestingly, on the right edge of this tablet there is a rectangular impression (6.2 × 1.6 mm).

[94] Messerschmidt 1906, 307.

Because of its form, however, this impression cannot have been originated from the stylus tip.[95] On the lower edge of the Old Babylonian tablet VAT 8535 (VS 18.72) there is a hole going almost from side to side of the 6.5 cm high tablet.[96] At the lower edge, the impression is roughly trapezoidal, with one side being slightly curved. The curved side measures 4.5 mm, the lateral sides 2.5 and 2.1 mm respectively. The form of the impression is compatible with that of the wedge impressions on the tablet, so that it might indeed correspond to a section of the stylus.

4.4 *A Ghost Stylus: Saggs' Sedge Stylus*

The reconstruction put forward by Messerschmidt has been contested by H. Saggs.[97] Though admitting the theoretical possibility for a stylus to be cut from a reed of circular cross-section, Saggs argues that using a "sedge" of triangular cross-section would provide "an admirable stylus without artificial shaping".[98] Saggs does not specify the actual plant to which he refers, but one assumes he considers species which were present in ancient Mesopotamia, like *Scirpoides holoschoenus (L.) Soják*.[99] Each side of the stem may be more or less flat, slightly concave or convex, depending on the single stem and on the number of removed sheating leaves. Since wedges on cuneiform tablets display aperture angles ranging from 10° up to 95°, but the cross-section of the sedge stem is basically an equilateral triangle, Saggs has to explain how such "thinner" or "larger" wedges might be obtained. According to him, "thinner" wedges can be obtained by impressing the natural "ridge", formed by sheating leaves "projecting out from each of the three apexes of the (convex-sided) triangle". "Larger" wedges, on the other hand, may be obtained "by coordinating a twist of the wrist with impression into the clay". "This", Saggs continues, "disposes of Driver's argument, based on the work of De Morgan and Messerschmidt", namely that in "the later periods, […] the stylus came to be cut out of a thicker reed, resulting in an angle which reached 95°".[100] Messerschmidt, however, never came out with the bizarre idea that bigger wedge angles point to thicker reed stalks, an idea which originates from Driver himself.[101] Indeed, the point is not to cut styli from a thinner or thicker stalk, but rather to cut the section at different angles.

Saggs' reconstruction is not convincing for at least two reasons. First, the specific characters displayed by wedge impressions originating from such a stylus have never been observed so far in original tablets. Second, Saggs' explanation for the variation of aperture angles seen in the original tablets is inadequate. The consistency in the aperture angle displayed by hundreds of wedges within a single fragment can hardly be explained by suggesting that scribes regularly twisted their wrist in the same way for each single wedge on the tablet, not to mention the fact that one would have to assume different "twisting trends" depending on place and period.

5. *Reed or Not Reed?*

Reed was not the only material used to produce cuneiform styli in the Ancient Near East. As was mentioned, there is archaeological evidence for styli made of bone and, reportedly, of bronze, as well as textual evidence for other materials. Moreover, there is at least one major scribal tradition, i.e. the Hittite scribal tradition, which never made use of reed to write tablets (§5.3). Although climactic conditions, in this case, were no doubt influential, non-reed styli were likely more common in Mesopotamia than one would assume, as well. The following sections will first discuss the diffusion of the reed stylus, then the use of other materials, and finally the issue of the Hittite stylus.

5.1 *Diffusion of the Reed Stylus*

The "reed-stylus pattern", essentialy consisting of the peculiar curvature of the right-hand wedge face, has been observed in numerous tablets of various provenance and dating.[102] The evidence collected by Messerschmidt and Powell, however, does not tell us much about the diffusion of this kind of stylus. First, the information at our disposal is hardly statistically relevant. Powell, who is the only one providing quantitative data, examined "about 4000" tablets. Of these, more than 3100 dated to the Ur III period, the remaining being "about 500 Presargonic, about 300 each of Old Babylonian and Neo-Babylonian, [and] less than a hundred from various periods over the three millennia (mostly Babylonian, but most Assyrian)".[103] He further states that the reed pattern could be observed in ten to twenty percent of the examined tablets "because

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[95] A similar impression is found on the reverse of the Neo-Babylonian tablet MLC 1859 (ca. 6× 1 mm; I thank S. Panayotov for providing me a photograph of the fragment). In all likelihood, such impressions originate from tools the scribes had at their disposal while working at the tablets.

[96] Kindly pointed out to me by Zs. Földi during a stay at the *Vorderasiatisches Museum* in Berlin, March 2014. A photograph is available online at the CDLI archive (photo P373135).

[97] Saggs 1981.

[98] *Ibidem*, 127.

[99] Cf. Hepper 1992, 194.

[100] Saggs 1981, 128.

[101] Driver 1976, 26. As Powell (1981, 426) noted, Driver "quite misunderstands the implications of Messerschmidt's work" in his account.

[102] Messerschmidt 1906, 304-307; Powell 1981, 426.

[103] Powell 1981, 426.

of the state of surface conservation".[104] But perhaps the "state of surface conservation" is not entirely to blame for the low percentages. In other words, in a number of cases Powell may not have noticed any curvature, not because of the "state of surface conservation", but rather because there was actually no reed pattern present, no curvature in the wedge, which might then point to the use of a different stylus. Along with the examples where the "reed pattern" is surely present, it would be, in fact, very interesting to list cases where that pattern is surely *absent*.[105] Only a systematic analysis of that kind could provide reliable data on the diffusion of the reed stylus within a certain corpus.

One problem in this type of study is that it is often difficult to determine the presence or absence of the reed pattern at all. The circular arc corresponding to the right edge of the tip is minimal and the original curvature of the reed stalk is easily modified by relaxation processes after the stylus has been cut; moreover, the circular cross-section of the reed hardly forms a perfect circumference. Thus, the pattern can be truly determined only in presence of wedges which display a right-hand face of appropriate width. Within the present study, it has been possible to inspect a sample of ten digitalized tablets from the Hilprecht collection in Jena, dating to the Ur III and the Old Babylonian periods.[106] Interestingly, only one of them displays the "reed-stylus pattern", whereas six do not show any curvature in the wedges, a fact which contrasts with the common idea of the ubiquitous diffusion of that kind of stylus.[107] A somewhat different picture has been gained by inspecting a small sample of fifteen Old Babylonian legal and administrative tablets at the *Vorderasiatisches Museum* in Berlin. Eight of them do display the "reed-stylus pattern", whereas three do not, and four cases are uncertain.[108] This confirms that only systematical studies could shed more light on the diffusion of the reed stylus. Such studies also should take into consideration the provenance of the fragments as well as the textual genre of the examined tablets, an element which may yeld significant results about possible links between specific genres and writing tools. In this respect, it is interesting to stress that all but one of the tablets in the Hilprecht collection sample which do not display the "red-stylus pattern" are literary texts, a fact which may be no coincidence. Were reed styli used more frequently in the case of administrative documents than of literary texts?

5.2 *Wood, Bone, and Metal*

Apart from reed, other materials were used in the Ancient Near East to make writing styli. As noted above, bone styli are attested for Old Babylonian Tell ed-Dēr, and bronze styli may be attested for Middle Bronze Age Tell Hammam et-Turkman and Late Bronze Age Ugarit (§3). Similarly, literary sources provide evidence for styli made of gold and silver.[109] In all likelihood, such precious styli indeed existed, but were reserved for gods or beings of analogous magnitude and were hardly used to write ordinary tablets.

Contrary to reed, wood is rather unsuitable for a stylus. Messerschmidt observed that wood tends to absorb humidity and stick to the clay while in use, so after some time the wedges become more and more blurred and the tip, therefore, must be frequently cleaned and dried in order to continue writing.[110] This problem can be alleviated by using hard woods (e.g. oak) and by hardening the stylus through drying techniques in order to occlude capillaries and membranes and thus increase impermeability.[111] Therefore, there is no reason to rule out the use of wooden styli, and indeed cases of wedges displaying fibrous traces but no face curvature may well originate from wood. Since both reed and bone prove to be far more suitable, however, it seems unlikely that wood ever experienced the same level of utility.

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[104] *Ibidem*.

[105] For example, Yoshikawa 1990 points out that the "reed-stylus pattern" never occurs within a sample of Emar tablets he could examine in Japan. According to J. Marzahn, also Neo-Assyrian tablets do not normally display the pattern (pers. comm.).

[106] I wish to thank M. Krebernik and S. Köhler for putting at disposal excellent 3D models of the Jena tablets and for the generous cooperation in the investigation.

[107] The relevant tablets are HS 1145, HS 1163, HS 1552, HS 1464, HS 1473+1598 (Ur III); HS 1431, HS 1433, HS 1448, HS 1486, HS 1507 (Old Babylonian). The "reed-stylus pattern" is observable in HS 1145 (administrative text), whereas is absent in HS 1163 (administrative text), as well as in HS 1473+1598, HS 1431, HS 1448, HS 1486, and HS 1507 (all literary texts). In the remaining tablets, the right-hand wedge faces are either too short or too badly preserved for a well-grounded judgment on the presence or absence of the curvature.

[108] I thank Zs. Földi for the opportunity of examining these tablets, which he was collating at the time of my stay in Berlin. I also thank J. Marzahn and the staff of the *Vorderasiatisches Museum* for their kind cooperation and assistance. The relevant tablets are VAT 8136, VAT 8139, VAT 8142, VAT 8156, VAT 8186, VAT 8383, VAT 8376, VAT 8513 (with "reed-stylus pattern"); VAT 8137, VAT 8369, VAT 8377 (without "reed-stylus pattern"); VAT 8105, VAT 8308, VAT 8400, VAT 8535 (uncertain).

[109] Volk 2009, 281-282.

[110] Messerschmidt 1906, 190, 304. Unexpected corroboration for this assumption came from an experiment organized in Würzburg at the Department of Ancient Cultures, Ancient Near Eastern Studies, to investigate formation and development of individual handwriting in writing cuneiform tablets. The students, who had to spend ca. two hours every week in writing tablets by using wooden styli, complained after the third week that writing became more and more difficult, since their styli kept sticking to the clay.

[111] Kindly pointed out to me by A. Baykal-Seeher.

Fig. 12 - Experimental antler stylus, manufactured at the University of Würzburg.

Antler, horn and bone make excellent styli. They were readily available in the ancient Near East and could be easily manufactured.[112] As was mentioned, an effective stylus must have sharp edges and smooth, glossy writing faces, and it must not stick to the soft clay while in use. In this respect, antler, horn, and bone are considerably more advantageous than metal. They can be reduced to the proper form simply by means of chisel and saw and eventually smoothed with an abrasive material. An experimental stylus made of roebuck (*cervus capreolus*) antler, manufactured at the Würzburg University in the frame of the "3D-Joins und Schriftmetrologie" project, has proved to be an excellent writing implement (Fig. 12).[113]

Compared to metal and hard stones, bone has the advantage of being more easily manufactured. This applies especially to the necessity of plain and smooth faces with sharp edges. Antler is tougher and more resilient than horn and bone, whereas horn is rather perishable, so that "finished objects and workshop debris are always likely to be meagre".[114]

Based on this, it is reasonable to suspect that antler, horn and bone may have been used to produce styli far more often than previously thought. The relatively perishable nature of these materials accounts for the scarcity of the findings, but a number of styli may have simply gone unnoticed: in principle, every rod-like piece provided with a three-faced sharp edge might have served as writing stylus. Due to its simple manufacturing, the ready availability of raw material, and its functional suitability, bone – together with horn and antler – is likely to have been the most common material to make cuneiform styli in Mesopotamia besides reed, and may have represented the standard wherever reed was not used. The most notable case within the latter category is represented by the Hittite tradition.

5.3 *The Hittite Stylus*

As far as we know, "Hittite" wedges – that is to say, wedges on cuneiform tablets from Boghazköy and other Hittite sites – never display the "reed pattern" observed in various tablet corpora from Mesopotamia.[115] This fact suggests that the Hittite scribes did not use reed styli at all. In Hittite wedges, all faces are tipically smooth and flat, without any curvature apart from those originating from movements of the stylus performed during the impression.[116] Climatic conditions may have played a role in the choice of materials other than reed, since the appropriate species (*Arundo donax*, see §4.2) had to be much more scarce than in Mesopotamia.[117] In the Hittite texts, the logograms GI(.)É.DUB.BA (HKM 71 l.e. 1, 2) and GI(.)É(.)*ṬUP-PÍ* (KUB 17.20 obv. ii 25) are attested. The meaning of "(cuneiform) stylus" is assured by the former passage, where the scribe Tarhunmiya, likely on expedition, asks his "beloved brother" in Tapikka to send him a new stylus since its own was "broken" or "lost" (*ḫar-ak-ta*).[118] Both logograms are likely to be re-interpretations of Sumerian GI.DUB.BA(.A) / Akkadian *qan ṭuppi*, *qan/rṭuppu*.[119] As already noted, the use of GI "reed" does not imply the material actually used, a point which is further corroborated, for example, by the fact that a GI(.)É(.)*ṬUP-PÍ* in KUB 17.20 is said to be made of silver and that Hittite *nata/i* "reed" does not occur in scribal-related context.[120] The passage from the Maşat letter HKM 71 suggests that, on the contrary, Tarhunmiya's stylus was not something one could easily make on the spot with readily available material, but rather a somehow elaborate implement. All these arguments coherently support the assumption that Hittite (cuneiform) styli were not made of reed.

Out of which material, then, were Hittite styli made? At this point, we may assume that they were made of wood, an idea which would easily explain the apparent lack of findings. However, this is not a flawless hy-

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[112] On the manufacture of bone and ivory in ancient Mesopotamia see MOOREY 1999, 111-127.

[113] The stylus was manufactured by the restaurateur and carpenter N. Schaller who made use of chisel, saw and sandpaper. After manufacturing, the stylus was tempered. It measures ca. 65 × 11 × 2 mm.

[114] So MOOREY 1999, 111.

[115] This assumption is based primarily on my personal experience, having examined more than a thousand fragments, mainly from Boghazköy, of various dating and genre. Based on casts kept at the Würzburg University, the tablets recovered in Kuşaklı (ancient Šarišša) also do not display the "reed pattern".

[116] On such movements and curvatures cf. §7.3 and CAMMAROSANO *et alii*, 2014, 14-16. Note that these movements result in convex faces of the wedge, whereas the reed stylus produces concave wedge faces.

[117] Remains of *Arundo donax* have been identified at Çatalhöyük, see MATTHEWS *et alii* in HODDER 1996, 307f.

[118] HOFFNER 2009, 229f., with previous literature; cf. now also TORRI 2012, 129-130.

[119] SCHWEMER 2005/06, 227 n. 71; WEEDEN 2011, 89.

[120] SCHWEMER 2005/06, 227 n. 71; CHD L-N, 406-408.

pothesis. To overcome the considerable disadvantages of wood (§5.2), all those styli would have needed specific treatment to increase their hardness and resistance to water. Secondly, and more importantly, we would expect to find more traces of wooden fibres in the wedge impressions. Wood may well be smoothed, but wooden patterns would nevertheless face up, at least occasionally. Wedges on Hittite tablets, on the contrary, regularly display perfectly smooth, flat faces.[121] Finally, the passage from the Maşat letter HKM 71 suggests that Hittite styli were somehow elaborated tools, not just wooden stabs.

Because of this, as well as the evidence reviewed in §5.2 above, we can reasonably assume that the standard material for cuneiform styli within the Hittite tradition was either metal, or antler, horn or bone.[122] If this is correct, we are left with the problem of the apparent lack of findings.[123] In view of the fact that the rooms storing the tablet collections from Boghazköy collapsed and burned, we may suspect that the styli existing at the time of the conflagration have been either destroyed or too badly damaged to be recognised and published by the archaeologists in modernity.[124]

Like in the Mesopotamian depictions of styli and in the examples from Tell ed-Dēr, the tips of Hittite styli could be right-angled or slope to the right (writing face down), and could be bevelled or unbevelled, as is clear from the various shapes of the wedges (cf. §7). The length of Hittite styli can be investigated only tentatively and through indirect evidence, but the peculiar way rulings are impressed in some tablets can be taken as evidence that short styli, at least, existed (§6).

In Hittite Anatolia, another kind of script was also widespread, namely the contemporary hieroglyphic script used on stone, lead and leather strips, and waxed boards.[125] Original Hittite boards, either waxed or not, have not been recovered so far, but their existence can be inferred from the many references to "wooden board(s)" (GIŠ.ḪUR and other terms) and "scribe(s) on wood" (DUB.SAR.GIŠ). Waxed boards could be inscribed both in cuneiform and hieroglyphic script. Indeed, the existence of wooden waxed boards inscribed in hieroglyphic script is proven by numerous bronze styli recovered in the Hittite capital Boghazköy (more than twenty examples)[126] as well as in Alaca Höyük (one example).[127] Such styli, whose length ranges from 8.5 to 23.6 cm, have pointed tips and a spatula-like flattened surface at the opposite end. These tools cannot produce wedges[128] and can only be interpreted as styli used to write a contemporary, non-cuneiform script on waxed boards, i.e. Anatolian hieroglyphs. This conclusion is confirmed by their perfect similarity to the styli used in the classical world to write on *tabulae ceratae*, as R.M. Boehmer convincingly argued in the past.[129] The pointed end was used for writing, while the spatula was used to erase signs when needed. To inscribe *graffiti* or write on leather or lead, of course, no spatula was needed, so that a number of awl- or nail-like objects made of metal or bone theoretically might be "hieroglyphic" styli as well.[130]

6. *Some Like It Short: Stylus Length & Handling*

Given the uncertainties in the interpretation of iconographical sources and the scarcity of archaeological findings, very little is known about how the stylus was held. Therefore, assumptions regarding stylus length and handling have to be drawn by combining indirect

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[121] The fragment Bo 3538+ was written with a damaged stylus so that the right-hand faces of the wedges appear to be "doubled" (for details see §6.3). But this doesn't tell us much about the material out of which the stylus was made.

[122] According to A. Baykal-Seeher and J. Seeher (pers. comm.), rib bones may be regarded as particularly suitable for the purpose.

[123] Two possible examples of bone cuneiform styli, identified by R.M. Boehmer, are very dubious and date back to the Old Assyrian Colony period, see §3.4. A perusal of the small finds from Boghazköy published by Bittel and Boehmer did not yeld results. Also among the small finds from the Lower Town, Büyükkaya, and the so-called Temple Quarter in the Upper Town there does not seem to be any bone object meeting the requirements for the interpretation as cuneiform stylus (pers. comm. by S. Herbordt, A. Baykal-Seeher, and J. Seeher). Objects found at Ortaköy (Šapinuwa) are viewed by A. Süel as cuneiform styli, but their interpretation is problematical (see §3.4).

[124] One should also keep in mind that from the entirety of Mesopotamia only one single convincing case of bone styli has been identified, although in all likelihood much more bone styli existed.

[125] MARAZZI 1994, with literature. For the lead strips see PAYNE 2005; AKDOĞAN, HAWKINS 2010, 2 with n. 3.

[126] One from Büyükkale (BOEHMER 1972, 134 and Pl. 41, No. 1207); 17 or 18 from the Lower Town, mostly from the South Area (BOEHMER 1972, 134 and Pl. 41, Nos. 1206, 1208-1218; Id. 1979, 31 and Pl. 19, Nos. 3395-3398A, cf. also No. 3418; overview of the findspots in BITTEL 1973, Fig. 1); further Bo 78/113, see *Hethiter 2002*, 353 Cat. 146. BOEHMER 1972 No. 1210 is the shortest piece (8.5 cm), Bo 78/113 the longest one (23.6 cm, its spatula is 1.7 cm large). One more example has been identified in 2012 (Bo 12-0-07, see SCHACHNER 2013, 147-149 with Fig. 4).

[127] KOŞAY 1966, Pl. 132 No. 10 (length: 19 cm).

[128] In *Hethiter 2002*, 353 Cat. 146, the spatula-like end is labelled the stylus' "Funktionsende", but both ends are actually to be regarded as such. In past years there has been exaggerated caution about the possibility that such styli might, in fact, be used to write cuneiform script: this option is impossible, as experimentation proves beyond doubt (an experiment has been carried out by D. Schwemer with an original stylus at Boghazköy in 2012).

[129] BITTEL 1973, 25-30; see also BOEHMER 1972, 133f.

[130] R.M. Boehmer put forwards this possibility for the following bone objects: BOEHMER 1972, 196f. & Pl. 73, Nos. 2046-2050 (on Nos. 2044-2045 see also §3.4); BOEHMER 1979, 50f. & 30, Nos. 3668-3673. But cf. also objects like BOEHMER 1972, Pl. 38 No. 1148.

evidence of various nature. The issues of stylus length and handling are addressed in §§6.1 and 6.2, whereas cases of split styli and aspects related to writing edges are dealt with in §6.3.

6.1 *Length*

Whilst looking for modern attempts at reviving the ancient technique of cuneiform writing, one finds that the reconstructed styli resemble a pen in length and are usually held with the palm facing down (Fig. 13).[131] In this way, excellent imitations of original cuneiform script can be achieved, as the empirical demonstrations by Powell, Marzahn, van den Hout and others show. Such reconstructions have likely been influenced by the famous depictions of scribes found in the Neo-Assyrian slabs.[132] Yet another theory might have contributed to this view, namely that tablet rulings (also called paragraph lines) could be obtained by simply lowering the stylus into the soft clay, without the need of pulling it all along the column. Accordingly, J. Taylor recently observed that the bone styli found at Tell ed-Dēr, which are just 3 to 5 cm long, "are too short (max 5.5 cm) to have made the longer rulings found on many tablets. Might they be training styli?"[133]

However, a different theory is suggested here, namely that ordinary cuneiform styli could be very short. There is both direct and indirect evidence to support this.

(1) Iconographical Evidence: The depictions of cuneiform styli as symbol of Nabu, ranging from a wide chronological and geographical span, suggest that the cuneiform stylus was normally a short, trapezoidal instrument with more or less slanted tip (§2.2). Within Neo-Assyrian writing scenes, the length is likely to be oversized on iconographical grounds (§2.1.4).

(2) Archaeological Evidence: At present, the bone styli from Tell ed-Dēr constitutes the only trustworthy instance of cuneiform styli (§3.1). They are just 3 to 5 cm long, which corroborates the implications of the iconographical evidence discussed above.

(3) Indirect Evidence: Some indirect evidence for the existence of short styli comes from horizontal rulings (paragraph lines). Such lines were normally traced with the stylus, as shown by similarities with the wedges present on the tablet and by the occasional presence of a wedge head at the left end. Whether straight or crooked, virtually all of these lines are continuous. However, at least two Hittite tablets could be identified where some, but not all, of the paragraph lines happen to be segmented: Bo 10 (*CTH* 505.1) and 167/c+ (*CTH* 811.A). The relevant rulings are made up by multiple stylus impressions next to each other; openly, the impressions were obtained by lowering the stylus into the clay at a flatter angle than when impressing wedges. In both tablets, these impressions are very short: 1.2 to 2.5 cm in the case of Bo 10, 1 to 3.3 cm in the case of 167/c+ (Fig. 14). Both tablets date back to the Late Empire period. Bo 10 is a cult inventory in cursive script,[134] whereas 167/c+ contains an Akkadian medical text, and is written in a clear, literary hand, displaying an inventory of sign forms with no parallel at all within the Hittite scribal tradition.[135] Its duplicate 1377/c+ (*CTH* 811.B) also has multiple stylus impressions in a paragraph line and a curious double row of multiple short stylus impressions at the end of col. iv (Fig. 14); its sign forms inventory is closer to the standard Hittite one.[136] It is difficult to say why these scribes at one point chose to impress rulings in such an uncommon way. In the case of Bo 10, an administrative text in cursive script, we are likely faced with a hasty way of tracing the rulings, whereas in the case of 167/c+ this is less certain. That said, these peculiar rulings point to a short stylus: had the stylus been as long as a pen, there would have been no reason to break the process into a number of short impressions.

On the whole, there is ample evidence proving that "short" styli existed in different periods and places, both in Mesopotamia during the Old, Middle, and New Babylonian periods as well as in the New Assyrian period and in Anatolia during the Hittite Empire.

6.2 *Handling*

Two features are of basic importance in discussing the handling of a stylus: (a) whether the writing implement is kept within the palm or it rests on the hand, protruding outward, and (b) whether the hand is pronate (palm down, *Obergriff*) or supinate (palm up, *Untergriff*), or in a half-way position between the two during the writing process.[137] In modern attempts

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[131] See the models by Messerschmidt (1906, 308 Fig. 9), Powell (1981, 432 Fig. 9), Donbaz (in *Boğazköy'den Karatepe'ye. Hititbilim ve Hitit Dünyasının Keşfi*, 2001, 89; now reprinted in Doğan-Alparslan, Alparslan 2013, 377 Fig. 1), Marzahn (in an educational movie produced at the FU Berlin and directed by I. Schrakamp and J. Levenson: *Am Anfang war der Keil*, available online at http://www.edubba.de/), and van den Hout (in an educational movie produced at the Oriental Institute of Chicago, available online at http://www.youtube.com/watch?v=LoqavHDlKZ0).

[132] See already Messerschmidt 1906, 187, who labels the Neo-Assyrian depictions of scribes as the "einzige zuverlässige Überlieferung" about the stylus' form.

[133] Taylor 2011, 13.

[134] Carter 1962, 90-104; Cammarosano 2013, 95-99.

[135] Schwemer 1998, 9; on the peculiar mixture of sign forms displayed on this tablet see already Ehelolf, KUB 29, VIII. Edition: Meier 1939. The "barbarian orthography" – so Ehelolf and Meier – of the text, on the other hand, proves that it was not imported from the "literate" Mesopotamian world.

[136] Ehelolf, KUB 29, VIII.

[137] The idea that the stylus might be held in the (clenched) fist can be ruled out, see already Deimel 1922, 12; Falkenstein 1936, 6 n. 2.

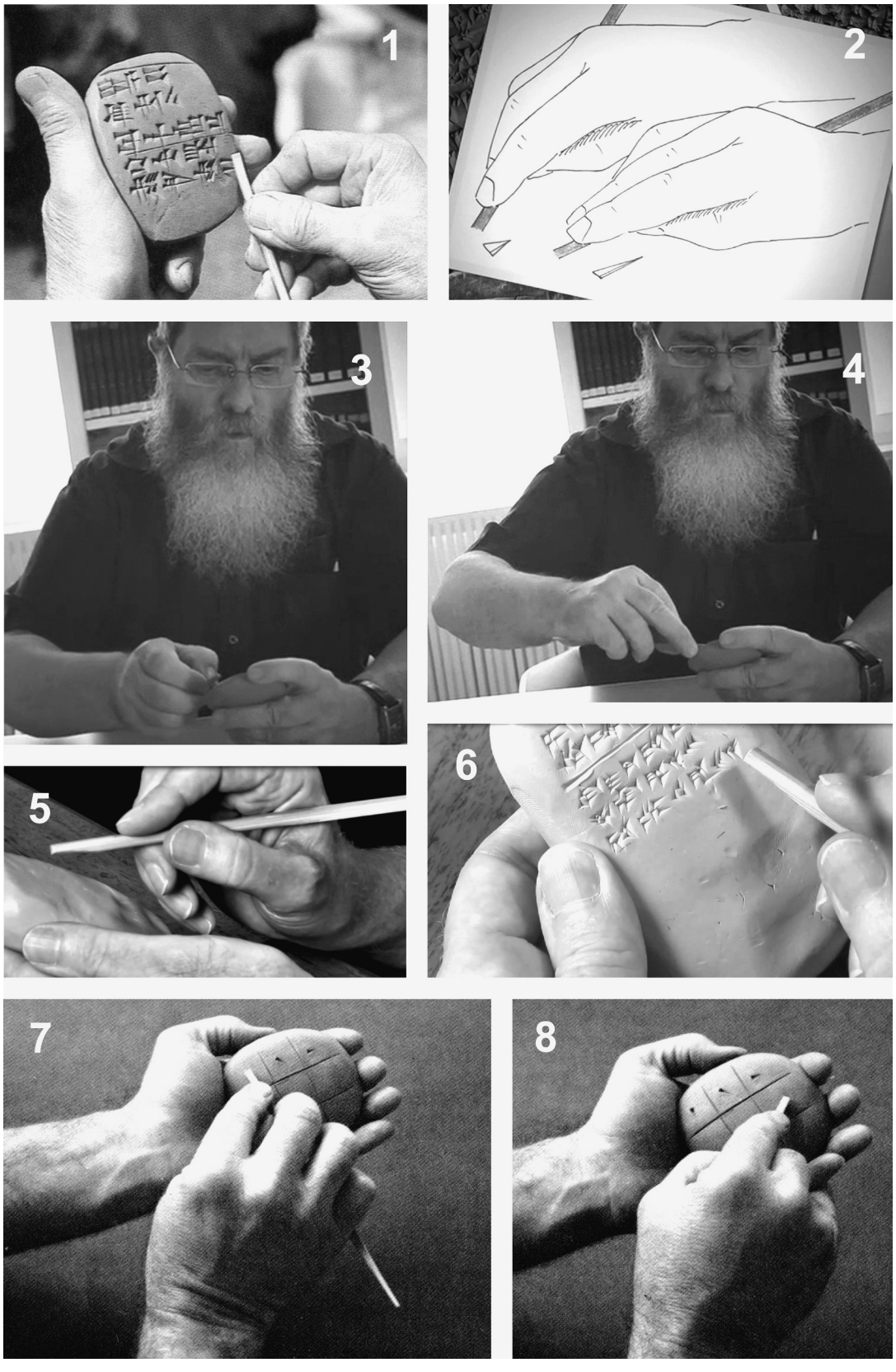
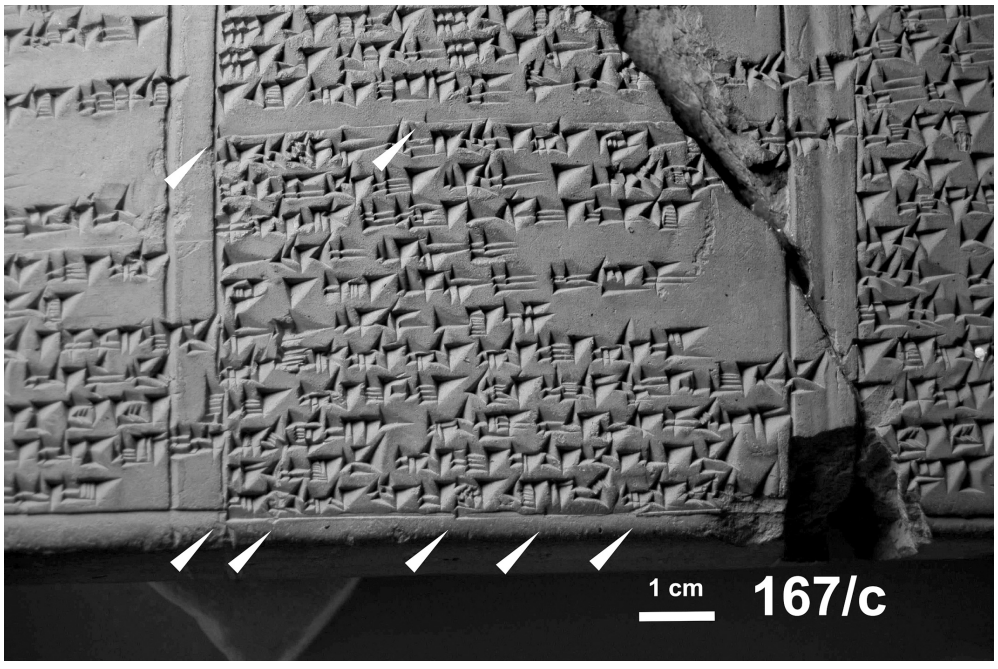
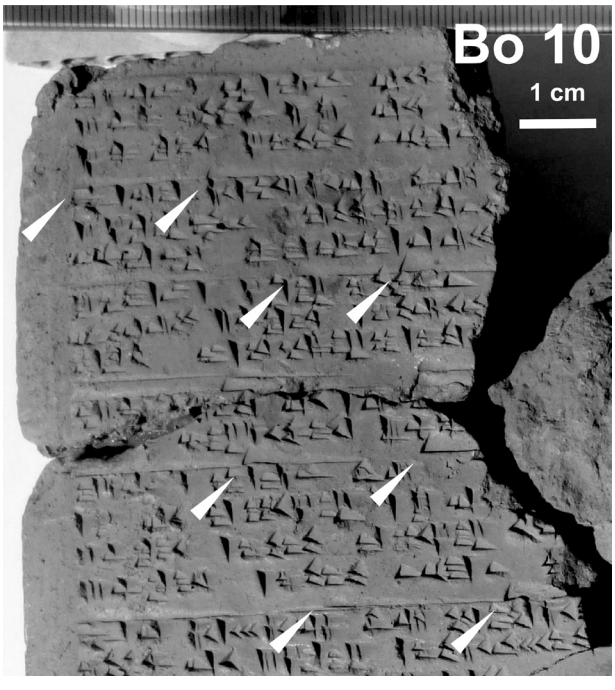


Fig. 13 - Modern reconstructions of cuneiform writing technique. 1: V. Donbaz (from the exibition catalogue *Boğazköy'den Karatepe'ye*: 89, photo by T. Birgili; now reprinted in Doğan-Alparslan, Alparslan 2013, 377 Fig. 1); 2-4: J. Marzahn (from the educational movie *Am Anfang war der Keil*, available online at www.edubba.de); 5-6: Th. van den Hout (from the educational movie *Scribes at Work*, available online at http://www.youtube.com/watch?v=LoqavHDlKZ0); 7-8: M. Powell (from Powell 1981, Figs. 3-4).





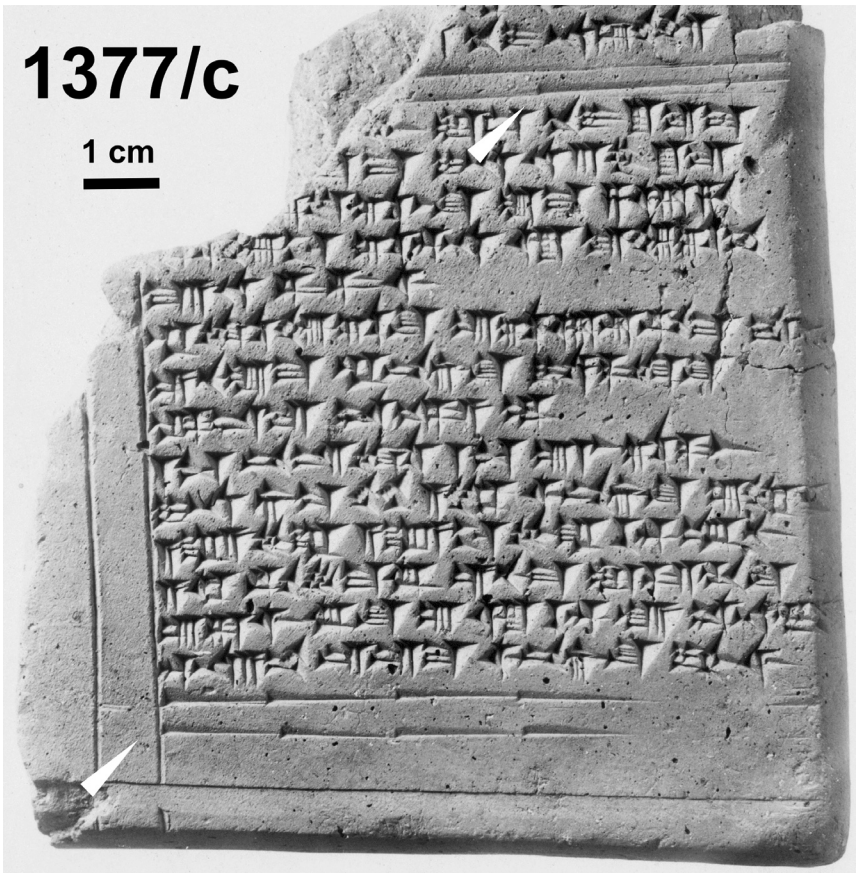


Fig. 14 - Close-ups of 167/c+obv., of Bo 10 rev., and of 1377/c rev., with arrows marking the starting points of the stylus impressions.

to reproduce cuneiform clay tablets, the stylus is usually as long as a pen, kept sometimes within the palm (e.g. in the experiment by J. Marzahn, see Fig. 13), sometimes outward, like a pencil (e.g. in that by Th. van den Hout, see again Fig. 13); the hand is usually pronated or in half-way position.

The assumption that ordinary cuneiform styli could be very short, if correct, has implications concerning its handling. Firstly, a "short" stylus has to be kept *within* the palm, with the shaft staying on the "inner" side of the thumb and not protruding outward.[138] Secondly, the option is open that, at least in some scribal tradition, the hand might be supinate. From a bare physiological point of view, the supinate position would be advantageous in terms of manageability and writing speed.[139] In fact, maximum ulnar deviation of wrist is bigger than radial deviation; that is to say, the maximum possible lateral movement of the hand at wrist is bigger when it moves away from the thumb than toward it.[140] Consequently, passing from a "horizontal wedge" to a "vertical wedge" position and vice-versa is, in principle, easier if the hand is supinate than if pronate, simply because the wrist alone can manage a bigger part of the required square-angled movement, requiring less effort from the arm and forearm. The same conclusion is also true with the hand in the half-way position between supination and pronation, that is, with the palm inward, as one can, in this way, take advantage of wrist extension and flexion;[141] in this case, too, shorter styli are easier to hold than longer ones, since the shaft does not interfere with the wrist.[142] At this juncture, it is interesting to note that the hand of the scribe of the Til Barsip mural painting, the only depiction of a scribe portrayed in the very act of writing, is indeed in half-supinate position (§2.1.4). Although we will probably never know much about how ancient scribes held their writing implements, it is possible that cuneiform styli were held in a very different way from the ones to which we are accustomed. Empirical experimentation as well as careful analysis of wedges' inner angles may sheld more light on this point in the future.

The stylus, manipulated by hand and fingers, undergoes a number of movements during the writing process. Some of these movements are necessary to write different types of wedges, whereas other ones depend on the scribe's writing style and attitude, and others are simply accidental. All of them influence the final appearance of the wedge. The following discussion will focus neither on accidental movements nor on those due to special conditions and constraints – e.g. writing on the edges of the tablet – but rather on basic movements which are *coherently* performed by the scribe while writing a tablet. Since we cannot observe ancient scribes at work, such movements are best investigated through the lens of the wedges left behind by the stylus. As a frame of reference,[143] the writing surface will be treated as a plane, and a cartesian coordinate system will be defined, the XY axes of which lay on the tablet plane, the X axis being parallel to the (abstracted) line direction. Within this system, it is possible to define the position of the stylus at any time through three angles (Fig. 15):

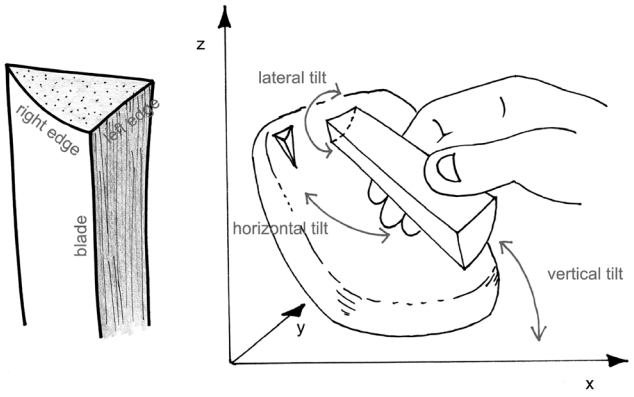


Fig. 15 - Stylus' writing edges (left) and tilts (right).

(1) Horizontal tilt, namely the angle between the "blade" of the stylus (cf. Fig. 15) and the YZ plane: determines the wedge's orientation on the tablet surface, distinguishing between horizontals, verticals and Winkelhaken;

(2) Vertical tilt, namely the angle between the blade of the stylus and the XY plane: determines the wedge's "slope", distinguishing e.g. oblique wedges from Winkelhaken; it is inversely proportional to the wedge's length;

(3) Lateral tilt, namely the stylus' rotation around the axis of its blade: determines the variation of the aperture angle's tilt, i.e. whether the wedge "hangs" toward its right or left face or is "symmetrical" to the tablet surface (cf. Fig. 16).[144]

Variation of horizontal and vertical tilt is intrinsic to the cuneiform system; that is, it is necessary in order

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[138] Discussing the Tell ed-Dēr styli, TANRET 2002, 26 already argued for the stylus being held within the palm.

[139] Next to nothing is known about writing speed in the ancient Near East, but the ability to write well and fast was probably appreciated, at least if we are to trust a Sumerian proverb: "A scribe whose hand can keep up with the mouth, he is indeed a scribe!" (quoted after ALSTER 1997, 53 No. 2.40).

[140] See e.g. RYU *et alii* 1991, 414 with Tab. II.

[141] Of course, small tablets held in the hand might be turned to the right or to the left while writing in order to require less movements from wrist, hand and arm, but this does not influence our question, insofar as big "unturnable" tablets also existed.

[142] In favour of the supinate position see also SIRAT 1987, 36-43.

[143] See CAMMAROSANO *et alii* 2014, 12.

[144] The aperture angle's tilt is defined through the angle between the bisector of the wedge's aperture angle and the perpendicular to the XY plane, see CAMMAROSANO *et alii*, 2014, 13-14.

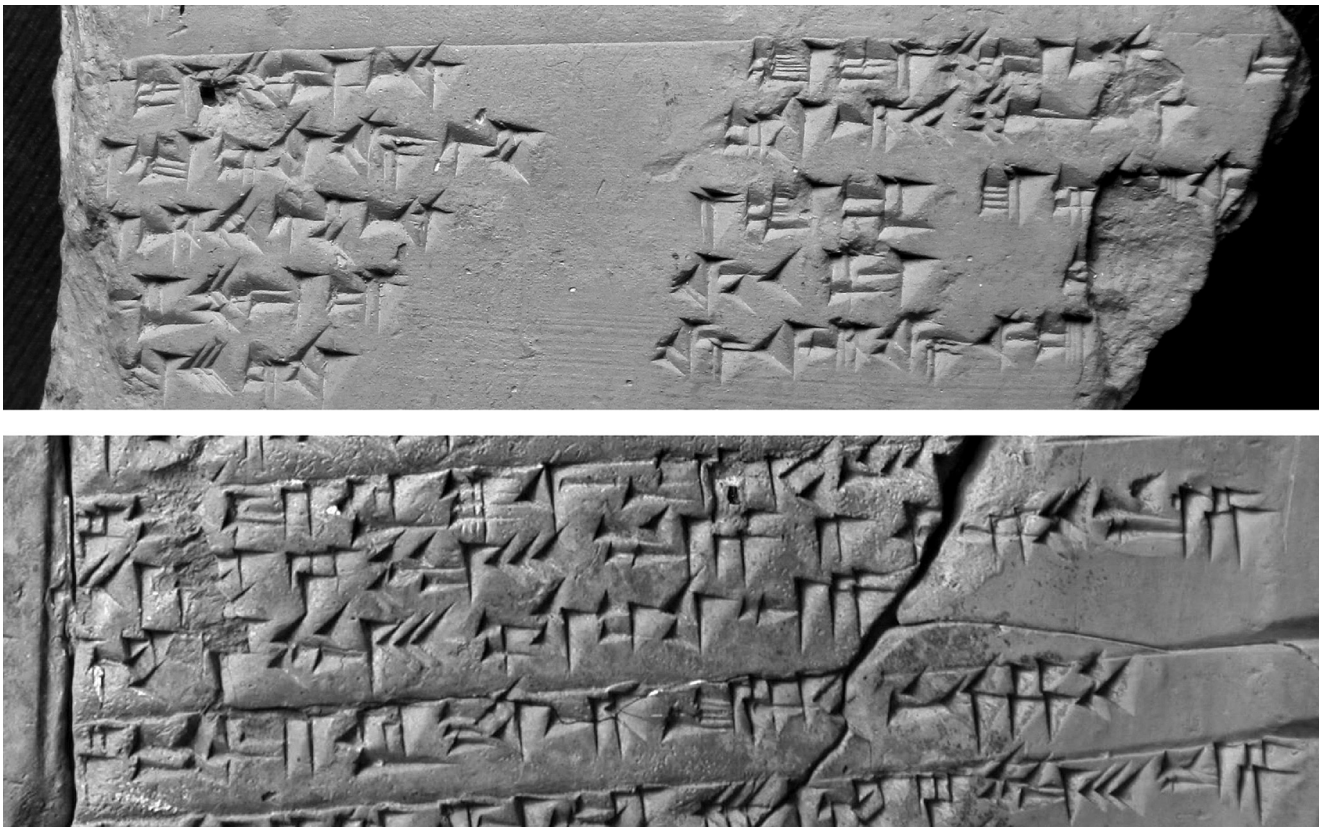

Fig. 16 - Whereas in Bo 495 (*CTH* 736, top), both horizontal and vertical wedges tend to display minimal inclination of the aperture angle, Bo 87/5a (*CTH* 242, bottom) displays different tilt patterns depending on the wedge type. Whereas horizontal wedges tend to display minimal inclination of the aperture angle, vertical wedges lean towards the right. Within the Hittite tradition, the former feature is typical of tablets pertaining to the "stream of tradition", like Bo 495, while the latter occurs frequently in administrative documents in "cursive" script, like Bo 87/5a.

to distinguish between different kinds of wedge and therefore bears, as it were, a basic semantic value. On the contrary: the lateral tilt of the stylus may, in principle, stay fixed for all wedges within the single tablet, its variation representing an accessory element which depends exclusively on the scribe's style and writing technique. Thus, there are both tablets where different wegde types are, in this respect, "symmetrical", i.e. display no variation in the aperture angle's tilt, and tablets which display diverging values of the aperture angle's tilt for each wedge type (Fig. 16).[145] As the example shows, the variation of the lateral tilt is easily recognizable to the naked eye, if only it is strong and coherent enough. The variation of the aperture angle's tilt is particularly interesting for the investigation of the stylus handling, since it reflects a rotation of the stylus around its main axis; that is, a rotation of the wrist "outward" or "inward". The fact that tablets exist which both display this variation and lack this variation shows that the stylus handling might vary in some respects from scribe to scribe, even within a single scribal tradition.

6.3 *Writing Edges and Split Styli*

The fact that the stylus may be rotated around its main axis during the writing process brings up another question, namely whether the stylus' edges to be impressed into the clay were always the same for all wedge types. Theoretically, in fact, one cannot rule out the possibility that at least some scribes or scribal traditions changed the stylus' writing edge by rotating the implement when passing from a horizontal wedge to a vertical one and vice-versa. An examination of wedges on a sample of tablets from various scribal traditions has shown that the stylus writing edges used for horizontals, verticals, and Winkelhaken were always the same within a tablet in all examined fragments. When the wedges display the "reed pattern", this can be proven easily by observing the position of

[145] Cf. already Deimel 1922, 13 n. 1.

the curved face within different wedge types.[146] In case no "reed pattern" is present, the assumption can be confirmed if the inner angles remain consistent across different wedge types,[147] or in exceptional cases where the tablet was written with a split stylus, allowing us to check whether or not the position of the "split" remains the same across different wedge types. Examples of documents written with a split stylus are SMN 1854 and SMN 2096, from Nuzi (ABUSCH 1981), BM 13038, dated to the Ur III period (TAYLOR 2011, 13), and the Old Babylonian letter BM 67298, probably from Sippar (VAN SOLDT 1990, 146 n. 187a). The only Hittite example known to me is Bo 3538 (KUB 50.72) + 1471/u (+) 1472/u (KBo 53.107).[148] As Miller notes,[149] the tablet has been written with a defective stylus, so that the wedges look as they were "doubled".[150] Interestingly, the wedges at the end of col. iv apparently do not show this feature: if this is true, it would mean that the scribe changed the stylus at some point between col. iii 8' (where split wedges are still visible) and col. iv 1'.[151] The fact that the "split" wedge face is the right-hand one both in vertical and horizontal wedges proves that there was no change of the stylus' edge(s) when passing from one type to the other. These observations, of course, do not allow to rule out the possibility that other scribal traditions might have followed different rules.[152]

7. *Their Styli Before Our Eyes: Writing Tip, Wedge, and Scribal Hand*

Investigating ancient writing techniques on the basis of the written sources alone, with no possibility to observe scribes at work, almost guarantees great difficulties.[153] In the case of cuneiform script, matters are further complicated by the fact that we know very little about the writing tools used at the time and have no treatise on writing at all at our disposal: all of the trustworthy resources we have are, ultimately, the wedge impressions on the tablets. The use of this chapter's title, based on an informative book by the Oxford palaeographer M.B. Parkes,[154] is then justified by a simple fact: because of its pronounced three-dimensional character, the cuneiform writing system commits a crucial role in determining the shape of the resulting strokes to the physical form of the writing tip. This does not mean, however, that the form of the writing tip can be reconstructed simply by taking a negative cast of the wedge impression. On the contrary, the relationship between the form of the wedge impressions and that of the writing tip which created them is a rather complex one. The main intervening factors are the following:

(1) Writing surface, namely form, chemical composition and moisture, mechanical properties;

(2) Writing tip, namely form, composition, mechanical properties;

(3) Impression, namely time-dependent interaction of writing surface and writing tip during the impression process;

(4) Wedge-to-wedge interaction, namely alterations due to neighbouring wedge impressions;

(5) Post-processing, namely alterations which take place after the wedges have been impressed: clay shrinkage, damages, etc.

The following discussion will focus on point 3, which constitutes the primary factor in determining the wedge shape and has essential implications for the investigation of the stylus.

7.1 *Wedge and Stylus Components*

In order to investigate their reciprocal relationship, wedge impressions and writing tips are first to be scrutinised as they were pure geometrical objects. The former is then to be viewed as a tetrahedron, the latter as a polyhedral cone. Within the terminological framework used here, the three edges of the wedge which lay on the tablet surface will be called "outer edges", the other ones "inner edges". The fundamental element in this system is the "directional edge", or "spine", of the wedge. The spine is defined as the wedge's edge that is left behind by the blade of the stylus when it is impressed into the soft clay. The determination of the spine is thus independent from other variables, like length or incline, which are exposed to secondary and partially unpredictable influences. Therefore, the spine will always be the vertical, horizontal and "NW-SE" oblique inner edge in the case of vertical wedges, horizontal wedges, and oblique wedges / Winkelhaken respectively. This assures that the subsequent analysis is based on a primary correspondence between writ-

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[146] In all tablets displaying the "reed-stylus pattern" mentioned at §5.1, the position of the curvature confirms that there was no change of stylus' edges when passing from one wedge type to the other.

[147] Note, however, that diverging inner angles across different wedge types do *not* prove the opposite, see §7.

[148] Kindly pointed out to me by J. Miller.

[149] KBo 53, VII.

[150] Photos are available at the *Konkordanz der hethitischen Keilschrifttafeln* online, http://www.hethport.uni-wuerzburg.de/hetkonk/.

[151] This, however, does not reopen the possibility of a join with 732/z (cf. MILLER *ibidem*), because the latter has been joined in the meantime with 354/z, which preserves part of the col. i and does not show split wedges.

[152] This might be the case, in particular, for Late Bronze Age Ugarit. A study conducted on this topic by J. Ellison will appear soon (pers. comm.).

[153] Even within the field of Latin palaeography, fundamental aspects of writing technique have been clarified only in very recent times (cf. GUMBERT 2002).

[154] PARKES 2008 (*Their Hands Before Our Eyes. A Closer Look at Scribes*).

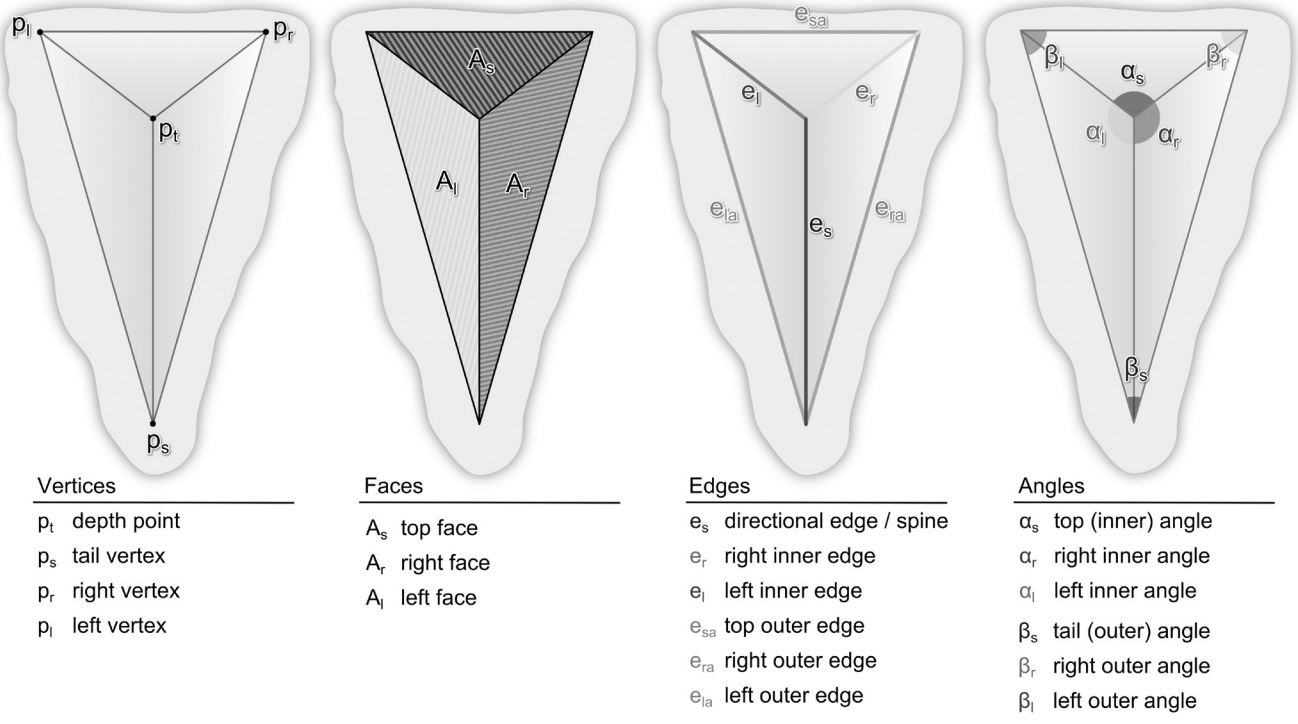

Fig. 17 - Wedge components (adapted from CAMMAROSANO *et alii* 2014, 5 Fig. 1).

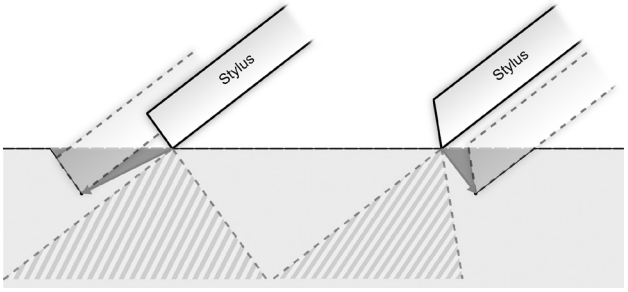

Fig. 18 - Side view of a stylus and its trajectory during the impression (adapted from CAMMAROSANO *et al.* 2014, 14 Fig. 7). The three edges of the writing tip determine a polyedral cone (hatched). Only if the trajectory of the stylus (marked with an arrow) falls within this cone do the wedge's inner angles correspond to those of the writing tip.

ing tip and wedge impressions. The orientation of the spine determines the positioning of all other wedge elements as illustrated in Fig. 17, Pl. 1a: inner and outer edges and inner and outer angles. Similarly, the stylus' edges corresponding to the right and left inner edges will be called "right" and "left" edge respectively (cf. Fig. 15 above).

7.2 *Writing Tip and Wedge Impression*

If we abstract from the factors represented by the chemical and mechanical properties of stylus and clay as well as from those pertaining to the "post-processing", the form of a cuneiform wedge is determined primarily by the following variables:

(1) The form of the writing tip, i.e. the angles of the stylus edges at the writing tip;

(2) The respective positions of the stylus and writing surface for every point in time during the impressing process.

It is conducive to start the investigation of the relationship between writing tip and wedge impression under the assumption that the former follows a linear trajectory while impressing into the clay. In this case, and if we abstract from modifications due to the mechanical interaction of stylus and clay, the inner angles of the wedge will be the same as those of the stylus's edges at the writing tip only if the latter's trajectory falls within the polyhedral cone which originates from the extension of its three edges (Fig. 18, Pl. 1b). If the stylus' trajectory falls outside that cone, there will be a discrepancy between the wedge's inner angles and those of the stylus' edges at the writing tip.

This consideration, overlooked in previous studies, has fundamental implications for the understanding of the geometrical variation from wedge to wedge within a tablet and, more generally, for the attempt at reconstructing the form of ancient styli. Since the stylus is impressed at a more or less perpendicular angle to the writing surface in order to write cuneiform script, the orientation of the right and left edges of the stylus in respect to the blade plays a crucial role in determining the shape of the resulting wedges. Thus, the right-leaning slope of the wedge's head, which is

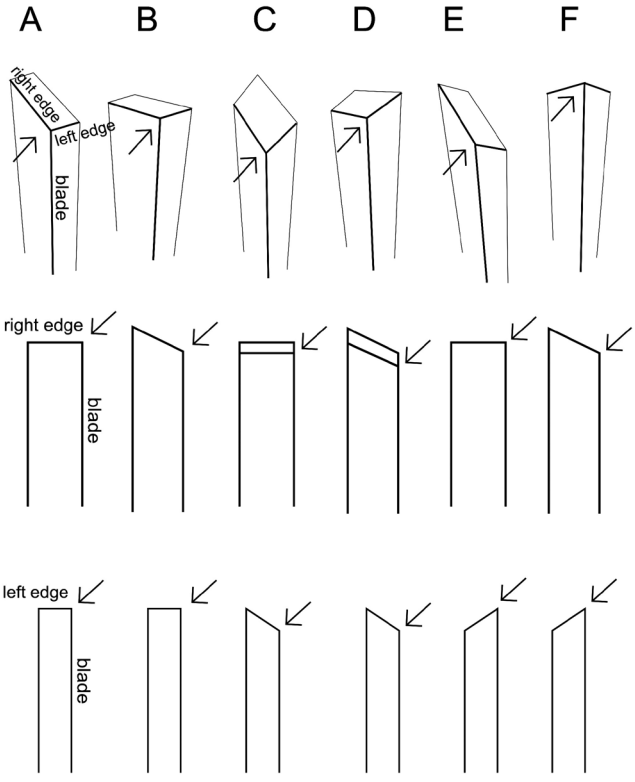

Fig. 19: Six experimental styli. Each one has a different configuration of the edges at the writing tip. Top: perspective view; middle: front view; bottom: lateral view. Arrows mark the writing tip.

Fig. 20: Top row: the three tablets with "random wedges"; middle and bottom rows: the six tablets written by Antonia Pohl using styli A, B, C (first row), and D, E, F (second row). The text, Paragraph 92 from the Hittite Laws (*CTH* 291), is the same for all tablets.

encountered frequently in certain epochs and traditions, is not only dependent on the right edge of the writing tip, as Messerschmidt and others assumed.[155] The shape of the wedge depends also on the left one; that is to say, on the three angles of the stylus edges at the writing tip, as well as on the respective positions of stylus and writing surface for every point in time during the impression process (cf. also Fig. 21 below).

From these considerations it also follows that certain configurations of the stylus' edges will tend more than others to produce wedges with stable inner angles and vice-versa. The assumption can be easily tested through empirical experiments, as in the following. Three pairs of wood styli were manufactured; the left edge of the stylus is perpendicular to the blade in the first pair, whereas it crosses the blade at an obtuse / acute angle in the second and third pair, respectively. The right edge of the stylus, in turn, is perpendicular to the blade in A, C and E, whereas it slopes to the right in B, D and F (Fig. 19).

Given the above premises, it would follow that the gap between the angles of the stylus' edges at the writing tip and the inner angles of the produced wedges will tend to be smallest for stylus C, greatest for stylus F, showing halfway values for the others. The assumption has been tested on two tablet samples. The former one contains random wedges produced by the author. The latter and more significant of the two consists in six tablets written by an undergraduate student at the University of Würzburg, Antonia Pohl. Being unaware of the experiment's goals and after some weekly training with a "neutral" reed stylus, she was then requested to write down the same text on six tablets one after another, using each time a different one of the six experimental styli (Fig. 20).

Tablets and styli were subsequently digitalized in order to ascertain the exact angles of the writing tips and of the resulting wedges.[156] The results confirm in full the hypotheses, as in both cases stylus C produces the wedges with the smallest difference to the "original"

[155] Messerschmidt 1906, 308 with Fig. 8; Clay 1906, 19.

[156] For the sake of simplicity, the following data refer to the vertical wedges only, but analogous results are obtained in the case of horizontals or Winkelhaken. For the scanning and clustering procedure see Cammarosano *et alii* 2014, 17-19; Fisseler *et alii* 2014.

'Random wedges'

[°]	Stylus A			Stylus B			Stylus C		
	left	top	right	left	top	right	left	top	right
Writing tip angles	91,8	94,8	89,2	93,6	98,5	54,0	130,2	89,5	90,7
Wedge inner angles	104,9	99,75	101,9	95,08	101,29	59,43	130,99	90,87	94,23
Difference	13,06	4,91	12,69	1,48	2,84	5,42	0,83	1,37	3,54
Difference (sum)	30,66			9,74			***5,74***		

[°]	Stylus D			Stylus E			Stylus F		
	left	top	right	left	top	right	left	top	right
Writing tip angles	116,0	104,0	58,1	55,2	92,7	90,0	55,7	70,7	62,1
Wedge inner angles	121,9	107,54	68,44	76,24	98,5	102,98	91,46	90,48	71,92
Difference	5,92	3,52	10,39	21,03	5,82	12,97	35,76	19,78	9,82
Difference (sum)	19,83			39,82			***65,37***		

'Antonia's tablets'

[°]	Stylus A			Stylus B			Stylus C		
	left	top	right	left	top	right	left	top	right
Writing tip angles	91,8	94,8	89,2	93,6	98,5	54,0	130,2	89,5	90,7
Wedge inner angles	96,9	117,4	100,6	101,4	103,2	63,6	127	88,8	95,9
Difference	5,1	22,6	11,4	7,7	4,7	9,6	-3,1	-0,7	5,2
Difference (sum)	39,1			22			***1,3***		

[°]	Stylus D			Stylus E			Stylus F		
	left	top	right	left	top	right	left	top	right
Writing tip angles	116,0	104,0	58,1	55,2	92,7	90,0	55,7	70,7	62,1
Wedge inner angles	121,5	106,9	67	70,6	102,7	98,5	84,4	88,3	70,3
Difference	5,5	2,8	9	15,4	10	8,5	28,7	17,6	8,2
Difference (sum)	17,3			33,9			***54,5***		

Tab. 1: Comparison of stylus and wedge angles based on a sample of random wedges produced by the author (top), and on "Antonia's tablets" (bottom). Average values, expressed in degrees, referring to vertical wedges only.

writing tip angles, whereas stylus F produces those showing the greatest one. Similarly, in both cases the pairs B and D, and A and E come in "second" and "third" place, respectively (Tab. 1).

7.3 *The Stylus and Its Movement: Patterns of Variation in the Cuneiform Script*

The above observations show that one has to be very careful in drawing conclusions on the form of the stylus based on the wedge impressions. There is no certainty that the inner angles of the wedge impressions would even mirror those of the stylus remotely, since the relationship between the two entities is highly dependent upon the geometrical configuration of the stylus edges combined with the respective position of stylus and tablet during the impression. This fact explains, among other things, why it is possible to obtain wedges with slanted heads by means of a stylus whose "top", to use Clay's words, does not "slope to one side" – or in other words, whose right edge is right-angled (Fig. 21).[157] It also explains why, in some tablets, different types of wedges show different "slopes": combined with the orientation of the stylus edges at the writing tip, variation of the stylus' lateral tilt is able to determine more or less important variations of the inner and outer angles of the wedges, as already seen in §6.2. Of particular interest are cases where the scribe apparently rotated his hand when passing from a vertical to a horizontal wedge (and vice-versa):[158] in this case, horizontal wedges will not appear simply as vertical at 90° (and vice-versa), but rather the two wedge types would each display a pecu-

[157] The wedges with rather sloping head in Antonia's tablet A, for example, have been obtained by using a right-angled stylus.

[158] The reference is here, of course, to lateral tilt as defined in §6.2, not to the horizontal tilt which is indispensable to distinguish between vertical and horizontal wedges.

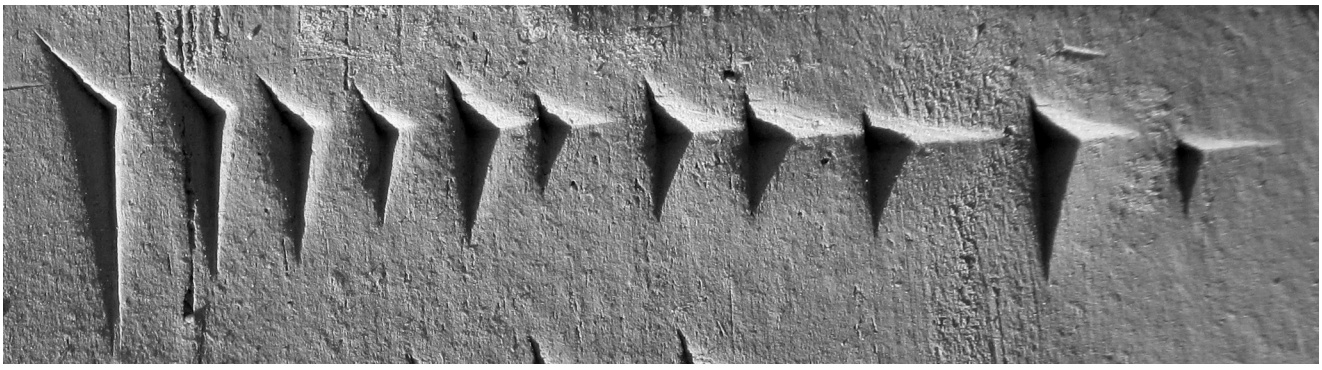

Fig. 21: Vertical wedges originating from stylus C. Although the stylus' right edge is right-angled, different slopes of the wedge's head are obtained simply by varying the stylus lateral tilt.

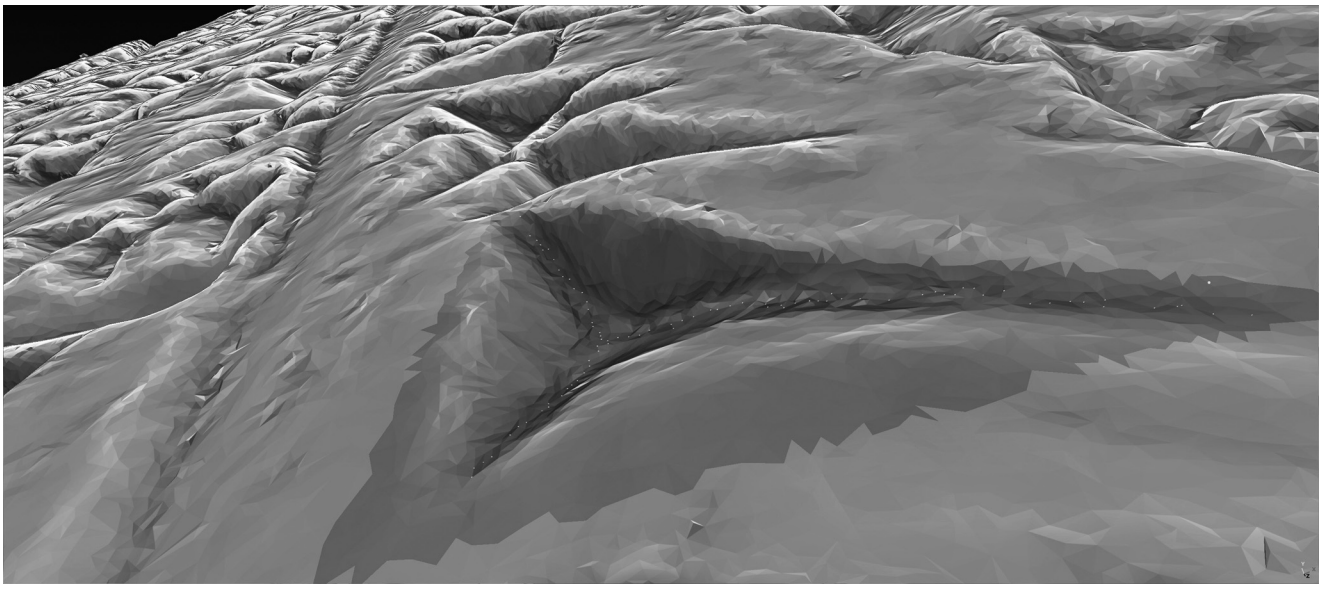

Fig. 22: Side view of a Winkelhaken from a 3D model of the Hittite tablet Bo 2062 (*CTH* 409.I.A), written by the scribe Pikku. The convex right-hand wedge face originates from a "stylus twist", which Pikku carried out only in combination with Winkelhaken.

liar appearance, corresponding to different inclinations of the aperture angle (cf. again Fig. 16 above).

Matters are even more complex if the stylus follows a non-linear trajectory during the impression. Indeed, a natural assumption would be that scribes would always impress the stylus with a (tendentially) linear trajectory; in general, non-linear movements of the stylus taking place during the impression process are unnecessary and tend to make the wedges less clean and readable. Nevertheless, an important exception seems to have been represented by a slight twist of the stylus on its main axis, for which the term "stylus twist" may be put forward.[159] Such a twist increases top inner angle and aperture angle of the wedge; moreover, if performed in a certain way, causes the right-hand face of the wedge to become curved (Fig. 22). It must be stressed that, in this case, the wedge face turns out to be *convex*, while wedges originating from a reed stylus have *concave* faces.

Interestingly, the "stylus twist" seems to have been consistently applied by certain scribes for a specific type of wedge, i.e. the Winkelhaken.[160] Given that the similar orientation of Winkelhaken and oblique wedges represents a possible source of confusion between two semantically distinct types of wedges, it is tempting to suspect that the attempt to stress the difference between them may be precisely the element that originally triggered this custom.

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[159] Corresponding to German *Abrollbewegung*, suggested by G.G.W. Müller, for which see Cammarosano *et alii* 2014, 13f.

[160] A concrete case has been indentified for the Hittite scribe Pikku, see Cammarosano *et alii* 2014, 26-28.

Although there will be no two wedges identical to each other even in a single tablet, variation is subject to specific contraints. First of all, there is a kind of variation which is required by the nature of the script itself, insofar as it is essential in order to distinguish between different types of wedges and therefore bears primary semantic value. The typical case is represented by changes in the horizontal or vertical tilt of the stylus to distinguish, e.g., horizontal from vertical wedges, and oblique wedges from Winkelhaken, respectively. A different kind of variation pertains to those variables which are not essential to the cuneiform script but rather depend on the habits of individual scribes or scribal traditions. The behaviour of such variables follows patterns which tend to be coherent, at least within a single piece of writing. For instance, a scribe may impress horizontal wedges just in the same way he impresses vertical ones, except for the difference in orientation on the XY plane, whereas another scribe may handle the stylus with a different vertical and/or lateral tilt depending on whether he is impressing a horizontal wedge or a vertical one; still another scribe may vary the lateral tilt of the stylus only for verticals which immediately follow a sequence of horizontal wedges, and so on. What remains is variation resulting from accidental and unintentional factors, as well as that related to special constraints, e.g. while writing on the tablet edge and similar ones. Thus, a general framework can be put forward, in which three kinds of variation in the respective position of stylus and tablet during the impression of individual wedges are singled out:[161]

(1) Distinguishing: variation inherent to the system of writing; bears primary semantic value;

(2) Idiosyncratic, positional: variation relating to patterns which are characteristic of specific scribal hands or scribal traditions;

(3) Other: variation pertaining to special contraints or to accidental factors.

It is point 2, of course, which intrigues the palaeographer interested in the individuation and description of scribal hands and traditions. Indeed, since the form of the wedge is highly dependent on that of the specific stylus creating it, bare measurations of the various wedge components are of little help in characterising scribal hands – although they can be suitable for characterising the script of a specific fragment and thus for identifying joins. Significant features related to a specific scribal hand are rather to be found in the variation of these values across different types and configurations of wedges.[162] Systematic investigations of this kind may indeed contribute to the identification of joins and scribal hands, and more in general to the study of cuneiform writing technique and scribal practice.

8. *Summary and Outlook*

The present study has attempted to reassess what we know about the stylus used to write cuneiform script on clay in the Ancient Near East. The first part of the study has been devoted to a review of the iconographic sources and archaeological remains. Within the first domain, the focus has been on a critical reappraisal of the writing scenes from Neo-Assyrian wall panels and other sources, as well as on a systematic examination of the numerous depictions of a cuneiform stylus as symbol of the god Nabu, spreading over a wide geographical and chronological span. These depictions coherently represent the cuneiform stylus as a short trapezoidal or triangular instrument, whose writing tip either is right-angled or slopes slightly on one side. This form happens to be precisely that of the Old Babylonian bone styli recovered at Tell ed-Dēr, and seems to come quite close to that of the alleged bronze styli from Late Bronze Age Ugarit, which, however, are longer and might point to a different scribal tradition. For other finds, the interpretation as cuneiform styli is either impossible or very uncertain.

In the subsequent sections of the study, the cuneiform stylus was examined through other kinds of evidence, based primarily on analysis of wedge impressions and experimentation. Questions related to materiality and manufacturing were discussed in §§4-5. On the one hand, the investigation confirmed the conclusions reached by Messerschmidt in his groundbreaking study on the topic and argued for a specific species of reed, *Arundo donax*, to have been the standard plant involved in the making of cuneiform styli in Mesopotamia. On the other hand, attention was called upon the fact that reed styli were, in all likelihood, less widespread than is usually assumed. Not only there is at least an entire scribal tradition, the Hittite tradition, which never made use of reed for this purpose, but even in Mesopotamia other materials – wood, bone, and metal – probably enjoyed greater diffusion than we suspect.

In the last part of the article, the issues of stylus length and handling were examined, as well as problems entailed in the reconstruction of the writing tip based on wedge impressions. The hypothesis that the cuneiform stylus was normally shorter than hitherto suspected was further supported by the investigation of rulings, which, consequently, has implications on our understanding of the stylus handling. The stylus, it was argued, could be kept within the palm, with the hand in supinate or half-supinate position. That

[161] Cf. Cammarosano *et alii* 2014, 14-15.

[162] For a concrete example, the reader is referred again to Cammarosano *et alii* 2014, 19-31.

the writing technique varied from scribe to scribe, on the other hand, was confirmed by the examination of wedge impressions. A theoretical framework for the three-dimensional analysis of cuneiform script has been put forward based on a thorough discussion of the questions entailed in the relationship between writing tip and wedge impression. Modern digitizing and computing technologies constitute the premises for a new approach in the study of cuneiform script, allowing for systematic analyses of wedges and wedge configurations according to discrete quantities, the development of open-access, searchable databases, and the establishment of more precise frameworks for the classification of script and scribal hands. The ultimate goal of the present study, in this sense, has been to encourage new researches on the topic, both from archaeological and philological perspective. The hope has been to make archaeologists more able to identify remains of writing styli among small finds, and to make philologists more aware of the rich potential of information concealed in the material appearance of the wedges: in all likelihood, these myriads of tiny impressions in the clay will long continue to be our primary source of information about styli, writing technique, and scribal practice in the Ancient Near East.

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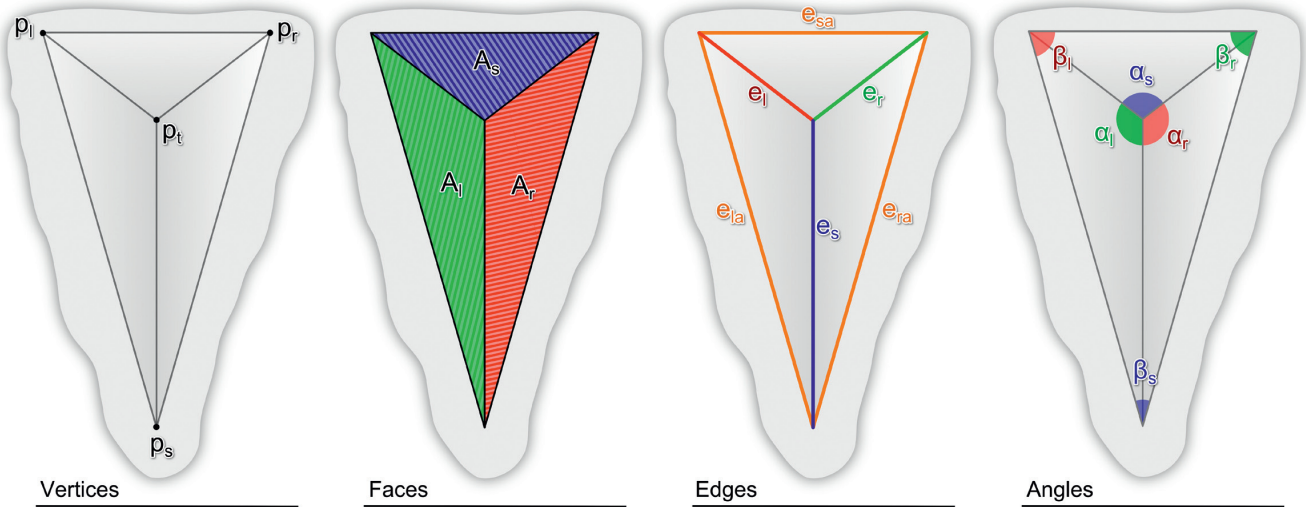


Vertices

- p_t depth point
- p_s tail vertex
- p_r right vertex
- p_l left vertex

Faces

- A_s top face
- A_r right face
- A_l left face

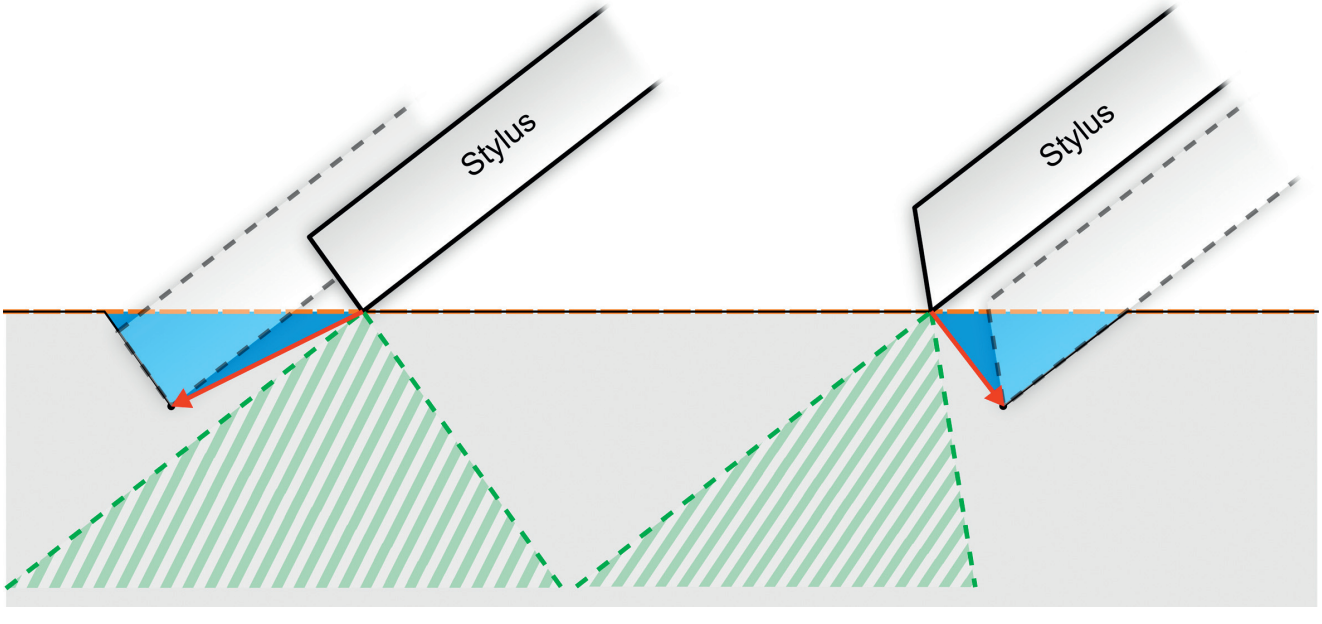
Edges

- e_s directional edge / spine
- e_r right inner edge
- e_l left inner edge
- e_{sa} top outer edge
- e_{ra} right outer edge
- e_{la} left outer edge

Angles

- α_s top (inner) angle
- α_r right inner angle
- α_l left inner angle
- β_s tail (outer) angle
- β_r right outer angle
- β_l left outer angle

a.



b.

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