ADMINISTRATIVE AND ARCHIVAL PROCEDURES IN EARLY BABYLONIA. WITH AN ADDENDUM ON THE IMPLICATIONS ON SEALING PRACTICES

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My first contact with Yuhong goes back to a somewhat complicated and – certainly by today's standards – very slow exchange of letters from the 1990s, prompted by Yuhong's research on the careers and promotions of high-ranking scribes in the city of Umma in the Ur III period (see Wu 1995). A comprehensive prosopography of the officials of the Ur III administration was long overdue (it still is…), and Yuhong's work on Umma was groundbreaking at the time. Our correspondence eventually resulted in Yuhong inviting me to China, to continue my studies of the Ur III administration in the Institute for the History of Ancient Civilizations (IHAC). Of course, Yuhong did not only invite me to IHAC and Northeast Normal University (NENU), but also very kindly to his home in Changchun and to his lovely family. Although I have never lived in an apartment colder in the winter, or hotter in the summer (and the seven flights of stairs could be a challenge after a few glasses of *báijiǔ*), I will always think back to those years in Yuhong's cramped university flat on Guilin Road with very fond memories. I am delighted to offer this contribution as a sign of my gratitude and appreciation for my teacher and friend. The experiments that form the basis for this communication were conducted on the NENU campus during a shorter research visit to IHAC in the summer of 2009, and the honoree might recall some of our animated conversations from back then on the topics of Ur III administration, cuneiform clay tablets and the potentials (and pitfalls) of experimental archaeology in Assyriology. I do hope he will enjoy the ensuing article presented in this honorary volume.[1]

[1] The preliminary findings from some of the experiments in this article were discussed in the talk "My Manchurian Summer: When it's Too Hot to Work Anyway" presented at the 7th International Congress on the Archaeology of the Ancient Near East, held in London on April 12–16, 2010.
All references to cuneiform texts in this article are according to the abbreviations used by the *Cuneiform Digital Library Initiative* (*CDLI*) at https://cdli.ucla.edu. I would like to thank Jacob Dahl and Seth Richardson for reading and commenting on an earlier version of the article. Any remaining mistakes or shortcomings in the study are my responsibility alone.

Problem and Purpose

The precise nature of the extensive bureaucracy, archival procedures and sealing practices of the Ur III administration remains enigmatic, and the topic has continued to engage and captivate scholars in the field (see, e.g., Steinkeller 1977; 2003; 2004; Nissen et al. 1990; Van De Mieroop 1999–2000; Englund 2003; and, more recently, Tsouparopoulou 2013; 2015; 2017; Molina 2016; Liu 2017; Dahl 2020; Widell 2020a and 2021). Moreover, important new insights on the administrative practices of the state have recently emerged within the context of the publication and discussion of the archive of the household of the princess *Simat-Ištarān* and her husband *Šū-Kabta* in the royal city of Garšana (see, e.g., Owen and Mayr 2007; Wu 2008; Owen 2011). However, despite all these efforts, we have to conclude that many of Markus Hilgert's rhetorical questions, highlighting our overall confusion and general lack of knowledge concerning the detailed structure and organization of the Ur III archives, remain unanswered – or at the very least uncertain – to this day (1998, 5):

> Which records were stored together? Were there duplicates of particular texts? Who was the "Archivherr" and who the "Leitperson"? Were the archives of large administrative units subdivided into smaller archives belonging to their subordinate departments? Should we think of an archive as a physical building in which large amounts of records were stored over a period of time? How long were records kept? Who were responsible for the archives, who for the keeping and updating of records?

The purpose of this article is to investigate how well our current understanding of the administration and record keeping of the Ur III state correlates with the general attributes and characteristics of the clay used in the cuneiform tablets. How could (and could not) clay tablets serve the administrative needs of the extensive Ur III bureaucracy? How would the unique properties of clay tablets influence the daily operations of the ancient scribes (dub-sar) and archivists ($ša_{13}$-dub-ba) of the period? Based on a set of simple practical experiments focused on the nature of clay and drying rates under specific circumstances and conditions, I hope to shed further light on some of these questions, and the overall administrative and archival practices of the Ur III period (ca. 2112–2004 BC).

An Outline of the Ur III Administrative Practices and the Use of Receipts

In an influential and often cited article from 2004 on early Babylonian documentary and archival practices, Piotr Steinkeller presented his understanding of the physical movement of products and labor, and how this movement was recorded (and subsequently filed) in the extensive archives of the Ur III state.

Receipts constitute the main category of tablets that have survived in these archives, with well over 20,000 available for study today (see Lampasona 2016, 200–201), and the following receipt can be used to illustrate Steinkeller's reconstruction of the state's administrative and archival procedures:

***SAT* 2 366 (*CDLI*: P143566 / S003496)**

Obv.

1.	4(barig) 2(ban$_2$) še lugal	4 royal barig (and) 2 ban$_2$ barley, (= 460 litres)
2.	e$_2$-kikken-ta	from the mill (in Umma),
3.	7(aš) 2(barig) 1(ban$_2$) še gur	7 (royal) kor, 2 barig (and) 1 ban$_2$ barley, (= 2,230 litres)
4.	a-ša$_3$ ^{geš}ma-nu-ta	from the field Manu.
5.	ki ARAD$_2$-ta	From ARAD$_2$,
6.	lugal-ḫe$_2$-gal$_2$	Lugal-ḫegal

Rev.

1.	šu ba-ti	received.
2.	iti ^{d}dumu-zi	The month of the (festival) of the god Dumuzi. (= month xii)
3.	mu si-mu-ru-um^{ki} lu-lu-bu^{ki} a-ra$_2$ 1(u) la$_2$ 1(diš)-kam-aš ba-ḫul	The year (when) the city of Simurrum (and) the city of Lullubum, for the 9th time, were destroyed. (= Šulgi 44)

Seal:

1.	lugal-ḫe$_2$-gal$_2$	Lugal-ḫegal,
2.	mu$_6$-sub$_3$ ^{d}šara$_2$	shepherd of the god Šara,
3.	dumu ur-nigar^{gar}	son of Ur-nigar.

The text appears to document two separate withdrawals of barley by Lugal-ḫegal, from the mill (almost certainly in Umma itself) and from the field Manu, which was located somewhere in the vicinity of the city.[2] Almost all references to "the mill" in Umma concern transactions or disbursements of agricultural products *from* the mill to various individuals or institutions. References to products entering the mill are almost non-existent (see Brookman 1984, 149). There is a simple explanation for this imbalance. Transactions of products brought out of the mill would typically be recorded on receipts, which would be archived within the central organization of the mill/Umma. According to the

[2] For the well-known field Manu, see Pettinato 1967, no. 567. Steinkeller's reconstruction of the line as "(removed) from (the hamlet) of Ašag-manu" (i.e., <e$_2$-duru$_5$> a-šag$_4$ ^{giš}ma-nu-ta) is not strictly necessary.

online database of the *CDLI*, we have approximately 250 receipts of this kind.[3] However, transactions of products *entering* the mill would generate receipt tablets archived by the different parties that provided the products, the majority of which would have been located outside the city of Umma. While the archives of the organizations in the vicinity of Umma in all likelihood also would have been located within the city (e.g., the field Manu), the fact remains that very few receipts from these organizations have been recovered.[4]

According to the receipt, the barley officially came from the important Umma official $ARAD_2$, who we know was in charge of the city's central granary (ka-$guru_7$) from Šulgi 33 until at least the end of Amar-Suen's reign, and possibly even longer (see Dahl 2007, 115–121; for a comprehensive study of $ARAD_2$(mu), see now also Johnson 2017). It has been suggested that the two barley transactions recorded in the receipt would have started with $ARAD_2$ issuing to Lugal-ḫegal some form of authorization for the withdrawals, possibly in the form of one (or two) so-called letter order(s).[5] In this model, a representative or subordinate of Lugal-ḫegal would then have been able to use the authorization to obtain the grain from the mill and from the field Manu.[6] As a final step in the transaction, and at a later stage in time, Lugal-ḫegal, or – perhaps more likely – a representative or subordinate of Lugal-ḫegal equipped with his seal, would enter $ARAD_2$'s office in Umma, and only now would the receipt *SAT* 2 366 be written, furnished with Lugal-ḫegal's seal, and archived within $ARAD_2$'s organization.

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[3] *Cuneiform Digital Library Initiative* (*CDLI*) at https://cdli.ucla.edu (20.06.2020).

[4] For a similar situation with the centrally controlled storehouse (e_2-kišib$_3$-ba) in Ur, see Widell 2018, 29; also Widell 2002 and 2010.

[5] See, e.g., Michalowski 2011, 14–15; Steinkeller 2003, 51; note also Manuel Molina (2016, §15): "... letter-orders were rarely dated, which speaks in favour of their immediacy and of the different conditions of archive keeping in antiquity."
The idea of letter orders as precursors to the transactions documented in the Ur III receipts was first proposed by Edmond Sollberger in his monograph on this text genre (1966, ix): "an order from A to B to give C one gur of barley must be reflected in a receipt from C to B." However, as pointed out more recently by Lance Allred, concrete evidence for a link between letter orders and receipts remain elusive in the Ur III record (Allred 2010, 11–12; see also Sallaberger 2015; Dahl 2020, 242). In fact, according to Allred (2010, 10), letter orders "were not the normal means by which officials requested goods and services. Instead, it is clear that most letter-orders have little or nothing to do with the administration of the Ur III state." Indeed, the hypothesis that letter orders served as (mandatory) precursors to Ur III transactions is especially problematic in light of the fact that these texts are very rare in the Ur III corpus. In his 2016 study, Daniela Lampasona estimated that approximately 600 letter orders have been published to date, which he compared to the approximately 20,000 tablets from the period that can be classified as receipts (Lampasona 2016, 200–201 and 203).

[6] It is possible that Lugal-ḫegal's withdrawal of barley from the mill and the field Manu would have generated additional administrative records (i.e., receipts), but the only written documentation preserved would be Lugal-ḫegal's sealed receipt *SAT* 2 366, which of course was kept by $ARAD_2$ in his Umma office.

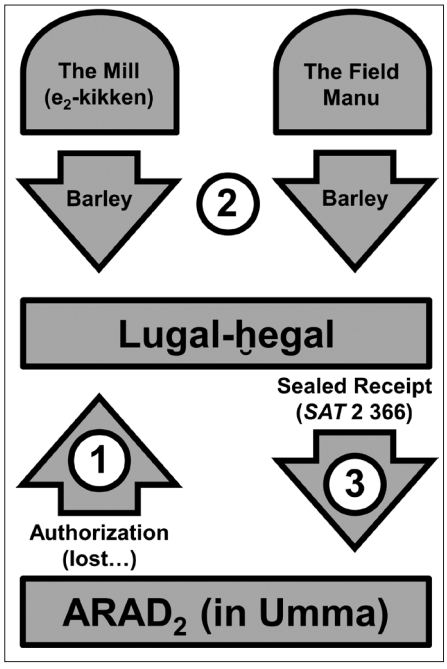

Figure 1: The administrative sequence of events
in relation to the barley withdrawals in *SAT* 2 366.

The justification for this reconstruction of the administrative sequence of events in relation to the barley transactions in the text lies in the fact that the single tablet *SAT* 2 366 functioned as the receipt for two separate withdrawals of barley made at two different locations. How can a single tablet be drawn up at two different locations? Where and when would the receipt have been sealed? The most likely explanation appears to be that *SAT* 2 366 was not drawn up or sealed in either of these two locations. $ARAD_2$, one of the most important officials in Umma, would almost certainly not have left his office in the city, to venture out into the field, to oversee personally the many barley transactions that he formally issued. Any receipts documenting such transactions made in the field were in fact drawn up in $ARAD_2$'s office at a later point in time.

The practice of preparing Ur III documents *post factum* and in locations different from where the transactions in the documents would have occurred, was not limited to receipts from Umma. In fact, Steinkeller argues that all (or at least most) Ur III texts may have been produced and archived under such conditions (2004, 73):

> As yet another illustration of the disparity between the physical event and its administrative version may serve the Puzrish-Dagan delivery tablets, which are characterized by the use of the term mu-DU, "delivery" or "delivered." Written (or at least dated) daily, these documents invariably record multiple deliveries of livestock from various sources. Given the fact that no delivery tablets recording individual deliveries are known, it follows that such records were produced at the end of a business day/period, and not when the animals were physically brought into the corrals of Puzrish-Dagan.

The reconstruction of the administrate sequence of events presented here would indeed offer plausible explanations for the occurrence of transactions taking place in multiple locations in single tablets, or how numerous transaction that cannot have occurred simultaneously could be recorded together in one single document. However, this understanding of the scribal/archival procedures surrounding the production, sealing and filing of Ur III texts, presents us with a set of new and unavoidable questions (Steinkeller 2004, 75):

> How was the relevant information gathered and stored until it was converted into a written form? Clay drafts are one candidate here, but this possibility can immediately be discounted, since no examples of such drafts have survived. Even more important, clay tablets would be a highly inefficient medium outside of the office setting, since it is difficult – if not impossible – to conceive of a scribe carrying with him supplies of wet clay on his errands.

There can be no doubt that an administrative system relying on clay drafts as mnemonic devices would offer certain practical advantages in Mesopotamia (the ubiquitous availability of clay in the region the most obvious one), and the alleged absence of recovered (or identified) clay drafts from the Ur III period does not necessarily prove that such drafts did not exist. In later periods, clay tablets were used as drafts, or at least as memoranda, as evidenced by the Akkadian classification *taḫsistu la mašê* "memorandum as reminder," attested on cuneiform tablets from the second millennium and onwards (see *CAD* M/1, 400, and *CAD* T, 53). Moreover, a few years ago, I published a small and unassuming Ur III tablet dated to Amar-Suen 6/ix (*CDLI*: P388399), listing unskilled workers forming a small part of Umma's annual obligation (bala) to the royal economy of the state. As I argue in the article (2009, §2), it seems plausible that this tablet should in fact be understood as the final and permanent record of this contribution of workers, drawn up based on a clay draft/memorandum published by Shin T. Kang more than 40 years earlier as *SACT* 2 73 (*CDLI*: P129030).[7]

[7] As a side note regarding the complicated issue of identifying drafts among the published Ur III tablets, it is worthy to point out that prior to the publication of *CDLJ* 2009/6 1, the community of Ur

The Use of Clay Tablets in the Field

The writing of clay tablets outside the office would no doubt be rather impractical in southern Mesopotamia. The scribes would need to somehow keep the clay wet and inscribable in a very hot and dry environment, or they would have to rely on access to water in the field, to enable the soaking and re-kneading of the sundried clay to an inscribable format (see Widell 2009, §2.3.7; Balke et al. 2015, 278). Relevant to the issue of the possible use of clay tablets in the field is the Neo-Assyrian relief from the central palace at Nimrud (BM 118882), dated to ca. 728 BC. The relief forms the right part of a group of reliefs commemorating Tiglath-Pileser III's military campaigns to southern Mesopotamia. In a well-known section of the relief, an Assyrian officer is counting out war spoils (sheep and goats) in front of what appears to be two scribes taking notes of the tally.

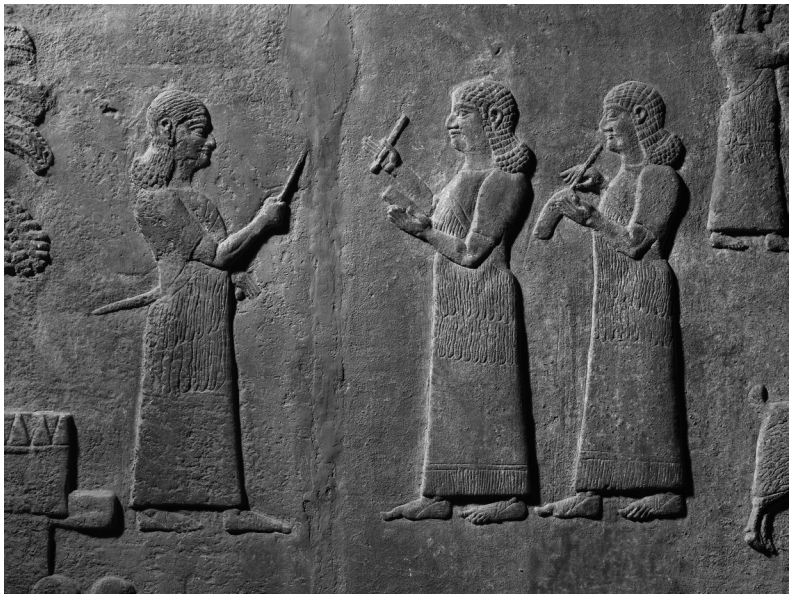

Figure 2: Relief from the central palace at Nimrud showing a Neo-Assyrian officer counting out the spoils on the battlefield to two scribes taking notes on a clay tablet and a roll of leather or parchment (ca. 728 BC). © The Trustees of the British Museum.

III scholars would have had little reason to consider *SACT* 2 73 anything but a regular administrative document, with a missing year formula. Duplicate texts are well-known in the Ur III text corpus (see, e.g., Dahl 2003), and it is certainly possible that at least some of these duplicate texts constituted similar drafts/memoranda. With the exception of the material from Garšana (see Such-Gutiérrez 2011), a more comprehensive study of the occurrence and function of duplicate texts and "copies" (gaba-ri) in the Ur III administration is long overdue.

For what appears to be a clay draft (or possibly a school exercise) of a letter from the Neo-Babylonian period, see Wagensonner 2020, 203–205.

The first scribe – next to the officer – is writing with a regular stylus in his right hand on a clay tablet in his left hand; the individual standing behind the Assyrian scribe has traditionally been interpreted as a second scribe, recording the same information in Aramaic on a roll of leather or parchment. Inspired by a proposal by the archaeologist and painter/sculpture Tariq Madhloom, Julian Reade has argued for an alternative interpretation of this individual, as a war-artist illustrating the ongoing events of the battle, while his colleague standing in front of him is taking notes in cuneiform (Madhloom 1970, 121–122; Reade 1981, 162–163 and 2012, 710–712). Although this suggestion remains somewhat tentative and has not received universal acceptance among scholars in the field, it offers a neat and convincing explanation for the common appearance of pairs of "scribes" in the Neo-Assyrian reliefs. While Aramaic and Akkadian certainly were used side by side in the Neo-Assyrian administration, one could perhaps argue that detailed notes in cuneiform, accompanied by drawings of the general surroundings, would have been a lot more useful to the Neo-Assyrian administrators (and the artisans at home expected to reproduce the battles) than two sets of identical notes written in two different languages.

It has also been suggested that that the first scribe on the relief may be recording the booty on a writing board, originally coated with a layer of beeswax for the inscription, rather than on a clay tablet (e.g., Parker 2011, 360). Indeed, such rectangular writing boards – hinged together to form diptychs or polyptychs – have been discovered in Nimrud, and already Max Mallowan was able to highlight a range of practical advantages of using such writing boards in the field (Mallowan 1954, 98–110, esp. 100; see also Wiseman 1955; Howard 1955; Volk and Seidl 2016).[8] However, artistic representations of hinged writing boards are relatively easy to identify on Neo-Assyrian wall panels, with deliberate and exaggerated renderings of the hinges or bindings (Reade 2012, 705 and figs. 13–16). Moreover, as demonstrated by Ursula Seidl, writing boards required a different type of stylus, with a pronounced groove running along its length (Seidl 2007; see also Jendritzki et al. 2019, 215–216). When a scribe with a writing board is facing left with the stylus in his right hand (as in our example), this groove should be clearly visible (Cammarosano 2014, 55). Even when no hinges/bindings are visible, and the groove in the stylus is absent or unclear, artistic representations of writing boards can be identified by the upright position in which the scribes typically hold them (Reade 2012, 705), or even by the characteristic way the scribes hold their styli, with their index and middle fingers extended (Volk 2009, 281; also Reade 2012, figs. 14–17). With

[8] For a recent discussion on the administrative use of wooden wax boards already from the late third millennium, see Zimmermann 2020 and forthcoming.

this in mind, it is possible to conclude with certainty that the relief is depicting one scribe/artist writing or drawing (or both) on a roll of leather or parchment. In front of him is a scribe writing on a clay tablet. It is also clear that the scribes in the relief are operating in the field outside any office environment, amongst sheep and goats, oxcarts and even with a city under siege in the background. Of course, it is possible that the scribes were included in the scene for dramatic effect and propaganda (or iconographic convention), with the tallying up and recording of the booty emphasizing the overall success of Tiglath-Pileser III's campaigns in the south. Indeed, as suggested by John M. Russell (1991, 28–29), the inclusion of these scribes in the scenes may simply have served as a form of visual validation of the veracity of the final counts of the booty, as presented in the written accounts of the military campaigns. Nevertheless, the relief constitute unambiguous evidence that the *concept* of scribes relying on clay tablets in the field could be envisioned in antiquity, and that their administrative functions outside the office environment was common enough to be immortalized in palace architecture.

Experiments – Framework and Conditions

The experiments in this study were conducted with crude clay tablets measuring approximately 40 x 40 x 10 mm, intended to represent so-called primary documents of the Ur III administration. No sophisticated production methods were used making the tablets, and each tablet was simply flattened-out by hand from a single lump of clay. To accurately reflect these records function as mundane and short-lived tools within the Ur III administrative system (see Van De Mieroop 1999–2000; Tsouparopoulou 2017, 622–624), the tablets were produced with speed and overall functionality in mind, rather than aesthetics or long-term durability. Note that based on the peculiar and layered appearance of the damaged Ur III tablet BM 26783 from Girsu (Fig. 3), Jon Taylor and Caroline Cartwright have argued that many Ur III tablets would have been produced by a much more complicated method (2011, 299–300; also Taylor 2011, 11–12). Their suggested method involved forming the tablets by folding thin layers of clay over each other, possibly bonding the layers together with water. However, there is little concrete evidence that such an elaborate and – from a technical/functional perspective – pointless production method should have been more regularly adopted for the thousands of primary documents that the Ur III administration required on a daily basis, and this production technique was not used in this study.

Figure 3: BM 26783 (*PPAC* 5 519; *CDLI*: P208254).

The tablets in the experiment were produced from a basic brown artist clay, obtained from the Jilin College of the Arts in Changchun. Obviously, the composition and properties of modern artist clay will differ from the clay obtained from the banks of Euphrates and Tigris in southern Mesopotamia.[9] On the other hand, it is not entirely without problems to identify any homogeneous "tablet clay" for southern Mesopotamia (or even within a specific site in southern Mesopotamia). As argued by Restelli et al. (2004, 163),[10] relevant factors for clay composition (and drying rates), such as grain size and inclusions, as well as mineral and chemical composition, may change within meters in a single bank of clay in the alluvial plain of southern Mesopotamia. The purpose of the experiments in this study is to offer a general assessment of the drying rate of clay tablets (not shrinkage). Although important factors when determining drying rate certainly include pore size and inclusions (see, e.g., Taylor 2011,

[9] Perhaps more accurately described as a fine-grained clayey silt (Thickett and Odlyha 1999, 812). For a recent study on clay as a material in ancient Mesopotamia (and elsewhere), see Balke et al. 2015.

[10] For other recent studies on the mineral and chemical composition of cuneiform tablets, see Thickett and Odlyha 2000, 170–171; Sterba et al. 2011; and Uchida et al. 2011.

6), the overall results of the experiments here are still valid, and are unlikely to have been significantly impacted by the use of higher plasticity artist clay. Higher plasticity is generally associated with inferior drying performance and high shrinkage, but with regular air-drying, the most important variables for the drying rate remain ambient temperature and overall humidity levels in the drying environment.

Changchun is located in the centre of the Northeast China Plain (43.897° N, 125.326° E). The summer in this part of China is typically hot and dry, with the occasional thunderstorms with heavy precipitation. The experiments were conducted over a period of 72 hours, starting at 09:00 am on June 24, 2009 through June 27, 2009. The weather during these days was hot, sunny, and dry, with somewhat cooler night temperatures (Fig. 4). Sunrise was at 03:57 in morning (56° Northeast), and sunset 19:25 in the early evening (304° Northwest). The conditions during these few summer days in Changchun can perhaps be compared to modern weather conditions in the spring or autumn in southern Iraq, although daytime lasts some 3–4 hours longer in the northeast of China during summer.

	Max:	Avg:	Min:
Temperature:			
Max Temperature	31°C	29°C	26°C
Mean Temperature	26°C	24°C	21°C
Min Temperature	21°C	17°C	15°C
Dew Point:			
Dew Point	21°C	17°C	7°C
Precipitation:			
Precipitation	0.0 cm	0.0 cm	0.0 cm

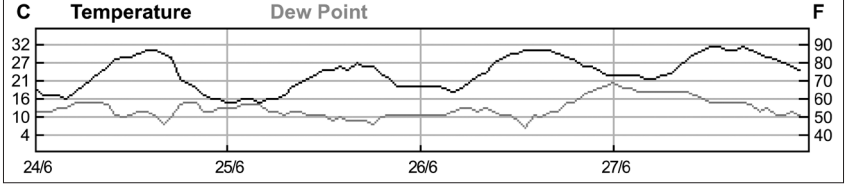

Figure 4: Weather history for Changchun (Longjia International Airport), June 24, 2009 through June 27, 2009. Data from www.wunderground.com (25.07.2009).

The tablets were first impressed with a cylinder seal, and then inscribed with a "stylus" carved from a wooden graphite pencil. The stylus was only used to imprint simple wedges on the clay tablets in the experiments (sequences of DIŠ and AŠ signs), and makes no pretense whatsoever on Ur III authenticity in its design.[11] The cylinder seal used in the experiments is a reproduction from the museum shop at the Oriental Institute of the University of Chicago, of a Neo-Babylonian seal depicting a heroic figure contending with two fantastical beasts. Unlike the seals used in the Ur III period, it does not have a text inscription identifying its owner.[12] Finally, in order to retain moisture and delay drying rates, some of the tablets in the experiments were wrapped in a moist thin plain-woven linen cloth, measuring approximately 28 x 28 cm. Although unconfirmed in the textual and archaeological evidence, I agree with Thomas E. Balke et al. that such linen (or wool) cloths likely would have been used by the Mesopotamian administrators (and schoolchildren) for this purpose (2015, 284; see also Taylor and Cartwright 2011, 304 and 311):[13]

> Abgesehen vom Schreibgriffel aus Rohr, spielten wahrscheinlich noch weitere Materialien bei der Herstellung von Tontafeln bzw. beim Schreibprozess eine wesentliche Rolle, wie z.B. Leinentücher, in welche vorfabrizierte Tafeln zur Bewahrung der Feuchtigkeit eingewickelt wurden, bis ein Bedarf zur weiteren Beschriftung entstand. Da Ton, wenn einmal beschrieben, relativ schnell trocknet, spielte das Bewahren der Feuchtigkeit des Materials ebenso wie die Möglichkeit einer Wiederverwendung von Tafeln eine wichtige Rolle in Schreiberschulen, da Ton nicht in unbegrenzter Menge zu Übungszwecken verfügbar war.

These tools, materials, and overall conditions, including the summer climate of northeast China, are of course entirely inauthentic for Mesopotamia in the late third millennium. However, for the modest aspirations of this article, they represent acceptable compromises, and it is unlikely that tools, equipment, and surroundings that are more authentic would have significantly influenced the outcomes of the experiments presented here.

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[11] For this interesting topic, the readers are referred to the recent studies by Konrad Volk (2009) and Michele Cammarosano (2014).

[12] Note that in the Ur III period, it was common to impress on tablets only the seal's legend, rather than the complete scene of the seal (Winter 2001, 6).

[13] For physical evidence of textile impressions on Ur III tablets, see now Garcia-Ventura and López-Bertran 2014, 195–198. For a discussion of the raw materials most likely used in wrapping cloths in the late third millenium, see Garcia-Ventura 2008, 249–251.

Figure 5: Stylus, clay, and cylinder seal used in experiments (not shown: linen cloth).

Experiments – Execution and Results

Four clay tablets were produced for the experiments in this study. The tablets were first sealed with the cylinder seal across the entire front and back, and then inscribed with a single cuneiform sign (numbered 1 to 4 in Sumerian).

At 09:00 am on June 24, 2009, the wet clay tablets were positioned as follows:

Tablet 1 was left on a dark grey concrete slab in the sun; Tablet 2 was left on a wooden table in the shade; Tablet 3 was also left on the concrete slab in the sun, but wrapped in a moist linen cloth; finally, Tablet 4 was wrapped in moist linen cloth and placed on the table in the shade.

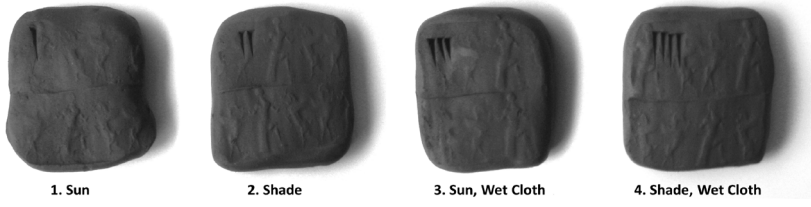

Figure 6: Four "pre-sealed" tablets at 09:00 am on June 24, 2009.

The tablets were checked and inscribed with a new "sign" every 1.5 hours. The cloths around Tablets 3 and 4 were moistened whenever it was necessary. Over the 72 hours of the experiment, the cloth around Tablet 3 was re-moistened 15 times, while the cloth around Tablet 4 had to be re-moistened 7 times.

Figure 7: The four tablets at 18:00 pm on June 24, 2009.

Tablet 1 reached a bone-dry state within the first hour in the morning sun, and after 9 hours in the shade, Tablet 2 was too hard to be inscribed. In fact, as can be seen on Figure 7, Tablet 2 started to dry already after 5–6 hours, and at 7.5 hours only faint wedges could be inscribed on the tablet. The last completely unaffected inscription was made 6 hours after the production of the tablet. Tablets 3 and 4 remained soft throughout the day, and both tablets could easily be inscribed after 9 hours wrapped in a wet cloth. In fact, both these tablets remained inscribable for the entire duration of the experiment. However, the constant wrapping (and re-wrapping) of the tablets with the wet cloth caused considerable damage and abrasion to these tablets' seal impressions. After 9 hours, the seal impressions on the wrapped tablets were significantly less clear than on the unwrapped tablets that were left in the open, and by the end of the experiment the seal impressions on the on the two wrapped tablets were practically illegible.

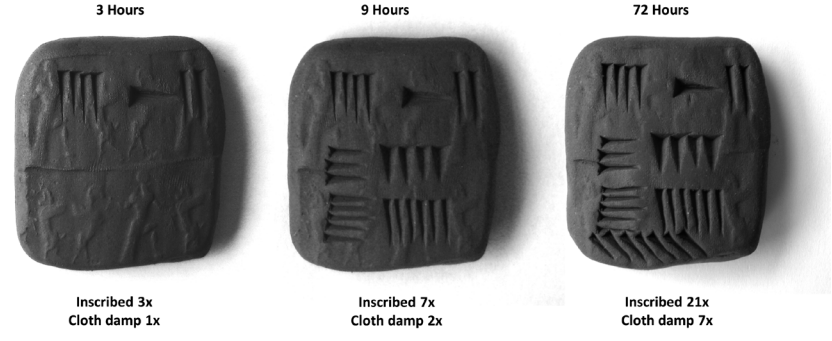

Figure 8: Tablet 4 (obverse) during different stages of the experiment, showing the gradual deterioration of the tablet's seal impression.

To sum up the observations of the simple experiment presented in this article, it is possible to conclude the following:

• A small (primary) clay tablet left in the sun remains inscribable for less than 1 hour.

• Left in the shade, the tablet remains inscribable 6–8 hours.

• A tablet wrapped in a (consistently) moist linen cloth remains inscribable for at least 72 hours (most likely indefinitely), regardless of the external environment (sun/shade).

• Depending on the external environment (sun/shade), the linen cloth wrapped around the tablet requires re-dampening approximately 2–6 times/day. A larger/thicker cloth able to retain a greater amount of moisture would no doubt require less frequent attention.

• The seal impression on a pre-sealed tablet wrapped in a wet cloth deteriorates in a matter of days, depending on the external environment (sun/shade) and the frequency of the re-dampening of the cloth.

Overall Conclusions

As noted by Julian E. Reade (2012, 711), a fundamental aspect of the scribal training in Mesopotamia was learning how to work with wet clay. The Ur III scribes and administrators would be intimately familiar with all limitations and possibilities offered by clay as a medium for cuneiform tablets, and we can confidently assume that the administrative and archival procedures of the period were designed to operate within the parameters of all such constraints and possibilities.

Single Ur III receipts and delivery tablets frequently record multiple transactions that are disconnected spatially and/or temporally. This has been used as evidence for an administrative model, in which a significant portion of the Ur III tablets (only the primary documents) was written (or at least completed) *post factum*, and in many cases in locations different from where the documented transactions actually took place. However, tablets recording multiple events from different locations and/or times do not necessarily constitute unambiguous evidence of such practice.

The daily records from Puzriš-Dagan of multiple individual deliveries taking place throughout the day, could easily have been written on a single clay tablet over the course of the day. The effort required in keeping the record inscribable for a single day, in the controlled office environment of the archives of Puzriš-Dagan, would have been minimal. From an administrative perspective, using an "open" document wrapped in a wet cloth over the course of the day (and let it dry overnight), would be significantly less cumbersome than attempting to summarize, at the end of the day, a set of accumulated temporary reminders/drafts, that each should be associated with an individual animal delivery.

Moreover, no clear evidence for such temporary reminders/drafts exist among the now approximately 17,400 available tablets from Puzriš-Dagan, and not a single tablet has been recovered documenting the individual deliveries of these animals to the centre.[14] Alternative forms of drafts/memoranda, such as wooden wax boards, or simple accounting devices, including clay/stone calculi or counting sticks, remain a possibility. However, archaeological or textual evidence for such alternatives in the Ur III period remains unconvincing. As iconographic evidence from later periods attest, clay tablets were used in the field for administrative purposes, and we have no reasons to assume that this was not the case also in Ur III Puzriš-Dagan.

Keeping clay tablets wet (and inscribable/sealable) during transport outside the office environment would no doubt require significantly more effort, and tablets recording the receipts of withdrawn products from multiple locations are likely candidates for *post factum* productions based on individual (clay) drafts. Ur III receipts were typically sealed by the recipient of the goods (and kept by the supplier as evidence of a completed transaction), and it is indeed difficult to imagine that the Ur III administration should attempt to transport these tablets in a wet state for more significant distances (either pre-sealed to be inscribed, or inscribed to be sealed). It has been suggested that the majority of the withdrawals that would generate receipt tablets were preceded by some form of authorization from the central office (perhaps in the form of a letter order), although concrete evidence for the widespread use of such authorizations remains limited. If, as a matter of routine, withdrawals *were* preceded by authorizations from the central office, it would seem very likely that those authorizations would provide the recipients with all necessary details to draw up (and seal) the final receipts for the central administration.

Addendum: Implications for Sealing Practices of Ur III Tablets

For some time now, Assyriologists have recognized that archival and administrative procedures in Mesopotamia are closely linked to the use of cylinder seals rolled over the cuneiform tablets (e.g., Winter 2001; Tsouparopoulou 2014, 49–52). A tremendous amount of work has been devoted to the cataloging and organizing of the seal impressions preserved on the Ur III tablets, typically based on the ancient provenience of the tablets (e.g., Hattori 2001 and 2002; Mayr 2005; Tsouparopoulou 2015). These efforts have provided detailed information

[14] The number of published tablets from Puzriš-Dagan is based on a simple search in the *Cuneiform Digital Library Initiative* (*CDLI*) at https://cdli.ucla.edu (13.07.2020). The most comprehensive treatment of the daily records of animal deliveries to Puzriš-Dagan remains Tohru Maeda's important study from 1989. For a more recent overview of these texts, see Widell 2020b, 220.

on specific aspects of the sealing of various types of Ur III tablets. However, a more comprehensive and systematic study of the overall administrative and archival processes of sealing these documents is currently lacking, despite the organization and publication of various conferences and collected volumes devoted to seals and sealing practices in the ancient Near East (e.g., Gibson and Biggs 1977; Westenholz 1995; Gyselen 1997; Hallo and Winter 2001; Ameri et al. 2018).

In the first of these collected volumes, Piotr Steinkeller offered a useful overview of the use of seals on Ur III documents, intended as "a starting point for future studies" (1977, 41). Under his discussion of discrepancies between seal inscriptions and tablet content, Steinkeller highlighted two curious but rather common occurrences in the Ur III documents (1977, 46):

> As any student of Ur III economic and legal texts knows, in numerous instances the impression of an official's seal can be found on a tablet written after the death or retirement of a king or dignitary to whom the seal was "dedicated." Another common irregularity is that the occupation or title of the seal's owner appearing in a seal inscription is different from that in the content of the tablet.

These occurrences of conflicting data in the tablets and their seal impressions, reflect a widespread (and well-known) practice among Ur III scribes of the continued use of outdated seals in official contexts (see, e.g., Hattori 2002, 197–198). For example, the so-called Royal Gift Seals of the period were regularly used after the deaths of the kings in their dedicatory inscriptions; sometimes they remained in use several years into the reigns of the succeeding rulers (e.g., *BRM* 3 31, *AR RIM* 4 18, *Ontario* 1 179, *SACT* 2 46, *Nik* 2 340, *AUCT* 3 259).

In addition to these two examples demonstrating the occasional use of outdated seals among the Ur III administrators, a third type of inconsistency between tablet inscription and the seal impression warrants some consideration: when a tablet identifies the official sealing it in its inscription (kišib$_3$ PN "seal of PN"), but carries a seal impression belonging to a different official.[15] Why would a

[15] The peculiar practice of substitute sealing was observed and discussed already in 1947 by the Luxembourger Sumerologist Nikolaus Schneider, the first scholar who more systematically studied Ur III sealing practices. The alternative interpretation of the expression by Christina Tsouparopoulou (2015, 78–79), as an indicator of authorship (i.e., dub PN "tablet of PN"), which in turn would be associated with the sealing of the tablet and the receipt of its products, appears overly complicated, and is in my onion less convincing. Whether drafted *post factum* or not, there can be little doubt that a major portion of the tablets from the Ur III institutional economy functioned as an instrument of fiscal control and accountability (Van De Mieroop 1999–2000; Englund 2003), and it is equally clear that the process of sealing these tablets (in particular the receipts) played an important role within this system. With this in mind, it would seem rather unlikely that the Ur III administration should have lacked a formal expression for this process. Moreover, the reading of the sign as kišib$_3$ "seal" (rather

tablet that specifically identifies the official sealing it end up being sealed by an entirely different individual?

The practice reflects the use of proxy sealers, whereby a subordinate (or colleague/family member) would simply seal the receipts of his superior (or colleague/family member). A good example of this as an established and official practice within the administration would be the Umma official Lu-duga (the son of Ur-nigar), who consistently sealed receipts for his brother Dadaga, the chief administrator of the governor in the city (see Dahl 2007, 124–125).[16] Other substitute sealers appear to be *ad hoc* arrangements, which often would be anticipated by the scribe and clarified in the text of the tablet (see, e.g., Widell 2020a, 126, n. 8; Hattori 2002, 191). However, occasionally we encounter Ur III tablets sealed by the "wrong" official, without any accompanying clarifications. For example, among the 168 published tablets from Umma that supposedly were sealed by an official named Lu-duga (i.e., inscribed kišib$_3$ lu$_2$-du$_{10}$-ga "seal of Lu-duga"), six were in fact embossed with seals belonging to officials other than Lu-duga.[17] How is it possible that the professional and highly educated scribes of the Ur III administration would make such embarrassing mistakes when drawing up the tablets?

One explanation would be that some time would have elapsed between the drafting of the tablet (and the scribe's identification of the official expected to seal it), and the tablet actually being sealed. By the time the tablet was to be sealed, the official whom the scribe originally anticipated as the sealer was no longer present (perhaps he never was), and an unanticipated substitute sealer would therefore have to take his place. If no appropriate substitute sealer was available, the tablet would not be sealed at all, which in turn would explain the fact that some unsealed tablets are inscribed kišib$_3$ PN (see, e.g., Tsouparopoulou

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than dub "tablet") is further supported by the appearance of the compound verb kišib$_3$--ra "to seal" on some of these tablets (see Dahl 2020, 105–109), or by the fact that the clause kišib$_3$ PN frequently appears on sealed tablet envelopes, while missing on the unsealed tablets inside the envelopes (see Hattori 2002, 187).

Note that the phenomenon of substitute sealing should not to be confused with allonomy or pseudonymy, whereby an official deliberately uses two different names in official contexts (see Mayr 2005, 85–89). While the use of different variants of names can be securely attested in the Ur III period (see Widell 2004), evidence for the use of unrelated double-names remains inconclusive (see Dahl 2007, 124, n. 430).

[16] Three so-called archival tags from the end of Šulgi's reign show that Lu-duga was officially responsible for Dadaga's accounts in Umma (see Dahl 2020, 8–9).

[17] Numbers according to the *Cuneiform Digital Library Initiative* (*CDLI*) at https://cdli.ucla.edu (20.07.2020). There are three different groups of texts with Lu-duga specified as the sealing official, using three different proxy sealers: *NYPL* 301 and *SACT* 2 229 (Lu-Emaḫ); *LAOS* 1 08 and *South Dakota* 37 (Lu-Nin...); *CST* 757 and *Iraq* 41, 128 6 (Ur-Nintu).

2015, 79).[18] An obvious implication of this explanation is that the tablets would have to remain wet (and sealable) during the time between their inscription and the sealing process, or that pre-sealed (blank) tablets would have to be kept wet (and inscribable) until their specific administrative transactions were recorded by the scribe.[19] As the experiment in this article have demonstrated, both these scenarios are technically possible.

Finally, one of the more vexing issues with Ur III sealing practices is the apparent lack of consistency regarding the order in which tablets were inscribed and sealed. Some tablets were first inscribed, and then had the cylinder seal rolled over the text, while others were first sealed, and then inscribed with the cuneiform text. Unfortunately, available information on the sealing-writing sequences of Ur III tablets is rather incomplete,[20] and it is currently difficult to establish any clear patterns regarding this curious inconsistency in the administrative practices of the state. In a book review published some 15 years ago, I concluded that most sealed tablets from Umma, Nippur, Lagaš, and Puzriš-Dagan appear to have received their seal impressions after they were inscribed, while approximately 60% of the sealed tablets from the capital Ur were sealed before they were inscribed. In my review, I raised a series of questions related to this inconsistency within the Ur III state, as well as within individual cities/centres, and the general preference in Ur to pre-seal tablets (Widell 2006, 266):

> Is it, for example, possible that an official in Ur would pre-seal blank tablets and then hand them out to different agents, or representatives; who would fill in the inscriptions at a later stage (and at a completely different location)? How long a time would a pre-sealed blank tablet remain inscribable? Could the inscribable time period of a wet tablet be extended (for example by wrapping it in a moist cloth), and how would such methods be visible or traceable on the tablets today? Were specific officials or households consistently pre-sealing their tablets, and, if so, what would this tell us about these officials or households?

Some of these questions have been answered in this contribution, while others no doubt will require further research. One thing is certain, the clear lack of consistency in the production of Ur III documents is significant in its own right,

[18] This should not be confused with unsealed (or sealed) accounts that frequently use the formula kišib$_3$ PN to refer to *other* (primary) documents, such as, e.g., *Erl.* 152, obv. v 13–17 referring to the sealed *MVN* 16 1567 (see Englund 2003, §15).

[19] For several references to both sealed and unsealed "blanks" from the late third- and early second millennium, see Taylor 2011, 8.

[20] See Widell 2006, 266, n. 3. It is to be hoped that new technologies for the digital capture of seal impressions will provide more data on this important aspect of the sealing practices in the different Ur III cities and administrative centres (see Dahl et al. 2018).

in an administration characterized by rigorous bureaucratic conformity and standardization (Michalowski 1991, 50–51), and hints at a deliberate application and adaptation of the opportunities and flexibility offered by pre/post-sealing practices. Such deliberate use of pre/post-sealing within the administration would support a bureaucratic model, in which a significant number of Ur III tablets were drawn up *post factum*, in locations different from where the documented transactions actually took place. As anyone can attest working in UK academia, which still regards electronic signatures with suspicion, there are very real logistical advantages offered by the practice of pre/post-signing, especially when documents have to be produced *post factum*. For example, before catching the last train home, an external Ph.D. examiner in the UK will duly sign the empty form of the "joint report" of the viva voce. Of course, no such report exists at this point, as it will have to be put together *post factum* over the next few days (or weeks…) based on the examiners' notes taken during the actual examination. Once completed, the internal examiner in the host university will insert the agreed upon text into an earlier (un-signed) page of the form, which now can be submitted together with the pre-signed final page of the report to the eagerly awaiting university administration.

Bibliography

Allred, L. 2010.
"Getting the Word Out: Letter-Orders and the Administration of the Third Dynasty of Ur." In: A. Kleinerman and J. M. Sasson (eds.), *Why Should Someone Who Knows Something Conceal It? Cuneiform Studies in Honor of D. I. Owen on his 70th Birthday*. Bethesda, MD: CDL Press, 9–13.

Ameri, M. et al. (eds.). 2018.
Seals and Sealing in the Ancient World: Case Studies from the Near East, Egypt, the Aegean, and South Asia. Cambridge: Cambridge University Press.

Balke, Th. E. et al. 2015.
"Ton." In: Th. Meier, M. R. Ott and R. Sauer (eds.), *Materiale Textkulturen. Konzepte – Materialien – Praktiken*. Berlin, Munich & Boston: De Gruyter, 277–284.

Brookman, W. R. 1984.
The Umma Milling Industry: Studies in Neo-Sumerian Texts. PhD-thesis: University of Minnesota.

Cammarosano, M. 2014.
"The Cuneiform Stylus." *Mesopotamia: Rivista di archeologia, epigrafia e storia orientale antica* 49: 53–90.

Dahl, J. L. 2003.
"A Note on Ur III Text Duplicates." *Cuneiform Digital Library Bulletin* 2003/5, accessed under: https://cdli.ucla.edu/pubs/cdlb/2003/cdlb2003_005.html (20.07.2020).
——— 2007.
The Ruling Family of Ur III Umma: A Prosopographical Analysis of an Elite Family in Southern Iraq 4000 Years Ago. PIHANS 108. Leiden: Nederlands Instituut voor het Nabije Oosten.
——— 2020.
Ur III Texts in the Schøyen Collection. Cornell University Studies in Assyriology and Sumerology 39. University Park, PA: Eisenbrauns & Pennsylvania State University Press.
Dahl, J. L. et al. 2018.
"A Structured Light Approach to Imaging Ancient Near Eastern Cylinder Seals: How Efficient 3D Imaging May Facilitate Corpus-Wide Research." In: K. Kelly and R. K. L. Wood (eds.), *Digital Imaging of Artefacts: Developments in Methods and Aims*. Oxford: Archaeopress, 49–74.
Englund, R. K. 2003.
"The Year: 'Nissen Returns Joyous from a Distant Island'." *Cuneiform Digital Library Journal* 2003/1, accessed under: https://cdli.ucla.edu/pubs/cdlj/2003/CDLJ2003_001.html (20.07.2020).
Garcia-Ventura, A. 2008.
"Neo-Sumerian Textile Wrappings. Revisiting Some Foundation Figurines from Nippur." *Zeitschrift für Orient-Archäologie* 1: 246–254.
Garcia-Ventura, A. and López-Bertran, M. 2014.
"Unveiling Clay and Metal: The Context and Use of Mesopotamian Textile Wrappings." In: S. Harris and L. Douny (eds.), *Wrapping and Unwrapping Material Culture: Archaeological and Anthropological Perspectives.* Publications of the Institute of Archaeology, University College London 64. Walnut Creek, CA: Left Coast Press, 193–208.
Gibson, McG. and Biggs, R. D. (eds.). 1977.
Seals and Sealing in the Ancient Near East. Bibliotheca Mesopotamica 6. Malibu, CA: Undena Publications.
Gyselen, R. (ed.). 1997.
Sceaux d'Orient et leur employ. Res Orientales 10. Leiden: Peeters.
Hallo, W. W. and Winter, I. J. (eds.). 2001.
Proceedings of the XLV^e Rencontre Assyriologique Internationale. pt. II: *Seals and Seal Impressions*. Bethesda, MD: CDL Press.
Hattori, A. 2001.
"Sealing Practices in Ur III Nippur." In: Hallo and Winter 2001, 71–99.

——— 2002.
Texts and Impressions: A Holistic Approach to Ur III Cuneiform Tablets from the University of Pennsylvania Expeditions to Nippur (Iraq). PhD-thesis: University of Pennsylvania.
Hilgert, M. 1998.
Drehem Administrative Documents from the Reign of Šulgi. Oriental Institute Publications 115. Chicago: The Oriental Institute of the University of Chicago.
Howard, M. 1955.
"Technical Description of the Ivory Writing-Boards from Nimrud." *Iraq* 17/1: 14–20.
Jendritzki, G., Streckfuss, M. and Cammarosano, M. 2019.
"Technische und materialgerechte Rekonstruktion einer Elfenbein-Klapptafel aus Aššur." *Mitteilungen der Deutschen Orient-Gesellschaft zu Berlin* 151: 201–218.
Johnson, H. 2017.
Feeding the People: The Economic and Social Role of the Granary in Ur III Umma. PhD-thesis: University of Liverpool.
Lampasona, D. U. 2016.
"Food and Drinks in the Letter-Orders Corpus. A Quantitative Analysis." In: P. Corò et al. (eds.), *Libiamo ne' lieti calici. Ancient Near Eastern Studies Presented to L. Milano on the Occasion of his 65th Birthday by Pupils, Colleagues and Friends.* Alter Orient und Altes Testament 436. Münster: Ugarit-Verlag, 199–220.
Liu, Changyu. 2017.
Organization, Administrative Practices and Written Documentation in Mesopotamia during the Ur III Period (c. 2112–2004 BC). A Case Study of Puzriš-Dagan in the Reign of Amar-Suen. Karum – Emporion – Forum. Beiträge zur Wirtschafts-, Rechts- und Sozialgeschichte des östlichen Mittelmeerraums und Altvorderasiens 3. Münster: Ugarit-Verlag.
Madhloom, T. A. 1970.
The Chronology of Neo-Assyrian Art. London: Athlone Press.
Maeda, T. 1989.
"Bringing (mu-túm) Livestock and the Puzurish-Dagan Organization in the Ur III Dynasty." *Acta Sumerologica* 11: 69–111.
Mallowan, M. E. L. 1954.
"The Excavations at Nimrud (Kalḫu), 1953." *Iraq* 16/1: 59–114.
Mayr, R. 2005.
Seal Impressions on Tablets from Umma. Unpublished manuscript SITU 05 03, March 2005.
Michalowski, P. 1991.
"Charisma and Control: On Continuity and Change in Early Mesopotamian

Bureaucratic Systems." In: McG. Gibson and R. D. Biggs (eds.), *The Organization of Power: Aspects of Bureaucracy in the Ancient Near East.* 2nd ed. with corrections. Studies in Ancient Oriental Civilization 46. Chicago: The Oriental Institute of the University of Chicago, 45–57.

——— 2011.

The Correspondence of the Kings of Ur: An Epistolary History of an Ancient Mesopotamian Kingdom. Mesopotamian Civilizations 15. Winona Lake, IN: Eisenbrauns.

Molina, M. 2016.

"Archives and Bookkeeping in Southern Mesopotamia during the Ur III Period." *Archéologie de la comptabilité. Culture matérielle des pratiques comptables au Proche-Orient ancien* 8, accessed under: https://journals.openedition.org/comptabilites/1980 (20.07.2020).

Nissen, H. J., Damerow, P. and Englund, R. K. 1990.

Frühe Schrift und Techniken der Wirtschaftsverwaltung im alten Vorderen Orient. Bad Salzdetfurth: Verlag Franzbecker.

Owen, D. I. (ed.). 2011.

Garšana Studies. Cornell University Studies in Assyriology and Sumerology 6. Bethesda, MD: CDL Press.

Owen, D. I. and Mayr, R. 2007.

The Garšana Archives. Cornell University Studies in Assyriology and Sumerology 3. Bethesda, MD: CDL Press.

Parker, B. J. 2011.

"The Construction and Performance of Kingship in the Neo-Assyrian Empire." *Journal of Anthropological Research* 67: 357–386.

Pettinato, G. 1967.

Untersuchungen zur Neusumerischen Landwirtschaft I: *Die Felder, 2. Teil*. Naples: Istituto Orientale Di Napoli.

Reade, J. 1981.

"Neo-Assyrian Monuments in their Historical Context." In: F. M. Fales (ed.), *Assyrian Royal Inscriptions: New Horizons in Literary, Ideological, and Historical Analysis. Papers of a Symposium Held in Cetona (Siena) June 26–28, 1980.* Rome: Istituto per l'Oriente, Centro per le Antichità e la Storia dell'Arte del Vicino Oriente, 143–167.

——— 2012.

"Visual Evidence for the Status and Activities of Assyrian Scribes." In: G. B. Lanfranchi et al. (eds.), *Leggo! Studies Presented to Fr. M. Fales on the Occasion of his 65th Birthday.* Wiesbaden: Harrassowitz, 699–717.

Restelli, F. B., Morbidelli, P. and Troja, O. 2004.

"Appendix: A Proposal for Investigating Beyond Writing. Archaeometric

Analyses of Clay Tablets." In: F. D'Agostino, F. Pomponio and R. Laurito (eds.), *Neo-Sumerian Texts from Ur in the British Museum: Epigraphical and Archaeological Catalogue of an Unpublished Corpus of Texts and Fragments*. Nisaba 5. Messina: Di.Sc.A.M., 163–169.

Russell, J. M. 1991.
Sennacherib's Palace without Rival at Nineveh. Chicago & London: University of Chicago Press.

Sallaberger, W. 2015.
"Special Cases and Legal Matters: Diction and Function of Letters in the State of the Third Dynasty of Ur (2110–2003 B.C.)." In: S. Procházka, L. Reinfandt and S. Tost (eds.), *Official Epistolography and the Language(s) of Power: Proceedings of the First International Conference of the Research Network Imperium & Officium. Comparative Studies in Ancient Bureaucracy and Officialdom University of Vienna, 10–12 November 2010.* Papyrologica Vindobonesia 8. Vienna: Österreichische Akademie der Wissenschaften, 15–30.

Sollberger, E. 1966.
The Business and Administrative Correspondence under the Kings of Ur. Texts from Cuneiform Studies 1. Locust Valley, NY: J. J. Augustin.

Schneider, N. 1947.
"Stellvertretende Siegelung der Vertragsurkunden in der Ur III-Zeit." *Orientalia* N.S. 16/4: 417–421.

Steinkeller, P. 1977.
"Seal Practice in the Ur III Period." In: McG. Gibson and R. D. Biggs (eds.), *Seals and Sealing in the Ancient Near East*. Bibliotheca Mesopotamica 6. Malibu, CA: Undena Publications, 41–53.

——— 2003.
"Archival Practices at Babylonia in the Third Millennium." In: M. Brosius (ed.), *Ancient Archives and Archival Traditions: Concepts of Record-Keeping in the Ancient World*. Oxford: Oxford University Press, 37–58.

——— 2004.
"The Function of Written Documentation in the Administrative Praxis of Early Babylonia." In: M. Hudson and C. Wunsch (eds.), *Creating Economic Order. Record-Keeping, Standardization, and the Development of Accounting in the Ancient Near East.* Bethesda, MD: CDL Press, 65–88.

Sterba, J. H. et al. 2011.
"NAA and XRF Analyses and Magnetic Susceptibility Measurement of Mesopotamian Cuneiform Tablets." *Scienze dell'Antichità* 17: 409–426.

Such-Gutiérrez, M. 2011.
"The gaba-ri Texts of the 'Garšana Archives'." In: Owen 2011, 391–403.

Taylor, J. 2011.
"Tablets as Artefacts, Scribes as Artisans." In: K. Radner and E. Robson (eds.), *The Oxford Handbook of Cuneiform Culture*. Oxford & New York: Oxford University Press, 5–31.
Taylor, J. and Cartwright, C. 2011.
"The Making and Re-Making of Clay Tablets." *Scienze dell'Antichità* 17: 297–324.
Thickett, D. and Odlyha, M. 1999.
"Playing with Fire: Characterisation of Clay Types Used to Fabricate Cuneiform Tablets and their Thermal Behaviour during Firing-Based Conservation Treatments." In: J. Bridgland (ed.), *Preprints of 12th Triennial Meeting of International Council of Museums – Committee for Conservation, Lyon, 29th August – 3rd September 1999.* London: James & James, 809–816.
——— 2000.
"The Contribution of Thermoanalytical Techniques to the Conservation Treatment of Cuneiform Tablets in the British Museum." *Thermochimica Acta* 365: 167–175.
Tsouparopoulou, C. 2013.
"A Reconstruction of the Puzriš-Dagan Central Livestock Agency." *Cuneiform Digital Library Journal* 2013/2, accessed under: https://cdli.ucla.edu/pubs/cdlj/2013/CDLJ2013_002.html (20.07.2020).
——— 2014.
"Progress Report: An Online Database for the Documentation of Seals, Sealings, and Seal Impressions in the Ancient Near East." *Studia Orientalia Electronica* 2: 37–68.
——— 2015.
The Ur III Seals Impressed on Documents from Puzriš-Dagān (Drehem). Heidelberger Studien zum Alten Orient 16. Heidelberg: Heidelberger Orientverlag.
——— 2017.
"'Counter-Archaeology': Putting the Ur III Drehem Archives Back in the Ground." In: Y. Heffron, A. Stone and M. Worthington (eds.), *At the Dawn of History: Ancient Near Eastern Studies in Honour of J. N. Postgate.* Winona Lake, IN: Eisenbrauns, 611–629.
Uchida, E., Sasaki, T. and Watanabe, C. E. 2011.
"Non-destructive Analyses Applied to Mesopotamian Clay Tablets." *Scienze dell'Antichità* 17: 393–401.
Van De Mieroop, M. 1999–2000.
"An Accountant's Nightmare: The Drafting of a Year's Summary." *Archiv für Orientforschung* 46–47: 111–129.

Volk, K. 2009.
"Schreibgriffel." *Reallexikon der Assyriologie und Vorderasiatischen Archäologie* 12/3–4: 280–286.
Volk, K. and Seidl, U. 2016.
"Wachstafel. A. In Mesopotamien." *Reallexikon der Assyriologie und Vorderasiatischen Archäologie* 14/7–8: 609–613.
Wagensonner, K. 2020.
"YBC 11431, a Draft Letter or an Exercise?" *Nouvelles Assyriologiques Brèves et Utilitaires* 2020/3: 203–205.
Westenholz J. G. (ed.). 1995.
Seals and Sealing in the Ancient Near East. pt. II: *Proceedings of the Symposium Held on September 2, 1993, Jerusalem, Israel.* Jerusalem: Bible Lands Museum.
Widell, M. 2002.
"A Note on the Sumerian Expression SI-ge$_4$-de$_3$/dam." *Sefarad: Revista de Estudios Hebraicos y Sefardíes* 62/2: 393–400.
——— 2004.
"Reflections on Some Households and their Receiving Officials in the City of Ur in the Ur III Period." *Journal of Near Eastern Studies* 63/4: 283–290.
——— 2006.
"Review of F. D'Agostino, F. Pomponio and R. Laurito, *Neo-Sumerian Texts from Ur in the British Museum*. Nisaba 5. Messina: DI.SC.A.M., 2004." *Journal of the American Oriental Society* 126/2: 65–69.
——— 2009.
"Two Unpublished Ur III Texts from Umma: Observations on Archival Practices and Household Management." *Cuneiform Digital Library Journal* 2009/6, accessed under: https://cdli.ucla.edu/pubs/cdlj/2009/CDLJ2009_006.html (20.07.2020).
——— 2010.
"From All the Stacks to the Center of Ur: A Note on the Handling of Finished Garments in the Neo-Sumerian Period." *Orient: Reports of the Society for Near Eastern Studies in Japan* 45: 177–182.
——— 2018.
"The Administration of Storage in Early Babylonia." *Orient: Reports of the Society for Near Eastern Studies in Japan* 53: 23–34.
——— 2020a.
"Ur III Economy and Bureaucracy: The Neo-Sumerian Cuneiform Tablets in the Hood Museum of Art, Dartmouth College (I)." *Orient: Reports of the Society for Near Eastern Studies in Japan* 55: 117–154.

——— 2020b.
"Destined for Slaughter: Identifying Seasonal Breeding Patterns in Sheep and Goats in Early Babylonia." *Journal of Near Eastern Studies* 79/2: 209–223.
——— 2021.
"The Sumerian Expression a-ra$_2$ X-kam and the Use of Installments in the Ur III Administration." *DABIR* 9 (Special Issue: Discussions in Assyriology): accessible under: https://sites.uci.edu/dabirjournal/issues (01.09.2021).
Winter, I. J. 2001.
"Introduction: Glyptic, History, and Historiography." In: Hallo and id. 2001, 1–13.
Wiseman, D. J. 1955.
"Assyrian Writing-Boards." *Iraq* 17/1: 3–13.
Wu, Yuhong. 1995.
"High-ranking 'Scribes' and Intellectual Governors during the Akkadian and Ur III Periods." *Journal of Ancient Civilizations* 10: 127–145.
——— 2008.
"Naram-ili,Šu-Kabta and Nawir-ilum in the Archives of Garšana, Puzriš-Dagan and Umma." *Journal of Ancient Civilizations* 23: 1–36.
Zimmermann, L.-S. 2020.
"The Function of Wax-Covered Writing Boards in the Transposition of Texts in the Kassite Period." *Manuscript and Text Cultures* 1.
——— forthcoming.
"Knocking on Wood: Wooden Writing Boards in Kassite Babylonia."

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edited by
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