

PROGRESS REPORT: AN ONLINE DATABASE FOR THE DOCUMENTATION OF SEALS, SEALINGS, AND SEAL IMPRESSIONS IN THE ANCIENT NEAR EAST

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This paper discusses efforts to create a relational database to document Ancient Near Eastern seals, sealings, and seal impressions. The aim of this paper is to report on the existence of such a project, as well as its background, methods, and future perspectives. A brief overview of glyptic art and sealing practices is given before the structure of the database is explained in detail.

1. INTRODUCTION

The idea for the creation of an online database to document Ancient Near Eastern seals, sealings, and seal impressions originated within the Cuneiform Digital Library Initiative (CDLI),¹ an international project working on the documentation, digitization, and online dissemination of cuneiform tablets from Mesopotamia.² Since many cuneiform tablets bear the impressions of seals, it was deemed necessary for a relational database to be implemented within the CDLI that

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2 The term Ancient Near East is understood here to include Anatolia, Syro-Palestine, Iran, and Mesopotamia, roughly corresponding to the following modern Middle Eastern countries: Turkey, Lebanon, Jordan, Israel, Syria, Iraq, and Iran. While the focus until now has been on Mesopotamia (both north and south), the database as it has been structured enables the inclusion of seals and sealings from all regions in the Ancient Near East.

would first document the seals impressed on these tablets, but could eventually include seals and other clay objects (sealings) on which seals were impressed.

Relatively recently, interest in sealing practices has reawakened. There are now studies on sealing practices on all sorts of documents from many different periods of Mesopotamian history, and archaeologists and Assyriologists alike are starting to appreciate the function of seals on tablets. Archaeologists are increasingly turning to seal impressions on tablets to understand administrative practices, while Assyriologists are mainly interested in identifying the person responsible for the sealing process; inscribed seals usually correspond to the name appearing on the seal. Thus, the time seems ripe for a database that could combine information of interest for both the archaeological and the Assyriological communities. This is the aim of this database: to act as a platform for Assyriologists, archaeologists, and art historians alike who are interested in sealing practices and the design of seals over five millennia. It is intended to facilitate the searching and identifying of particular seals on multiple levels, based on iconographical and technological characteristics.

There are considerable difficulties in building a database for the seals and seal impressions of all periods in the Ancient Near East. The main obstacles arise in the field of art history, where no common vocabulary exists for the description of the iconography. The vocabulary used in the database can express basic designs and subjects in the iconography of the seals. It does not intend to replace the vocabulary used by specialists in different periods, but rather it is only an attempt to systematically and broadly categorize seal iconography.

2. OVERVIEW OF SEALS STUDIES

Two main types of seals were used in Mesopotamia, the stamp seal and the cylinder seal. Stamp seals first appeared in 'administrative' contexts in central and northern Mesopotamia in the sixth millennium and were used exclusively until the fifth millennium. Cylinder seals appeared first around 3500 BC in southern Mesopotamia and south-western Iran. They gradually replaced stamp seals, becoming the tool par excellence of a rising class of bureaucrats in the early stages of state formation. Even though stamp seals were still produced in the third and second millennia, cylinder seals predominated. In the first millennium, stamp seals made a strong comeback and eventually replaced cylinder seals entirely.

By studying the material they are made of, as well as their artisanship, craftsmanship, inscriptions, and function, seals can provide a wealth of information (Collon 1987). Their impressions can be found on a variety of clay surfaces, from doors to bags and jars. They were also widely used to imprint clay cuneiform documents, a ubiquitous practice throughout ancient Mesopotamia. Naturally enough, they have been the object of many studies. However, a definitive account of the multipurpose role that seals played in the written documentation of Mesopotamia does not yet exist.

The study of the function of seals and sealings has played a major role in the reconstruction of administrative practices in times and places where writing was not yet invented or still not widely used. But whenever information on the administrative practices could be drawn from the texts, scholars have tended to focus on the text itself and less on the sealing practice. This is especially true for early publications of cuneiform texts, in which authors did not even acknowledge the existence of a seal on the documents they published. Assyriologists today are increasingly aware of sealing practices on cuneiform documents, yet their interest remains mainly focused on the text of the inscribed seals, the so-called "legend", in combination with the text of the sealed docu-

ment itself. Since most seals were anepigraphic, and since the sealing practice was not limited to the textual information, the main bulk of literature on this topic still lies outside Assyriology and within the realm of Near Eastern archaeology. For their part, however, archaeologists tend to mainly be interested in the physical characteristics of sealed documents, and the information that can be obtained in combination with the text written on them is usually not scrutinized. Thus, this database acts as a bridge between Assyriology, Near Eastern archaeology, and art history by including data that is relevant to them all, from the legend of the seal and content of the sealed tablet to the function of the sealed object and the iconography of the seal.

2.1 Brief overview of themes and iconographic repertoire

It is impossible to describe the miniature glyptic art of more than five millennia in a few pages, and so here will be mentioned only a few iconographic features, which are the most characteristic for each glyptic period.³

In the prehistoric period when only stamp seals were produced, they were mostly decorated with geometric patterns and animal scenes (Fig. 1a). In the Uruk period (c.4000–3100 BC), animal scenes were preferred, and a wide variety of animals was represented. Another characteristic of glyptics of this period is the “priest-king” (Fig. 1b). Uruk period cylinder seals were mostly made of limestone or gypsum, while a few were of lapis lazuli.



Figure 1

a. Halaf period rectangular grey-green schist button seal, front deeply engraved with rectangular geometric design, from Chagar Bazar Syria, 2.370 x 1.684 x 0.831 cm, BM 125559 © The Trustees of the British Museum;
 b. Late Uruk calcite cylinder seal, squatting animal-shaped knob, a priest-king wearing a headband and net robe is feeding flowers to a pair of ewes, while reed bundles (symbols of the goddess Inana) divide the scene, 7.2 x 4.2 cm, BM 116722 © The Trustees of the British Museum.

In the Jemdet Nasr period (c.3100–2900 BC), animals, activities, and geometric patterns were common, with pig-tailed figures in a variety of performing activities being the most characteristic (Fig. 2). The materials used were mostly soft stones, such as chlorite or calcite, but one can also find hard stones such as rock crystal.

³ To name just a few, detailed studies on glyptic art can be found in Porada 1947a; Boehmer 1965; Amiet 1980; Porada et al. 1980; Teissier 1984; Collon 1987; 2007; Salje 1990; Pittman 1994; 2013; Matthews D. 1990; 1992; 1997; Rakic 2003; Karg 1984; Otto 2000; Stiehler-Alegria Delgado 1996; Colbow 1995.



Figure 2

Cylinder seal of black stone (marble) in the Jemdet-Nasr style, depicting a pig-tailed figure and vessels, 2.1 x 2.0 cm, BM 102471 © The Trustees of the British Museum.

In the Early Dynastic I period (c.2950–2750 BC), cylinder seals were often tall and thin, mostly decorated with geometric designs.⁴ It is in the Early Dynastic III period (c.2600–2350 BC) that more complex and individualised themes reappear: contest scenes, banquets, figures, and animals show up together (Fig. 3). The banquet scene also became popular in this period (Fig. 3a). Cylinder seals of the Early Dynastic I period were often made of talc (steatite), while later they were mostly made from soft stones, such as marble, calcite, and limestone. There also appear seals made of precious materials, like lapis lazuli and alabaster.



Figure 3

a. The cylinder seal of “Queen” Pu-abi. Early Dynastic III period (c.2600 BC), lapis lazuli seal depicting a banquet scene and inscribed: “Pu-abi nin”. From the Queen’s Grave in the Royal Cemetery of Ur, ht. 4.9 cm, dia. 2.6 cm, BM 121544 © The Trustees of the British Museum;
b. Early Dynastic II (c.2700 BC) white calcite (marble) cylinder seal, depicting a contest scene with bull-men and heroes, possibly from Sippar, ht. 4.12 cm, dia. 3.65 cm, BM 89538 © The Trustees of the British Museum.

In the Akkadian period (2334–2193 BC), the seals are usually large and concave cylinders. Characteristic themes of this period are contest (Fig. 4a) and “mythological” scenes (Fig. 4b). There are also many examples of introduction and worship scenes, as well as banquet scenes. The predominant material used for cylinder seals of this period was serpentine, although seals of diorite, greenstone, jasper, and rock crystal have also been found.

By the Ur III period (c.2112–2004 BC), the standard theme was a presentation scene, either to a deity or the king. Several variations of this occur: an audience with the king, the introduction of a worshipper to a deity, or the king by the goddess Lama (Fig. 5), salutation scenes, and others. There are still found, however, some contest scenes, as well as a few ritual scenes,

⁴ For the glyptic styles of the Early Dynastic I period (brocade style, glazed steatite style, “City”-seal style), see Pittman 2013: 327–329.

especially depicting libations. Chlorite was the predominant material used, while seals made of serpentine and steatite were also ubiquitous; there also exist seals made of marble, hematite, and lapis lazuli.

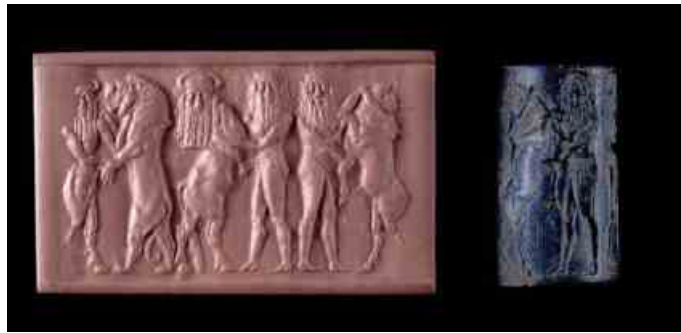


Figure 4

a. Akkadian lapis lazuli cylinder seal from the Royal Cemetery of Ur (U.9813) depicting a contest – a bull-man in full-face fighting with a lion, 3.50 x 2.05 cm, BM 121566d © The Trustees of the British Museum; b. The so-called Adda seal. Akkadian greenstone, slightly concave cylinder seal depicting a mythological scene, with a full-faced hunting god, a full-faced Ishtar armed with weapons, the sun god Shamash with rays emerging from two mountains, the water god Ea stretching out his right hand (probably towards the Zu bird) and behind him his two-faced attendant god Usimu. A two-line inscription is in a frame below with a roaring lion, ht. 3.90 cm, dia. 2.55 cm, BM 89115 © The Trustees of the British Museum.



Figure 5 An Ur III period black chlorite cylinder seal, depicting a standard introduction scene to a goddess with rays rising from her shoulders, erased two-line inscription with some traces still visible, 2.55 x 1.36 cm, BM 132193 © The Trustees of the British Museum.

In the Old Assyrian trading colonies (c.2000–1740 BC), the seals that appear impressed on cuneiform documents seem to be quite distinct from but also influenced by the Mesopotamian tradition.⁵ Introduction, worship, and procession scenes are rather common, while the weather god is the most often represented deity (Fig. 6). The main material used for the manufacture of seals during this period was hematite.



Figure 6 Old Assyrian black hematite cylinder seal, depicting a scene of worship of the moon god and a figure of the storm god on the back of a crouching bull, 1.8 x 0.9 cm, BM 103010 © The Trustees of the British Museum.

⁵ The Syrian seals impressed on tablets from Kültepe (Cappadocia) belong to the Middle Bronze I period (the so-called Pre-Classical period), which corresponds to c.1920–1830 BC.

The Old Babylonian seals (c.2000–1600 BC) were quite “formal”, and the repertoire ranged from presentation scenes with deities and worshippers to contest and ritual scenes. New figures make an appearance, such as the figure with the mace (Fig. 7a), the god with scimitar, or the nude figure (Fig. 7b). A prevalence of hard stones is also evident: hematite, limonite, and serpentine were the preferred stones, while from the Late Old Babylonian period (c.17th–16th century BC) there appear seals with long inscriptions made of agate or jasper.



Figure 7

a. Old Babylonian hematite cylinder seal that is inscribed, depicting the king with a mace, the suppliant goddess, and the robed king with an animal offering, facing the warrior goddess who holds the rod and ring and rests her foot on a lion, ht. 2.55 cm, dia. 1.40 cm, BM 130695 © The Trustees of the British Museum;
 b. Modern impression of an Old Babylonian hematite cylinder seal, depicting a lion-scimitar, the nude goddess and the king with a mace facing a god in striped robe who holds the sun god's knife, ht. 2.5 cm, dia. 1.1 cm, BM 89784 © The Trustees of the British Museum.

Moving to northern Mesopotamia and Syria in the period 1800–1730 BC, the Classic Syrian glyptic is characterized by ritual and worship scenes and the elements are quite variable:⁶ deities (such as the naked goddess and various “local” gods), real and fantastic animals, Egyptian motifs, and male figures representing heroes, rulers, and demons. The main material used for the production of “elite” seals was hematite. During the Mittanian hegemony in northern Mesopotamia and Syria (c.1500–1360 BC), two glyptic styles can be distinguished: the Common Mittani style and the Syro-Mittanian, or Elaborate Mittani style (Salje 1990). Seals of the Common Mittani style, although distinctive, are rather limited in their iconographic repertoire, with simple ritual scenes predominating, usually depicting figures flanking a tree (Fig. 8b). The iconographical motifs of the Elaborate Mittani style seals were taken from Cappadocian (Kültepe), Syrian, and Mesopotamian seals, the most common being ritual, drinking, and offering scenes, as well as scenes of animal rows (Fig. 8a). The materials used in the manufacture of seals of the Common Mittani style were compositional, but some seals made of chert and hematite have also occasionally been found. Seals of the Elaborate Mittani style, on the other hand, are characterized by the use of a drill on hard stones, such as hematite, chalcedony, carnelian, and agate.

⁶ For the Classic Syrian style, see Otto 2000; for an example of a cylinder seal of this style, see Fig. 3 in Marchetti 2003.



Figure 8

a. Elaborate Mittani style cylinder seal, made of hematite, from the Tiryns Treasure, Mainland Greece, CMS-IS-019 © CMS;

b. Common Mittani style heavily worn frit cylinder seal from Assur, with a stylised representation of an anthropomorphic figure and a bird in front of a tree, Ass.2000.D-18 © Peter Miglus.

Kassite seals – found as far afield as Dilmun (Bahrain), the Persian Gulf, Mycenaean Thebes, and the Uluburun shipwreck – are divided into four stylistic groups (Beran 1957/1958; D. Matthews 1990; 1992). The First Kassite group, with one or two figures, filling motifs, and long inscriptions, was in use in the fourteenth century (Fig. 9a). This style derives from Old Babylonian prototypes. The Pseudo-Kassite style is very closely related to the First Kassite group, but more cursory in linear style. It was prevalent in the latter half of the fourteenth century (Fig. 9b). The Second Kassite group is more elaborate and imaginative than the First Kassite group, and it appeared in the second half of the fourteenth century. Its most common scene shows a mountain deity flanked by streams of water (Fig. 9c). It continued at least until late in the thirteenth century. The Third Kassite group, characterized by uninscribed seals often depicting quadrupeds flanking a tree, appeared in the thirteenth century and dominated the glyptic production of the Second Dynasty of Isin (c.1157–1104 BC). The first and second Kassite groups included seals made of hard stones, such as chalcedony and agate, and were often mounted on gold caps. The seals of the Pseudo-Kassite style were usually made of soft composite materials, while the seals of the Third Kassite group were usually made of soft stones and quartz. In total, only about 400 different seal designs can be attributed to the Kassite glyptic.



Figure 9

a. First Kassite carnelian cylinder seal, with modern impression, seven-line prayer to Shamash, BM 89128 © The Trustees of the British Museum;



b. Pseudo-Kassite style cylinder seal of greenish stone from Marlik Tepe in the tradition of Pseudo-Kassite seals, taken from Negahban 1977, no. 6;

c. Second Kassite style cylinder seal of lapis lazuli bearing the name of the Kassite King Burna-buriash II (c.1359–1333 BC), found in a hoard at Thebes in Greece, 4.18 cm x 1.50 cm, taken from Aravantinos 2008, Fig. 177a.

Middle Assyrian glyptic art (c.1350–1200 BC) has been divided into three phases:⁷ early (14th century BC), middle (13th century BC) and late (12th century BC). The later phase shows a greater variety of iconographic repertoire with chariot and cultic scenes before temples. Contest scenes were prevalent in all phases of this period (Fig. 10). In animal scenes characteristic of this period, the horse and the winged bull appear for the first time in glyptic art, to reappear only in Neo-Assyrian glyptic art. Agate, marble, quartz, and carnelian were the most preferred stones, but there also appear seals made of soft materials, such as talc.



Figure 10 Middle Assyrian carnelian cylinder seal, depicting a bearded, kneeling hero grasping the tails of two lion-griffins which stand above two bulls on either side of a stylised tree, the small circles in the design were made by a tubular drill, 2.90 x 1.45 cm, BM 134855 © The Trustees of the British Museum.

In the first millennium, devotional, hunting, contest, banquet, siege, and animal scenes characterize the Neo-Assyrian glyptic repertoire (c.934–611 BC). Subject matters treated in the glyptic art of the period include “royal worship”, the “king with bow and cup”, the “king’s fight with the lion”, “figures flanking a tree”, the “siege”, the “hunt”, etc. (Winter 2000; Fig. 11a). Soft

⁷ For the Middle Assyrian glyptic, see Kühne 1995; Beran 1957; Moortgat 1941; 1944.

stones (serpentine and limestone) were the preferred materials in the ninth century, but by the end of the ninth century seals were cut from hard stones. By the end of the seventh century, stamp seals had replaced cylinder seals in official business (Fig. 11b).⁸ Distinguishing between Neo-Babylonian and Neo-Assyrian seals can be difficult, but there appear certain characteristics that aid in identification. Neo-Babylonian seals (*c.*626–539 BC) were cut almost entirely from hard stones; other typical Babylonian features are the high headdress worn by deities, the duplication of figures, and wings of equal length for the four-winged creatures (Fig. 11c).



Figure 11

a. Neo-Assyrian mauve chalcedony cylinder seal (8th century BC), depicting two kilted heroes standing on the backs of two human-headed, winged bulls called ‘lamassu’.

A bearded god (Adad?) is found beneath the canopy, and behind the heroes is an inscription in positive on the seal, 3.40 cm x 1.04 cm, BM 132257 © The Trustees of the British Museum;

b. Neo-Assyrian horizontally perforated dome-shaped stamp seal of white chalcedony. On the convex base, Ishtar is seated on a straight-backed throne supported by a lion, while a king and queen approach her, with a scorpion above, 1.85 x 1.50 cm, BM 2002,0515.1 © The Trustees of the British Museum;

c. Neo-Babylonian (7th–6th century BC) barrel-shaped sardonyx quartz cylinder seal with eyes, depicting a bearded god in a tall cylindrical headdress holding a staff in one hand, rising from a crescent moon before a bearded worshipper. Back to back with this worshipper stands another identical figure, 2.9 x 1.6 cm, BM 89780 © The Trustees of the British Museum.

During the Achaemenid period (*c.*550–330 BC), both cylinder and stamp seals were used; stamp seals were used privately while cylinder seals were used for official business, in contrast to Neo-Assyrian and Neo-Babylonian practices two hundred years before. Many links can be found between the Achaemenid glyptic and Neo-Assyrian and Neo-Babylonian glyptics.

⁸ Recently Fügert (2013) suggested that on the basis of stratigraphic context the glyptic material at Dur Katlimmu now could predate the re-introduction of the stamp seal in the 9th century.

Iconographically speaking, the main subjects were the royal hero-grasping animals, the kneeling archer, abstract designs, and animals in combat (Fig. 12a; 12b). Colorful stones, such as agate, jasper, and chalcedony, were chosen as the medium for the Achaemenid seals.



Figure 12

a. Achaemenid stamp seal with oval, slightly convex base, and domed top, of yellow-brown and orange-brown banded agate. Engraved design on the base depicts a king fighting a rampant bull, 2.0 x 1.5 x 2.8 cm, BM 132512 © The Trustees of the British Museum;

b. Achaemenid cylinder seal in the Persepolitan style of white chalcedony, depicting a winged disc above two facing winged ibexes, each of which are speared from behind by male figures wearing Persian robes, but with the upper half covered with a stiff corselet, 3.15 x 1.60 cm, dia. 0.40 cm (perforation), BM 128842 © The Trustees of the British Museum.

2.2 Brief overview of sealing practices on lumps of clay (sealings)

Stamp and cylinder seals have been impressed on a variety of clay objects since the sixth millennium. However, information on the function of these sealed clay surfaces can be obtained mainly from the Late Neolithic period onwards. Apart from the iconography and style of the seal that was impressed, the study of a sealing entails analysis of its function. Only by studying the underside of the lump of clay are we in a position to comprehend the use and function of the sealing itself. The underside bears marks of the object (or objects) on which sealings were attached, such as strings, ropes, leather surfaces, textiles, door pegs, clay and stone vessels, and many more (see Otto 2009; Fig. 13 on next page). The pioneer in this avenue of work is Fiandra (1975), and many researchers have since followed her lead (Charvát 1988; Zettler 1987).

The earliest documented use of sealings comes from northern Mesopotamia and particularly from Sabi Abyad in the Balikh Valley of northern Syria. In Level Six there, which was destroyed by fire and dated to the transition between the Late Neolithic and the Halaf periods, approximately 300 sealings were found (Duistermaat 2010). These sealings – used on baskets, jars, stone bowls, leather bags, and mats – were mostly found in two rooms of Building II, identified as a storage area, and associated with vessels, figurines, and tokens (Akkermans & Duistermaat 1996). No door sealings were found.

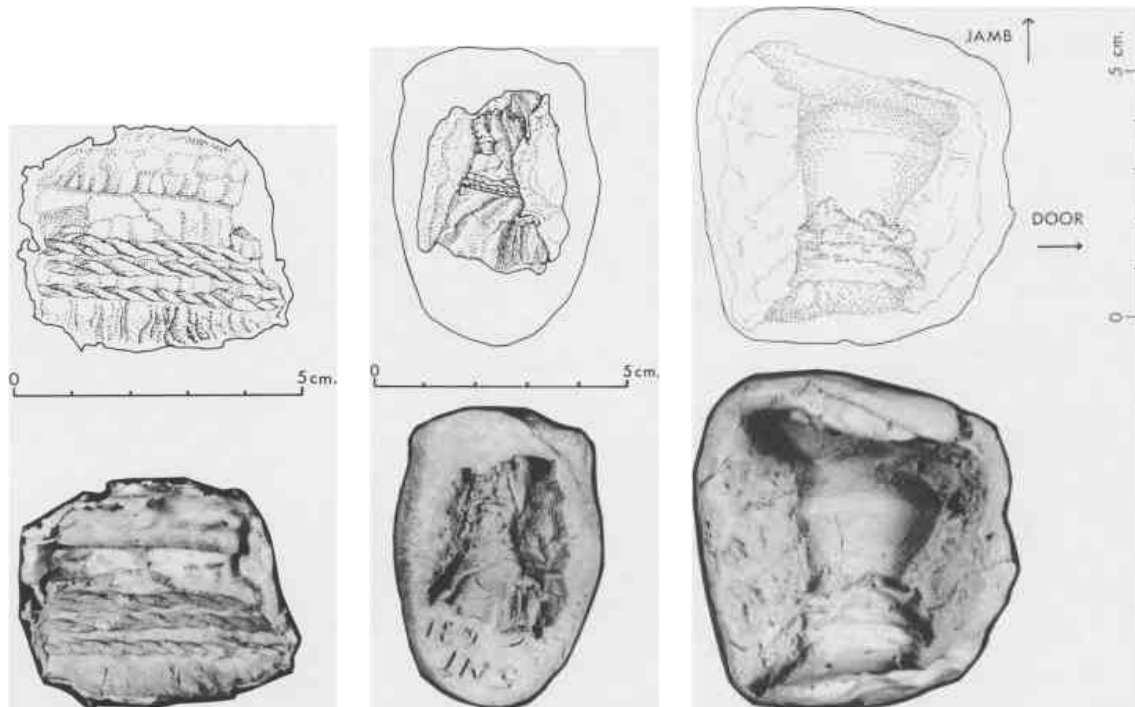


Figure 13 a. Line drawing and photograph of positive made from sealing taken off a jar (after Zettler 1987: Fig. 11); b. Line drawing and photograph of positive made from sealing taken off a leather bag (after Zettler 1987: Fig. 12); c. Line drawing and photograph of positive made from sealing taken off a knob with a cord wound around it (after Zettler 1987: Fig. 14).

In Degirmentepe, which was located on the upper Euphrates approximately at the end of the fifth millennium, about 450 sealings were found; these were attached to sacks, jars, and doors, as well as bullae (Esin 1994: 66–69). Twenty-four stamp seals were also found. While seals and sealings were found dispersed throughout the site of Degirmentepe, most sealings were found together in one room. In Level VIII of Tepe Gawra, located near the Upper Tigris in northern Mesopotamia (c.3600 BC), sealings have been found in connection to centralized administration and storage (Rothman 1997: 185). Sealings on bags, baskets, jars, doors, and bullae, as well as sealings used for closing sacks, have been found in a central storehouse in a building interpreted as an administrative center and in buildings related to workshops and religious areas (Rothman 1994). The earliest levels of Arslantepe date to the end of the Northern Ubaid period (end of fifth millennium). In the VIa period (c.3400–3000 BC), more than 2000 sealings were found discarded in a fill in Building IV's southern storeroom, a palace-like complex. The excavators managed to match the sealings to their function, and they have recognized jar sealings, door sealings, and sealings used to close containers such as bags, sacks, and wicker containers. When the item that was sealed was opened, the sealing was kept and carefully discarded (Frangipane 2007).⁹

Sealings have been also found within purely domestic contexts in northern Mesopotamia, such as at Hamoukar, where hundreds of sealings from jars and baskets have been excavated

⁹ For this overview of sealing practices in 5th and 4th millennium northern Mesopotamia, I made use of the paper by Sarah Kiehl (Costello) "The Syro-Mesopotamian Origins of Arslantepe's Administrative System", which was presented in 1997 at the Graduate Student Symposium of the Department of Classical and Near Eastern Archaeology at Bryn Mawr College.

(Reichel 2002). Equally, from the LC3-4 structures at Brak (LC3 corresponds to Middle Northern Uruk, approximately 3600 BC), many sealings applied on containers were discarded at dumps (Emberling & McDonald 2003; McMahon & Oates 2007: 163–166). Hacinebi has also produced a number of sealings used to close containers, such as bags, sacks, and baskets, while there is no evidence at all for door sealings (Pittman 1999).

Even though sealing has been and still is equated with bureaucracy, evidence from the households in northern Mesopotamia cited above shows that the act of sealing was not reserved only for the state or the elite, but it was also “a property control mechanism at the level of the household [...] clearly not restricted to centralized political authority” (Ur 2010: 397). Moving on to the third millennium in northern Mesopotamia, Tell Beydar seems to have the largest corpus for the sealing practices of the Late Early Dynastic in the north: 1,535 sealings, representing 215 different designs (Jans & Bretschneider 2011). Forty-four Nineveh sealings have been studied by Charvát (2005; the reverse of the sealings) and by Collon (2001b; iconography), which were produced in the transition from Ninevite 4 to Ninevite 5 in the early third millennium. Approximately 64% of the sealings were attached to portable containers, while 16% were used for door-locking mechanisms, which otherwise were non-existent in Ninevite 2-3 sealings.

In southern Mesopotamia, evidence for sealings comes mainly from the third millennium, as well as from Uruk and Susa in Iran at the end of the fourth millennium. Charvát (1988) studied the sealings from Susa dated from 4000 to 2340 BC, concluding that Susa B-style seals (in use 4000–3500 BC) were used to close portable containers (such as bags, sacks, and pots), Susa C-style stamp and cylinder seals (3500–3000 BC) were reserved for bullae and to close doors (“locks”), and Proto-Elamite and Pre-Sargonic cylinder seals (3000–2340 BC) were employed both for portable containers and for doors.

In the Early Dynastic period at Fara, large collections of sealings have been found in two loci: a rubbish dump dated to Early Dynastic I and a large house dated to Early Dynastic IIIa. At least 838 sealings were found in the Early Dynastic rubbish dump; of the identified ones, 88% were door-peg sealings and only 9% were applied to containers (R. Matthews 1991). Of the sealings found in the house, 75% were door peg sealings, while 14% were from containers, indicating a more heterogeneous range of activities. Similar functions to the door sealings from the dump in Fara can be seen from the sealings found at the Seal Impression Strata at Ur (Legrain 1936), where again almost all sealings were applied to doors and were probably discarded after use in a building of supra-domestic function, perhaps a temple. Again in the Ash Tip at Abu Salabikh (Martin & Matthews 1993), out of the total of 202 sealings unearthed, door-peg sealings were the most common – almost 57% of the sealings were used for doors. This seems to have also been the case from the 4C88 dump at Jemdet Nasr (R. Matthews 1990).¹⁰ Forty-three sealings come from the Early Dynastic I level at the Inana Temple in Nippur, impressed with both cylinder and stamp seals. From the few ones whose underside could be studied, it becomes evident that the greatest majority was used for securing doors (Zettler 2007b).¹¹ Moving to the Ur III period, Zettler (1987) has studied the 149 clay sealings found in Level IV of the Inana temple and managed on the basis of the sealings to reconstruct

10 For sealing practices in the Akkadian period, see Rakic 2003: 315–353. It is worth mentioning that in contrast to the preceding Early Dynastic period, not many sealings have been found and studied that date to the Akkadian period.

11 For discussions on the interesting practice of over stamping during the Early Dynastic I period, see Zettler 2007b: 351 ff., and references therein.

administrative procedures practiced there.¹² From the above, it seems that sealings as part of door-locking or closing mechanisms appeared first in the Late Ubaid period, but this function became customary only in the third millennium in both North and South Mesopotamia.

Moving to the second millennium, sealings have been found in both North and South Mesopotamia. In Kassite Nippur, sealings were found that were used to close doors, as well as some that were attached to containers. In Tell Sabi Abyad, more than 170 sealings dated to the Middle Assyrian period have been found; most of these were impressed with cylinder seals, and only rarely with stamp seals. From the impressions on these clay sealings, thirty-one different seals have been identified to date, but none of those actual seals have been found. These sealings were used to either close doors or portable containers (e.g. bags, wooden boxes, pottery jars). Interestingly, only two seals were used for both fastening doors and portable containers.

Regarding the first millennium, Herbordt's (1992: 53–70) study remains the most complete for Neo-Assyrian sealings.¹³ No less than 565 sealings come from Nineveh, found in Room LXI of the southwestern palace during Layard's excavations. Yet 66 sealings have also been found in Nimrud. These were used to close portable containers, while there are also a few that were used to fasten doors. At Hasanlu, located in northwestern Iran, 31 sealings have been unearthed that date to the beginning of the first millennium. Analysis of the material by Marcus (1990; 1996) shows that seals of the so-called "local style" were pressed on jar necks, over a cord that secured a leather covering, and were also used to fasten a variety of containers (e.g. reed baskets, leather bags) and doors. The use of seals at Hasanlu shows that there was a need to control goods and access to them, possibly at the household level. As writing took over, sealing practices on materials other than tablets grew far less common, and studies and documentation of such sealings accordingly declined as well. Mentioned above are examples of those few studies that concentrate on sealings in the second and first millennia on other media than documents.

2.3 Brief overview of sealing practices on cuneiform documents

A very brief overview of sealing practices on documents is also included here.¹⁴ As shown above, seals were stamped on clay surfaces from at least the sixth millennium. However, it is only in the fourth millennium, during the Uruk period, that they appeared alongside writing, impressed on clay tablets bearing numerical notations and cuneiform signs. Those are the so-called archaic tablets, which come mainly from Uruk and Ur – two of the most important southern Mesopotamian sites. The sealing practices of these documents has been extensively studied by Roger Matthews (1989; 1993). From the end of the fourth millennium until the end of the third millennium, the practice of sealing cuneiform documents was rare,¹⁵ whereas the sealing of other media (such as baskets, doors, pots, and tags) was common. Whether this was intentional or due to accidental discovery is hard to say. Tablets from the Early Dynastic I period (c.3000–2750 BC) are lacking seals, and the same is true for the Early Dynastic II tablets (c.2750–2600 BC). For the late Early Dynastic (c.2600–2350 BC), there is only one sealed envelope from Lagash (Zettler 2007a).

12 See also Reichel 2001 for a reconstruction of the palace at Tell Asmar, based on the evidence from the sealings.

13 Herbordt's (1992) drawings and some of her conclusions should now be checked against Mitchell & Searight 2008. For Neo-Assyrian sealings, see also Fügert 2013.

14 For a thorough philological overview of sealing practices, see Radner 2009.

15 But see the Proto-Elamite tablets from Susa, contemporary to the Jemdet Nasr and Early Dynastic I periods, which were still sealed (Dittmann 1986: 346–350).

From the Akkadian period (*c.*2334–2154 BC), only eleven tablets are known to have been sealed (Rakic 2003): four administrative tablets of unknown provenance, recording delivery of ovine animals, written in Sumerian; one administrative tablet encased in a sealed envelope from Nippur, written in Akkadian, documenting receipt for barley; one administrative tablet of unknown provenance, of the letter-order type, authorizing an issue of grain, written in Sumerian; one more letter-order from Uruk, written in Sumerian; and an letter-order also of unknown provenance, written in Akkadian. There are also three legal documents that were sealed: one letter-order in Akkadian regarding the beginning of a court case, a sealed tablet probably from Isin recording the conclusion of a legal case, and one sealed legal text from Nippur.

On the contrary, sealed documents from the Ur III period (*c.*2112–2004 BC) number into the thousands, and it seems that it is only during this period that rolling a seal on a document became mainstream practice. From the Ur III, we have a corpus of more than 120,000 (mostly administrative) tablets, stemming from at least six administrative centres of the state and the periphery: Umma, Drehem, Nippur, Girsu, Garshana, and Ur. Almost a fifth of these documents were sealed. The majority of Ur III sealed documents come from Umma, where almost half of the documents were sealed (Mayr 1997; Dahl 2007). Hattori (2001; 2002) has extensively studied the sealed tablets from Nippur, whereas Laurito in D'Agostino et al. (2004) studied some Ur sealed documents in the British Museum. Furthermore, a PhD thesis focusing on a holistic approach to seals, sealings, and seal impressions on documents from Ur has recently been submitted (Vischer 2013). Fischer (1992; 1997) has also studied the sealing practice on the Girsu tablets housed in the British Museum. Tsouparopoulou (2009; forthcoming) has comprehensively studied the Drehem sealed documents,¹⁶ and the Garshana material is currently being prepared for publication by Mayr (forthcoming).

By the second millennium, sealing practices on inscribed documents became much more complicated, since it is then that we start having private archives (belonging to merchants, families, and others) and the first proper legal documents. In southern Mesopotamia, during the Old Babylonian period (*c.*2000–1600 BC), sealing played a major role in legal transactions, both private and official (Renger 1977). The sealers were primarily witnesses and participants in these transactions (Blocher 1992a; 1992b). The practice of encasing tablets in a sealed envelope also became mainstream during this period, again mainly for the purpose of documenting legal affairs and contracts (Leemans 1982; Kraus 1985). The envelope was used to safeguard the contents of the tablet; if a dispute arose, the envelope could be torn open and the actual contract read. Interestingly, in Ur the use of an actual seal seems to have been thought of as essential; even clay seals made on the spot are attested (the so-called *burgul* seals; see al-Gailani Werr 1988). This is in contrast to Sippar (Tanret 2010), Nippur, and Dilbat; in these places, garment hems or fingernails could be impressed in place of a seal (Blocher 2001: 144).

In northern Mesopotamia, during the Old Assyrian period (*c.*1900–1740 BC), merchants left the capital of Assur to establish trading colonies in Anatolia, exchanging textiles and tin for silver and gold, with the most famous trading colony being Kanesh (modern-day Kültepe). These merchants communicated with the capital and their families via letters, and it is mainly this correspondence that was sealed. However, the seals used on these documents were mostly uninscribed (Teissier 1994; Özgüç & Tunca 2001).

16 See also Reichel 2003.

In the north during the Mittani period (c.1500–1370 BC), Nuzi produced most of the written documentation (almost 20,000 tablets). Family legal archives comprise the main bulk of the textual evidence, although there are a few public documents. The sealing practice on the documents from the archive of Šilwa-teššup has been comprehensively studied by Stein (1993), while the sealing practice on documents from the Pula-Hali family archive has been studied by Lion & Stein (2001). Porada (1947b) also extensively studied sealing practices on documents from Nuzi.

In the south, after the fall of the Old Babylonian Empire and the sack of Babylon by the Hittites in 1585 BC, the Kassites took over Babylon. Of unknown origin, they came to rule Babylonia for almost five hundred years. The sealing practice of this period for the Nippur material has been studied by Donald Matthews (1992), with a focus also on the iconography and style of the cylinder seals. Usually it was seals of the First Kassite stylistic group that were impressed on documents from Nippur and Nuzi.

The sealing practices of the documents produced during the Middle Assyrian period (c.1400–1050 BC), when Assyria re-emerged as a political power after a long period of decline, have been the object of numerous studies (Röllig 1980; Postgate 1986; 2003 and most recently Feller (forthcoming) and Postgate 2014). The bulk of documents, comprised of both private and official texts, comes from the capital Assur and other provincial centres such as Tell Billa (D. Matthews 1991), Tell al-Rimah, Sheikh Hamad, and Tell Sabi Abyad. All or some of the witnesses present at the legal case sealed the legal contracts, as well as the person accepting liability. On the other hand, administrative texts only bear seal impressions of the persons acknowledging liability.

The first millennium was a period of major political changes in Mesopotamia, which left their imprint on administrative practices. Thus, subsequent documentation and sealing practices also evolved and changed. For example, during the Neo-Assyrian period (c.911–612 BC) seals were not only used to secure the contents of texts against tampering, but to also add more information to what was written on the tablet (Radner 2008). Moreover, during this period and especially in the second half of the eighth century, the stamp seal, which had fallen out of use, reappeared and slowly started replacing the cylinder-seal (Boehmer 1975: 343). The practice of sealing consequently changed, since the application of a stamp seal on a clay surface is quite different than of a cylinder. One innovation of this period was the use of “bureau seals”, which are “seals that are associated with a particular administrative department – a ‘bureau’ – rather than a specific person and that exist in a number of copies [...] (T)he bureau seals employed by the palace administration were always stamp seals” (Radner 2008). Interestingly, in contrast to the seals used in previous periods by officials high up in the bureaucracy, these seals were of very simple design.¹⁷

During the Neo-Babylonian period (c.626–539 BC), sealed documents were usually administrative and legal in nature, found in private as well as official archives (Jursa 2005). Generally speaking, Neo-Babylonian sealed tablets had a different shape. One main aspect of sealed Neo-Babylonian legal texts was clauses included at the end of the text with a list of the witnesses who were present (Baker 2003). After that, a seal could be impressed and then followed by a caption, or there could be a caption only, nail marks or blank edges.

In the Achaemenid period, two archives have been unearthed mostly containing tablets impressed with stamp seals: the Persepolis Fortification tablets and the private Murašû archive

17 For Neo-Assyrian sealing practices on documents, see Herboldt 1992 and Klengel-Brandt & Radner 1997, and now on the Dur-Katlimmu sealed documents see Fügert 2013: 229–236.

at Nippur (Bregstein 1993). The majority of the Persepolis archival texts (almost 15,000–18,000 distinct tablets), in the Elamite language, record the storage and distribution of food. There are also a number of uninscribed, sealed clay tags (Jones & Stolper 2008). The seal practices for both inscribed and uninscribed tablets in the Persepolis archive seem to be consistent in terms of the size of the tablet, the number of sealings on the tablets, and the office held by the sealer (Garrison 2008). The Murašû family archive comprises 880 cuneiform clay tablets written in the Late Babylonian dialect of Akkadian, together with some twenty anepigraphic sealed clay tags. Many of the tablets were impressed with cylinder and stamp seals of the Babylonian style, as well as with metal rings and fingernails. Captions were included in cuneiform, documenting the personal names of the witnesses and sealers (Bregstein 1993; 1996).

3. DOCUMENTATION

Data for the database comes from two main “types” of seals: 1) the actual seals (that is, the physical objects that acted as seals) and 2) the impressions of those seals on clay-inscribed objects (e.g. tablets, their envelopes, bullae), as well as on lumps of clay used to secure (seal) doors, such as baskets, jars, and others.

The so-called physical seals can be of many different shapes, the two most common being the cylinder (Fig. 14a) and the stamp seal (Fig. 14b), followed by ring seals, engraved amulets, and engraved pendants.



Figure 14 Physical seals together with their modern impression.
a. Old Babylonian cylinder seal, of hematite, BM 86267 © The Trustees of the British Museum;
b. Pyramid-shaped Neo-Babylonian stamp seal, of chalcedony, BM 115607 © The Trustees of the British Museum.



The second “type” of material, impressions left on clay objects, produce what we will call composite seals (Fig. 15): the mirror image of the physical seal, reconstructed from the ancient impressions of the physical seal on clay objects. In cases where we have only one impression of a particular seal, then that impression is treated as the composite seal.

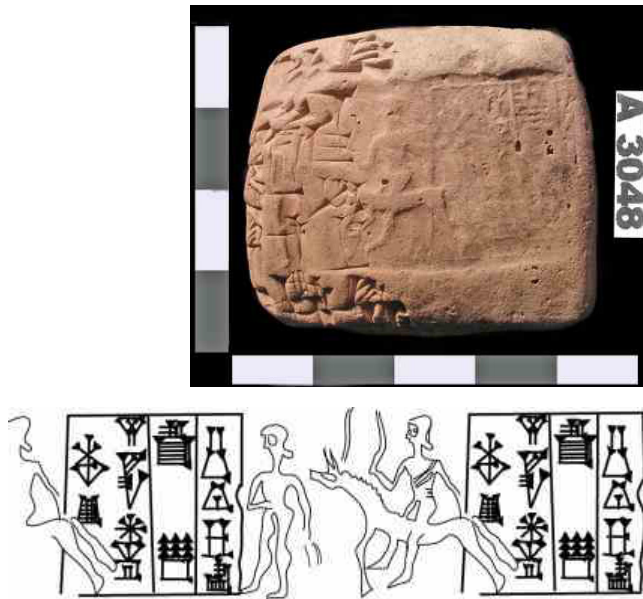


Figure 15

a. Impression of the physical seal of Abba-kala on a document from Puzrish-Dagan, OI A3048, photograph by the author © Oriental Institute, Chicago.

b. Ur III composite seal of Abba-kala, ht. 1.9 cm, drawing by the author;

It is extremely rare to have both the ancient physical seal and its ancient impression on clay objects. Hallo (2001: 252, 253: no. 43) documents two such confirmed cases for an Old Babylonian seal and a Kassite seal, while he also mentions two possible cases from the Ur III and the Old Assyrian periods (pp. 246–267). Radner (2012) recently confirmed a fifth case for the Neo-Assyrian period. This database would eventually facilitate such recognition and answer important questions regarding the function of seals. The main categories of the database will be briefly discussed here. These entail the included data, regarding both the physical seals and the composite seals.

3.1 Basic information

Basic information – such as the museum or collection number of the physical seal, publication data of the physical seal and the composite seal, and chronology – can be documented in the database. Chronology is a thorny issue that is still open to discussion, since it requires strict rules that must conform for example, to many different stylistic characteristics and many different geographic peculiarities. For the time being, the basic historical time periods are included, even if they do not conform to the time periods used in the field of art history.

Moreover, information on the provenance of the physical seal can also be documented. In terms of provenance, aside from the main excavation site and the square of the find spot, the spot's location can also be documented, if known, such as if the seal was found on the street, as a surface find, in a public building, or in a grave, rubbish dump, archive, storeroom/magazine, or room fill.

3.2 Iconography/design/style:

Iconographical information comes from both physical and composite seals. The main distinction is made between figurative and geometric **designs**, but after that one can focus on the **scene** appearing on the seal, such as human activity, warfare, presentations, master of animals, worship, mythological elements, sexual play, hunting, contests, boating, banqueting, proces-

sions, rituals and commemorative events, unidentifiable actions, and so forth. After then selecting the appropriate type of scene, one should identify the **elements** that appear there: for example, crafts, deities, filler motifs, emblems, body parts, astral symbols, architecture, heroic figures, and monsters. Then a free-text field may be used to describe the seal. This is considered as extremely important, since each case of art needs to be described by the art historian in different words, which cannot always fit in boxes. **Style** can also be included in the free-text field.¹⁸ Finally, an additional field is included to allow entering of information on the composition of the seal: whether it is circular, heraldic, in one-register or two-register, tête-bêche, triangular, vertical, and others.

3.3 Technology of the seal

Information on the technology of the seal can come from both composite and physical seals, but more details can only be obtained from the physical seal itself (Fig. 16). First of all, an identification of the **seal device** is made: whether the seal was a cylinder, a stamp, a seal-ring, an engraved amulet, or an engraved pendant. For the physical seals, more detailed information can be documented regarding the **seal form** of the cylinder or the stamp, using two drop-down menus describing the appropriate form. For stamp seals, it is possible to select an entry from Buchanan's typology (1984), while for cylinder forms, several possibilities are given: convex, concave, tall, or short, together with narrow and wide. Both fields can be left blank if the seal form is unclear.

The screenshot shows a complex database form titled "Information on Physical Seals". It is organized into several main sections:

- Seal preservation:** Includes fields for 'artefact_state', 'decoration_state', and 'seal_surface_preservation'.
- Seal Dimensions:** Fields for 'height', 'height_with_surround', 'diameter', 'width', and 'thickness'.
- Seal Chronology:** Fields for 'seal_period' (with a dropdown menu) and 'period_remarks'.
- Seal Publication:** Fields for 'seal_primary_publication', 'primary_publication_author', 'primary_publication_date', and 'publication_history'.
- Seal Collection Information:** Fields for 'collection', 'museum_no', 'accession_no', 'acquisition_history', and 'collection_remarks'.
- Technology:** Fields for 'seal_device' (dropdown), 'form_stamps(Buchanan1984)' (dropdown), 'form_cylinder' (dropdown), 'material', 'material_remarks', 'end_caps' (checkboxes for Yes/No, Metal caps, Imitation caps, Missing), 'incising_technique' (dropdown), 'incising_technique Remarks', and 'functional_modifications_remarks'.
- Seal Provenience:** Fields for 'provenience' (dropdown), 'provenience_remarks', 'excavation_no', 'findspot_square', 'findspot_location' (checkboxes for various locations like grave, public building, temple, palace, etc.), 'findspot_remarks', 'stratigraphic_level', and 'google_earth_provenience'.
- Depiction:** Fields for 'design' (dropdown), 'design_remarks', 'Scene' (dropdown), 'Common_Scene_elements' (checkboxes for Agriculture, Altar, Animals, Architecture, Astral Symbols, Boat, Body Parts, Composite beings, Crafts, Deities, Emblems, Filler Motifs, Furniture, Geometric design, Heads and Busts, Heroic figure, Humans, Landscape, Men, Monsters, Musical instruments, Mythical beings, Plants, Portrait, Royal Figures, Symbols, Vessels, Warfare, Women, Unclassified), 'Scene_remarks', 'Composition' (checkboxes for Circular, Triangular, Heraldic, Vertical, One_register, Two_registers, Tete-bêche, other), and 'Seal_Inscription' (checkboxes for yes/no, Language dropdown, Legend_type dropdown, Legend_description checkboxes for 1col, 2cols, 3lines, 4lines, 5lines, 6lines, 7lines, within_image, caption, seal_owner, and inscription_remarks).

Figure 16 A FileMaker database screenshot of the user interface for the documentation of information on physical seals.

18 For a discussion on defining “style” in Mesopotamian glyptic, see Dittmann 2001 and Fügert 2013: 39–44.

Regarding **end caps**, for the physical seals one can choose to document whether metal caps are still attached to the seal (Fig. 17a) or whether the seal had imitation ridged caps carved from the seal stone (Fig. 17b). For composite seals, however, one can document their existence based on the grooves at the top and bottom of the impression, but it is impossible to distinguish between real and imitation end caps. In this case, it is better to use the category of “uncertain”. If no signs of the grooves in other impressions of the same seal are visible, one can indicate that in the cutting technique section and choose “uncertain” in this field.

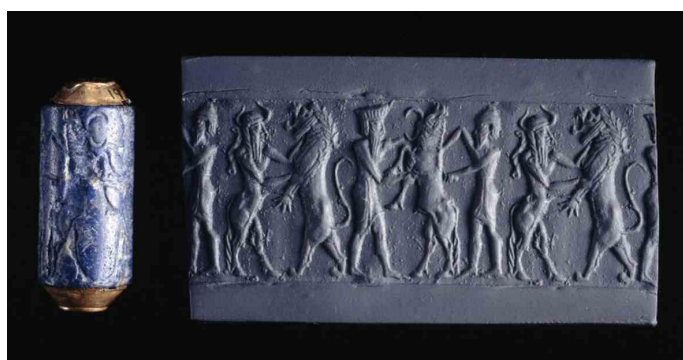


Figure 17

a. Cylinder seal of lapis lazuli with original gold mounting or ornamental caps and its modern impression, from the Royal Cemetery at Ur (2200–2100 BC), BM 121547 © Trustees of the British Museum;

b. Cylinder seal of hematite from the Ur III period, with imitation ridged caps carved from the seal stone, dia. 1.3 cm, 42.738 © The Walters Art Museum.



In the fields for **cutting technique**, one can fill in all additional information regarding the cutting of the seal: if it was re-cut, perforated, and so forth. This information is given in the drop-down menu, but it can also be added in the remarks field.

Regarding the **material** of the seal, one can choose from the drop-down menu basic categories of material from which the seal was manufactured, such as stone, clay, glass/frit/faience, metal, and rock crystal. In the remarks area, one can add more details about the material. For example, if stone was chosen in the previous field as the basic material, here one could indicate which kind of stone it is (e.g. serpentine, lapis lazuli, calcite, chlorite, chalcedony, hematite). If one is unsure of the type of stone, it is possible to describe its texture, hardness, and color.

In the field for **incising technique**, both a drop-down menu (including categories like cut, carved, drilled, filed, chipped, pecked, and mixed) and a free-text field are given, so that one can fill in all additional information regarding the incision of the seal (for example, if the seal was re-cut or perforated), as well as any other information one may have regarding the caps of the seal or other special features of the seal, such as handles, and gold settings. For the **measurements** of the seal, one can give the basic height, diameter, width, and thickness, as well as the height with surround, including the mounting and caps.

For physical seals only, one can also document information on the **preservation of the artifact**, the state of its decoration, and the preservation of its surface. These are categorized by means of drop-down menus, indicating whether the artifact is intact, almost intact or partial, whether the decoration is complete, almost complete, partial or destroyed, and finally whether the surface of the seal is pristine, worn, or damaged.

3.4 Sealing practice

Information on the sealing practice is attested only for the composite seals. This layout gives the possibility to document the physical details of the sealed object and the way in which the seal was impressed on that object. Five questions require answers in this schema: who, what, when, where, and how.

- 1) The answer to “who applied the seal” comes either from the text, the seal-legend, or an annotation below or above the seal on the document (for which see the role of the sealer, as well as the entry for the inscription below).
- 2) “What” refers to the actual sealed object, whether it is a document or a clay lump used to fasten doors, close bags, secure jars, and such.
- 3) “When” refers to the chronological timing of the act of sealing in relation to the writing of the document.
- 4) “Where” is answered by means of a grid for the exact place(s) in which a seal was impressed.
- 5) “How” refers to the orientation of the seal with regards to the writing, the pressure applied, and others.

Basic information on the sealed object, such as object type (e.g. tablet, bulla, jar sealing), as well as provenance and preservation of the sealed object, comes directly from the CDLI catalogue, although information can also be changed in an internal CDLI catalogue located in the database. If this change is deemed important for the main CDLI catalogue, then it will also be applied there in due time. New data on the sealing practice vis-à-vis the inscribed object can be added as well, such as the orientation of the seal with regards to the text on the sealed object (parallel, vertical, diagonal, mixed) and the seal level, in terms of whether the seal was applied on the document before or after the latter was inscribed (i.e. if the object was pre-sealed or post-sealed).

Information can also be provided on the exact place of the object that the seal was impressed on. This is feasible with the creation of a grid that overlays tablets, like the one pictured in Fig. 18. On the basis of this grid, one can choose the place where the seal was impressed (such as on the top left edge of the tablet, and the reverse upper left of the tablet) and enter additional information in a free-text field. An example can be briefly given here, indicating the importance and usefulness of such a grid for the documentation of sealing practices on cuneiform documents. On Middle Assyrian tablets from Assur dated to the thirteenth century, it seems that there was a prescribed place for each participant in the contract to impress his or her seal. The debtor sealed the top of the obverse (Postgate 1986: 11), the scribe would seal on the reverse side and sometimes the upper edge, and the witnesses sealed on the reverse and/or the left edge. A separate field is also provided to document the number of different seals impressed on the

same document. Schematic designs of tablets to indicate the places a seal was impressed on are not unknown in the literature (see, for example, D. Matthews 1991: 42; Blocher 1992a; 1992b; Voet 1991), but nonetheless such schematic designs are not normally used.

Information on the role of sealer in the sealed text (for example, terms as *kišib₃*, *maškim*, *šu ba-ti*, *giri₃* in the Ur III texts) can be embedded in CDLI ATF transliterations. ATF stands for ASCII Transliteration Format, which is employed by the CDLI project for its transliteration files.¹⁹ Within the ASCII transliteration file of the text, one can include “keys” to explicitly document the role of the sealer in the following way: `#key: sealinfo pn=ur-lugal role=kiszib3` (or in cases of more than one seal impressed on the same document: `#key: sealinfo seal=1 pn=ur-ba-ba role=maszkim`).

This information can also be added for the caption in the text. Here “caption” means the notation on the tablet, which is related to the identification of the sealer in mostly unscribed seals (see the discussion on sealing practices above). For example, one can code this accordingly: `#key: caption seal=1 pn=ur-ba-ba role=maszkim`. For more on the transliteration capabilities of the seals database, see section 3.5 below.

For sealings (i.e. lumps of clay impressed with a seal) on jars or doors, information can be provided on any underside markings (matting, textile, rope marks, peg, leather, vessel, etc.), as well as any other markings on the sealing, such as fingerprints, nail marks, fingertips, straw markings, and others (see discussion above in section 2.2).

3.5 Inscription

Inscribed seals first appeared in the Early Dynastic period, when the “legend” of the seals most commonly included the seal owner’s personal name and his or her patronymic. In the Akkadian period, many seal legends also bore the owner’s professional affiliation.²⁰ In the Ur III period, there appear inscribed seals also denoting the seal owner’s servitude, either towards the king, a deity, or other individuals. The same applies also to the Old Babylonian period, while in Late Old Babylonian and Kassite seals there appear legends with a short prayer; incantations appear only on Kassite seals. From the Mittanian period onwards, seals were only rarely inscribed.

The inscription was cut vertical to the design of the seal. By Achaemenid times, the rotation changed to 90° and could now be read horizontally (Gelb 1977). Interestingly, while on most seals of the third and second millennia BC the inscription was cut in negative so that when impressed on a clay object it would be positive and thus legible, on many seals of the first millennium the legend was cut in positive (Collon 2001a: 17; 2007: 111; and here Fig. 11a).



Figure 18 Grid on a tablet, regarding the division of places used for its sealing.

¹⁹ See <oracc.museum.upenn.edu/doc/builder/cdli>.

²⁰ For inscribed seals of the Early Dynastic and Akkadian periods in Mesopotamia, see Rohn 2011.

Basic information on the inscription of seals can be included in the FileMaker database. This information entails the language of the inscription, the type of the seal legend (simple, simple servant, royal servant, prayer, incantation, etc.), a description of the legend (number of columns and number of lines), and the name of the seal owner. The complete transliteration of the seal is given in a separate ATF file, following the standardized transliteration practices of CDLI. The transliteration of a composite seal in an ATF file would be:

```
&S000536 (this is the number of the seal as in the FileMaker Database)
#atf: lang sux (the language of the inscription; in this case "sux" stands for Sumerian)
@object composite seal (this line denotes that the object is a composite seal)
@column 1
1. [ {d}szu]-{d}suen
2. lugal kala-ga
3. lugal uri5 {ki}-ma
4. lugal an-ub-da limmu2-ba-ke4
@column 2
1. a2-bi2-[a-bi]-ih
2. sagi
3. urdu2-da-ni-ir
4. in-na-[ba]
```

4. THE TECHNOLOGY AND INFRASTRUCTURE BEHIND THE DATABASE

The design of the database began in December 2008. At first, it was a FileMaker database that was put online using the FileMaker Instant Web Publishing function. This was funded by a four-month postdoctoral position at the Max Planck Institute for the History of Science in Berlin. When multiple users accessed the database simultaneously on the web, it became obvious that there were many problems. It was thus decided that the database should be created and maintained in FileMaker, but presented on the web using technology similar to the system used by the CDLI, which serves about one million pages per month, facilitated also by the expertise of the IT group of the Max Planck Institute for the History of Science.

Thus, the database was initially created at the Max Planck Institute for the History of Science (MPIWG) in Berlin in cooperation with the Cuneiform Digital Library Initiative (CDLI). It was comprised of a catalogue (a FileMaker database), images, and a transliteration server for the epigraphic seals, all of which were hosted at UCLA in Los Angeles. The web interface was developed at the MPIWG in Berlin by Robert Casties, and it was hosted in both Berlin and Los Angeles. Catalogue data on the tablets and seals was entered and edited online in FileMaker databases on the L.A. server using a FileMaker client. Transliterations of tablets and seals in ASCII Transliteration Format (ATF) were kept on a separate transliteration server, while images of sealed tablets and seals were stored on the L.A. server; high-resolution files were archived and lower resolution files for online reference were kept on the web server.

In what follows, we describe the data flow used in the seals database project for archival storage and web presentation.

4.1 Archival storage

The main catalogue (a FileMaker database) is hosted on a FileMaker server at UCLA in Los Angeles, together with the main catalogue of the CDLI project. The images and the transliteration server used for the epigraphic seals are also hosted in Los Angeles. The web interface, developed in Berlin but also hosted in Los Angeles, combines all three, with mirrors of all services in Berlin.

4.2 Structure of the FileMaker database

Two files are currently used for the temporary seals database: the seals database and the main catalogue of CDLI tablets (CDLI_cat) from Los Angeles. The seals database has been structured as a relational database and is based on the Seal_ID, which is a combination of “S” and six digits. This field cannot be changed or edited, and the ID is automatically generated with the creation of a new record. The seals database has four different internal tables: 1) all_seals, 2) physical_seals_only, 3) composite_seals_only, 4) and cdli_cat_local. There is also the external database of cdli_cat (Fig. 19).

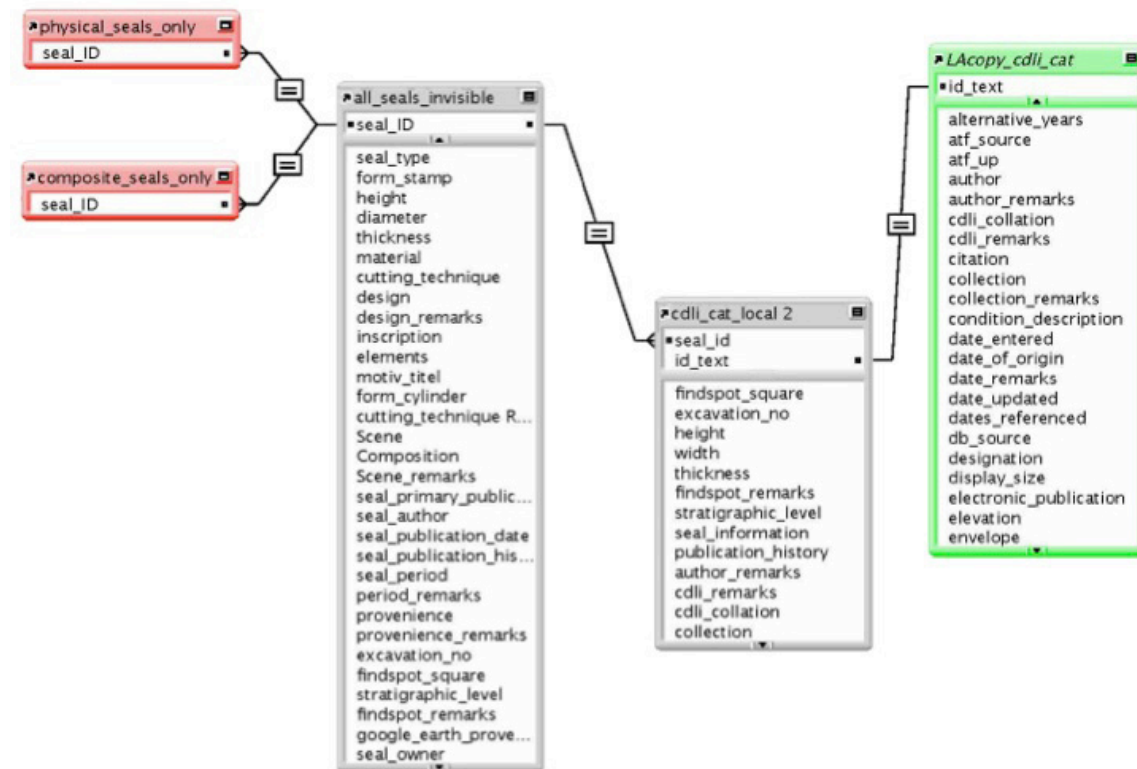


Figure 19 Schematic structure of the FileMaker database.

The first table (all_seals) is the main database for all types of seals: composites and physical. It has 48 defined fields, which are relevant for both composites and physical seals. Most of these fields are pre-organized, and there is a drop-down menu to include data in these fields with specific lists of values. Thus, this table acts as the main repository for information on seals and seal composites.

The two other tables (physical_seals_only + composite_seals_only) are views linked to the first table by the seal_ID. All information written in these two tables is directly inserted into the

all_seals table. These two tables do not have any fields of their own, apart from the seal_ID, which is necessary for the creation of the relations. The inclusion of these two different views was deemed important for the input of new information, due to the nature of the database. Each of these two tables has related fields according to the type of entry: one table is for composite seals and the other for physical seals.

The main table (all_seals) is related to the seal impressions table (cdli_cat_local), which includes some extra fields for additional information on the sealing practice (four new fields), and it also has some extra values in some lists of values (for example, in the object_type). These two tables are linked with the seal_ID. This “seal impressions” table is used for instances of composite seals (via portals and different layouts), and it enables the inclusion of new data related to sealing practices for objects already included in the L.A. CDLI_CAT tablet catalogue and already having a P-number. It also allows for the creation of new records of objects, which are given a provisional ID (instead of a P-number) to be included later in the L.A. CDLI_CAT with a P-number. The content of most fields in this table are taken from a copy of the L.A. full CDLI_CAT, which is used only externally here. It is not possible to change the fields in the L.A. original version; one must instead extract the relevant information from there.

There are 12 different layouts corresponding to these four internal tables. These facilitate viewing of the records in the FileMaker catalogue and the input of new data. By using scripts, one can go from one layout to another and from one table to another with the push of a button.

4.3 Structure of the online presentation interface (by R. Casties)

The CDLI online presentation system consists of four parts: the FileMaker master catalogues for tablets and seals on the L.A. FileMaker server, the SQL database for online content, the transliteration server, and the web application front-end server.

The catalogue data on tablets and seals was entered and edited in the FileMaker databases on the L.A. server over the network by means of a FileMaker client. The full catalogue is exported every day into an XML file that is imported into the SQL database, which has a read-only copy of all catalogue data and information about the available image files.

Images of tablets and seals – photos and line-art hand copies – are put on the L.A. server. The file names include the tablet or seal ID and the type of image. High-resolution files are archived and web-resolution files are kept on the web server.

Transliterations of tablets and seals in ATF format are kept on a separate transliteration server. The transliterations can be added and updated through a frontend on the web. The transliteration server also allows full-text searches in all transliterations.

The web frontend for the catalogue was written using the Zope web application framework. The frontend offers searches in catalogue fields that can be combined with full-text searches in the transliterations. The results can be presented in compact lists with optional images and transliterations or can be browsed, with a full page per object. Complete searches can also be called up with a single link, which is also used in the presentation of collections. The web frontend also offers easy access to the full-object pages by their object ID. In this way, references to objects can be embedded as links in electronic publications, as exemplified in the CDLI articles accessible through the CDLI page.²¹

21 See, for example, the article at <cdli.ucla.edu/pubs/cdlj/2012/cdlj2012_001.html>.

The web frontend of the catalogue pulls the information for searches or even the display of one page from different sources. Catalogue information comes from the SQL database, while transliteration texts come from the transliteration server and images from the web server. The web server also hosts pages with information on the CDLI project and the collaborative CDLI wiki.

The screenshot shows the CDLI search interface with the following elements:

- Header:** "cdli" logo, "Search composite and physical seals" title, and "Search Form Copyright" link.
- Representation of results:** Radio buttons for "Concise list of results", "List of results with images" (selected), and "Browse".
- Number of results:** Radio buttons for "1", "10", "50", "100" (selected), and "1000", followed by "records to be shown".
- Type of object:** A dropdown menu showing "physical or composite".
- Seal owner's name:** A text input field and a "Sort by" radio button.
- Legend transliteration (e.g. "dumu"):** A dropdown menu showing "part of word" and a text input field.
- Legend type:** A dropdown menu showing "Inaba".
- Legend description:** A grid of checkboxes for "1col", "2cols" (checked), "Within image", "caption", "1 line", "2 lines", "3 lines", "4 lines", "5 lines", "6 lines", "7 lines", "8 lines", and "9+ lines".
- Scene:** A dropdown menu showing "Presentation".
- Provenience, Period, Collection, Seal ID:** Each has a text input field and a "Sort by" radio button.
- Buttons:** "Start Search" and "Clear Form".

Figure 20 Screenshot of the web-interface search page

5. CURRENT STATE OF RESEARCH

The online presentation of the database at the mirror website of the CDLI project of the Max Planck Institute for the History of Science in Berlin is currently on hold, since collaboration has been postponed. The Cuneiform Digital Library Initiative very recently announced the creation of a new project on seals and sealings, which is based on this database and now available online,²² but it is concerned only with the documentation of the epigraphic components of seals and sealings (Englund 2014). Similarly, seal attestations on tablets from the Ur III period at the Database of Neo-Sumerian Texts (BDTNS) are also documented,²³ but again the focus is on the inscription of the seals and naturally restricted to the Ur III period. Thus, the need for a holistic approach to the documentation of seals and sealings is even more critical nowadays.

It is envisaged that this database in due time will be freely available online for everyone to use. It is hoped that this will be the first step in establishing an online Corpus of Near Eastern Seals and Sealings, following the paradigm of the CMS project (Corpus der Minoischen und

22 See <cdli.ucla.edu/projects/seals/seals.html>.

23 See <bdtns.filol.csic.es>.

cdli Search composite seals in cdl catalog Access System Inform
Search Form
Copyright

Representation of results Concise list of results List of results with Images Browse

Number of results 1 10 50 100 1000 records to be shown

Seal

Seal owner's name: Sort by

Legend transliteration (e.g. "dumu") Advanced search syntax

Legend type:

Legend description:

1col 1 line 5 lines 9+ lines
 2cols 2 lines 6 lines
 Within Image 3 lines 7 lines
 caption 4 lines 8 lines

Scene:

Sealed Object

Object type Sort by

Provenience Sort by

Period Sort by

Date Sort by

Collection Sort by

Text search within sealed object (e.g. "kiszib3") Advanced search syntax

Figure 21 Screenshot of the web-interface search page

Mykenischen Siegel).²⁴ However, we look forward to moving even further: the possibilities opened by such a database are countless for an understanding of the evolution of scenes, motifs, local styles, spatial distribution, uses, and functions. This can be realized by connecting the database to GIS programs and annotating the images (photos and drawings) by possibly using or building software that is similar to the “HyperImage”.²⁵ With continued research and funding, a second phase of the project will focus on the visual 3D documentation of seals and sealings, dispersed in collections and museums around the globe.

The reader will have noticed that very rarely in the text is an average number of seals, sealings, or seal impressions given. This is due to the difficulties in calculating even approximately



²⁴ See <www.uni-heidelberg.de/fakultaeten/philosophie/zaw/cms>.

²⁵ See <www.uni-lueneburg.de/hyperimage/hyperimage/>.

cdli

Search result
 Record 1 to 8 of 8 found

[Access System Information](#)
[Search Form](#)
[Copyright](#)

<p>Fs Pettinato 160, 167 01</p> <p>Collection Museum no. CDLI no. S000082 Provenience Period Ur III Item composite Measurements (mm)</p>		<pre> @object seal @column 1 1. {d}szul-gi 2. nita kala-ga 3. lugal uri5(ki)-ma 4. lugal an-ub-da limmu2-ba @column 2 1. e2-a-ni-sza 2. lukur-kaskal-la-[ka]-ni-ir 3. in-na-[ba] Revisions: 1: 2011-02-11 06:19:57 by christina </pre>
<p>Fs Pettinato 160, 167 02, 169 02</p> <p>Collection Museum no. CDLI no. S000093 Provenience Period Ur III Item composite Measurements (mm)</p>		<pre> @object seal @column 1 1. {d}szul-gi 2. nita kala-ga 3. lugal uri5(ki)-ma 4. lugal an-ub-da limmu2-ba-ke4 @column 2 1. gams2-[d]nin-lil2-la2 2. ki ag2-ga2-ni-ir 3. in-na-ba Revisions: 1: 2011-02-11 06:19:57 by christina </pre>

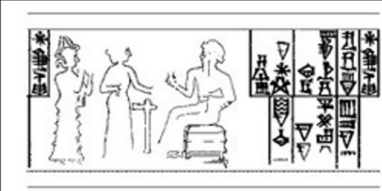
cdli

Text display: Fs Pettinato 160, 167 01

[Access System Information](#)
[Search Form](#)
[Copyright](#)

<p>Collection Museum no. CDLI no. S000082 Provenience Period Ur III Measurements (mm)</p>	<p>Source of original files:</p> <p>Catalogue: CDLI staff via</p> <p>Transliteration:</p> <p>Photographic: If not otherwise indicated, images were prepared by CDLI staff. For copyright, click here.</p> <p>Line art: If not otherwise indicated, line art drawings are to be credited to primary publication author(s).</p>
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[View full catalog entry](#)

	<pre> @object seal @column 1 1. {d}szul-gi 2. nita kala-ga 3. lugal uri5(ki)-ma 4. lugal an-ub-da limmu2-ba @column 2 1. e2-a-ni-sza 2. lukur-kaskal-la-[ka]-ni-ir 3. in-na-[ba] Revisions: 1: 2011-02-11 06:19:57 by christina </pre>
---	--

Objects that were Impressed with this seal
P320488/Sealing(1480)

Figure 22 Screenshots of the results page.

the thousands of seals that exist in collections and museums around the world; the same applies to sealed documents. We could give an idea of the magnitude of cylinder seal production for the Ur III period alone by providing here the number of reconstructed seals (composite) that were impressed on documents from Umma (Mayr 1997) and from Drehem (Tsouparopoulou 2009; forthcoming): 900 and 550, respectively. Two British Collections, the British Museum and the Ashmolean Museum, together house more than 5,000 stamp and cylinder seals. The British Museum boasts (numbers are approximate): 480 cylinder seals (“physical” seals) dated to the Akkadian, Post-Akkadian, and Ur III periods (Collon 1982); 650 cylinder seals dated to the

Isin-Larsa and Old Babylonian periods (Collon 1986); 820 stamp seal impressions dated to the first millennium and impressed on tablets, bullae, and jar handles (Mitchell & Searight 2008); and 390 Neo-Assyrian and Neo-Babylonian cylinder seals (Collon 2001a). The Ashmolean Museum contains over 1,200 cylinder seals dating from the Uruk to the Achaemenid period, with many seals also coming from the Levant (Buchanan 1966), and over 1,300 stamp seals dating from the fifth millennium to the first millennium (Buchanan 1984; 1988). Currently our database has 3,000 entries, and it is expected that in due time the database will appear online again.

In creating this database, we have tried to address the various needs and terminologies used in many different periods and styles of Mesopotamian art history. Therefore, since this is an ongoing project, we wholeheartedly welcome comments and critiques from as many colleagues as possible, be they Assyriologists, archaeologists, art historians, or experts in the digital humanities.

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