Spheres of interest: Hollow clay balls at the dawn of ancient Near Eastern history

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ABSTRACT:
This paper discusses hollow clay spheres containing clay symbols ("tokens") from sites of the prehistoric and early historic Near East. A list of them is provided, and an interpretation as information conveyors to sites with central functions is suggested. The hollow clay balls (HCB) represent an important source for the administration of the socially engineered flow of goods in the preliterate societies of Western Asia, and they do constitute a predecessor of writing.

KEYWORDS:
prehistory; archaeology of the ancient Near East; reciprocity; redistribution; tokens of clay; writing

The beginnings of literacy in the ancient Near East have received considerable attention, and remarkable progress has been achieved in terms of our knowledge of the cuneiform script, one of the earliest manifestations of writing culture in the history of mankind. In recent times, attempts have been made to elucidate the emergence of cuneiform signs with the aid of the small clay objects of geometrical shapes, "tokens", which have turned up in a number of excavations of Near Eastern sites (see, for instance, Schmandt-Besserat 1980 and most recently MacGinnis — Monroe — Wicke — Matney 2014; for a critical stance, see Bennison-Chapman 2019).

Such "tokens" have frequently appeared within hollow clay balls or spheres (henceforth HCB), the surface of which bears impressions of either stamp or cylinder seals, and which contain small clay objects of geometrical shapes, the so-called tokens. These complex objects constitute the target of my present study, as one of the first efforts to create a comprehensive system of visual and tangible symbols used for the communication of commonly acknowledged semantic units.

The HCB have recently been the theme of a thorough and inventive review by R. Dittmann (Dittmann 2012). Thanks to him, we now know that chronologically speaking, the HCB belong to the Late Chalcolithic phases 3 to early 5 (op. cit. 73–74), and that they appeared over an extensive area of the ancient Near East delimited by the sites of Hacınebi in SE Anatolia, Hamoukar in NE Syria, Chogha Mish in SW Iran and Uruk/Warka in S Mesopotamia (op. cit. 72). A fairly instructive picture of HCB chronology follows from the recent excavations at Susa Acropole I. At this site, evidence for cylinder-seal use first turned up in layer 20, followed by the first occurrence of an HCB in layer 19 and their persistence in layer 18 (see also Boehmer 1999: 119). In the latter layer, HCB were found with round tablets bearing numerical signs and

cylinder-seal impressions. From layer 16, only rectangular tablets bearing signs of writing and cylinder-seal impressions remained in use (Amiet 1994: 90–91; Dittmann 2012: Fig. 4 on p. 71; on the stratigraphy, see also Dahl — Petrie — Potts 2013: 354–357).

As to the iconography of cylinder seals impressed on HCB (Dittmann 2012: 75–80), the lion motif (see op. cit. 77 Fig. 8 for the distribution of such icons at Jebel Aruda) has recently received an important supplement from the Late Chalcolithic Tell Brak (McMahon 2009). Seal impressions from Tell Majnuna, dated to Late Chalcolithic 2–3, articulate in compositions depicting a fight between a lion and a naked hero, and lions confined in cages and/or nets, the ideas of conflict with, victory over, and control of powerful nonhuman forces by the paragons of human civilization.

Dittmann further observes that in known cases, the HCB appeared in domestic structures (Dittmann 2012: 78–80 — Chogha Mish, Gebel Aruda; on the Susa context, see now Dahl — Petrie — Potts 2013: 356). Though natural-history analyses have been very rare up to now (but see below), I think that we will agree with Dittmann's proposal that in most cases, local clays probably served for the formation of the HCB (Dittmann 2012: 80–81); the fragility of HCB has been noted by the excavators of Chogha Mish (Delougaz — Kantor — Alizadeh 1996/I: 121). However, we shall much appreciate a thorough analysis of the clay of the HCB, similar to that performed on the sealings of Tepe Gawra (Rothman — Blackman 1990). There are exceptions, e.g. analysis of the Tepe Yahya HCB has shown that its clay is of nonlocal origin (Schmandt-Besserat 1980: 363 n. 28).

The HCB bear impressions of cylinder seals, and occasionally also of stamp seals (Dittmann 2012: 80). As to the tokens enclosed within the HCB, a list has been supplied in 1980 (Schmandt-Besserat 1980: 368, 369 Fig. 6). Since then, a review of the Uruk situation has been published (Boehmer 1999, see below).

In this brief survey, I have decided to operate on the "functionalist" line, attempting to characterize the *Sitz im Leben* of the HCB according to the archaeological evidence available. I am concentrating on the HCB, and do not take into account the solid, mostly elongated "bullae" (= tags), or any other solid clay objects including pot lids.

I wish to add one more note here. Most students of the ancient Near East work on the assumption that cylinder and stamp seals constituted personal markers of individual human agents. This remains to be proved. I have pointed out the fact that with the onset of the Late Uruk period, seals vanished from graves and appeared among the *suppelectilia* of the foci of social life instead (Charvát 1992: 281–282; Charvát 2005b: 395–396). A case in point is Chogha Mish itself, where a small hoard contained beads and a cylinder seal (Delougaz — Kantor — Alizadeh 1996/I: 110). When Late Uruk graves are found, they contain stamp seals only; Tell K of Tello, Lagaš, for instance, has yielded Uruk-age burials with stone vessels and stamp seals (Huh 2008: 270–271). Similarly, out of the 370 interments of the "Jamdat Nasr Cemetery" at Ur from the end of this period, only two contained cylinder seals (Legrain 1951: 12 No. 73, 13 No. 88, on the cemetery, see Sürenhagen 1999: 109–143).

I thus operate under the assumption that while cylinder seals constituted institutional signs of office, stamp seals represented ensigns of human individuals.

1. TELL SABI ABYAD, SYRIA

This is the earliest find known to date, from the turn of 7th and 6th pre-Christian millennium (6050–6020 cal. B.C., Akkermans et al. 2012: 309). The find is so unusual that it seems advisable to follow closely the words of the publication (Akkermans et al. 2012). It appears that sometime between 6050 and 6020 BC, a young woman died at Tell Sabi Abyad. Her body was laid to rest on the floor of a T-shaped building, designated V6 by the excavators, with one half of a mace head placed in her hand, and covered with soil (op. cit. 313 Fig. 6). The building in question consisted of three parallel rows of small rooms, with a long but narrow room (divided into two smaller compartments) at a right angle in front of them (op. cit. 307, 312 Fig. 5). By the time of the woman's burial, the building did not contain many artifacts.

Following the internment, the building was set on fire, which burnt the walls throughout and accumulated thick deposits of ash and burnt debris. The roof of the building was still in place, but it gradually collapsed as a result of the intense fire. A large number of objects found their way into the building either prior to or during the burning event. All material categories, such as ground-stone tools, bone tools, clay objects, administrative objects, pottery containers, objects of personal adornment, and so on, are represented (Akkermans et al. 2012: 321). The burnt debris also yielded large numbers of animal bones (op. cit. 322, n. 7).

The artifacts from this locus included 36 sealings from Rooms 1 (n = 8), 3 (n = 8) and 5 (n = 20). All sealings showed stamp-seal impressions and/or fingerprints. Their fragmentary state indicates that the originally sealed objects had been opened. Among the sealings, there were also four *bullae* (= HCB, pch) with the impressions of tokens inside them found in rooms 3 (n = 3) and 5 (n = 1). Small clay tokens — counters for administrative purposes — occurred in spherical, oval and conical shapes (Akkermans et al. 2012: 316).

When the fire died out, all the objects were left inside the building, and no attempt was made to restore the house to a habitable condition. Although new architecture was erected around it, the building, it seems, remained in its final state of destruction, barred from any possible future practical use for dwelling or storage. The excavators believe that the "deliberate, violent destruction of the building by fire had an important symbolic meaning to the villagers" (Akkermans et al. 2012: 322).

2. DEĞIRMENTEPE, TURKEY?

One of the very early instances in which the HCB might have turned up concerns the Eastern Anatolian site of Değirmentepe (Helwing 2003: 71–74 with refs.; Gurdil 2010). Layer 7 of this small site, submerged now under the waters of the Karakaya dam, displays several tripartite buildings with large central halls and rows of small rectangular rooms adhering to their longer sides. This phase of the settlement was protected by a brick rampart, and the major architecture bears traces of 3–4 rebuilding phases (Esin 1985: 253–254; Esin 1994: 59). Some of the tripartite buildings showed, in their interiors, painted images of the sun and trees on the whitewashed walls of their cen-

tral halls (Helwing 2003: 71). In addition, such halls contained ovens, and neonates (and, in one instance, a dog) found their last resting places by these ovens. Pits filled in by burnt animal bone, pottery sherds, and slag, seal and sealing finds frequently accompanied such kilns. One of the *podia* erected in these halls showed traces of pigment (now colored orange) in cavities on its surface (op. cit. 71–72).

Excavations of layer 7 at Değirmentepe brought to light some 450 sealings (Esin 1994: 66). Most of these came from mobile containers — pots, bales, sacks and the like. Sealings, including "bullae", occurred in quantity in an area characterized by workshop refuse (Helwing 2003: 73). Yet it may be questioned how far the term "bullae" has been used by the excavator to denote sealed objects falling under the HCB category. Ufuk Esin does refer to "real bullae" (Esin 1985: 255b; cf. Esin 1994: 69 "bullae"), but the example she cites (Esin 1985: 261 Pl. 3 : 1, republished in Esin 1994: 67 Fig. 7 : 1) displays the form of a flat clay disc bearing a seal (?) impression. It thus rather resembles the sealing category later referred to as "test strips". Nevertheless, only a part of the Değirmentepe sealings has been published as yet, and we cannot exclude that HCB remains will surface among the finds from this site in the future.

2A. TELL MASAIKH IN NORTHERN MESOPOTAMIA?

New excavations at this polycultural site on the Euphrates River by Terqa yielded a clay artifact with seven impressions of the same Halafian-style seal impressions with a linear pattern (Poli 2015: 348, Sounding D). It is not clear whether this artifact may be considered a bulla fragment, but it must be registered for completeness of the source base.

3. CHOGHA MISH, IRAN

This Protoliterate city, probably falling into a period close to Susa, Acropole I, 17 (Delougaz — Kantor — Alizadeh 1996/I: 102), has yielded a sizeable group of HCB (ibid.: 120–121, 125–133; Delougaz — Kantor — Alizadeh 1996/II: Pls. 34–40). Dittmann's mapping of these finds (Dittmann 2012: Fig. 10 on p. 81) shows that in the West and East areas, the local HCB were mutually exclusive with "lock" sealings ("0 sealed bullae"). If this were so, and upon the assumption that the "lock" sealings document redistribution of the produce of the relevant institution (Charvát 1992: 281–283; Charvát 2005b: 395–396), the HCB would thus have marked property transactions crossing competence boundaries and coming in from outside of the property sphere of the institution in question.

In fact, the HCB appeared throughout both sectors, and also under the High Mound.

— Within the East area, they turned up in R17:212 (Delougaz — Kantor — Alizadeh 1996/II: Pls. 34, 39, 264: 6 items), R17:408 (ibid.: Pls. 37, 264: 1 item), R18:312 (ibid.: Pls. 35, 36, 39, 264: 19 items), R21:509 (ibid.: Pls. 37, 260: 1 item) and north of Q18:308 (ibid.: Pls. 38, 264: 3 items), for a total of 30 items.

— Within the West area, they appeared at H14:304 (Delougaz — Kantor — Alizadeh 1996/II: Pl. 34, 265: 2 items), Trench VI (ibid.: Pl. 34, 260: 2 items), H14, Sounding C (ibid.: Pls. 34, 260: 2 items), Sounding C South (ibid.: Pls. 37, 260: 4 items), H14, Trench IX (ibid.: Pls. 34, 260: 3 items), J14:305 (ibid.: Pls. 38, 265: 2 items) and H14:310 (ibid.: Pls.38, 265: 2 items), for a total of 17 items.
— The High-Mound finds appeared in a sounding situated on its slope, and thus presumably documenting finds thrown into rubbish as no longer necessary: N9:302 (ibid.: Pls. 36, 260: 4 items).

Most of the Chogha Mish finds come from domestic architecture and pits (Dittmann 2012: 80), more particularly from pits and pottery deposits (Delougaz — Kantor — Alizadeh 1996/I: 126, "100% of the bullae"). They repeatedly occurred in groups. One case comprises four items on a floor near a wall at the western edge of R17:212 (op. cit. 120). The excavators reaped a much richer harvest with a group of 21 complete or fragmentary HCB, found "in a hole that had been scooped out anciently immediately below the bottom course of the almost completely eroded east wall of room R18:312" (op. cit. 120–121). Were these actually "records on file", or are we dealing with (evidence for) a foundation deposit? In the 24 HCB from R18:312, at least 15 different seals marked the "equators", and none of them impressed the "poles" of the deposit HCB. Over half of these designs occurred on one HCB only. In four instances, single seals impressed two balls each in "equatorial" positions (op. cit. 131). These four HCB also bear imprints of one single "polar" seal. If there was more than one design on a single HCB, no "equatorial" seal marked the "polar" positions, and *vice versa* (op. cit. 132).

Moreover, when HCB occurred in common contexts with other types of sealings like the "locks", the HCB seals never marked the other sealed materials (Delougaz — Kantor — Alizadeh 1996/I, 131). The majority of HCB were obviously broken open in antiquity (op. cit. 121).

The excavators of Chogha Mish also discuss the sequence of closing the HCB (Delougaz — Kantor — Alizadeh 1996/I, 125). After inclusion of the clay tokens, the ball received an "equatorial" cylinder-seal impression along its greatest circumference, with one to two "polar" sealings in the spaces left untouched by the first rolling. Sometimes just one matrix produced both the "equatorial" and the "polar" sealing. One such item displays an image of rampaging lions and a human figure (op. cit. 125); on this, see above for the new seal evidence from Tell Brak. In other cases, just one seal marked both "polar" positions of an HCB. With more than two "polar" sealings, the upper and lower poles do not share designs. Singular HCB bore impressions of up to three cylinder seals, and up to three stamp seals.

A review of the iconography of the Chogha Mish HBC seals has been provided by R. Dittmann (Dittmann 2012: 85).

The local situation at Chogha Mish thus allows the following observations.

1. The spatial distributions of finds of HCB and "lock" sealings are in direct proportion to each other: the more "locks", the more HCB at the particular subsites (next to none at High Mound, more in the West area, most in the East area, according to Dittmann 2012: Fig. 10, p. 81). This implies that the HCB belong to the same cat-

egory as the "locks" — namely, to the sphere of redistribution of (presumably) material goods of which Chogha Mish represented one of the period's foci.
2. However, the seals that marked the "locks" and the HCB differ, and thus the HCB initiators must have come from outside Chogha Mish. Clearly, two goods-delivery modes may be seen: those coming in from the estates belonging to the local elites *sub sigillo* (= mobile-container sealings), and those delivered in accordance with a generally acknowledged information-treatment procedure producing the HCB, *sub signo* (= HCB).
3. The fact that the HCB bear predominantly cylinder-seal impressions probably indicates that the HCB reflect the activities of institutions.
4. Such institutions, delivering commodities *sub signo*, probably displayed at least two mutually exclusive competence spheres: "equatorial" sealings never mark the "polar" positions, and *vice versa*.
5. The presence of stamp-seal impressions on HCB probably visualizes the participation of human individuals (co-signing or counter-signing? see Pittman 2001: 422).

4. SUSA, IRAN

The Susa finds of HCB have been commented on extensively by R. Dittmann (Dittmann 2012 with refs.; see also Schmandt-Besserat 1980: 359–361, and n. 12 on pp. 361–362 for a list of them). In this part of my paper, I shall return to the results of my short-term study of the Susa sealings which I carried out in the Louvre Museum in 1985, with the kind consent of M. Pierre Amiet, then Director of the Département des Antiquités Orientales du Musée du Louvre, who also suggested to me the idea of studying impressions of the same seal on different carriers. I acknowledge my debt of gratitude to him for his friendly help, and for the kind consent to publish my findings.

The Susa HCB, of which some fifty items have been accumulated in the course of archaeological activities lasting over almost a century, first entered the archaeological record in 1907 (Amiet 1986: 75), but were first published only in 1921–1923. The excavators noted that at least in one instance, the finds rested along the base of a wall (Schmandt-Besserat 1986: 94, 108). The de Mecquenem expedition found "numerous envelopes (= HCB, pch) and tablets in what appears to have been a large lens about 30 cm deep, which may represent a dump of archival material" at the depth of 17,50 m in their *Sondage 2* at the southern end of the *Acropole* tell. The architecture of this context has a *pisé* character with large cones, divided into small compartments about 2 m "in size" (op. cit. 96). The HCB finds seem to be confined to the southern part of the *Acropole* tell, with next to none occurring in its northern half (op. cit. 106).

Modern excavations in 1969–1978 contributed an assemblage of administrative material including HCB (for its chronology, see above) from a building also located in the *tell*'s southern part. The architectural unit from which they came, rebuilt several times over the period of the levels 18, 17A and 17B, displayed a marked absence of any rubbish layers, which points to the possibility that these were not standard living quarters. Five consecutive floors yielded a quantity of archival material, scattered on large surfaces of the floors; D. Schmandt-Besserat sees this as evidence for an ad-

ministrative discard (Schmandt-Besserat 1986: 107–108; see also Schmandt-Besserat 1980: 378). The Susa HCB contained predominantly cylinder- and sphere-shaped clay tokens (Schmandt-Besserat 1986: 108) and bore markings of up to four seals (Schmandt-Besserat 1986: 112; a list in Schmandt-Besserat 1980: 367 n. 40). At least some of the HCB were fired at low temperatures (Amiet 1986: 85).

The iconography of the Susa HCB, and its differences from the Chogha Mish *répertoire*, again received the attention of R. Dittmann (Dittmann 2012: 78, 85). He pointed to the fact that unlike Chogha Mish, where the themes depicted frequently pertain to the economic and production sphere, sealings of the Susa HCB include scenes likely to be drawn from the symbolic world.

Individual cases clearly delineate the differences between the Susa and Chogha Mish HCB sealings.

1. A stamp seal showing a squatting figure and rectangular figures in front of a facade with "flag" (Amiet 1972: No. 456 p. 66, Pls 4 and 60) impressed three HCB fragments (Sb 1948, Sb 1974 and Sb 5355). On find No. Sb 1948, the icon is combined with a "storage unit" scene (Dittmann 2012: 85). The inner surface of Sb 5535 bears unclear impressions of two triangular (?) and two round tokens.
2. Another stamp seal showing a cattle-copulation scene (Amiet 1972: No. 458 p. 66 Pls. 4 and 61) marked two items: Sb 5306, showing on the reverse an even surface tied over with cords or laces, and Sb 6944, from an HCB with a reverse impression of a cord passing through a lug excised in the thickness of the HCB's wall. This shows that the Susa HCB were meant to be carried around, possibly before the final official control procedure, after which they were simply discarded. Another possibility is that of a string bearing tokens and passing through the clay of the HCB (see for instance bulla No. 4523 of the Schøyen collection: http://www.schoyencollection.com/mathematics-collection/pre-literate-counting/bulla-string-tokens-ms-4523 [accessed 25.11.2019]). Fine perforations are visible on other Susa HCB (Schmandt-Besserat 1980: 363).
3. A cylinder seal depicting a "master of snakes" and a heraldic composition (Amiet 1972: No. 482, p. 86, Pls. 5 and 63) also sealed two items: Sb 1975, an HCB fragment with smooth inner surface bearing fingerprints, and Sb 2178, the reverse of which is illegible.
4. Another cylinder seal showing a *guilloche* of snakes between birds (?) (Amiet 1972: No. 486 p. 86, Pls. 6 and 63) marked two HCB, Sb 1930 and Sb 1956. The former item is still closed and rattles upon shaking; the latter displays a smooth inner surface.
5. A cylinder seal depicting a herd of cattle with a ladder-like device frequently symbolizing textiles (Amiet 1972: No. 552 p. 92, Pl. 10) impressed two items, Sb 1928 and Sb 1968. Sb 1928 is a closed and rattling HCB with small round dimples in its surface. The reverse of Sb 1968 is quite even and bears possible traces of a cord impression.
6. In layer Susa Acropole I, 18, one single seal marked an HCB, a clay tablet, and an elongated oval-shaped clay tag (Boehmer 1999: 119, 136 Abb. 116c, 144 Abb. 128C and 128D).

The Susa HCB thus show situations more complex than the Chogha Mish evidence. First and foremost, there is one identical feature: both at Chogha Mish and at Susa, HCB seals never mark doors (*pace* Amiet 1994: 91). At Susa and Chogha Mish, the *sub sigillo* and *sub signo* circulation spheres were thus clearly separated. The excavators of that site do not explicitly state whether the Chogha Mish HCB seals impressed mobile containers or not; but if such cases occurred, I believe that they would have noticed. The Susa HCB thus (demonstrably) belonged to the sphere external to the site itself.

However, in Susa, at least in three cases, singular stamp and cylinder seals marked both HCB and mobile containers (see above sub No. 2 and 5). This happened as early as the stamp-seal use period, and, at least in one instance, continued into the cylinder-seal use period. The fact that the two delivery modes (*sub sigillo* and *sub signo*) commingled together there may be interpreted in various ways. Either the whole sealing sphere lay outside Susa, and the singular external supplying agencies provided their contributions to the center in accordance with these two delivery modes (an analogy being the two-tiered hierarchy of the Chogha Mish HCB sealings?). Or the reason somehow concerns proceedings at the very site of Susa, the elites of which might have used "travelling seals". Their owners, based at Susa and using their personal ensigns (also) to mark the HCB, might have sent them out to mark shares in the mobile output of various economic agencies, apportioned to them by common consent (on such "travelling seals", see Charvát 1992: 282).

Much as at Chogha Mish, we shall do well to keep in mind the archival functions of the HCB. They contained devices facilitating transport of the documents to their users (see above sub No. 2). If the early reference to de Morgan's excavations is credible, we may even have an indication that the HCB were ranged on shelves along the walls. However, after the extinction of their information value the Susa HCB found their way into rubbish accumulations.

At any rate, the Susa situation shows a greater complexity of local social practice, attesting thus to an exceptional status of the capital of southwestern Iran.

5. URUK, IRAQ

In Uruk, we know of at least one hoard find of 26 HCB which came to light within a hole in a wall of "Riemchen" brickwork. M. Brandes has proposed a date between the end of Uruk V and end of Uruk IVa, probably before Uruk IVa and Uruk IVb. R. Eichmann believes that the HCB were deposited here intentionally (Boehmer 1999: 104; see also Schmandt-Besserat 1988: 13, 21–22).

The Uruk HCB bear impressions of up to three cylinder seals, and also of stamp seals; the stamp seals were impressed over the cylinder-seal mark (No. 51; Boehmer 1999: 105, Taf. 51; for a list, see Schmandt-Besserat 1980: 367 n. 40). At least one cylinder sealed two HCB (Nos. 45A and 45B: Boehmer 1999: 109), and another cylinder sealed three HCB (Schmandt-Besserat 1988: 22 n. 150). It seems also that "equatorial-zone" cylinders did not seal in "polar-zone" positions, as at Chogha Mish (Boehmer 1999: 110–111). A recent examination of the clay matrix of the Uruk HCB showed this

to have come from the site itself, or from southern Mesopotamia in general (Daszkiewicz — Van Ess — Schneider 2012: 97).

On the clay tokens enclosed in the Uruk HCB, see Schmandt-Besserat 1988; Boehmer 1999: 112 with Tafeln 102 and 103. P. Damerow and H. P. Meinzer believe that most of the hitherto identified HCB come not from the proto-cuneiform, but the Proto-Elamite sphere (*apud* Boehmer 1999: 115). That may be true for the seals impressed in them, but before examination of the origin of their clay matrix, the origin of the Uruk HCB must remain open. The Uruk evidence shows that there as well, the HCB are slightly earlier than tablets with writing (Amiet 1994: 87 with refs.).

R. M. Boehmer gives an overview of symbols ("tokens") contained within the Uruk HCB (Boehmer 1999: 160–163):

Warka excavation number	**Contents**
W 20987, 18	Imprints of 1 ball, 2 bigger balls and 1 disc?
W 20987, 9	4 discs
W 20987, 15	Kept with 3 small balls and 1 disc
W 20987, 12	5 discs
W 20987, 16	5 small balls among the fragments
W 20987, 13	3 small balls
W 20987, 11	2 large balls, 1 small ball, 2 discs
W 20987, 7	Kept with 7 ovoids with incised circular ("ringförmiger") markings
W 20987, 8	Kept with 5 small tetrahedrons and 2 discs
W 20987, 17	Kept with 1 large cone, 1 disc, 2 lentil shapes, 4 small balls and 1 bolt ("Stift")
W 20987, 3	1 small ball, 1 lentil shape, 1 cube

6. TEPE GAWRA, IRAQ

Two *bullae* (= HCB?), impressed with figural compositions came to light in layer XI, and one in layer X (Rothman 1994: table on p. 116). D. Schmandt-Besserat notes that "cups" similar to those of Tappeh Sharafabad (see below) also appeared at Tepe Gawra (Schmandt-Besserat 1980: 364 n. 31). How far such "cups" find their antecedents in a sealing of a small gabbro-stone bowl from Tell Sabi Abyad (Duistermaat 1996: 348, figs. 5.14, Nos. 1–1a on p. 393 and 5.19, No. 1 on p. 398; Akkermans — Duistermaat 1997: 21, fig. 6 on p. 27) must be elucidated by further research.

7. TELL SHEIKH HASSAN, SYRIA

This multilayer site on the middle course of the Euphrates River has yielded a Middle Uruk settlement enclosed by a fortification wall. A deep sounding revealed a tower or gateway structure, and a small temple and parts of other buildings came to light in

the later layers of the site. Pyrotechnic workshops, including deposits of ash, charcoal and metalworking slag, occurred in layer 8 (Lupton 1996: 58–59).

Three "spherical bullae" (= HCB) appeared in layer 10. One of these is closed by a single cylinder seal, while two show cylinder-seal impressions complemented by stamp-seal imprints (Boehmer 1999: 134, Abb. 111A-C; Pittman 2001: 425 Fig. 11.14, 426; Butterlin 2003: 325, Fig. 58).

8. HABUBA KABIRA SOUTH AND TELL KANNAS, SYRIA

At least one HCB (probably two, Schmandt-Besserat 1980: 362 n. 19), bearing impressions on its (their) surface, came to light at Habuba Kabira South (Strommenger 1980: 63–65, 64 Abb. 58; Schmandt-Besserat 1988: 22; Boehmer 1999: 119, 137, Abb. 117A). The first of these finds appeared "im Planquadrat Md II ¾, Raum 6, Mittelsaalhaus, über älterem Estrich im Füllschutt", thus probably in the filling above the house floor (Boehmer 1999: 119), in the northern part of the main room, together with tablets and elliptical *bullae* (Schmandt-Besserat 1980: 377). A second find from Habuba has found only a cursory reference (Boehmer 1999: 119, 126, 137 Abb. 117b). A photograph of one of the local HCB is shown in Schmandt-Besserat 2007: 164 Fig. 3.

Another HCB was unearthed at Tell Kannas (Boehmer 1999: 116, 134, Abb. 111D).

9. TELL HAMOUKAR, SYRIA

Excavations at this site have yielded, in addition to evidence for settlement in later historical periods, a Late Chalcolithic tripartite building destroyed by fire in a violent conflagration. Its ruins rewarded the excavators with an abundant inventory of finds, including seals and sealed materials (Reichel 2002). Of this material, at least the fragmentary sealing 3 HM 32 (C.1217) (op. cit. Fig. 11 on p. 43), marked by four kidney-shaped stamp seals depicting a gazelle and a quadruped (?), could represent an HCB, though it seems to be too big for one. The sealing comes from locus 135, one of the subsidiary rooms of the tripartite building (op. cit. Fig. 12 on p. 45). It might, however, have fallen there from its original position on the upper floor of the building (op. cit. Fig. 15 on p. 49). Let us note that one of the impressions of stamp seal A, depicting a rotating group of lions and occurring on door sealings, also bears an impression of a cylinder seal (op. cit. 52, 56).

Thus, we come to the conclusion that cylinder seals can be present even at sites with their own complex and "native" administrative arrangements. For the time being, the closer interpretation of this fact eludes us.

10. TELL BRAK, SYRIA

A "bulla", possibly an HCB, with impressions of stamp seals, datable "Gawra A-zeitlich, d. h. spätestens frühurukzeitlich", occurred at Tell Brak CH (Boehmer 1999: 117, 135 Abb. 113A–B).

11. HACINEBI, TURKEY

This is a site situated above the Euphrates River close to the modern town of Birecik, southeastern Turkey (Stein 1998: 233–247; Stein 2000; see also Butterlin 2003: esp. pp. 279–284, 317–321). The local occupation extends from sometime in the early fourth millennium (phases A and B1) over a late Chalcolithic, Uruk-related phase (B2) to the Achaemenid and Hellenistic period. The main contribution of Hacınebi to intercultural studies is represented by the fact that during the B2 phase, two distinct communities apparently existed side-by-side here — a local settlement and an Uruk-related enclave, both of which retained their specific economic, social, administrative and political features ("two encapsulated, economically autonomous communities"; Stein 1998: 242).

Together with a sealed clay tablet and sealings of ceramic jars, all related to Uruk-style glyptic (Stein 1998: 244, 246), the B2-phase Hacınebi settlement yielded an HCB with Uruk-related cylinder-seal impressions (Stein 1998: 244, Fig. 11–7: b; see also Boehmer 1999: 118, 136 Abb. 115A–B; Stein 2001: 291 Fig. 8.9: B). As against this, Anatolian-style seals come predominantly from "locks" and mobile containers (Stein 1998: 243, 245).

One single find of an HCB hardly allows any higher-order conclusions. Yet we must observe that a) the HCB occurred in an Uruk-related context, and b) the other Uruk-related sealings from Hacınebi denote a simpler, reciprocity-related exchange pattern. Therefore, it would seem that the Hacınebi material allows the assumption of a singular, Uruk-related community, which depended very much on its metropolitan area for the fundamentals of its organization, including supplies of material goods (on the forms of contact of Hacınebi with the Uruk-culture area, see Stein 2000: esp. pp. 16–18).

12. TAPPEH SHARAFABAD, IRAN

Just for the sake of completeness, but also as a highly important methodological guide, let us now refer to the excavations of a minor rural site between Susa and Chogha Mish (Wright — Miller — Redding 1980; map in Wright — Redding — Pollock 1989: 107 Fig. 9.1). This *tell* was investigated in 1971 for the purpose of documentation of the local Middle Uruk period, in three areas called "Uruk Rooms" (on the hilltop), "Uruk Dump" (western foot) and "Uruk Pit" (eastern foot; Wright — Miller — Redding 1980: 269 Fig. 3). The "Uruk Pit" (henceforth UP), probably a rubbish dump measuring 4 x 10 m on the surface, yielded a sequence of 26 layers interpreted by the excavators as deposited (bottom up) during a summer, winter, and another summer and possibly winter season, and dating to the later part of Middle Uruk (Wright — Miller — Redding 1980: 270 Fig. 4, 271; Pollock 2008: 44, 46 Fig. 2). The unusually meticulous excavation and interpretation procedures applied make these conclusions highly plausible.

As was to be expected, Tappeh Sharafabad did not yield any HCB (Wright — Redding — Pollock 1989: 112). However, some conclusions of the excavators reached during the interpretation of seal and sealing evidence there (Wright — Miller — Redding

1980: 277–281) may be relevant from our point of view. The UP site displayed five categories of sealed and related materials: counters, "cups" (semicircular, hollow, unbaked clay objects, with diameters 5.5 to 9.5 cm and wall thicknesses 0.85 to 2.20 cm), "locks" (= door sealings), bale- and basket sealings and jar sealings. As to the "cups", the excavators note that "had they been closed up around a set of counters when still plastic, they would be similar in size to the spherical bullae so common at the large centers (= HCB, pch)" (Wright — Miller — Redding 1980: 278 sub 2). The original excavators do not refer to any seal impressions on the "cups"; however, H. Pittman notes that these "cups" displayed seal impressions (Pittman 2001: 431). D. Schmandt-Besserat notes that such "cups" also appeared at Tepe Gawra (Schmandt-Besserat 1980: 364 n. 30 for the Sharafabad ones, n. 31 for those of Tepe Gawra).

The excavators further noted that counters and "cups" were probably discarded in late winter and summer, when crops would leave the site. "Locks" were broken and dumped in mid- to late winter. Bales and jars went to the dump throughout the year. Possible seasonal variation shows that more cups flew into the rubbish during the first UP deposit year, "locks" taking their place during the second year (Wright — Miller — Redding 1980: 278).

At the UP subsite, twelve seal impressions were found. Of these, six have suffered too much damage to yield any information. As to the remainder, three were left by cylinder seals on a jar, on a bottle and on a "lock", with a fourth, possibly another cylinder seal, marking three bale wrappings. Two stamp seals impressed "locks" and bale sealings (Wright — Redding — Pollock 1989: 112).

An unpublished NAA-analysis of the Sharafabad sealed clays has shown that the door sealings "and other items" are of local clay, but one of the sealings marking a large band-rim jar was made of nonlocal clay (Wright — Redding — Pollock 1989: 113 n. 2). The quantity of such jars increased visibly during the second year (Wright — Redding — Pollock 1989: 110). The first year markedly surpassed the second in the supply of information-bearing items. Opening of bales and bottles increased slightly throughout the second year and in the same year, storerooms were opened much more frequently, especially during late winter and early summer (Wright — Redding — Pollock 1989: 112).

Thus, we may summarize the excavators' interpretation of a famine at Sharafabad during the UP's second year as follows: decrease in the supply of meat, killing off more young animals (apparently in the belief that they would not survive anyhow), increased imports of large band-rim jars, fewer information items (in view of the diminution of harvest), and more frequent opening of storage spaces. If this was so, the Sharafabad community appears to have overcome this difficult time without major problems, apparently with the external aid of (one of the) major social centers.

The excavators surmise that the counter- and cup-discards of late winter and early summer suggest the "spherical bullae were leaving the site (Sharafabad, pch) presumably with agricultural products…en route to larger centers for consumption or storage" (Wright — Miller — Redding 1980: 281).

The Sharafabad evidence shows that the cylinder seals, which I interpret as signs of institutional authority, could have been present (at least in their impressions) even on minor sites.

13. TEPE FARUKHABAD, IRAN

A Middle Uruk HCB(?) with impressions of three stamp seals, and possibly numerical signs, came to light at Tepe Farukhabad (H. T. Wright *apud* Boehmer 1999: 116; Schmandt-Besserat 1980: 362 n. 14, 364 n. 32).

14. TEPE YAHYA, IRAN

A "football-shaped" HCB from this site may be found in the collections of the Peabody Museum of Harvard University, USA (Schmandt-Besserat 1980: 362 n. 15; ibid., 365 Fig. 4). It turned up in layer IV B2, dated c. 2800–2600 B.C. (op. cit. 365 n. 36; ibid., 379), and does not bear any seal impression(s) (op. cit. 366, 370).

15. SHAHDAD, IRAN

Another HCB, now stored at the Musée Iran Bastan, Teheran, turned up at this site as a surface find (Schmandt-Besserat 1980: 362 n. 16; ibid. 365 n. 37). It bears a ring-shaped stamp sealing, covering the entire surface of the artifact (op. cit. 366–367).

16. DHAHRAN, SAUDI ARABIA

A complete HCB turned up near the airport of Dhahran (Schmandt-Besserat 1980: 363 n. 21). It does not display any seal impression (op. cit. 366).

17. UNKNOWN SITE 1

In addition to archaic cuneiform tablets, the collections of Cornell University, USA also contain 34 HCB, mostly from a private collection (Monaco 2014: 2–3, 18–19, 31–64, 159–161). These HCB do not possess any archaeological data, and thus they contribute little to our knowledge of social mechanisms involving their use. Their surfaces bear impressions of one to three different seals. Almost all of them, though being open, do contain *calculi*, usually small spheres; one has just one *calculus* and another, intact one encloses three — one sphere, one hemispheroid, and one "elissoid with a flattened base". A cross sign with two marks on one side is impressed into the flat bottom of the last-named item. S. Monaco suggests an interpretation of "two-year old sheep" (op. cit. 3).

17A SINGLE-SEAL HCB

Seal type	No. of examples
A (animal fable)	**3**
B (heraldic composition, animals)	**5**
B+	1
C (human-animal contest)	**3**
C+	1
D (animal contest)	2
E (animals+trees+spread eagle)	**3**
G	2
H+	1
J	1
K+	1
unknown	1

17B SEAL-COMBINATIONS HCB

Seal types	No. of examples
A+C (animal fable, human-animal contest)	1
B+E (animal fable, animals+trees+spread eagle)	1
B+C+D (animal fable, human-animal contest, animal contest)	1
C+D (human-animal contest, animal contest)	**5**
C+F (human-animal contest, mythical birds in a network)	1
E+F (animals+trees+spread eagle, mythical birds in a network)	1

Out of all these combinations, seal type C appears most frequently, either alone or in combinations, most frequently with seal type D, but also with seal types A and F, and also in the only triple combination, B+C+D. Thus, we are witnessing the activities of one dominant, but not monopoly-wielding agency.

One interesting feature may be noticed in bulla No. 34, bearing the impression of an Old Akkadian cylinder seal. This find thus proves that the HCB did function together with early cuneiform documents, surviving down to at least the 23rd century B.C. (Monaco 2014: 2, 161).

18. UNKNOWN SITE 2

Several HCB are included in the Schøyen collection (http://www.schoyencollection.com/mathematics-collection/pre-literate-counting [Nos. MS 4523, MS 4631, MS 4632, and MS 4638; accessed 12.09.2015]). The lack of archaeological context makes the as-

sessment of these objects speculative. They all bear impressions of two cylinder seals each.

* * *

The earliest HCB are likely to possess the same characteristics as the "terminal" ones. They probably conveyed quantified and qualified information relevant in terms of the socially engineered movements of goods. Their "launching into orbit" fell into the sphere of individuals represented by their seals, and after delivery, they might have been deposited as archive records, at least for some time.

As to the "terminal" HCB (Susa, *Acropole* I, layers 18 and 17), the same essential traits apply: quantification and qualification of the information conveyed, authorization of the transaction by means of seal impressions, and archivization of the information conveyed. In addition to this, the following observations, relevant to the "terminal" HCB only, seem to be of consequence to me.

a) By common consent, the HCB seem to fall within the economic-activity sphere of ancient social foci.
b) Within the individual sites, the HCB seem to have come from outside the "catchment areas" of their own managing agencies, that is, to have reflected actions of authorities extraneous to the (management of) the respective sites.
c) The HCB probably indicate activities (cooperation?) of both legal (cylinder seals) and
d) physical persons (stamp seals).
e) The preserved contents (or traces thereof) of the HCB indicate simple, not complex tokens.

All in all, I understand the HCB as representing records of fulfilment of obligations of external agencies to the central-institution management office. They may have been made at the (archive of the) central institution, as symbols of goods and/or services supplied, by means of seals carried in by officials of the contributing agency, either as signs of authority of their own institution(s) (cylinder seals) or as tokens of function envisaged for physical personalities (as witnesses, for instance). In the capacity of such confirmations, they entered the central-institution archive and, after the final check of the accounts, were discarded as no longer necessary. Their deposition in archives may be indicated by the fact that some of the Susa items show "a small area flattened by scratching or chipping the surface when the clay had already hardened, to allow the artifacts to stand more securely and prevent them from rolling" (Schmandt-Besserat 1980: 363).

In fact, the HCB could easily mark activities of some kind of amphictyony, or (con) federation of social institutions, expressing their mutual relations by commodity (gift?) exchange, like the later Late Uruk corporate polity or the "City League" of the incipient Early Dynastic period. In subsequent periods (after c. 3000 B.C.), the HCB lived on as information-storage devices pushed to the margins of the accountancy systems, and applied whenever the ancient administrators deemed it applicable.

Finally, it should be stated that the information-storage and information-flow system of the HCB represents a distinct predecessor of true writing. The HCB have been fittingly characterized thus: "Die versiegelten Tonkugeln dienten demnach offenbar der fälschungssicheren Verwahrung bestimmter Kombinationen von Tonsymbolen und damit der Beurkundung bestimmter Informationen" (P. Damerow — H. P. Meinzer, *apud* Boehmer 1999: 112). While it is true that the cuneiform script was invented and introduced over a comparatively short period of time, the social function which it fulfilled preceded its emergence by more than two millennia.

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