TOKENS
Culture, Connections, Communities

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THE INVENTION OF TOKENS

Denise Schmandt-Besserat

Introduction

It seems appropriate for a volume dedicated to 'tokens' to investigate the genesis of the earliest presently known archaeological tokens. In my paper I show how the chronology, the geographic distribution, and the duration of tokens were linked to the cultivation of cereals. Moreover, the sizeable quantities of foods tokens administered, and the large sized silos built by early farming communities to amass reserves, provide evidence that tokens were created to manage an early redistribution economy.

In 1992 I published an analysis and catalogue of 8,000 Near Eastern clay tokens dated ca. 9000–3100 BC.[1] Since then the idea that, after an existence of 6,000 years, tokens morphed into writing has been widely circulated.[2] However, what prompted the need for tokens in the first place has yet to be further elucidated. What was the impetus for creating a new counting technology at the dawn of the Neolithic?

In this paper I analyse the early assemblages of Near Eastern clay tokens. I highlight five remarkable facts: 1. The appearance of tokens coincides with the cultivation of cereals. 2. The geographic distribution of tokens corresponds with the areas where the cultivation of cereals was practiced. 3. The duration of the use of tokens concurs with the rural agrarian economy that preceded the creation of cities. 4. Large silos for communal storage occur at the same time as tokens.
5. According to their corresponding signs on the first Uruk tablets, tokens referred to measures of goods. These five facts allow me to conclude that, from their incipience, the tokens were linked to the management of goods. The need for counting arose when the survival of the early farming communities depended on an economy of redistribution.

It should be acknowledged that the cultivation of cereals is to be understood in the broad sense of domestication of plants or agriculture. Cereals always represented the staple food of the ancient Near East, but they were not the only food crops. It is likely that legumes such as lentils, peas, chick- peas, horse beans, and vetches were also cultivated.[3] Cereals are, however, the easiest to detect in excavation because, once roasted, their capacity to germinate is destroyed and the grains become practically indestructible.

The appearance of tokens coincided with the cultivation of cereals (fig. 1)

At the site of Mureybet (Syria) the earliest levels (I, II and IIIa) held the remains of hunters and gatherers. The following level, IIIb, dated 9000–8700 BC, produced the earliest evidence for agriculture[4] as well as the first specimens of tokens.[5] The small token assemblage of Mureybet consisted of two discs.[6] The cultivation of cereals was signalled in several ways. First, by a quantum jump in the quantity of cereal pollen in the soil compared to that of the preceding strata. Because cereal pollen is heavy, it does not travel far from the plants that generated them. The pollen deposits of Mureybet, therefore, point to the presence of cereal fields near the settlement.[7] Second, carbonised grains of barleycorns, and especially einkorn (*triticum-boeticum*), became numerous in level IIIb, whereas they were scarce in the earlier levels.[8] Third, the analysis of organic deposits on the surface of flint sickle blades denote cereal residues in level IIIb, but reed cutting in the previous levels.[9]

The first piece of evidence and the timing of the appearance of tokens show that the new technology of counting coincided with the cultivation of cereals.

[1] Schmandt-Besserat (1992), vol. 1; http://sites.utexas.edu/dsb (accessed 17/05/2019).
[2] Harford (2017).
[3] Scott (2017), 44.
[4] Cauvin (1978), 74.
[5] Schmandt-Besserat (1996), 102.
[6] Schmandt-Besserat (1992), vol. 2, 362.
[7] Cauvin (1997), 82–86.
[8] Cauvin (1997), 83.
[9] Cauvin (1997), 83.

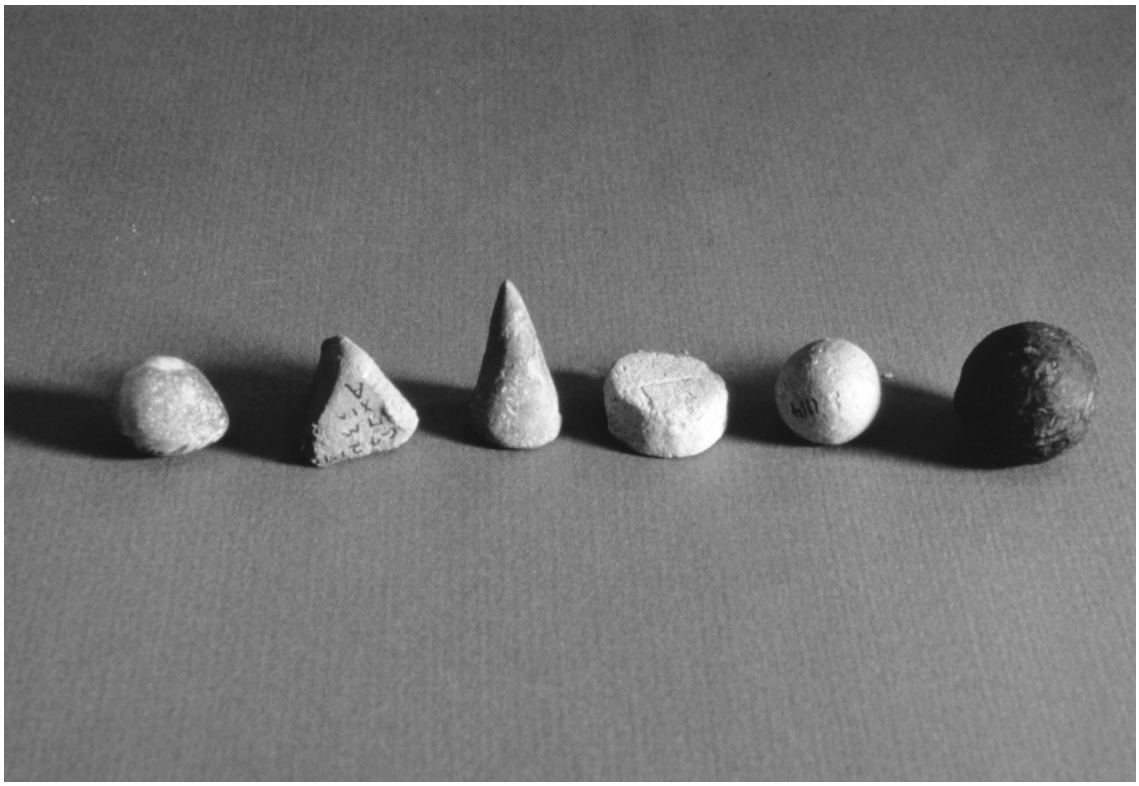

Fig. 1: Plain tokens from Tepe Gawra (Iraq). Photo by author.

Tokens were adopted wherever cereals were cultivated

In the ninth millennium BC, the domestication of cereals and the technology of counting with tokens spread jointly over the breadth and width of the Fertile Crescent, where they were adopted by myriads of cultures, which had their own traditions, customs and dialects.[10] For instance, the sites of Tell Aswad (Syria), situated along the Mediterranean shores, and Tepe Asiab, located further away beyond the Euphrates and Tigris rivers in north-western Iran, had dissimilar settlement patterns and tool industries but shared cereal cultivation and the same clay tokens in identical shapes (table 1).[11]

Table 1: Scheme showing counting objects at Tell Aswad and Tepe Asiab.

Object/typology	*Tell Aswad (Syria)*[12]	*Tepe Asiab (Iran)*[13]
Animals		1
Cones	65	6
Cylinders	3	73
Discs	5	5
Ovoids		4
Rectangles	1	1
Spheres	245	101
Tetrahedra		1
Triangles		1
Vessels	7	

[10] Nesbitt (2002), 124; Bellwood (2005), 59; Lafont, Tenu, Johannès and Clancier (2017), 26–27.
[11] Tell Aswad: De Contenson (1995), 226. Tepe Asiab: Braidwood, Howe and Reed (1961), 2008.
[12] Schmandt-Besserat (1992), vol. 2, 366–70.
[13] Schmandt-Besserat (1992), vol. 2, 103–10.

The second piece of evidence, namely the widespread association of cereal cultivation and tokens over the entire Near East, indicates that the technology of counting was adopted wherever cereals were grown.

Tokens remained unchanged as long as the Near East had a rural agrarian economy

From 9000 to 3500 BC, tokens represented mostly products of the farm, such as measures of cereals, oil and small cattle. These tokens were 'plain' – that is to say they had a smooth surface, devoid of markings, and were modelled in a dozen simple geometric shapes, including cones, spheres, discs, ovoids and cylinders.[14] What is remarkable about 'plain tokens' is that they remained the same during their 5,500-year lifespan. Whereas coexistent cultural artefacts, such as pottery, never ceased to evolve, plain tokens continued to be modelled from the same material, in the same shapes and sizes. For example, in 9000 BC Mureybet (Syria) and Tell Asiab (Iran) yielded plain tokens before pottery ever appeared. Plain tokens were numerous during the Jarmo Culture of 6000 BC, when pottery was crude and barely fired. One thousand years later, the same tokens were also present in the Halaf Culture (ca. 5000 BC), when pottery was at its finest, perfectly fired and decorated with harmonious complex compositions. Again, one thousand years later (ca. 4000 BC) the same smooth faced cones, spheres and discs were still used in the Ubaid Culture, when pottery was over- fired and sloppily decorated. Contrary to all other contemporaneous Neolithic artefacts, which were in constant flux, plain tokens remained for five and a half millennia persistently and obstinately identical.

Finally, tokens changed in the urban centres of the fourth millennium BC.[15] The new 'complex tokens' referred to goods manufactured in urban workshops, such as textiles and garments. Their shapes multiplied to 16 types, including bi-conoids, paraboloids or rhomboids and bore markings in the form of series of lines and dots. At this time, the Mesopotamian metropolis of Uruk (Eanna Level IV–VI) produced a collection of 812 tokens, which included as many as 16 types and 241 subtypes. The 783 tokens excavated in the Elamite city of Susa (levels 17–18), consisted of 16 types and 190 subtypes.

Compared to the plain tokens, complex tokens had a short duration. Within two or three centuries (ca. 3200 BC) (Uruk IVa and Susa 17) writing was invented. Entries and expenditures of merchandise were then recorded on clay tablets, and no longer with tokens.

The third piece of evidence, namely the fact that tokens were used continuously throughout the Near East for over 5,500 years, certainly attests to their usefulness in farming communities. Their collapse when trade, commerce and industry started to play a role in the economy shows that the counting technology was only suited for the administration of a simple agrarian market.

Tokens coincided with the creation of food reserves

A new type of rectilinear building appeared among the round houses of level IIIb of Mureybet and in the contemporaneous site of Cheikh Hassan (Syria).[16] These rectangular or square structures were small, they had no door at floor level and their inside was divided into cubicles. The rectangular building of Cheikh Hassan was built of rammed earth rein- forced with sticks laid horizontally into the mud. The walls of the square building of Mureybet were made of a single row of loaf-shaped pieces of soft chalk, set in mortar. This latter structure measured 3.5 x 3.5m and was internally divided into four cells paved with flagstones.[17] Each cell measured 1.5 x 1.5m, which made them unsuitable for habitation. The multiple exiguous cells therefore suggest that the first rectilinear architecture, devoid of doors, was designed for the storage of goods.[18] The structures were silos or granaries, meant

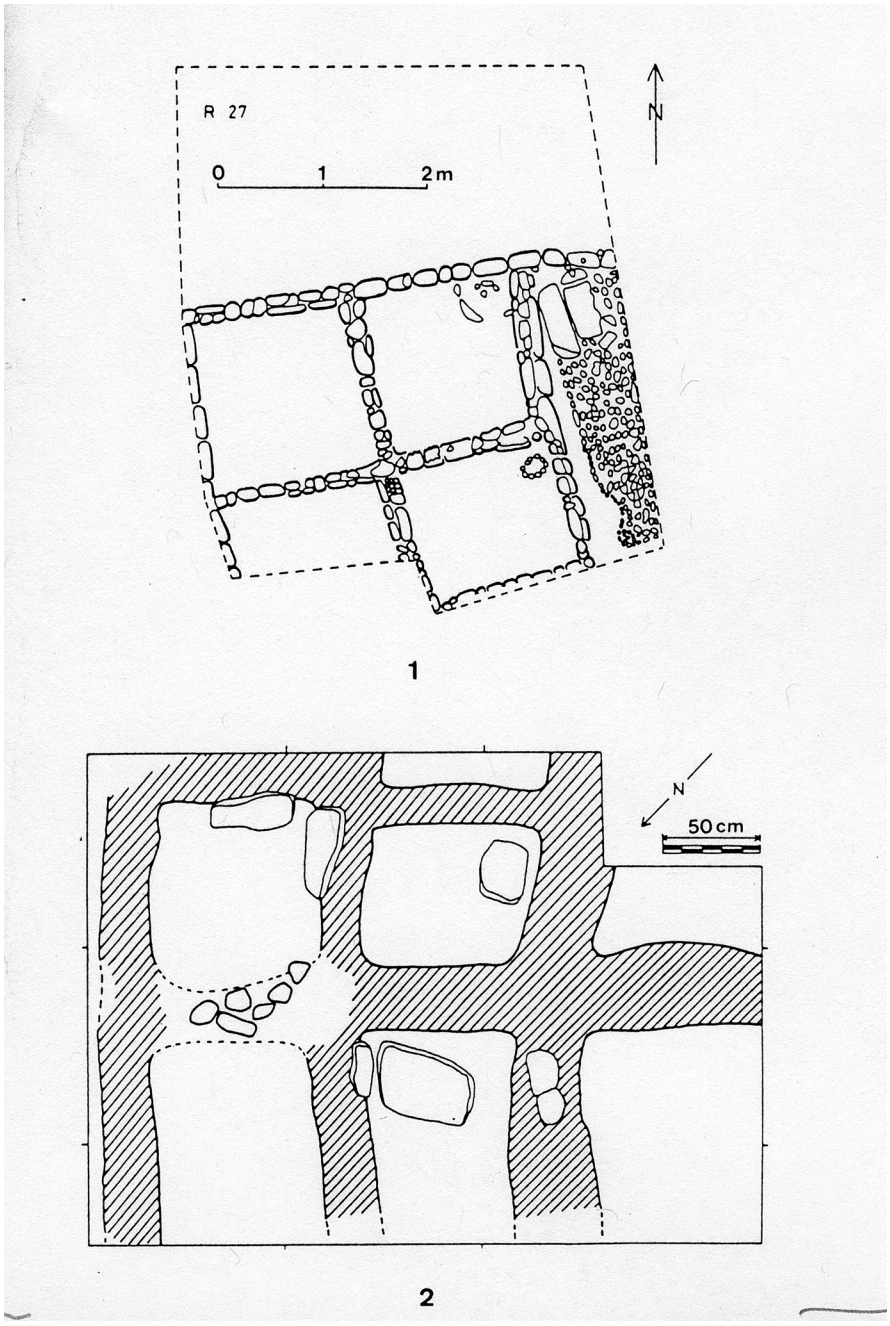

Fig. 2: Plans of silos in Mureybet IIIb (Syria) (no. 1) and Cheikh Hassan (Syria) (no. 2) (Cauvin (1997), 67).

to be filled through an opening high in the wall or from the roof (fig. 2). Furthermore, the size and number of cells in the silos were visibly intended to store goods in quantities disproportionate to the needs of an individual household. Instead, they seem to indicate a communal storage facility.

The fifth piece of evidence, that is the architectural context of the tokens, documents the existence of silos large enough to store communal resources. The simultaneous introduction of public food reserves and of a technology for counting suggests the objective was to control collective goods. Such an administration prefigures the redistribution economy that presided over the brilliant fourth millennium Mesopotamian civilisation.

Tokens administered large quantities of cereals

Tokens morphed into writing when quantities of goods were communicated by signs made by impressing tokens onto a clay tablet. Tokens in the shapes of spheres, discs and cones were replaced by two-dimensional circular and wedge-shaped impressed signs, which perpetuated their meaning. Today the value of early pictographs and their token antecedents can be retrieved by tracing the evolution of cuneiform signs backwards through the centuries. This is the case for the cuneiform signs indicating measures of cereals, which can be traced back to their three-dimensional cone, sphere and disc token antecedents. Consequently, these tokens are considered as having represented the following values:[19]

an isosceles cone = a small measure (perhaps equivalent to one peck?)
a small sphere = a large measure of grain (one bushel?)
a large cone = a very large measure of grain (one bag? = 3 bushels)
a large sphere = larger measure of grain (one cauldron? = 36 bushels)
a flat disc = an even larger measure of grain (one load? = 40 bushels).

Accordingly, the token collections of Tell Aswad and Tepe Asiab can be tentatively computed (table 2).

Table 2: Scheme showing tokens and their values at Tell Aswad and Tepe Asiab.

Site	*Tokens*	*Value*
Tell Aswad (Syria)	54 isosceles cones	54 pecks
	1 large cone	1 bag (3 bushels)
	240 spheres	240 bushels
	2 flat discs	2 loads (80 bushels)
Tepe Asiab (Iraq)	1 isosceles cone	1 peck
	96 spheres	96 bushels
	1 flat disc	1 load (40 bushels)

It is significant that most tokens represented substantial quantities of cereals. For instance, the spheres, which were most frequently used, denoted a large measure of grain. It is striking that the earliest tokens recovered at Mureybet were two discs, equivalent to very large quantities of grain. This suggests a considerable cereal production, probably unimaginable for a single household, but rather that of a communal enterprise.

The fourth piece of evidence, the meaning of the cones, spheres and discs, makes it evident that the volume of goods ordered by the tokens denotes a public rather than a private administration. In sum, the excavations of early farming communities provide multiple pieces of evidence associating the creation of a counting device (tokens) with the domestication of cereals, as well as the management of public food reserves. These facts can be interpreted as follows.

Sharing food in the Neolithic Period

When cereal agriculture spread in the Fertile Crescent, people became increasingly sedentary, and by doing so, they became vulnerable to famine during the harsh Near Eastern winter months or the unpredictable lean years.[20] The early farmers had the wisdom to join forces to amass the amount of food necessary for every individual in the group, the strong and the weak, to survive dire times.[21]

The farmers were not the first to altruistically partake of food communally. Already thousands of years earlier, Palaeolithic hunters broke rank with the other primates by dividing their game catches between the members of their band.[22] In both instances, sharing resources increased the chances of survival of the group.

[19] Schmandt-Besserat (1996), 81.
[20] Blumler (2002), 101.
[21] Cappers, Bottema, van der Plicht, Streuman and Woldring (2002), 4–5.
[22] Binmore (2001), 156; Hayden (2014), 36.

The practices of sharing, however, were very different. During the Palaeolithic, the distribution of meat took place as the hunter came back to camp. It was an immediate and direct operation because tradition assigned a specific morsel to each individual according to his or her kinship rank. But during the Neolithic, the lengthy and complex process of accumulating, protecting and redistributing communal reserves fairly necessitated formal management. And, as communities grew and resources multiplied, the administration required the mastery of counting and accounting.[23]

Palaeolithic hunters had no need for counting to redistribute meat one piece at a time. But computing the cereal reserves of farming communities went far beyond subitising, the minimal innate numerical capacities humans are born with.[24] The invention of tokens brought a structure to expand the needed cognitive skills.[25] By just moving and removing the counters in one-to-one correspondence, individuals could learn to perform the simplest form of adding and subtracting. Throughout the centuries, a continuous cross-fertilisation took place between the redistribution economy's increasing complexity and the development of administration. The tokens were used to perform more complex tasks such as collecting, organising, recording, storing, retrieving, communicating, calculating or controlling data. For example, with the help of tokens, a leader could compute the yields of the forthcoming harvest, request contributions in correspondence with the estimated surplus and control the actual delivery of the goods. Once the collected grain was stored in communal granaries and the quantity of the reserves calculated, a leader could allocate amounts for: a) seeds; b) a reserve for subsistence in dire times; c) ritual offerings to the gods; d) the preparation of festivals.[26]

There was no hiatus between the Neolithic and the Early Bronze Age accounting procedures in the ancient Near East. From 9000 to 2700 BC, tokens and written tablets formed a straight trajectory: both served exclusively to register the same goods in similar quantities and both acted in tandem with the same system of seals. It is well established that tablets recorded the movement of goods in the Early Bronze Age Mesopotamian redistribution economy. It should be recognised that tokens had exactly the same function in prehistory. They enabled control of the collection of communal goods at the harvest and administered their redistribution for the good of the community and the pleasure of the gods. Tokens should be recognised as the cornerstone of the Near Eastern redistribution economy, at its genesis and during its first 6,000 years.

Conclusion

In this paper I have presented data indicating that tokens and counting were related to the most seminal event of the Neolithic period: the cultivation of cereals. I have further discussed the evidence suggesting that, following the fundamental, universal and immemorial altruistic human tradition of sharing food, tokens were created to administer communal reserves of agricultural goods.[27] I conclude that these tokens became the centrepiece of the agricultural redistribution economy of the ancient Near East, which can be credited with two major achievements. First, this economy successfully kept people and their culture alive over the course of some 6,000 years of food uncertainty, hardship and adversity. Second, the cognitive skills created by handling data in the abstract brought humans onto a path that ultimately led to writing and civilisation.

[23] Frangipane (2010), 81.
[24] Lakoff and Nunez (2000), 52–53.
[25] Stewart (2008), 12–13.
[26] Schmandt-Besserat (2001), 399–400.
[27] Wilson (2014), 22–23.

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