

AN ARCHAIC RECORDING SYSTEM AND THE ORIGIN OF WRITING*

by

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A recording system based on tokens, spread throughout the Near East from the early Neolithic on, is proposed as a demonstrable antecedent of the cuneiform writing system. Consisting of a rich and differentiated repertory of shapes and markings, this token system is more complex than a simple system of undifferentiated counters. A first attempt at an inventory of the most representative shapes of tokens from throughout the Near East is provided, including all the documentation presently available to me. On this basis a preliminary comparison is made with signs found on the earliest tablets, and an interpretation is suggested for the identification of some of the existing tokens. Finally, a developmental scheme is proposed to explain the transition from tokens and bullae as prototypes of writing to a full-fledged writing system of impressed and incised signs.

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1. Some Characteristics of the Early Tablets

The origins of writing are still surrounded with mystery. All we know is that writing first appears in Mesopotamia but the date remains only approximated to 3500-3000 B.C. and it is disputed whether the Sumerians or rather the Subarians (their predecessors in upper Mesopotamia) are the inventors. Writing is assumed to have evolved from a first pictographic stage where each word is represented by a small picture or logogram, to the elaborate cuneiform script where the characters, or phonograms, represent sounds. We base our present knowledge of the beginnings of writing on a body of around 1500 texts recovered in Warka (1000), Jemdet Nasr (200), Kish, Nippur, Godin Tepe, Jebel Aruda, and Habuba Kabira. (The Tartaria tablets are not considered here because of their peculiar typological features and questionable chronological attribution.) The content of the texts is for the greatest part still enigmatic to epigraphists but there is strong indication that they were administrative records of economic activities. The seal impressions they bear confirm their official use.

The early texts have a number of enigmatic features.

1. The signs belong to two types:
 - (A) Pictographs which depict in a readily recognizable fashion the objects they stand for. This type is rare and represents a vocabulary of infrequent use such as chariot, variety of birds, wolf, etc..
 - (B) Totally abstract signs which cannot be understood by the non-initiated. This second category constitutes the great majority of the signs (which explains why most of the tablets are still undeciphered). It is important to note that while some characters assume totally odd shapes, series consist of multiple variations of basic forms including circles, cones and rods (Fig. 1). Indeed, among 950 signs compiled by Falkenstein from the Warka tablets, 107 (11%) are variations on circles, semi-circles, ovals, etc.; 96 (10%) are variations of cones and diamonds and 42 (4%) are rods of various sizes and bearing different striations and appendices.¹ The abstract signs which have so far been understood represent commodities of current usage; for instance the sheep is represented by a circle enclosing a cross, bread by a cone with an incised line parallel to the base, oil by a cone with a convex base, and beer by a cone with a constriction above the base. Numbers are also represented by variations of cones and circles which are differentiated from the remaining vocabulary by the technique of impressing them with the blunt part of the stylus while the other characters are incised with the pointed tip.
2. The repertory of the first signs unexpectedly consists of a sophisticated and impressive vocabulary estimated to consist of around 2000 words.²
3. Although the sites where the early texts have been recovered are scattered over a wide area extending from Warka in Mesopotamia to Habuba Kabira in Syria and Godin Tepe in Iran, the signs used are mostly identical and evidence a rapid, if not instant, standardization.
4. Except for land sales which are usually written on stone tablets (Figs. 2a,b), the early texts are usually written on tablets made of clay—an impractical material in some respects,

¹A. Falkenstein. *Archaische Texte aus Uruk*. Ausgrabungen der Deutschen Forschungsgemeinschaft in Uruk-Warka, Deutsche Forschungsgemeinschaft, Berlin 1936.

²*Ibid.*, p. 29.

since it smears easily, it does not allow for an easy impression of curved lines and it requires an extended drying or firing process before circulation (Fig. 3).

The abstract character of the signs, the extensive repertory of vocabulary, and its immediate standardization seem to indicate that, as we have it, it was already a well developed and sophisticated writing system, not a humble beginning. Some epigraphists have suggested that prior to the tablets an earlier phase of writing may have existed, possibly practiced on a perishable material which has not survived. I am inclined to think that the shape of the abstract signs and the choice of material of the tablets may lead to an earlier prototype for which I believe I can adduce concrete evidence.

2. A New Hypothesis

In 1966, Pierre Amiet identified in the archives of Susa an archaic system of recording dating from the second half of the Fourth Millennium B.C., and slightly predating the earliest tablets.³ The system consists of small clay tokens of geometric shapes mostly in the form of spheres, discs, cones, and tetrahedrons, found enclosed in clay envelopes in the shape of hollow clay balls (called "*bullae*") (Fig. 4). The surface of the *bullae* usually bears seal impressions and sometimes marks indicating the number of tokens enclosed. Pierre Amiet interprets each *bulla* as representing a transaction, the tokens inside indicating the kinds of goods exchanged by their shapes and the quantity by their size and number. Amiet suggests a possible relationship between the tokens and the earliest writing, and in particular between the shape of the abstract signs and the shape of the tokens.

In the course of my recent study on the earliest uses of clay in the Middle East, I found that geometric tokens (Fig. 5-6) identical to those identified by Pierre Amiet in the *bullae* are actually found in *most* Middle Eastern sites and over a long span of time, from the ninth to the second Millennium B.C..⁴ I was also able to establish the existence of a complex typological inventory of shapes, the internal structure of which is brought to light by the similarity of the shapes of the tokens with some of the early abstract signs, particularly the numerical signs and several representing some of the most usual commodities. In the present paper I will first provide a documentation for the system of tokens and will then describe four stages in the evolution from the early recording system based on tokens to actual writing as known from tablets.

3. An Inventory of Clay Tokens

3.1. Shapes

The tokens come mostly in four broad types of shapes including: I. Spheres, II. Discs, III. Cones and Tetrahedrons, IV. Cylindrical Rods. Each category can be divided into a series of subtypes as illustrated in Chart 1.

³ Pierre Amiet. "Il y a 5000 ans les Elamites inventaient l'écriture," *Archéologia* 12:20-22, 1966.

⁴ For earlier reports on my findings see Denise Schmandt-Besserat, "The Use of Clay before Pottery in the Zagros," *Expedition* 16, 2, 1974; "The Earliest Uses of Clay in Syria," *Expedition* 19, 3, 1977; and "The Earliest Uses of Clay in Turkey," *Anatolian Studies* 27, 1977.

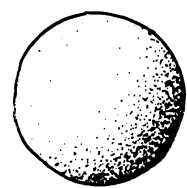
TYPE I: SPHERES



Pellet



Sphere



Large Sphere



$\frac{3}{4}$ Sphere

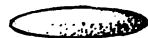


$\frac{1}{2}$ Sphere



$\frac{1}{4}$ Sphere

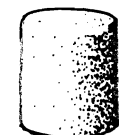
TYPE II: DISCS



Pellet



Discs

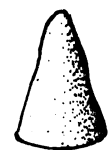


High Disc

TYPE III: CONES & TETRAHEDRONS



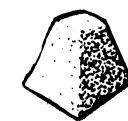
Cone



Large Cone



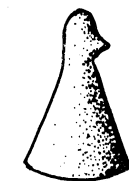
Tetrahedron



Pyramid



Biconoid

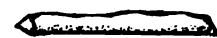


Cone + pinched top

TYPE IV: RODS



Elongated Pellet



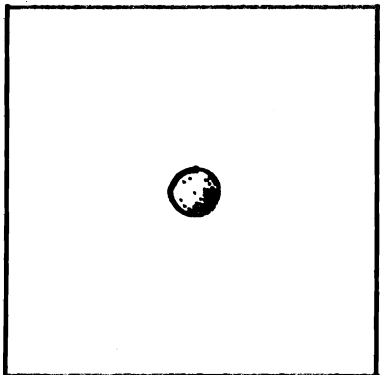
Rods

Chart 1
Geometric Objects

Type I: Spheres

The spheres are usually nicely spherical but as they are modelled between the palms of the hands, many examples show a tendency to be somewhat flattish or ovoid and others are faceted. The surface is usually very smooth, suggesting that they were made with wet clay which produced a self slip. There are, however, examples which exhibit a rough, uneven surface, including cracks. On occasion there are traces of the material they were laid upon to dry, such as straw or textile.

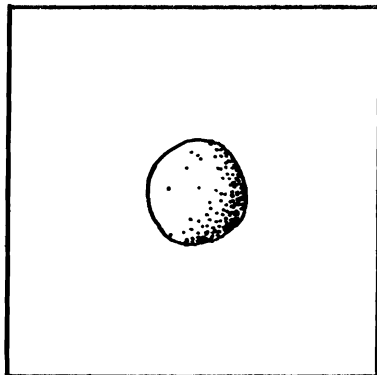
The spheres can be divided into 11 different subtypes according to size, fraction and surface markings such as incisions and punches.

1. Pellets

Size: 5 mm. in diameter and less

Distribution: Tepe Asiab, Ganj-Dareh Tepe,
Sarab

Number: at least 61 at Asiab

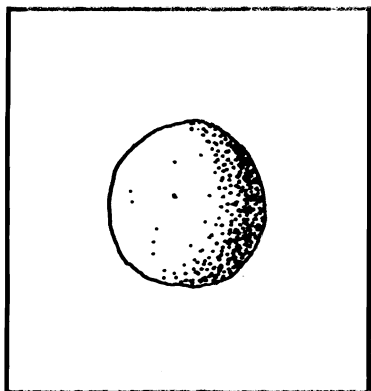
2. Spheres

Size: 6 mm. to 2.5 cm. with maximum frequency
1-1.5 cm.

Distribution: most common type of geometric objects
found in virtually all early Near Eastern sites; present
in Khartoum

Number: 1153 at Jarmo

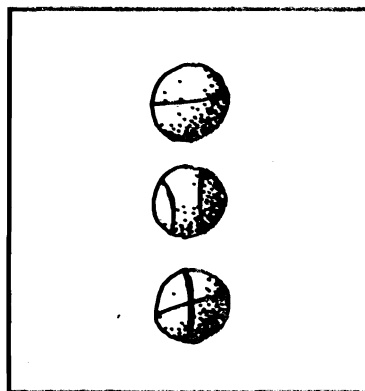
3. Large Spheres



Size: larger than 2.5 cm.

Distribution: Ganj-Dareh Tepe, Tepe Guran,
Tell Abu Hureyra

4. Incised Spheres



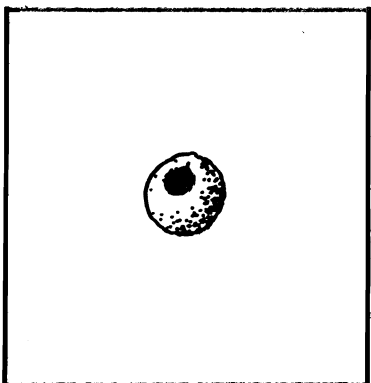
Size: 6 mm. to 2.5 cm.

Distribution: Khartoum, Jarmo, Ur, Susa, Tepe Hissar

Description: bear incisions probably practiced with a
pointed stick or bone awl

Patterns: a circle or spiral around the maximum
diameter; two circles or spirals on either side of
the maximum diameter; two circles intersecting at
right angles

5. Punched Spheres

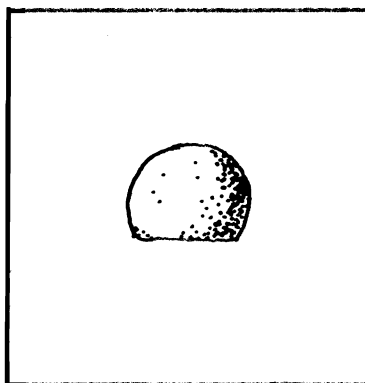


Size: ca. 2 cm.

Distribution: Tepe Asiab, Ganj-Dareh Tepe,
Tepe Guran

Description: bear a deep punch probably
applied with the blunt end of a stick

6. 3/4 Spheres

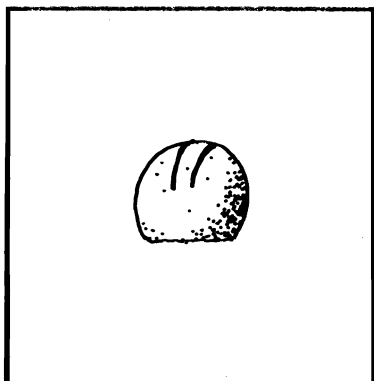


Size: ca. 2 cm. in diameter and 1.5 cm. high

Distribution: Cayönü Tepesi, Ganj-Dareh Tepe, Tepe
Sarab, Jarmo, Chaga Sefid, Susa

Description: one flat side achieved by applying
pressure on a wet ball against a flat surface

[illegible]

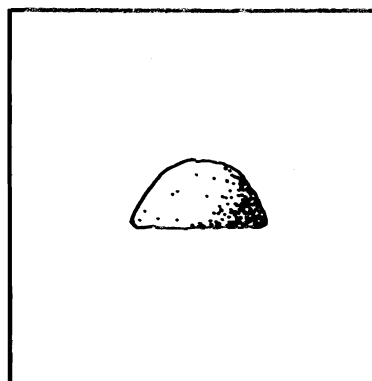
7. Incised 3/4 Spheres

Size: same as above

Distribution: Chaga Sefid, Susa

Description: bear incisions either on the flat or on the convex part

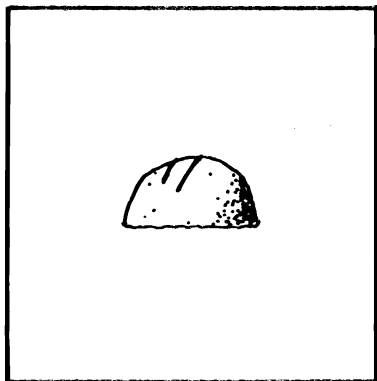
Pattern: two circles on either side of the maximum height

8. Hemispheres

Size: ca. 1.5 cm. in diameter and 7 mm. high

Distribution: Tepe Asiab, Ganj-Dareh Tepe, Tepe Sarab, Jarmo, Kish.

Description: shape achieved by pressing a clay ball against a flat surface; no trace visible of cutting; convex side usually nicely spherical and smooth

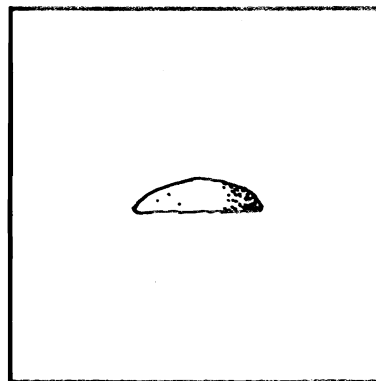
9. Incised Hemispheres

Size: same as above

Distribution: Jarmo

Description: bear incisions on the convex side

Pattern: diagonal lines

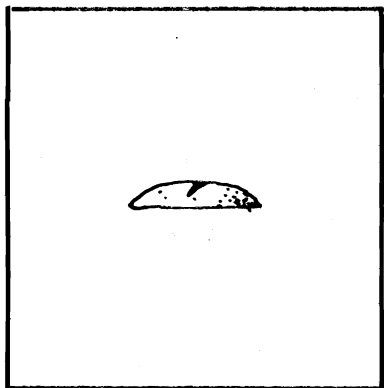
10. 1/4 Spheres

Size: ca. 1.5 cm. in diameter and 3 mm. thick

Distribution: Tepe Asiab, Ganj-Dareh Tepe, Tepe Sarab, Jarmo, Can Hasan, Kish

Description: plano convex disc, very close to type II.1

11. Incised 1/4 Spheres



Size: same as above

Distribution: Jarmo, Chaga Sefid, Ur

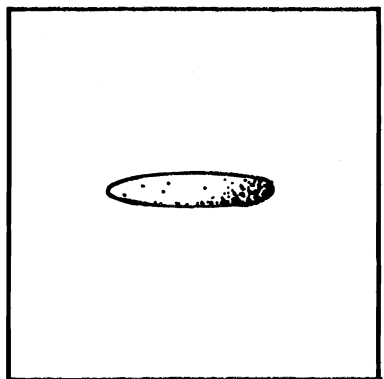
Description: bear incisions on the convex surface

Pattern: diagonal lines; two lines meeting at right angles

Type II: Discs

The discs may be divided into eight different subtypes according to their thickness and the different markings, including incisions and punching.

1. Flattened Pellets

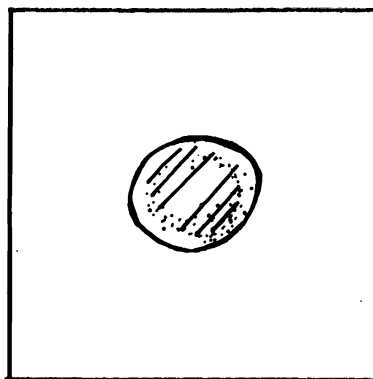


Size: 1-4 cm. in diameter and 5 mm.-1 cm. thick

Distribution: Khartoum, Tepe Asiab, Ganj-Dareh Tepe, Cayönü Tepesi, Tepe Guran, Tepe Sarab, Tell Ramad, Chaga Sefid, Can Hasan, Seh Gabi, Susa

Description: made by squeezing a pellet between the fingers; tapering sides, usually with irregular contours; uneven thickness and coarse surface

2. Incised Flattened Pellets



Size: 35 mm. in diameter and 7 mm. high

Distribution: Susa

Description: bear incisions on one side

Pattern: six parallel lines arranged in two rows of three lines









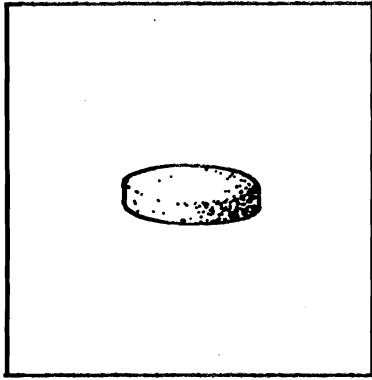
 II.1	7		1	●	1		206		●	●	●	●	2	●	●	
 II.2	6						⋮								●	
 II.3				●	2	7	↓	●	●		●	●	3	●	●	
 II.4										●					●	
 II.5													●		●	
 II.6											●					
 II.7											●					
 II.8										●						
	KHARTOUM															
	ABYDOS															
	TELL RAMAD															
	CAYÖNÜ TEPE SI															
	CAN HASAN															
	BELDIBI															
	JARMO															
	JEMDET NASR															
	KISH															
	TEPE ASIAB															
	GANJ DAREH															
	TEPE GURAN															
	TEPE SARAB															
	CHAGA SEFID															
	TEPE YAHYA															
	SEH GABI															
	SUSA															
	Egypt	Syria	Anatolia	Mesopotamia	Iran											

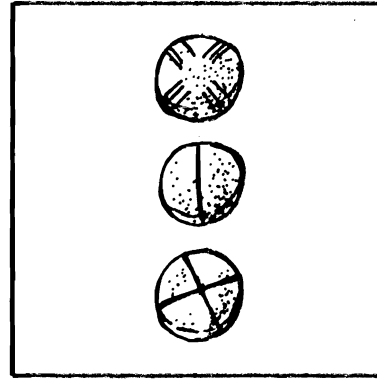
Chart 3. Discs

3. Discs

Size: ca. 1.5 cm. in diameter and 1 cm. thick

Distribution: Beldibi, Ganj-Dareh Tepe, Cayönü Tepesi, Tepe Guran, Tepe Sarab, Can Hasan, Chaga Sefid, Tepe Yahya, Susa, Tepe Hissar

Description: straight sides; both circular surfaces slightly concave from pressure between fingers during manufacture; usually very carefully made

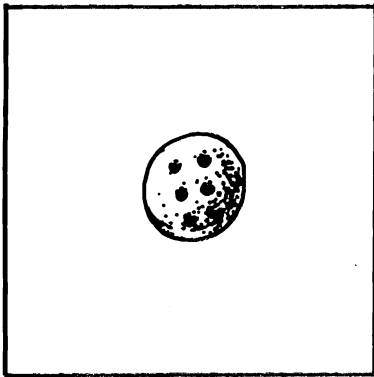
4. Incised Discs

Size: same as type 3

Distribution: Ganj-Dareh Tepe, Susa

Description: bear incisions on one side

Patterns: small strokes around the edge; one line in the center; two lines meeting at right angles in the center; series of parallel lines

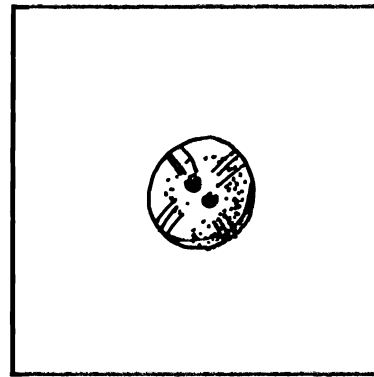
5. Punched Discs

Size: same as type 3

Distribution: Tepe Sarab, Susa

Description: bear punched marks on one side

Patterns: one punch in the center; six punches in two rows

6. Incised and Punched Discs

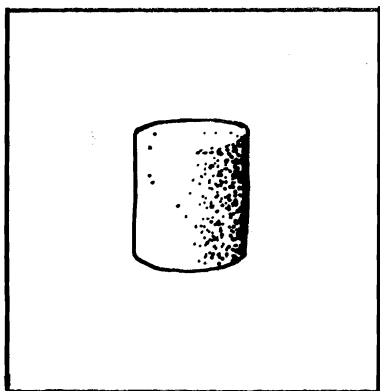
Size: same as type 3

Distribution: Ganj-Dareh Tepe

Description: bear incisions and punched marks

Patterns: punch marks in the center; incisions at the periphery

7. High Discs

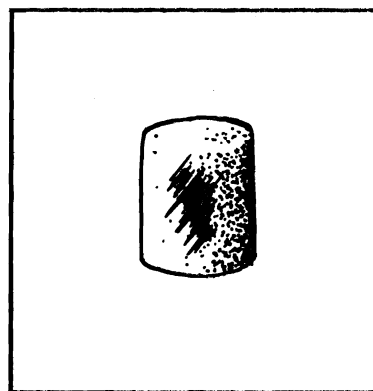


Size: 7 mm.-1.5 cm. in diameter and 1-1.5 cm. high

Distribution: Ganj-Dareh Tepe

Description: short cylinder with straight or slightly convex sides

8. Incised High Discs



Size: same as above

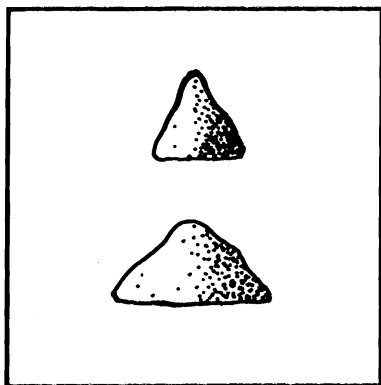
Distribution: Tepe Asiab

Description: bear deep incision along the side

Type III: Cones and Tetrahedrons

This category contains the most popular and numerous shapes after the spheres. The majority of the examples are carefully made with fine clay. Twelve subtypes have been identified.

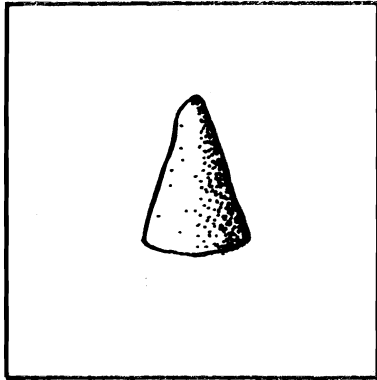
1. Cones



Size: 1-3 cm. high; 1-2.5 cm. base diameter, usually 1.5 cm. high and 1 cm. base diameter

Distribution: Tepe Asiab, Ganj-Dareh Tepe, Cayönü Tepesi, Tepe Sarab, Tepe Guran, Jericho, Jarmo, Suberde, Tell Aswad, Tell Ramad, Belt Cave, Hajji Firuz, Anau, Seh Gabi, Can Hasan, Tell es Sawwan, Tepe Gawra, Arpachiyah, Tal-i-Iblis, Susa, Tepe Hissar, Tal-i-Bakun, Tepe Yahya, Ur, Kish, Megiddo, Abu Hammam

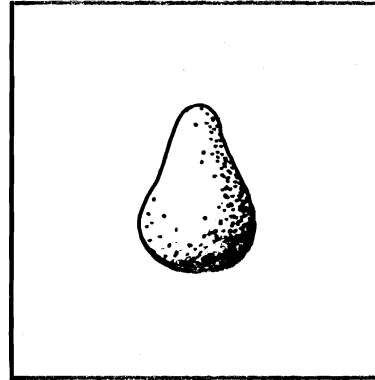
Description: many variations including squat or high examples; round or pointed tips; usually slightly concave sides; round to oval base sometimes slightly concave

2. Large Cones

Size: 3-5 cm. high and ca. 2-2.5 cm. at the base

Distribution: Ganj-Dareh Tepe, Cayönü Tepesi, Chaga Sefid, Tepe Yahya

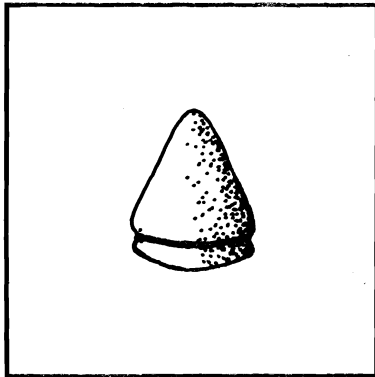
Description: usually asymmetrical with the top bending in one direction; often carelessly made

3. Cones with a Rounded Base

Size: 1-2 cm. high and 1-1.5 cm. base diameter

Distribution: Tal-i-Bakun, Susa

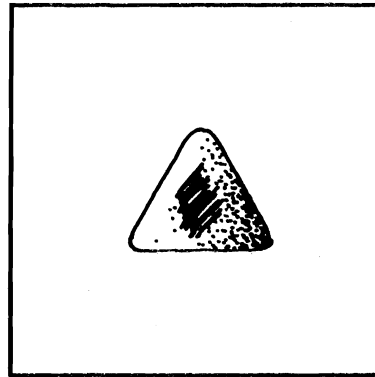
Description: convex base in the shape of a pear or drop. There is often an incision running around the maximum diameter

4. Cones with a Constriction Above the Base

Size: same as type 1

Distribution: Tepe Sarab, Tepe Guran, Susa

Description: deep groove or circular incision above the base often performed with fingernail

5. Incised Cones

Size: 2.5 cm. high and 2-2.5 cm. base diameter

Distribution: Ganj-Dareh Tepe, Cayönü Tepesi, Tepe Sarab, Suberde, Susa

Description: bear incised marks on the side

Patterns: deep groove in a saw-tooth pattern penetrating 3-5 mm. inside the cone, made by pushing a stick back and forth; rarely, decorative motifs such as herringbone patterns













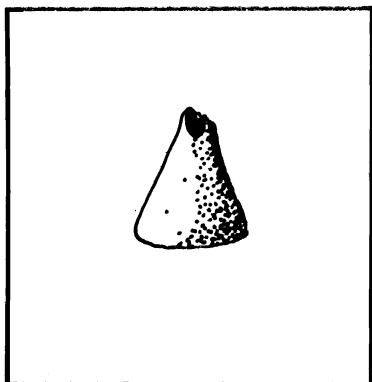
 III.1	●	●	●	4	●	●	33	3	106	●	●	●	●	●	●	●	5	●	●	●	●	●	10	●			
 III.2						●			↓								●		2			●					
 III.3																								●			
 III.4																		●			●			●			
 III.5						●	2										●	●						●			
 III.6				1												●	●							●			
 III.7				1																							
 III.8						●			20							●		●		●		●		●			
 III.9																								●			
 III.10																●								●			
 III.11																								●			
 III.12				21	●		1	13		●	●					●	●							●			
	JERICHO	MEGIDDO	ABU HAMMAM	TELL RAMAD	TELL ASWAD	CAYÖNÜ TEPE SI	SUBERDE	CAN HASAN	JARMO	TEPE GAWRA	ARPACHIYAH	TELL ES SAWWAN	UR	KISH	TEPE ASIAB	GANJ DAREH TEPE	BELT CAVE	TEPE SARAB	CHAGA SEFID	SEH GABI	HAJJI FIRUZ	TEPE GURAN	ANAU	TEPE YAHYA	TAL-I-IBLIS	TAL-I-BAKUN	SUSA
	Palestine		Syria			Anatolia				Mesopotamia					Iran												

Chart 4. Cones and Tetrahedrons

6. Punched Cones

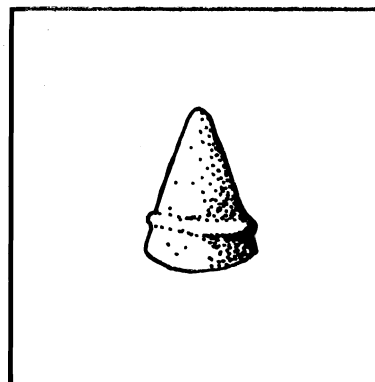


Size: same as type 1

Distribution: Tepe Asiab, Ganj-Dareh Tepe,
Tell Ramad, Susa

Description: bear a punch mark usually at the
tip or along the side; on one occasion six
punch marks on the sides

7. Cone with a Coil

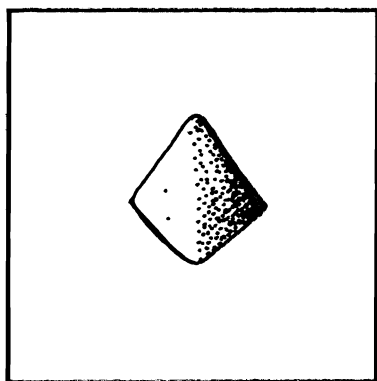


Size: 2 cm. high and 1.9 cm. at the base

Distribution: Tell Ramad, Chaga Sefid

Description: small clay coil wrapped around the
base

8. Tetrahedrons

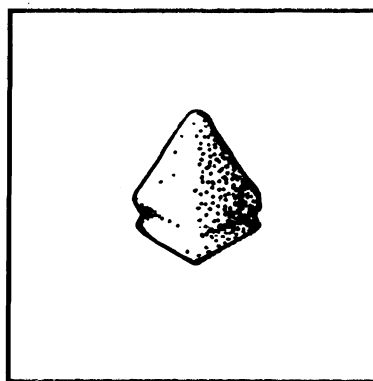


Size: ca. 2.5 cm. at the base and 2 cm. high

Distribution: Ganj-Dareh Tepe, Cayönü Tepesi,
Anau, Jarmo, Tepe Sarab, Chaga Sefid, Seh
Gabi, Susa

Description: triangular base and three sides
defined by more or less sharp edges; tip
pointed or round

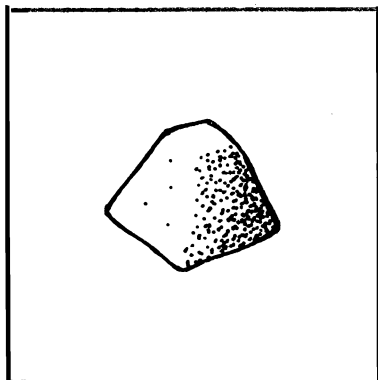
9. Tetrahedrons with a Constriction Above the Base



Size: same as type 8

Distribution: Susa

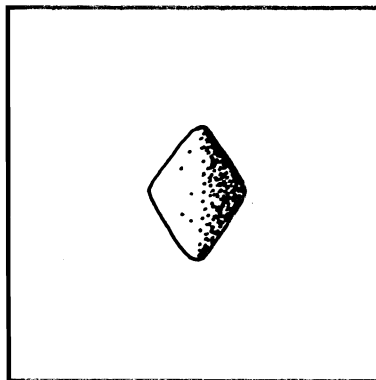
Description: deep groove fashioned with nails
above the base

10. Pyramids

Size: ca. 1.5 cm. high and 2-2.5 cm. at the base

Distribution: Ganj-Dareh Tepe, Tal-i-Bakun

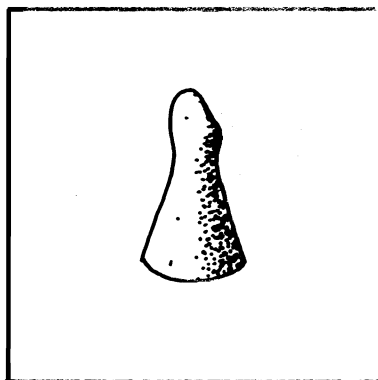
Description: square base, four sloping sides defined by more or less sharp edges; usually flat top

11. Biconoids

Size: 2.7-2 cm. high and 1.5-1 cm. thick

Distribution: Susa, Ur

Description: two cones joined at the base; usually nail incisions emphasize the greatest diameter; on one occasion, incised linear pattern on one of the two cones

12. Cones with Pinched Tops or Animal Heads (Figure 4)

Size: 2-3 cm. high and 2-2.5 cm. at the base

Distribution: Tepe Asiab, Ganj-Dareh Tepe, Tell Aswad, Tell Ramad, Suberde, Can Hasan, Tell es Sawwan, Tepe Gawra, Susa

Description: tip pinched into a flat squarish end; often takes the appearance of a bird's head; in other cases looks like an animal or human head; details may include pointed muzzle, ears, incised mustache

Type IV: Rods

The shape of these objects makes them particularly fragile and very few have come to us complete. There are two distinct types, classified according to their manufacture.

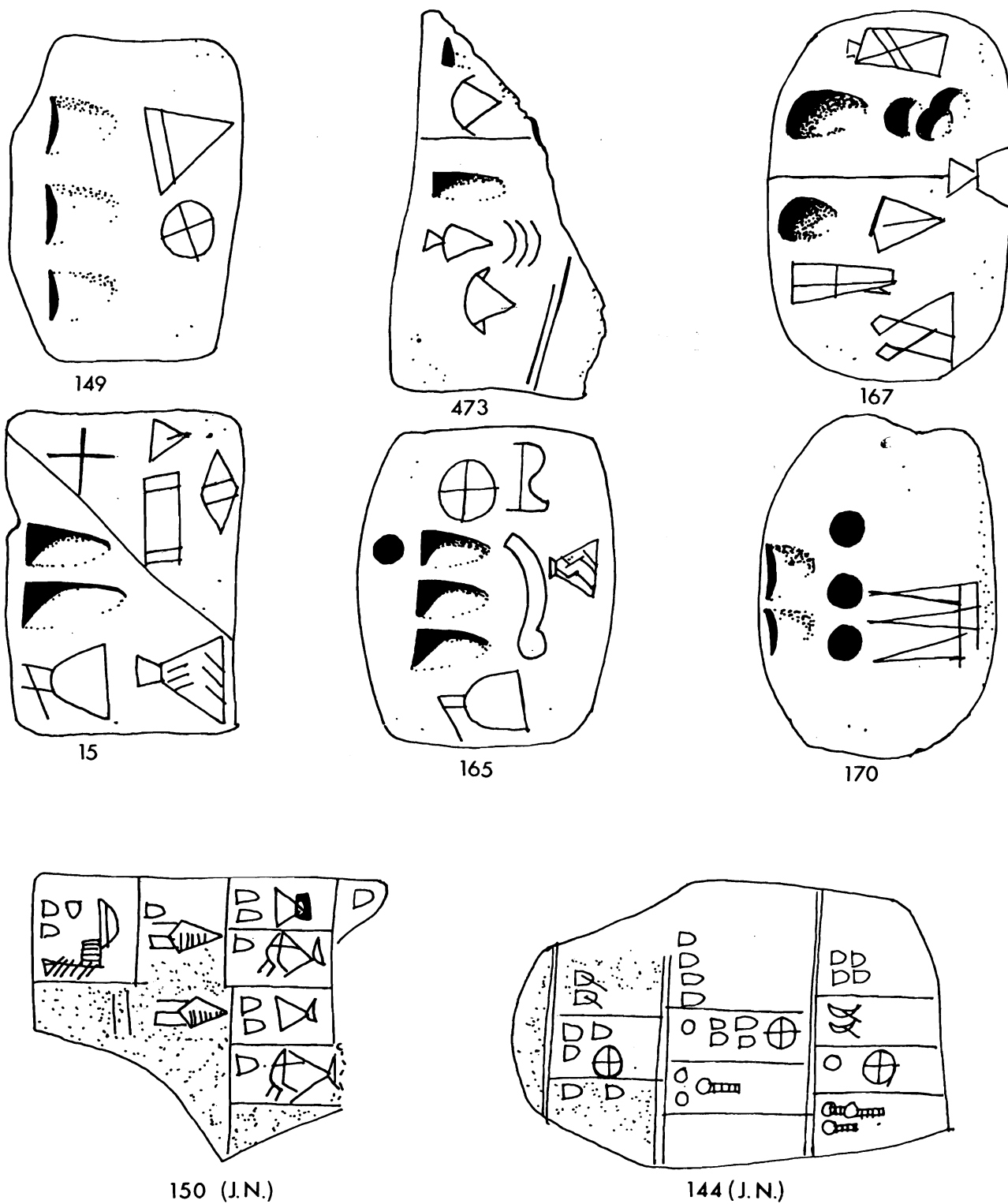


Figure 1. Clay tablets from Warka (149, 15, 167, 170, 473, 165) and Jemdet Nasr (150, 144)



Figure 2a.
Black stone tablet, obverse, sale of land property.

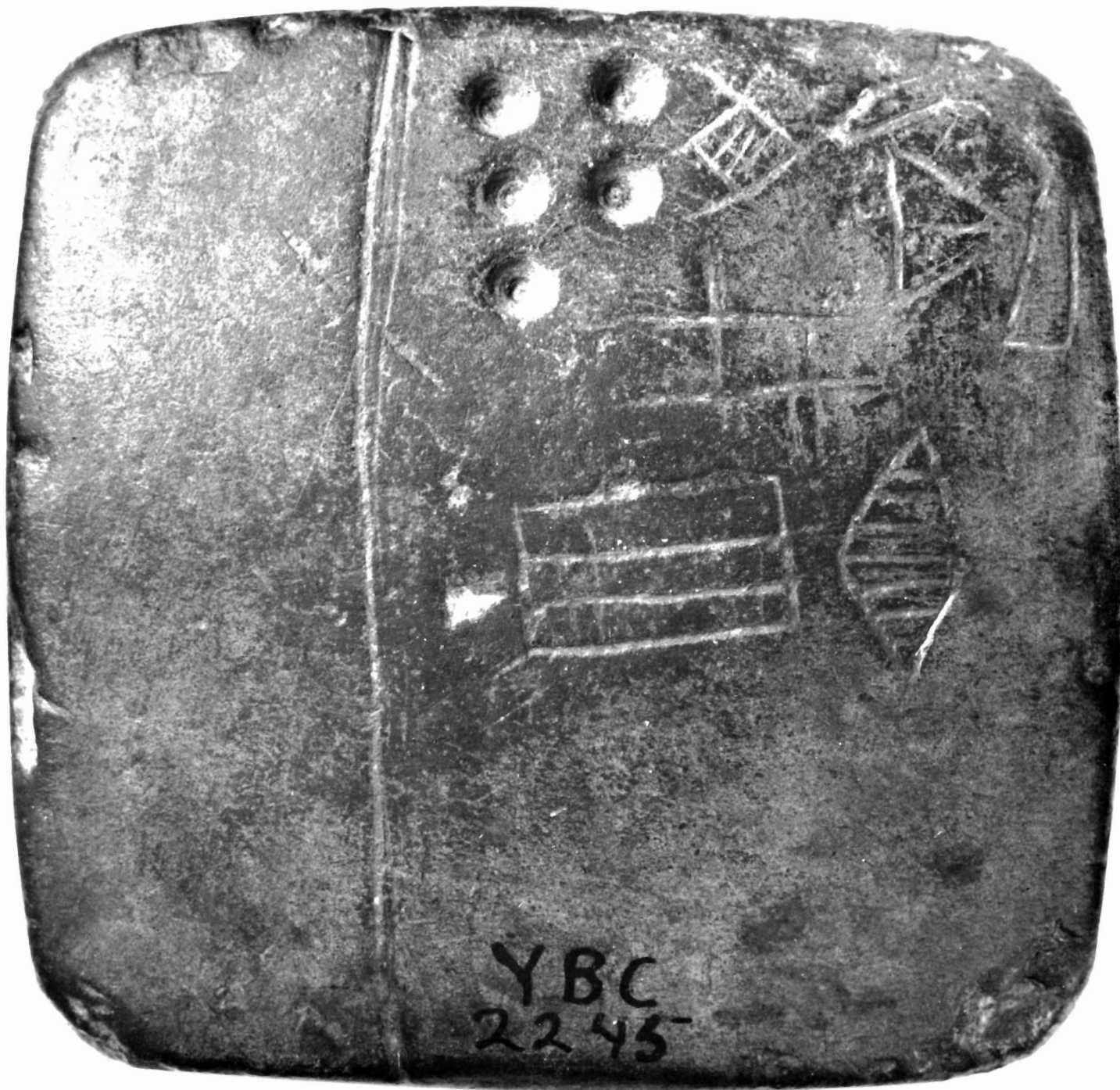


Figure 2b.
Black stone tablet, reverse.

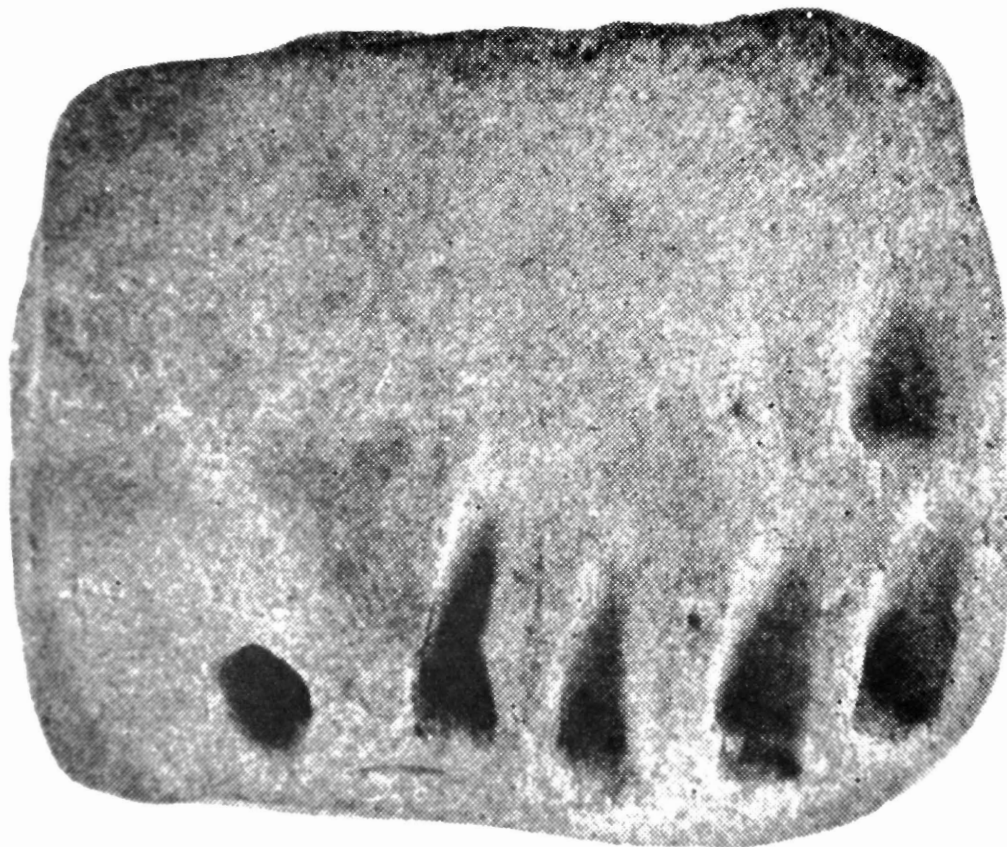


Figure 3. Clay numerical tablet.
Each conical punch mark stands for 1 unit, the circular one for 10 units.

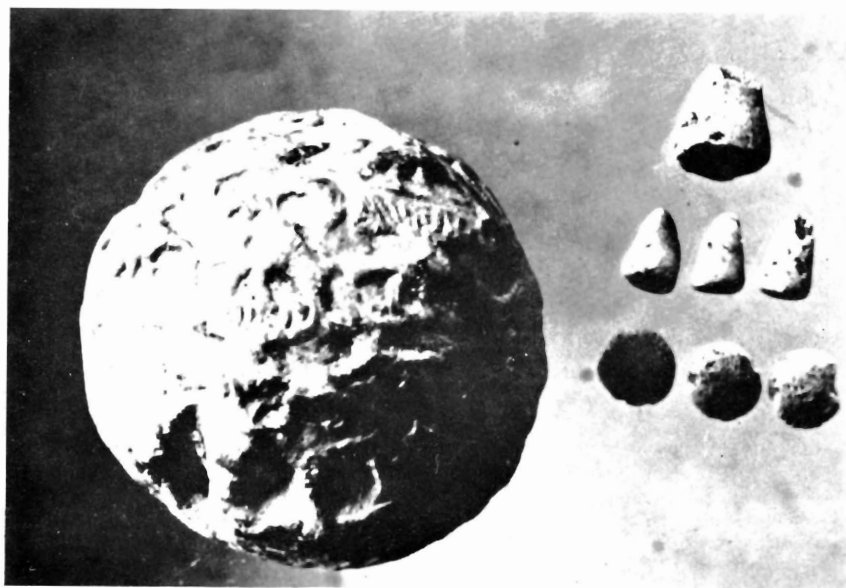


Figure 4. Susa, Iran. Bulla with its contents:
1 large cone, 3 cones, 3 discs. Note corresponding circular
and conical marks on the outside of the bulla.



Figure 5.
Jarmo, Iraq. Spheres, discs, cones and tetrahedrons.



Figure 6.
Tepe Yahya, Iran. Spheres, discs and cones.

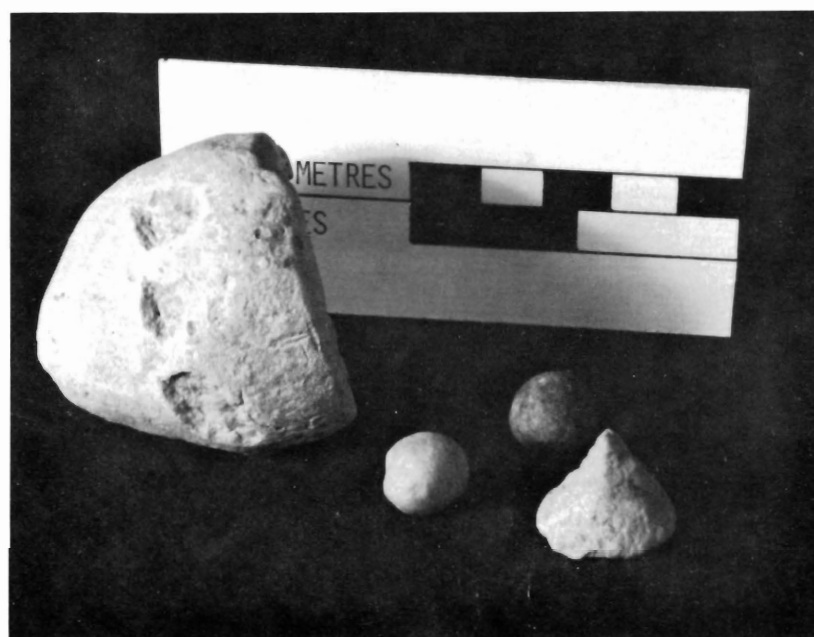


Figure 7. Tepe Yahya, Iran.
Bulla with its contents:
1 cone and 2 spheres.
Note the three undifferentiated
marks on the surface of the bulla.

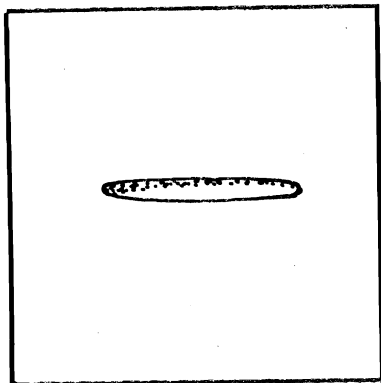


Figure 8. Susa, Iran. Bulla with its contents:
3 discs and 3 elongated pellets.
Note the corresponding marks on the outside of the bulla.



Figure 9.
Discs with an incised cross from Ur.

1. Elongated Pellets

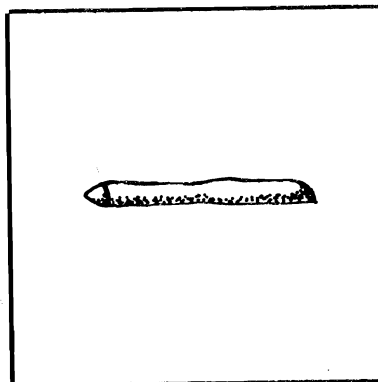


Size: 1.5-5 cm. long and 3 mm.-1 cm. thick

Distribution: Tepe Asiab, Ganj-Dareh Tepe,
Tepe Sarab, Chaga Sefid

Description: small coil with tapering ends
rolled between the palms of the hands;
usually straight, but sometimes curved in
a crescent shape

2. Rods



Size: 5 cm. long and 1-1.5 cm. thick

Distribution: Ganj-Dareh Tepe, Tell Abu Hureyra

Description: rods with sharp ends manufactured
by cutting a long clay coil to desired length;
on occasion coils were achieved by pinching
clay on a flat surface giving a triangular section
to the rods

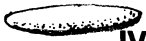
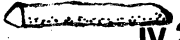
	IV.1							●		●	●			●	
	IV.2	●	●	●	●		●		●	●	●	●	●	●	
		TELL ABU HUREYRA		SUBERDE	BELDIBI		JARMO		TEPE ASIAB	GANJ DAREH TEPE	BELT CAVE	TEPE SARAB	CHAGA SEFID		
		Syria	Anatolia	Mesopotamia	Iran										

Chart 5. Rods

3.2. Materials

It is noteworthy that the general shape of the tokens is globular. There are no angular shapes represented such as squares, cubes and triangles. This may indicate that the prototypes originated in a soft pliable material such as clay and that tradition perpetuated the habit of modelling them in this material. Indeed almost all the tokens recovered are made of clay. It seems that a very fine clay with rare sand or organic inclusions was generally selected for their manufacture. The clay was usually left untempered.

Rarely are other materials selected for the manufacture of the geometric objects. There is one sphere made of white plaster, recorded at Suberde; five bone discs bearing incisions at Ur; and a unique series of three spheres, seven discs and one cylinder made of red ochre (hematite), at Beldibi. In the IX-VIth millennia, there are few specimens made of stone. Fine colorful stones such as white, pink and black marble and grey slate become popular in later times, for instance at Jemdet Nasr, Kish and Tepe Gawra. The royal cemetery of Ur produced a series of tetrahedrons and cones made of lapis lazuli.

3.3. Manufacturing

The manufacture of the tokens did not involve any mold or particular technique other than hand modelling. No example shows any trace of cutting or abrasion. The spheres, elongated pellets, and cylinders were rolled between the palms of the hands. The 3/4, 1/2 and 1/4 spheres appear to be spheres flattened by applying pressure against a flat surface. The cones, tetrahedrons and discs were shaped between the finger tips. The tetrahedrons involved a slight pressure between three fingers to create the edges. All these shapes are extremely easy to achieve; they are in fact the shapes which spontaneously emerge when doodling with a small lump of clay between the fingers. The tokens usually exhibit regular features and smooth surfaces, which would suggest that the clay used for the manufacture was very soft. The incisions described in the various subtypes and which may confer a special meaning to some cones, spheres and discs, were performed either with the finger nail or with a pointed stick or bone awl. Otherwise there is generally no surface treatment, though occasional burnished specimens occur, and at Susa, two cones appear to have been covered with a red slip.

The general color of the objects is buff, reddish, or red but there are a great number of gray, blackish and black examples. This is the typical range of colors achieved by fired clay. Broken specimens often exhibit a black core, which would suggest that the tokens were fired at low temperatures unable to achieve complete oxidation through the thickness of the objects. This hypothesis was confirmed by a series of tests including DTA (Differential Thermal Analysis) and examination through the scanning microscope performed at MIT under the supervision of W. D. Kingery, on a series of tokens from Tepe Asiab and Tepe Sarab. The tests concluded that a partial fusion of the crystals had occurred, a process which begins at a temperature between 500-700° for Montmorillonite—the type of clay involved.⁵ This

⁵Denise Schmandt-Besserat. "The Use of Clay before Pottery in the Zagros." *Expedition* 16, 2:13, 1974.

temperature range is typical of an open hearth and indeed in some instances tokens were found mixed within the ashes of hearths as, for instance, at Tell Ramad. The differences in color would correspond to their location in the hearth during the firing process. The buff and red ones were probably fired on the border where there is much oxygen exchange and the atmosphere oxidizes. The gray and black specimens were at the center where oxygen is rare and the atmosphere reducing. When the geometric objects are executed in stone, they exhibit a superior craftsmanship—the spheres are perfectly round, the cones and tetrahedrons perfectly symmetrical.

3.4. Distribution in Space and Time

The tokens appear in the IXth millennium B.C. (see Chart 6) together with small human and animal figurines and beads, representing the earliest evidence of the use of clay by man in the Middle East. Except for the minute conical flint cores found in quantity for instance at Ganj-Dareh Tepe, there are no objects of similar shape which seem to precede them in the Mesolithic or Paleolithic periods. As was already mentioned above, the globular outline of the general shapes does seem to point to clay for the prototypes.

Tepe Asiab and Ganj-Dareh Tepe are the earliest sites where the tokens occur, and both may be dated to the middle of the IXth millennium B.C. (Ganj-Dareh Tepe, level E 8450± GAK 807). They are present in virtually all Neolithic sites—for instance at Jarmo, Suberde, Anau, Tell es Sawwan and Tal-i-Iblis. They continue in the Bronze Age at Warka, Jemdet Nasr, Tepe Gawra, Kish, the Diyala, Ur, Susa and Tepe Hissar. They are still present in the IInd millennium at Tepe Hissar and Megiddo. There is no evolution to be noticed in the shapes, sizes or types. Vivian Broman notes that at Jarmo tetrahedrons occur when cones become less frequent.⁶ This remark does not seem to be true in other sites. There seems to be a greater concentration of tokens in the Zagros and Mesopotamia than in the remaining parts of the Middle East. At Suberde, in Anatolia for instance, the total amount of tokens is 36 cones, 6 spheres and 13 cylinders. This is small compared to the 1153 spheres, 206 discs and 106 cones of Jarmo.⁷ Tepe Sarab also has a great number of tokens which are in the process of being inventoried by Vivian Broman. Syria seems to have the fewest, and sites such as Bouqras, Mureybat and Koum have conspicuously yielded none. This may mean either that the tokens were more in demand in Mesopotamia and Iran or that the compact clay archaeological layers of Syria make them especially difficult to find while they are very visible in the sandy fill of the Zagros.

The tokens cover a great spatial extension (see Map 1): they reach Anau and Hissar to the northeast, Bampur and Tepe Yahya to the southeast, Beldibi to the northwest, and Khartoum to the southwest. I also know of their presence in the Franchthi cave on mainland Greece.

3.5. Intra-site Clustering

The find spots of the tokens have been carefully plotted in the excavations of Hajji Firuz by Mary Voigt. The publication of the site report is therefore expected to throw light on

⁶V. L. Broman. *Jarmo Figurines*, unpublished Master Thesis, Cambridge, p. 58.

⁷*Ibid.*, pp. 62, 63, 58.

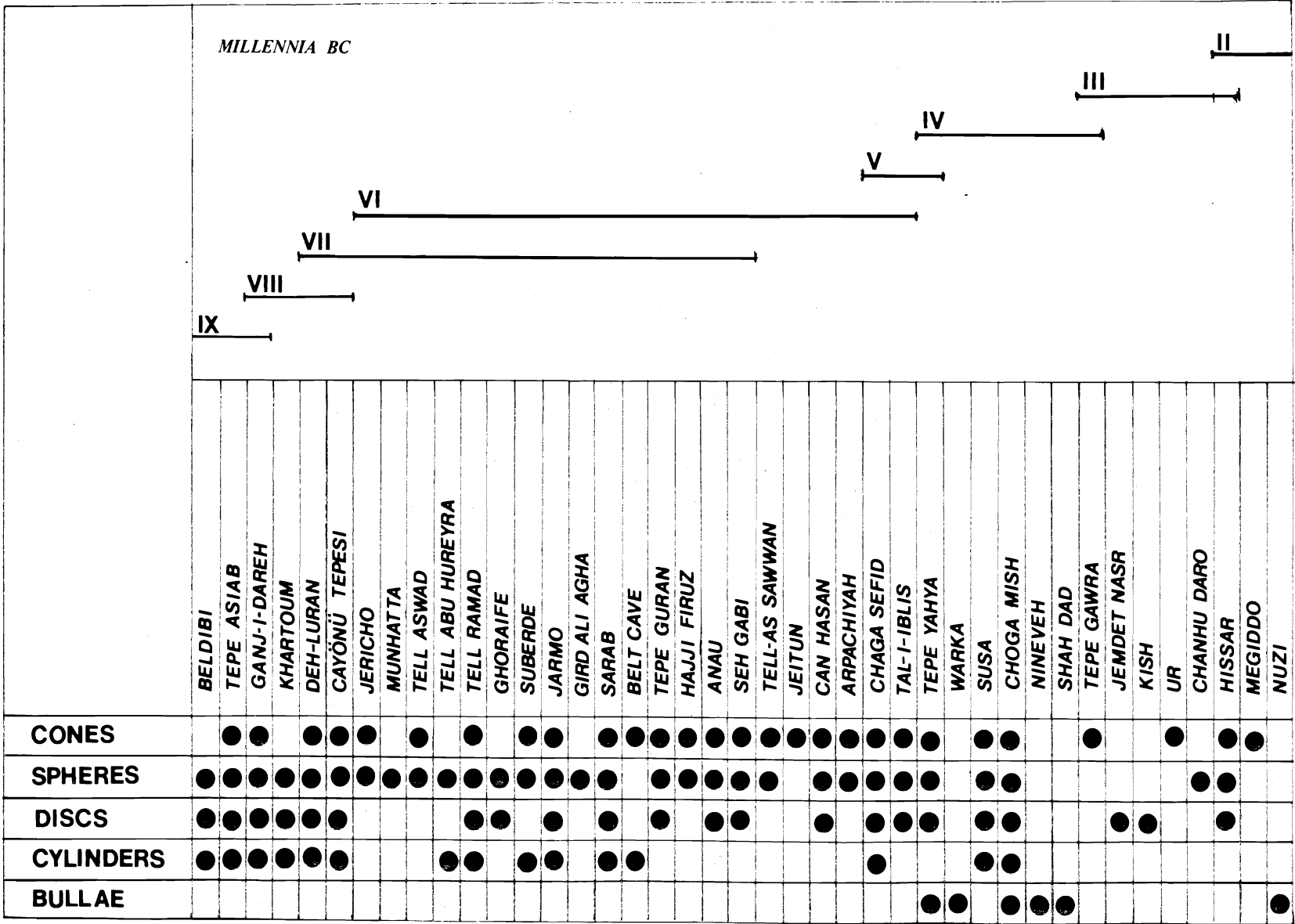
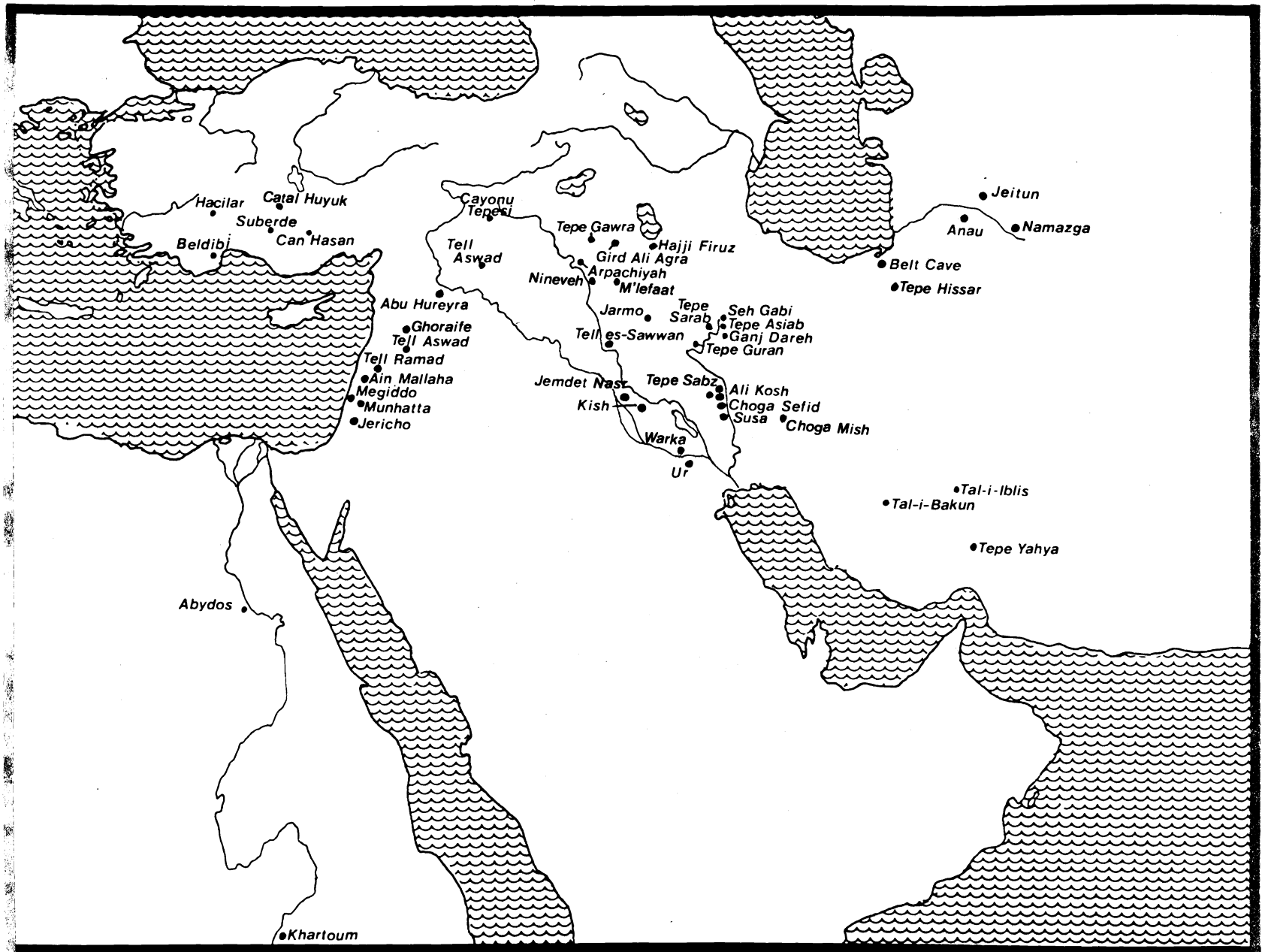


Chart 6. Time Distribution



Map 1. Space Distribution

the location of the geometric objects in the houses. In other sites the objects are usually found laying on the floors of houses. They may have a tendency, such as at Tepe Gawra, to concentrate in storage areas. They are found either isolated or in groups of two to five specimens, or, rarely, 15 to 40 at a time. At Tepe Gawra 460 were clustered together.

The tokens may be found in great numbers at certain sites. For instance the inventory made by Vivian Broman for Jarmo lists as stated above 1153 spheres, 206 discs and 106 cones. Unfortunately many sites do not give an accurate count and we are left with vague statements such as in the Tepe Gawra report: "the pieces are virtually ubiquitous."

There is an overwhelming majority of spheres at Jarmo as compared to cones. There also seem to be more spheres at Tepe Asiab, Cayönü Tepesi, Chaga Sefid and Ali Kosh. In contrast, cones are in the majority at Tell Ramad, Suberde, Can Hasan, Ganj-Dareh Tepe and Belt Cave. Discs are predominant at Tepe Guran and Beldibi.

The tokens are usually found loose; if they were kept in containers they must have been baskets or bags made of skin or textile which did not leave any trace.

At a number of sites, including Susa, Tepe Yahya, Shah Dad, Habuba Kabira and Warka, tokens have been found enclosed in hollow clay balls serving as envelopes. These clay balls, called "*bullae*," are dated to about the first half of the IVth millennium. They are the size of a tennis ball or smaller. They were found totally sealed and had to be broken to identify their contents. The number and type of tokens enclosed has always been variable. For instance, in one case were found one large cone, three small cones and three discs (flattened pellets); in a second, three cylinders (elongated pellets), and three discs; in a third, two spheres and one cone. Some bullae bear the imprint of cylinder or stamp seals impressed upon the entire surface. Some also have a number of punched marks on the outside which repeats the number of items enclosed. At Tepe Yahya, a bulla containing two spheres and one small cone shows three marks (Fig. 7). At Susa, the shape of the punched marks obviously reproduce the form as well as the number of the objects inside (Figs. 4 and 8).⁸ A large or small cone is rendered by a conical mark of appropriate size made with the pointed end of a stick or stylus. Discs and spheres are reproduced as a circular mark with the round end of the stylus.⁹

4. The Function of the Clay Tokens

4.1. Epigraphic Evidence from Historical Periods

A *bulla* found at Nuzi may shed some light on the function of the geometric objects.¹⁰ The Nuzi bulla, dated ca. 1500 B.C., was found containing 48 small objects described as

⁸Pierre Amiet. "Glyptique Susienne." *Mémoires de la Délégation archéologique en Iran*, Vol. XLIII. Paris 1972. Vol. II, Pl. 61ff.

⁹*Bullae* of the same appearance and covered with undeciphered signs have also been found at Abydos in Egypt. However, they seem to be part of a funerary rite and their content and purpose seem totally different. One series of bullae found in a tomb contained small textile pellets. In another case the content was a tuft of child's hair. T. Eric Peet, "A Remarkable Burial Custom of the Old Kingdom." *The Journal of Egyptian Archaeology* 2:8-9, 1915. Winifred M. Crompton, "Two Clay Balls in the Manchester Museum." *The Journal of Egyptian Archaeology* 3:128, 1916.

¹⁰The *bulla* is referred to by A. Leo Oppenheim as an "egg-shaped tablet." A. Leo Oppenheim, "An Operational Device in Mesopotamian Bureaucracy." *Journal of Near Eastern Studies* 17:121-28, 1958.

“pebbles” in the report. The *bullā* had the unique feature of bearing on its surface a lengthy cuneiform inscription which referred to the “pebbles” as *abnū* (Akkadian: *abnu*, pl. *abnū*, *abnāti*, counter). The translation of the inscription is the following:

“*Abnū* (referring to sheep and goats):

21 ewes that have given birth

6 female lambs

8 full grown rams

4 male lambs

6 she-goats that have given birth

1 he-goat

2 female kids

seal of Ziqarru (the shepherd).”

The sum of all the animals mentioned adds up to 48, and there is no doubt that the *abnū* were counters representing animals of a herd. According to A. Leo Oppenheim, there are many instances in which the word *abnū* occurs in short administrative notes and usually it occurs in conjunction with three verbs: “deposit,” “transfer” and “remove.” Such notes may read “these sheep are with PN; the (pertinent) *abnū* have not been yet deposited;” “three lambs, two young he-goats, the share of PN, they are charged to his account (but) not deposited among the *abnū*;” “one ewe belonging to PN, its *abnū* has not been removed;” “all together 23 sheep of Silwatešup, PN brought . . . their *abnū* have not been transferred;” “x ewes that have lambed, without (pertaining) *abnū*, belonging to PN.” These texts suggested to Oppenheim the existence of a system in the Palace of Nuzi of keeping records of the herds by means of small counters. Each animal of the herd was represented by a small object or *abnū* and deposited in a receptacle such as a basket or a pot bearing a mention such as kids, lambs, ewes, rams, he-goats, she-goats, etc.. New *abnū* would be deposited when new animals were born or passed into a new category; *abnū* could be transferred in various receptacles to keep track of change of shepherds or pasture, when animals were shorn, etc.. They would be removed when an animal was traded, died, or was killed for food or sacrifice. Oppenheim interpreted the *bullā* as a transfer of *abnū* from one account to another, possibly between two different services of the palace. It is interesting to note that the total number of animals did not figure in the inscription, which emphasizes the fact that each category was to be treated separately and deposited in a separate container. This system of accounting was probably widespread in Western Asia and is similar to many early counting systems, in particular, the use of *calculi* in classical times. In fact, Jacobsen notes that Iraqi shepherds still keep account of the animals in their care by means of pebbles.¹¹ The system of *abnū* could be, and certainly was, applied to accounting for all possible goods. For instance, the Bible pictures Yahweh keeping account of all humans with the same device: all living individuals are represented by a counter in a receptacle. Death occurs when an angel whirls a counter away with a sling.¹²

It seems plausible that the *bullae* found in Mesopotamia and Iran in the IVth millennium had a similar function and were part of a system of accounting as described above. Another very

¹¹Thorkild Jacobsen, *Human Origins*, Series II, Second Edition, p. 245. University of Chicago Press, 1946.

¹²Otto Eissfeldt, *Der Beutel der Lebendigen*, Berichte über die Verhandlungen des Sächsischen Akademie der Wissenschaften zu Leipzig, Philologisch-Historische Klasse, Band 105, Heft 6, Akademie Verlag, Berlin 1960.

similar interpretation by Pierre Amiet for the *bullae* of Susa is that they were bills of lading accompanying finished products such as textiles, manufactured in the country and transferred to the administrative center in the city.¹³ The producer consigned his goods to the care of a middle man together with a *bull*a containing a number of tokens corresponding to the load of goods. The *bull*a was duly sealed for authentication. The recipient of the load could, by breaking the *bull*a, check the accuracy of the shipment upon arrival.

Transfer of items from one account to the other, bill of lading, the interpretations are certainly not mutually exclusive. In general terms, we may consider the *bullae* as part of an accounting system based on tokens to keep records of transactions. If this assumption is correct, the tokens are counters. Because their presence is recorded throughout the millennia without any evolution of shapes, it may be assumed that this system of recording had its origin in at least the IXth millennium B.C.

4.2. Internal Evidence Based on Comparison with Early Tablets

One crucial point remains to be elucidated: the meaning of all the different shapes of the geometric objects. When the Nuzi *bull*a was found, it was intact and still contained all 48 *abnū*, which in the meantime have unfortunately been separated from the *bull*a and seem irrecoverable. We, therefore, have no information on their material or shapes. Had they been adequately described we may have had the key to whether goats and sheep, kids and lambs, ewes and rams, he- and she-goats were represented by *abnū* of different shapes.

One fact which may be deduced from the Nuzi counters is that each one had the value of one, so that, for instance, the 21 ewes were represented by 21 *abnū*. However, my own conclusion is that such geometric objects as the cones and the spheres (or discs) may have represented different numerical values. I base this hypothesis on the fact that the conical and spherical marks punched outside the *bullae* and obviously representing the cones and spheres (or discs) inside, are identical to the conical and spherical punched signs expressing one and ten on the first numerical tablets (Fig. 8). This would suggest that a first system of recording by the means of counters where a cone stood for one and a sphere (or disc) stood for ten was then complemented by a system of punched marks on the outside of their envelopes, the clay *bullae*. So from the bidimensional syntactical arrangement of the signs on the tablet we can extrapolate to the tridimensional token arrangement of clusters such as are preserved inside *bullae*. The Sumerian signs for one and ten would, in fact, be the pictographs of former *abnū*, probably types III.1 and I.2. It is also important to note that four further signs were used in the early Sumerian arithmetic based on a sexagesimal system: 60 was a large cone; 600 was a cone with an added circular punch; 3600 was a large circle; and 36,000 was a large circle with an added circular punch. All these variations are represented in three dimensions by the geometric objects of types III.2 (large cones), III.6 (punched cones), I.3 (large spheres), and I.5 (punched spheres).

What could be the meaning of the various other shapes of the tokens? Pierre Amiet suggests that they may represent the kinds of items recorded. Amiet bases his hypothesis on the fact that when the earliest pictographs appear, they are generally no longer a true representation

¹³Pierre Amiet, *Elam*, Auvers sur Oise, 1966, pp. 70-71.

of the objects, but are already an abstraction.¹⁴ This would indicate that a previous system had already elaborated a repertory of simplified forms, either in a yet unknown earlier writing on perishable material, or in a system of objects such as the geometric clay objects.

It is certainly very puzzling that the general shape of the series of pictographs on the early tablets from Uruk and compiled by A. Falkenstein¹⁵ are based on variations of conical and spherical forms strikingly similar to specific types of the geometric objects (Chart 7). For instance, the cones with a constriction above the base (III.4) are similar to Falkenstein's No. 139 which means pitcher. The cone with a coil at the base (III.7) is similar to sign 535 meaning bread; the cone with a rounded base (III.3) is similar to sign 733 meaning oil. Several unidentified pictographs such as 182, 434, and 526 are similar to shapes III.11, III.6, and III.1. Other series such as 753-768 are circles filled with linear patterns reminiscent of either the discs or spheres bearing incisions (II.2, II.4, or I.4). In particular, 761 with a cross enclosed into the circle which means "sheep," is identical to I.4 or II.4 (Fig. 9). Pictographs such as 528-530 are similar to the 1/2 and 3/4 spheres with incisions (I.7 and I.9). Of course these represent only a few shapes out of the 940 identified by Falkenstein, but what a wealth of information the tokens could reveal if indeed they represent the goods stored, exchanged, traded, or taxed in the early settlements.

5. The Evolution from Tokens to Tablets

5.1. The "Bullae"
















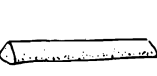


































The "Bullae" (described above under 3.5) are of great importance because they represent our only evidence that tokens did in fact cluster together according to a specific syntactic system. One might say that for this early recording system the individual tokens are to morphology what the *bullae* are to syntax. We are, in other words, beyond the level of representational (or even symbolic) pictography and are conceptually closer to the intrinsic dynamism of writing as a symbolic linkage of symbols.

The *bullae* fulfilled the same function as the early tablets. They were administrative records of economic transactions. The former used a three-dimensional system of tokens in the shape of cones, spheres, etc., enclosed *in* a clay ball; the latter used two-dimensional written characters, some in the shapes of cones, spheres, etc., written *on* a clay ball. The *bullae* could therefore be viewed as the prototypes of the tablets, thereby explaining also the choice of clay for a writing medium.

In developmental terms we may say that the bidimensional system (of tablets) proved more efficient than the tridimensional system of calculi and superseded it. One might say that the hollow *bullae*, or *bullae* proper, were soon replaced by "full" *bullae*, i.e. tablets, bearing only the numerical signs on their outside. It is interesting to note in this connection how materials selected to bear the early pictographs vary in the different parts of the world: clay in the Middle East; bone and shell fragments in China; stone architecture in America;

¹⁴ Pierre Amiet, "Il y a 5000 ans les Elamites inventaient l'écriture." *Archéologia* 12:16-23, 1966.

¹⁵ A. Falkenstein. *Archaische Texte aus Uruk*. Ausgrabungen der Deutschen Forschungsgemeinschaft in Uruk-Warka, Deutsche Forschungsgemeinschaft, Berlin 1936.

CLAY TOKENS	PUNCHED CONE	CONSTRICTED BASE CONE	INCISED CONE	INCISED BICONOID	CONE	INCISED 1/4 SPHERES	
							
PICO- GRAPHS							
	F	136(silo)	139(pitcher)	407(leather)	434	526	528
CLAY TOKENS	INCISED 3/4 SPHERES	CONE WITH COIL	INCISED 1/2 SPHERE	RODS	PYRAMID	INCISED DROP	
							
PICO- GRAPHS							
	F	530	535(bread)	545	556(wood)	570	733(oil)
CLAY TOKENS	INCISED FLATTENED PELLET	DISC	INCISED DISCS	DISCS	PUNCHED DISC	PUNCHED SPHERE	
							
PICO- GRAPHS							
	F	747(earth)	753	754	759(garment)	761(sheep)	799
CLAY TOKENS	CONE	PELLET	LARGE CONE	PUNCHED CONE	SPHERE	1/2 SPHERE	1/4 SPHERE
							
PICO- GRAPHS							
	F	1	10	60	600	3600	fractions
F	892	897	899	905	907	925	926

*F - See Falkenstein

Chart 7
Warka Pictographs and Suggested Corresponding Clay Tokens

wooden tablets in the Easter Islands. All are hard material, except for clay. The hard materials required for their preparation the smoothing of a face onto which the signs were incised or carved. The use of clay involved the modelling of a tablet in the shape of a small cushion. The signs were impressed with a stylus, and the documents could not be circulated, certainly presenting some problems in their handling until they had been exposed to the sun or hardened by fire. Why this complicated and time-consuming process? The usual answer is that raw materials such as stone and wood are rare in Mesopotamia. One might also consider that it was perpetuating a tradition beginning with the use of clay *bullae*.

5.2. From Tokens to Signs

The *bullae* provided the great advantage of securing the tokens tightly and presented a surface where seals could be impressed for authentication. Their disadvantage was to totally hide the tokens, thus any verification necessitated the breaking of the *bullae*. To overcome this difficulty some *bullae* bear on their outer surface impressed signs repeating not only the numbers but also the vague shape of the tokens inside: circular impressions for discs and spheres, conical impressions for cones (Fig. 4). The innovation was of course of great convenience as it allowed one to "read" at all times the amount and kind of tokens without breaking the *bulla*. These marks may be viewed as the crucial link between the archaic system of recording in three dimensions and writing. As soon as the system of marks on the exterior of the *bullae* was generally adopted and understood, it obviously made the system of tokens inside the *bulla* superfluous and obsolete and tablets with numerical signs made their appearance. At the present stage of my research it appears to me that only a restricted number of token shapes are represented in the *bullae*, in particular those which can be paralleled with numerical signs. If this observation is correct, the *bullae* could have been identical in function to the archaic numerical tablets (Fig. 8), where only numbers were indicated and the goods transferred were evident to the interested parties.

The signs impressed with the blunt tip of a stick did not allow much precision. In particular there was no difference possible between the representation of a sphere or a disc, between a cone and a tetrahedron. Signs incised with a specialized pointed tool or stylus were developed which could render more complicated shapes with accuracy. Though these signs were pictographs, they did not represent the shapes of the items themselves but rather the tokens of the previous recording system. As writing was established, the new vocabulary expressing new inventions such as metal tools, the plough, chariot, etc., consisted of true pictographs, drawn according to the objects themselves.

6. Conclusions

Writing may not have been, as previously assumed, brought by such newcomers to Mesopotamia as the Sumerians, but may represent a new step in the evolution of a sophisticated system of recording which was indigenous to the Middle East since the IXth Millennium B.C.. This accounting system was based on tokens of various geometric and odd shapes. It was used without apparent modifications until the IVth Millennium B.C., when what should have remained a marginal invention, the use of a clay envelope to hold the tokens of a particular transaction and bear the relevant seals, was to thrust the system in a drastically new course.

Check marks noted on the surface of the *bullae* to repeat for convenience the number of tokens inside proved effective and soon supplanted the old system of tokens. If this hypothesis is correct it would shed light on some of the characteristic features of the archaic tablets and in particular their material and often convex forms. It would explain the instant standardization of writing in a widespread area as well as the abstract shapes of all the numerical signs and of a score of commodities of daily use. This theory alters our previous conception of human cultural development. First it pushes back by five millennia the origins of writing. Second it evidences the existence of a sophisticated system of recording prior to writing. Third it suggests the presence of a *lingua franca* in the form of tokens which was shared by a number of prehistoric and early historic cultures of the Middle East and may have extended as far as Nubia and the Indus Valley.

Of course it also raises many more questions, among which some of the more crucial would be what was the prototype of the remaining some 800 signs of the Warka tablets? Which culture of the Middle East from Anatolia to the Zagros invented the token system? How did it become so widespread before any trade is evidenced? Did tokens of identical shapes bear the same meaning in Jarmo and Khartoum? Although they may remain unanswered, these questions are certainly exciting challenges. They will hopefully create a new awareness among excavators and will attract attention to the small, but clearly significant, tokens which up to now have been labeled in site reports as "objects of uncertain purposes."

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