

Tokens: the cognitive significance

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ABSTRACT - *Media shape the mind of those who use them. I analyze how tokens used for counting and accounting in prehistory brought people to thinking in greater abstraction.*

IZVLEČEK - *Mediji oblikujejo mišljenje tistih, ki jih uporabljajo. V članku razčlenjujemo, kako so žetoni, ki so jih v prazgodovini uporabljali za štetje in računanje, spodbudili ljudi k bolj abstraktnemu razmišljanju.*

KEY WORDS - *Neolithic tokens; Neolithic media; ideograms; counters*

INTRODUCTION

In the fifties, Marshall McLuhan of the University of Toronto alerted the world that media are not passive conduits of information, but deeply affect the human mind. He made a compelling case that “the medium is the message” by demonstrating that writing and oral communication required, and therefore instigated, the creation of different cognitive skills (McLuhan 1962.27-39; 1964.81-90; Moos 1997). Following in McLuhan’s footsteps, I argue that the token system, a Neolithic medium of communication, provoked profound cognitive changes (Schmandt-Besserat 1992.1996).

I. THE TOKEN SYSTEM: A NEOLITHIC MEDIUM OF COMMUNICATION

Tokens are recovered in Middle Eastern archaeological sites dating 8000-3000 bc, from Syria to Persia and from Anatolia to Palestine as well as in parts of Eurasia ca. 5000-4000 BC (Budja 1998). These clay artefacts, about 1-2 cm across, are modeled in multiple shapes. Some have geometric forms such as cones, spheres, disks, cylinders, tetrahedrons, ovoids, triangles and quadrangles (Fig.1). Others take naturalistic shapes such as miniature animal heads, vessels, tools and furniture (Fig. 2). Many bear markings in the form of incised lines (Schmandt-Besserat 1996.15-20) (Fig.3).

Tokens were counters used to keep track of goods, with each token form standing for one specific unit of a commodity. A cone and a sphere, for example, represented a small and a large measure of grain, respectively (Fig. 1), and a disk with an incised cross, a sheep (Fig. 3). The number of units of merchandise was shown in one-to-one correspondence. In other words, two small units of grain were shown with two cones, three cones stood for three small units of grain, and so on. It is now well established that in the fourth millennium bc the tokens were an accounting device used by the Mesopotamian temple administration to record entries or expenditures of goods offered by worshippers during monthly religious festivals. Presumably their function was similar in prehistory, when they served to collect and administer communal goods and, as such, were the backbone of a redistribution economy (Schmandt-Besserat 1992.170-183).

The token system was a medium of communication (Schmandt-Besserat 1992.161-165). Each counter can be termed an “ideogram” or sign standing for a concept: a unit of merchandise. Moreover, there was not only one type of token carrying a discrete meaning, but rather an entire repertory of interrelated types of tokens, each with a corresponding discrete meaning. The tokens therefore represent the earliest non-verbal code or sign system for transmitting eco-



Fig. 1. Plain tokens. Mesopotamia, present day Iraq, ca. 4000 bc. The cone, spheres and disk represented various grain measures; the tetrahedron stood for a unit of labor. Courtesy of Denise Schmandt-Besserat, The University of Texas at Austin.

nomic information. The token system is furthermore the immediate forerunner of the first writing system, the Mesopotamian cuneiform script. The transition from counters to script occurred about 3300 bc, when tokens, probably representing a debt, were stored in an envelope until payment. The envelope was in the shape of a hollow clay ball that hid the tokens held inside. The accountants therefore impressed the tokens on the surface of the envelopes before enclosing them, so that the shape and number of counters could be checked at all times without breaking the envelopes (Fig. 4). The cones and spheres, representing measures of grain, for example, appeared as wedge-shaped and circular impressed markings, respectively. About 3200 bc, once the system of impressed signs was understood, clay tablets – solid cushion-shaped clay artifacts bearing the impressions of tokens – replaced the token-filled envelopes (Fig. 5). At that point the three-dimensional tokens had been replaced by two-dimensional impressed signs that conveyed the same meaning.

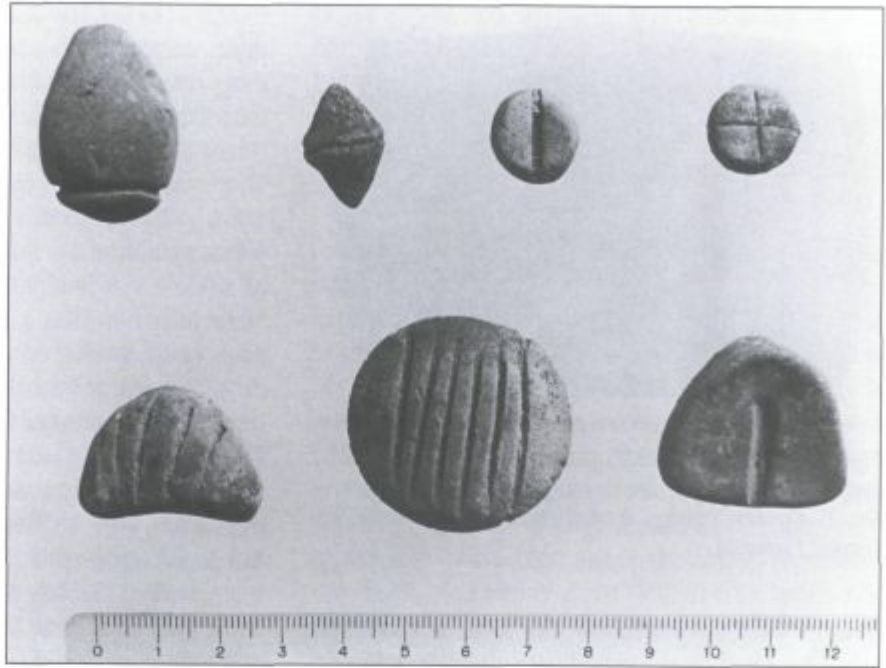
For the first three to five hundred years, writing continued in the wake of tokens. It is only at about 2700 bc that the cuneiform script finally broke away from its forerunner to emulate spoken language. Writing borrowed the syntax of speech and as a result texts were no longer restricted to itemizing goods, but were opened to various fields of human experience. Writing became progressively phonetic (Roch Lecours 1995.219). Logograms, referring to the sound of monosyllabic words, gave way to syllabograms representing fragments of words. Finally, after the invention of the alphabet at about 1500 bc, letters reached the ultimate segmentation of sound (Tzeng, Hung 1981.237).

The tokens were not a marginal or esoteric medium. On the contrary, the considerable number of counters and their widespread distribution within settlements prove that during no less than five millennia, the clay tokens were household items for keeping track of everyday mundane commodities, and in



Fig. 2. Naturalistic tokens representing animal heads (above: dogs; in the center, from right to left: ox and goats or ewes; below: a double spouted vessel). Susa, Iran, ca. 3300 bc. Courtesy of the Musée du Louvre, Département des Antiquités Orientales, Paris.

Fig. 3. Complex tokens representing (above, from right to left:) one sheep, one unit of a particular textile, one measure of honey and one jar of oil, (below, from right to left: one fleece of wool, one ingot of metal. Susa, Iran, ca. 3300 bc. Courtesy of the Musée du Louvre, Département des Antiquités Orientales, Paris.



particular, of dues to the collectivity. Their pervasiveness in all parts of the Middle East and their spread into Eurasia is good evidence of their importance in pre- and proto-history. Finally, they played a crucial role in the evolution of communication (Vygotsky 1978:46). The fact that the token system was the first code to supplement speech and that it is the immediate precursor of western writing makes it an important medium to be reckoned with.

II. TOKENS AND NEOLITHIC MEDIA

The token system originated in the Neolithic period, about 5000 years before civilization, and in particular, before the invention of writing. The tokens were therefore the creation of an oral world, when infor-

mation was exchanged face to face, by word of mouth. In this part of the paper, I compare and contrast the tokens to the spoken word.

Both tokens and words were symbols. Tokens were artefacts, and words were strings of sounds that stood for something else. That is to say, the words and tokens were "signifiers" standing for the "signified" (Baron 1981:168-169). As symbols, spoken words have semantic values. A word such as "sheep" refers to a single, discrete, unequivocal entity, here a ruminant mammal of the genus *Ovis*. Likewise, each token shape was endowed with a single, discrete, unequivocal meaning. A disk incised with a cross, for instance, meant "sheep". Whenever repeated, the disk with a cross always referred to the same item - "sheep" - and only to that item.

Fig. 4. Envelope and its content of tokens with their corresponding markings. Susa, Iran, ca. 3300 bc. Courtesy of the Musée du Louvre, Département des Antiquités Orientales, Paris.

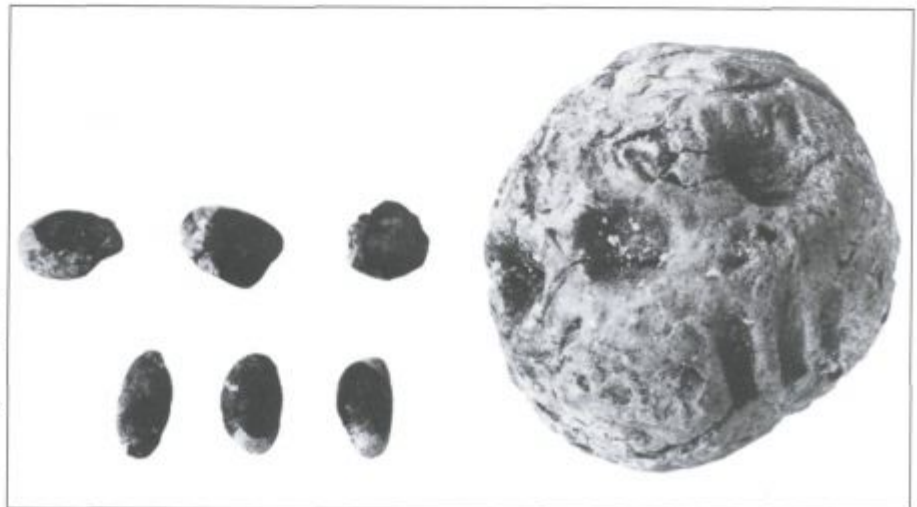




Fig. 5. Impressed tablet featuring an account of grain. Godin Tepe, Iran, ca. 3100 bc. Courtesy of Dr. T. Cuyler Young, Royal Ontario Museum, Toronto, Canada.

Because they were symbols, the form of a token is arbitrary, much as the sounds of words are arbitrary (White 1949.25–30). There was no fundamental reason why the disk bearing a cross meant “sheep.” Similarly, there is no fundamental reason why the assembled sounds “sh-ee-p” refer to a ruminant mammal of the genus *Ovis*. In fact, any other shape or sound would do, as long as it was adopted by a society. The naturalistic tokens were similarly arbitrary. For instance “dog”, signified by a dog’s head (Fig. 2), was an arbitrary choice, since the animal “dog” could just as well be represented by a dog’s tail or a representation of the entire animal.

Tokens, like words, were part of comprehensive, integrated systems. In other words, just as each society has enough words to communicate all useful items – the Inuit have words to describe all possible snow conditions and Arabic has a vocabulary to denote all varieties of camel hair – so there were as many token forms as there were goods to administer. The assemblage of tokens from Tepe Asiab, an early agricultural community ca. 7500 bc in western Iran, yielded multiple subtypes of tokens (sixteen) standing for farm products. But the token repertory grew in time because, like spoken language, the system was open. That is to say, when the inventory of merchandize expanded, so did the number of token types. In the fourth millennium bc, for instance, in the Sumerian city of Uruk, the token repertory reached 250 shapes to represent products manufactured in the urban workshops, including textiles, garments, jewelry, perfume, vessels, furniture and tools.

The token system and spoken language, however, shared only the fundamental features of symbolism.

Needless to say, the tokens were a rudimentary medium compared to spoken words. Unlike speech, they were restricted to one type of information only, namely, real goods. Furthermore, the counters were “ideograms” standing exclusively for noun concepts. The system had no symbols for verbs, pronouns, articles or prepositions. Unlike spoken language, the token system made no use of syntax. The meaning of a token was independent of its placement order. “Jane likes Bob” has a meaning different from “Bob likes Jane”, but three cones and three spheres arranged in any possible way, were always to be translated “three small and three large baskets of grain.” Furthermore, the token system had no way to express number other than by one-to-one correspondence, i.e., by matching the number of counters to the number of units counted (Justus 1996). Most importantly, the fact that the same token shapes were used in a large area of the Near East, where many dialects would have been spoken, shows that the same type of counter always referred to the same goods even though the words for these goods differed. In other words, the tokens were truly ideograms, not logograms, corresponding to language specific words. Unlike spoken language, the counters were not based on phonetics.

It may be added here that the token system also differed from the rare manifestations of Neolithic symbolic art. The overriding function of art is to stimulate or express emotions rather than to communicate concrete information (Scheffler 1997.112). Therefore, although the tokens and art were two visual media, they greatly differed in content. Whereas the counters conveyed specific economic data, statues, figurines, amulets, wall paintings or plastered skulls dealt with intangibles (Cauvin 1997). Whereas the images probably evoked nebulous supernatural religious or magical powers, the tokens referred to precise units of a specific daily life commodity. Finally, whereas the meaning of some of the counters can be traced through the cuneiform signs that replaced them, the significance of Neolithic images will always remain enigmatic and, therefore, art is beyond the scope of this paper.

The tokens constituted an original medium of communication to collect, process, store, and retrieve information. The system of counters differed fundamentally from other Neolithic symbolic media such as art and spoken language. Namely, they differed from art in content and from the spoken word in form.

III. TOKENS: THE NEW COGNITIVE SKILLS

The tokens were a radical departure from oral communication because they relied on a different sensory mode: words were aural and tokens were visual. In the following part of this paper I discuss how, as McLuhan would have predicted it, shifting communication from the ear to the eye had irrevocable cognitive consequences.

The first notable outcome of a visual communication system was abstracting knowledge from the knower. Aural information was stored in individuals' brains, requiring willingness and certain physiological conditions in order to be retrieved. But tokens were extra-somatic. As a result, information stored by tokens could be decoded at any time by anyone initiated into the system (*Olson 1980.3*).

The tokens transmitted reveal data. For example, three cones stated "3 small measures of grain" in the most concise, explicit and unambiguous manner. This differed from oral information which, in order to facilitate memorization, was often couched in a flowery style in narratives, allegories or metaphors, and used rhythmic devices such as repetition and alliteration (*Ong 1982.37-41*). Tokens abstracted data from verbal contexts (*Goody 1977.88*).

There are more than 50 ways to say "tonight," because, as McLuhan observed (*1964.82*), oral communication is "hot," involving gestures, facial expressions, intonation and inflexion. But the tokens were "cold" because they abstracted data from body language. A cone was a cone and its significance, namely, a small measure of grain, never varied.

Moreover, oral communication, also in McLuhan's word, was "vibrant" because it was meant for and tuned to an audience, constantly adjusting to its reactions. In contrast, the tokens were "static." Whatever the circumstances, the value of the cone or any other token remained unchanged. Tokens abstracted data from subjectivity.

The shift from ear to eye was of great importance because it made it possible for individuals to touch and visualize information. In other words, tokens prompted new cognitive skills to manipulate, scan, evaluate, scrutinize and analyze an account. This, in turn, allowed new ways of abstracting data.

Whereas words consist of immaterial sounds, the tokens were concrete, solid, tangible artefacts which

could be handled, arranged and rearranged at will. For instance, the tokens could be ordered in special columns according to types of merchandise, entries and expenditures, donors or recipients. The token system thus encouraged the manipulation of data by abstracting all possible variables (*Harth 1983.19*).

Patterning, the presentation of data in a particular configuration, was undoubtedly developed to highlight special items (*Luria 1976.20*). Organizing units of the same kind in lines, for example, became possible with tokens. Furthermore, these lines, as is illustrated by the signs impressed on envelopes and tablets, were organized hierarchically - the units of greater value being placed above the lesser ones. Spheres, standing for large measures of grain, were systematically lined up above the cones, representing small measures of grain (Fig. 5). The token system provided strategies to abstract the relative value of the merchandise.

Tokens facilitated counting. They made it easy to add, subtract, multiply and divide by manually moving and removing counters. The geometric layout of operations such as adding two tokens to two tokens, and three tokens to three tokens, and so on, helped the conceptualization of abstract numbers (*Justus 1999.56, 64; Hoyrup 1994.70*).

Whereas words can only be uttered one at a time, groups of any number of tokens could be handled at the same time. This made it possible to deal simultaneously with the multiple components of a comprehensive budget. The system stretched human cognition to cope with new levels of complexity.

Compared to the spoken word, which fades instantly, the single most important advantage of solid tokens was permanence. The artefacts could be stored for any length of time. For example, the record of a debt could be kept until it was repaid. The tokens were mnemonic: they liberated memory.

Finally, because the tokens provided physical proof of an agreement and because they were small, light and sturdy, the counters could be transported to conduct transactions in the absence of a party involved. Communication over distance expanded the sphere and scope of human interaction.

In sum, the substitution of tokens for real goods introduced multiple new ways of handling data in abstraction (*van Gijch 1991.234*). A word like "sheep" and the corresponding token, a disk bearing

a cross, abstracted data from their context in a similar way: the sheep could be accounted for orally in a conversation, or visually on the accountant's table, independently of the status or location of the animals. But tokens further abstracted information from any human source and from verbal and body language. As a result, the Neolithic accountant was no longer the passive recipient of someone else's knowledge, but took an active part in decoding the visual information encoded in the counters. This necessitated the acquisition of new cognitive skills that capitalized upon the visualization and physical manipulation of data. In turn, these new techniques fostered further abstraction of the data according to such variables as type of goods, value and number. As a result, Neolithic society was able to handle larger amounts of more complex information with greater efficiency and objectivity. Finally, tokens removed data from the contingency of place and time and, by so doing, they expanded the sphere of human interaction and liberated human memory from tedious lists of data difficult to memorize.

CONCLUSION

The Paleolithic medium of communication was speech. Spoken language is the natural, universal form of human communication that mankind has the inborn ability to acquire. As McLuhan eloquently argued (1964.83), the directness, freshness and

subtleness of a face to face transaction, which combines voice intonations with facial expressions and body-language, has never been surpassed.

The Neolithic farmers of the Middle East invented a system of clay tokens to count and account for units of goods. As McLuhan would have predicted it, the switch to a radically different medium based on visual and tangible artefacts, spurred significant cognitive changes. The major outcome was to increase the human capacity for dealing with actual things in abstraction.

The token system set media on a visual course that incessantly challenged the human mind to deal with the real world in greater abstraction. In short, tokens paved the way for writing by translating aural communication into a visual form. Two-dimensional written signs were further removed from the goods they represented than were the previous three-dimensional tokens. Then phonetic signs no longer represented commodities, but the sounds of the corresponding words. Ultimately, the alphabet with semantically meaningless letters standing for semantically meaningless sounds created yet another double level of abstraction (McLuhan 1964.86). Writing in electronic form today further removes humans from the real world. McLuhan referred to the effect of media on the human mind as a powerful vortex. This metaphor certainly suits the token effect.

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REFERENCES

- BARON N. S. 1981. *Speech, Writing and Sign, A Functional View of Linguistic Representation*. Bloomington.
- BUDJA M. 1998. Clay tokens - accounting before writing in Eurasia. *Documenta Praehistorica XXV*: 219-235.
- CAUVIN J. 1997. *Naissance des Divinités, Naissance de l'Agriculture*. Paris.
- GIGCH van J. P. 1991. *System Design Modeling and Metamodeling*. New York.
- GOODY J. 1977. *The Domestication of the Savage Mind*. Cambridge.
- HARTH E. 1983. *Windows on the Mind. Reflections on the Physical Basis of Consciousness*. New York.
- HOYRUP J. 1994. *In Measure, Number, and Weight*. New York.
- JUSTUS C. 1999. Pre-decimal Structures in Counting and Metrology. In Gvozdanovic J. (ed), *Numerical Types and Changes Worldwide*: 55-79.
1996. Numeracy and the Germanic Upper Decades. *Journal of Indo-European Studies* 23: 45-80.
- LURIA A. R. 1976. *Cognitive Development. Its Cultural and Social Foundations*. Cambridge, Mass.

- McLUHAN M. 1962. *The Gutenberg Galaxy*. Toronto.
1964. *Understanding Media*. New York.
- MOOS M. A. 1997. (ed.) *Marshall McLuhan essays. Media Research*, Amsterdam.
- OLSON D. R. 1980. Introduction. In Olson D. R. (ed.), *The Social Foundations of Language and Thought: 1-6*.
- ONG W. J. 1982. *Orality and Literacy*. New York.
- ROCH LECOURS A. 1995. The origins and evolution of writing. In Changeux J-P., Chavaillon J. (eds.), *Origins of the Human Brain: 213-235*.
- SCHEFFLER I. 1997. *Symbolic Worlds, art, science, language, ritual*. Cambridge.
- SCHMANDT-BESSERAT D. 1992. *Before Writing*. 2 vols. Austin.
1996. *How Writing Came About*. Austin.
- TZENG O. J. L. , HUNG D. L. 1981. Linguistic Determinism: A Written Language Perspective. In Tzeng O. J. L., Singer H. (eds.), *Perception of Print, Reading Research in Experimental Psychology: 237-255*.
- VYGOTSKY L. S. 1978. *Mind in Society, The Development of Higher Psychological Processes*. Cambridge, Mass.
- WHITE L. A. 1949. *The Science of Culture, A Study of Man and Civilization*. New York.