Writing, counting and scribal Education in Aššur and Kaniš

Cécile Michel

ANATOLIA'S PROLOGUE

KULTEPE KANESH KARUM

ASSYRIANS IN ISTANBUL

To the memory of our teacher Prof. Dr. *h.c. multi* Tahsin Özgüç

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Cécile Michel*

WRITING, COUNTING AND SCRIBAL EDUCATION IN ASSUR AND KANESH

The Old Assyrian period, which covers the first three centuries of the 2nd millennium BC, is documented by 22,700 cuneiform tablets.[1] But Assur (on the Upper Tigris), the mother town of the Assyrian merchants settled in Central Anatolia, delivered only 24 tablets. They were scattered in later archives and contained several school texts, and some 30 royal inscriptions from temples. In contrast, Kültepe, the ancient Kanesh, produced, up to now, 22,500 cuneiform tablets, a number which makes this site among the richest supplier of cuneiform texts from the whole Near East. These tablets form the very first important corpus of private archives and represent also the most ancient evidence of a complex trade system based on international exchange. They have been found in merchant houses in the kārum, located north-east of the citadel, where the merchants lived. Only 40 cuneiform tablets were found on the citadel, where one finds a huge Anatolian palace.

The authors of these texts knew enough about writing, so that they were capable to draw up memoranda about their transactions. They were able to write letters and some of them knew the appropriate formulas for various contracts. The Assyrians left their wives and children in Assur, and went to Anatolia. This family break-up explains the abundance of the letters discovered in Kanesh.

The merchants had to record various accounting procedures during their numerous transactions, from the purchase of merchandise in Assur to their sale in Anatolia, or as part of their commercial partnerships. They needed to know the different measurement systems and to be able to calculate prices by converting a quantity of a product into silver or copper according to a tariff decided in advance. In the course of the long distance trade, they practiced various contractual relationships in order to collect important amounts of money or to increase the assets already obtained. They were familiar with addition, subtraction and multiplication with integers or the inverse of a number, and able to work out a succession of golden rules.

The enormous number of texts discovered in Kanesh reveal that the skill of reading and writing was not reserved to a few educated scribes but was widely spread among the population. How did they learn to read and write? In fact, there are very few Old Assyrian texts dealing with scribal education compared with the large number of school texts from the contemporary Old Babylonian period, for which the progression of scholarship has been reconstructed.[2]

OLD ASSYRIAN SCRIBAL EDUCATION AND PRODUCTION

The majority of the tablets excavated from the merchant houses in the kārum of Kanesh – 22,040 texts – are dated to level II (c. 1945-1835 BC); only 420 documents date to level Ib (c. 1832-1710 BC). The tablets were stored in groups of 20 to 30 units in baskets, boxes or clay jars with sealed clay labels, some bearing inscriptions (fig. 1).

These archives belonged to several generations of merchants, mainly Assyrians, but a few of them were stored in houses owned by Anatolians. These documents are of various kinds: letters, legal documents and private notices. The great majority of them concern trade. The merchant harbor delivered also a few tablets that are not commercial: school texts – to which one should add school exercises found in Assur –, incantations, copies of royal inscriptions, eponym lists and an Old Assyrian Sargon Legend. All these documents provide strong evidence for a scribal apprenticeship.

Old Assyrian school texts

The Old Assyrian school texts are quite few, less than twenty coming both from Assur and Kanesh, thirteen round small tablets bear computing exercises,[3] and four others consist mostly of lexical and metrological lists written on large tablets over several columns.[4] The two fragments of the document Kt t/k 76+79, found in a big house dated to level Ib, contain 4 columns on each side. On the obverse, the scribe registered a progressive list of weights from 1 šekel to 100 talents (table 1).[5]

i	ii	iii	iv
[1 GÍN]	[1 *ma-na* 8 GÍN]	[5 *ma-na*]	[2 GÚ]
[2 GÍN]	[1 *ma-na* 9 GÍN]	[6 *ma-na*]	[3 GÚ]
[3 GÍN]	[1 *ma-na* 10 GÍN]	[7 *ma-na*]	[4 GÚ]
[4 GÍN]	[1 *ma-na* 11 GÍN]	[8 *ma-na*]	[5 GÚ]
[5 GÍN]	[1 *ma-na* 12 GÍN]	[9 *ma-na*]	[6 GÚ]
[6 GÍN]	[1 *ma-na* 13 GÍN]	[10 *ma-na*]	[7 GÚ]
[7 GÍN]	[1 *ma-na* 14 GÍN]	[11 *ma-na*]	[8 GÚ]
[8] GÍN	1 *ma-na* 1[5 GÍN]	[12 *ma-na*]	[9 GÚ]
9 GÍN	1 *ma-na* 16 [GÍN]	[13 *ma-na*]	[10 GÚ]
10 GÍN	1 *ma-na* 1[7 GÍN]	[14 *ma-na* (x ŠE?)]	[11 GÚ]
11 GÍN 7 1/2 ŠE	1 *ma-n*[*a* 18 GÍN]	[15] *ma-na* [15 ŠE]	[12 GÚ]
12 GÍN 15 ŠE	1 *ma-na* 19 [G]ÍN	16 *ma-na* 16 ŠE	13 [GÚ]
13 1/8(?) GÍN	1 1/3 *ma-na* <LÁ> 1 GÍN	17 *ma-na* ŠE	14 G[Ú]
14 1/6(!)GÍN		[18] *ma-na* 18 ŠE	15 GÚ
15 1/4(!)GÍN	1 1/3 *ma-na*		
16 1/3 GÍN	1 1/2 *ma-na*	[1]9 *ma-na* 19 ŠE	16 GÚ
17 1/2 GÍN	1 2/3 *ma-*[*na*]	20 LÁ 1 *ma-na*	17 GÚ
18 2/3 GÍN	1 5/6 *ma-*[*na*]	20 *ma-na*	18 GÚ
19 5/6 GÍN	[1 5/6 *ma-na* 1 GÍN]	30 *ma-na*	19 GÚ
1/3 *ma-na*	[1 5/6 *ma-na* 2 GÍN]	[4]0 *ma-na*	2[0] GÚ
1/2 *m*[*a-na*]	[1 5/6 *ma-na* 3 GÍN]	[50] *ma-na*	[30] GÚ
2/[3] *ma-*[*na*]	[1 5/6 *ma-na* 4 GÍN]	55 *ma-na*	[40 GÚ]
5/[6] *ma-*[*na*]	[1 5/6 *ma-na* 5 GÍN]	1 GÚ	[50 GÚ]
[1 *ma-na*]	[1 5/6 *ma-na* 6 GÍN]	[1 GÚ 10 *ma-na*]	[(60 GÚ)]
[1 *ma-na* 1 GÍN]	[1 5/6 *ma-na* 7 GÍN]	[1 GÚ 20 *ma-na*]	[(70 GÚ)]
[1 *ma-na* 2 GÍN]	[1 5/6 *ma-na* 8 GÍN]		
[1 *ma-na* 3 GÍN]		[1 GÚ 30 *ma-na*]	[(80 GÚ)]
[1 *ma-na* 4 GÍN]	[1 5/6 *ma-na* 9 GÍN]	[1 GÚ 40 *ma-na*]	[(90 GÚ)]
[1 *ma-na* 5 GÍN]	[2 *ma-na*]	[1 GÚ 50 *ma-na*]	[(1 *me-at* GÚ)]
[1 *ma-na* 6 GÍN]	[3 *ma-na*]		
[1 *ma-na* 7 GÍN]	[4 *ma-na*]		

table 1. Transliteration of the obverse of Kt t/k 76+79.

The intent, when writing the list, was not only to memorize the weight system used by the merchants (see below), but also to practice the different notations of integers and fractions. For example, 1 mina and 19 šekels (col. ii 12), may also be written, in the sexagesimal system, 1 1/3 mina minus 1 šekel (col. ii 13). These items are not found in the Old Babylonian lists. The reverse of this tablet bears a lexical list enumerating

various metals, stones and plants. The list of metals or metal objects mentions gold, iron, tin, copper and bronze; silver is curiously lacking. After that the scribe starts a long list of minerals.[6] These lexical lists, which classify the words thematically, contribute to the education of the scribes who copy and memorize them. The fragment k/-129 also belongs to the lexical list genre; it represents one fourth of a big tablet and gives names of stones, animals, aromatics and multiplication formulas. Its two first visible lines are similar to col. vi lines 11-16 of the previous lexical list. The enumeration has no systematic character. Therefore it is possible that this tablet has been written by a pupil trying to put down extracts of various lists that he had already memorized.

The text Kt 00/k 12, found in a house of the karum dated perhaps to the Ib level, gives an extract of a proper names list.[7] The names are arranged according to the theophoric element by which they start: Adad, Shamash, Assur. Another list of this type has been found in Assur but is still unpublished. Since the Old Assyrian documentation quotes an enormous amount of proper names, such an exercise was quite useful (table 2).

obverse	reverse
[^{l}] ^{d}IM-*pì-lá-ah*	[^{ld}]*A-š[ùr-...]*
[^{l}] ^{d}IM-*ták-lá-ku*	[^{l}]^{d}*A-šùr-be-el-*
^{ld}IM-GAL	*ma-tim*
^{ld}IM-DU_{10}	[^{l}]^{d}*A-šùr-e-a-šar*
^{ld}UTU-DU_{10}	[^{l}]^{d}*A-šùr-du-gul*
^{ld}UTU-*tí-li-tí*	[^{ld}]*A-šùr-dan*
[^{l}]^{d}UTU-*ma-lik*	^{ld}*A-šùr-e-na*
^{ld}UTU-*ba-ni*	[^{l}]^{d}*A-šùr-ma-lik*
[^{ld}]UTU-[...]	^{ld}*A-šùr*-DU_{10}
(rest destroyed)	
Lower edge	
[^{l}]^{d}*A-šùr*-SIPA	

table 2. Transliteration of the obverse and reverse of the list Kt 00/k 12.

fig. 1 Group of tablets excavated in 1993 in the kārum and belonging to the archives of Assur-taklaku, son of Alahum. Photo C. Michel.

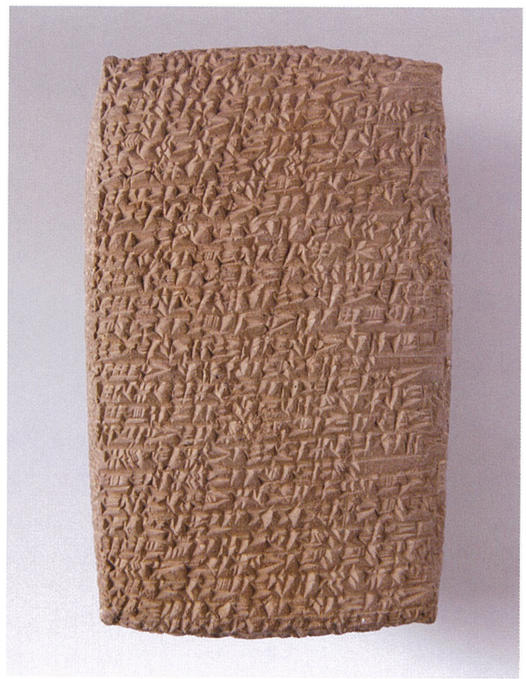

fig. 2 Old Assyrian Sargon legend. Kt j/k 97 (cat. 409)

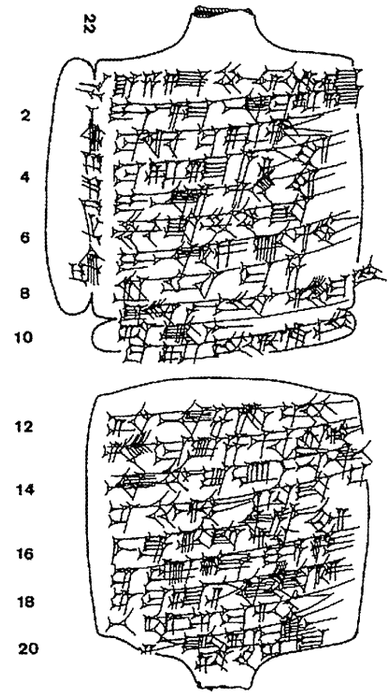

fig. 3

Another type of list is represented by the huge tablet, Kt v/k 7 + u/k 31, discovered in a large house dated from level Ib. Other similar tablets have been discovered in 1969 and 1970, but they are still unpublished. The present document comprises a list of expressions used in letters arranged over at least six columns. Among the formulas given by this list, one finds a conjugation exercise of verbs at the D stem: *ina karim tuqtallili* (Aii', 2-3) "you discredited me in the kārum" or *u atta kaspam tartiši yam kaspam tusappihma* (Aii', 6-8) "and if you, you did obtained silver, you wasted my own silver"... It gives also several figurative expressions, some of them using parts of the body: *ēnika* (Aiii', 30) "as to you", or and *u libbī tultammin* (Aiii', 14-15) "and you made me angry". These expressions are very frequent in the Kanesh letters.[8] The spontaneous character of the Old Assyrian written epistolary language explains the frequency of several style figures.

Such school texts bearing letter models are quite rare in Mesopotamia, a sample is known from Ugarit.[9] In fact, unlike contracts using standard juridical formulas learned by the scribes during their studies, the epistolary literature has almost no repetitive character. Since the letters form the main type of documents found in Kanesh, it seems normal that scribes had to get familiar with this literary genre during their studies.

All the Old Assyrian school tablets with round shape concern small arithmetic exercises directly related to the merchant profession. Most of these tablets, being reused as building material, have been discovered in the middle Assyrian houses of Assur (11 texts published or quoted).[10] In these tablets, the scribe had to calculate the weight of silver necessary for the purchase of a known weight of another metal. There are only two known arithmetic school tablets from Kanesh, discovered in 1948 and 1984, bearing the same type of exercises as those of Assur, but more still remain to be published.

The few samples of Old Assyrian school texts discovered fit quite well with the basic needs of the merchants. Lexical lists contributed to the learning of the cuneiform script; the one discovered at Kanesh contains materials useful to the merchant in his professional activities, metals and stones, or in his daily life such as plants and animals. Likewise, the trader had to know perfectly well the system of weights and notation of numbers, and how to convert prices. Learning formulas used in letters and the writing of proper names allowed him to write his tablets himself. The majority of the school texts (excluding the arithmetic exercises), when they can be dated, belong to level Ib, the second level of occupation of the karum by the Assyrian merchants. Thus we can guess that if the Assyrians in the early phase received their education in Assur, later on they developed a scribal education in Kanesh.

Old Assyrian scholarly texts

Beside the school tablets that were used for the scribal education, the scholarly texts were written by educated scribes. Among these, there are two copies of inscriptions of Erišum I, king of Assur (Kt a/k 315 and 353), found in a private house of level II.[11] They combine two different royal inscriptions: a regular building-inscription of the Assur-temple and a special stela-inscription that originally had been set up in the Step-gate.[12] It is likely that the original text has been composed in Assur.

The copies of the Kültepe eponym lists (KEL) belong also to the historical documents; six were found in houses of level II, and another one was found in a level Ib building.[13] The lists from level II start with the first year of Erišum I's reign and offer the succession of years named after Assur dignitaries. The most complete copy contains the names of the kings and the duration of their reigns. It could have been elaborated from other rough lists, and was taken down in shorthand by a professional scribe. It is most probable that this document has been written in Assur, and was later brought to Kanesh. But the Kültepe Eponym List covering level Ib, and ending with a list of proper names among which there are Anatolian names, has been written in Kanesh. All these texts that have a historical character have been composed by professionals or at least by highly educated scribes.

The Old Assyrian Sargon legend has been discovered in a private house dating perhaps to level II.[14] It has been interpreted in various ways

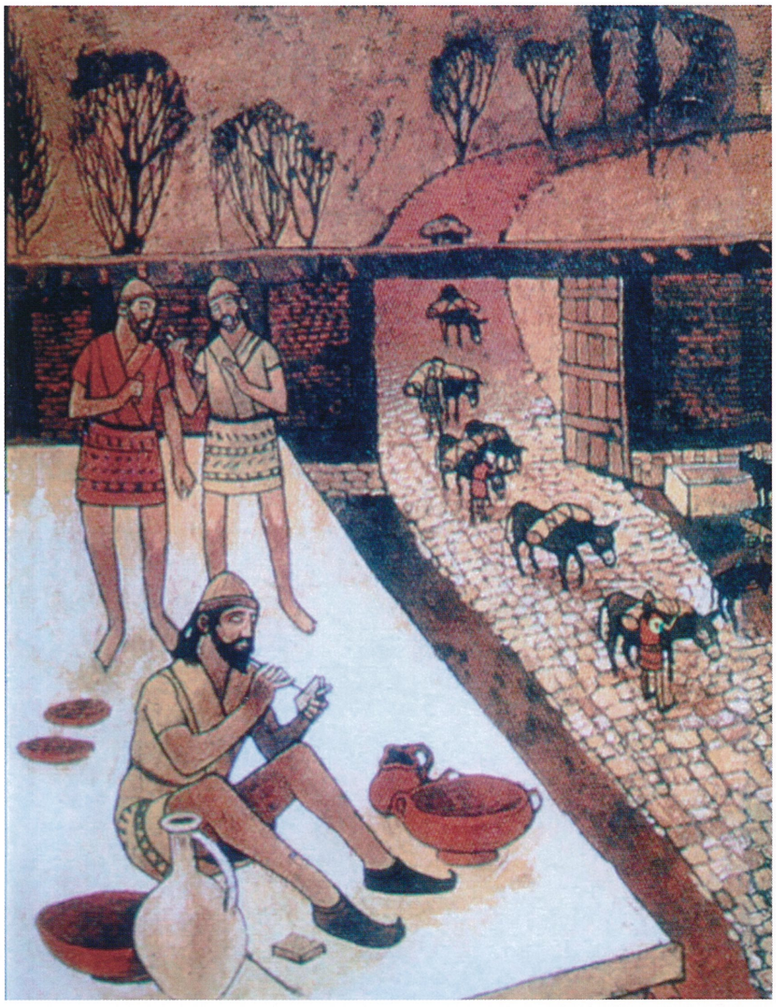

fig. 4 Fresco on the wall of the Ankara Museum of Anatolian Civilizations showing a man writing on clay tablets.

fig. 5 Seal of Hananātum, daughter of Puzur-Shadâ, used by Shatahshushar (ICK 1, 24a, seal C)

fig. 6 Seal of Tarisha on the envelope Kt 93/k 372+380. Photo C. Michel.

as a "laudatory royal inscription,"[15] a "parody of inscriptions or legends about Sargon," full of wordplays,[16] as a text having functioned "to extol Sargon of Akkad during kispum celebrations that were part of the official cult of Assur,"[17] as well as somewhere between these extremes,[18] or an "early example of the same type of heroic literature as one finds in the later Alexander Romance."[19] The document is composed in the Old Assyrian script and dialect, and is likely to have been written in Assur (fig. 2).

The houses of level II produced also seven texts containing nine incantations dealing with several topics: against Lamashtum, against a dog, against several diseases or to help a woman giving birth. One of the texts has the shape of a small amulet with a hole for a string in order to hang it on the bed of the sick person (fig. 3).

The existence of these documents in private archives can be explained by their practical use: Assyrians used them to treat the diseases. They have been copied or written by professional scribes or exorcists inspired by Old Babylonian samples.

READING AND WRITING IN ASSUR AND KANESH

Since the great majority of the documents are dated to an eighty-year period, one may ask how many individuals were involved in producing these texts?[20]

Professional scribes and educated merchants

Kültepe tablets are quite silent about scribal education and about the authors of the documents. We have the names of several scribes, identified with the logograms DUB.SAR.[21] They work for the main firms and take part in the administration of the colony: their skills cover purely commercial matters. Their tablets, perfectly formed, are filled with a tidy writing full of unusual signs. These professionals, working for the administration of the kārum, for the main firms, or for the Anatolian chancery, got paid for their effort in producing the documents. They are to be distinguished from the educated merchants, who were able to write their own tablets.

The apprenticeship of reading and writing was first done in Assur where we find heads of family firms, women and kids. Some young boys

had a scribal education before following their fathers in Anatolia, but evidence to such training is rare. The oldest son of Pushu-ken, as he was still in Assur with his mother, learned to write and to count together with one of his brothers. He wrote to his father: "As you know, we are learning the scribal art. Send me a garment for my teacher!"[22] But unfortunately, we do not know how old he was and what he learnt (fig. 4).

The Old Assyrian syllabary is quite simple and limited, containing some 130 syllabic signs and about 30 logograms. There are very few heavy syllabic signs containing the sequence "consonant-vowel-consonant"; the ones we find are at the end of the words and in proper names. The few logograms used concern: raw materials such as metals, textiles, stones, professions, animals, units of measure, etc. The enormous number of letters found at Kanesh may be explained only if an important proportion of the Assyrian population was able to write. Personal letters seem to be mostly written by the merchants, who were traveling a lot and could not always have a scribe at hand. The fact that an important fraction of the population was able to write explains the simplicity of Old Assyrian script. Many persons who write without being trained by a master might use less complex signs and the syllabary then gets smaller and easier to learn. This kind of "virtuous circle" would have taken effect with the growing mobility of the merchants. But the tablets which are perfectly formed with a very nice and regular script, and use complex signs, have been written by educated persons.

Writing among the Assyrian women

Women are largely involved in the letters. At least 200 letters were sent by women living in Assur, such as Lamassi, wife of Pushu-ken, Tarish-matum, wife of Assur-malik, and Taram-Kubi, wife of Innaya.[23] These ladies managed their houses and servants, took care of their children and attended to their husbands' affairs in the city. Women of Kanesh appear as recipients of tablets sent by their fathers, brothers or husbands. Tariša, sister of Assur-taklaku, the owner of the archives unearthed in 1993 in the karum, kept in her house the many letters written by her brother after the death of their father.[24] Their letters use a vernacular language. The grammar and syntax they use are sometimes quite inadequate, but their prose is full of emotion.[25]

Women from Assur and Kanesh were themselves involved in commercial and financial operations. Different types of texts were written down at their initiative: loan and sale contracts, likewise family contracts.[26] They had to certify legal documents by leaving the imprint of their personal seal on the envelopes, just as men did; the use of a seal shows that these women were regularly involved in operations needing written documents.[27] We know for example the seals used by Hananatum, daughter of Puzur-Shada (fig. 5), or by Tarisha, daughter of Alahum and sister of Assur-taklaku (fig. 6). They owned personal archives and were in charge of the archives of their husbands. Merchants often asked them to open the sealed rooms and containers where the tablets were kept, to extract and send specific documents.[28] Moreover, a legal document explicitly mentions a tablet written by a woman. A man asks: "Extract for me my tablet concerning one mina of silver that Shat-Ishtar, the wife of Assur-taklāku, wrote".[29] Thus, several women were able to read, classify and even write tablets.

Writing among the Anatolians

Most of the tablets discovered in the private houses of the kārum were owned by Assyrians. But small archives belonged to Anatolians who adopted the cuneiform writing and the Old Assyrian language. For level II, ten or so Anatolian merchants owned about 5% of the excavated documents. Among these, Peruwa and Shuppiahshu were living in some of the biggest houses of the kārum, with respective surface areas of 224 m2 (Y-Z/27-28) and 130 square meters (M-N/15-17). For level Ib, the proportion of texts belonging to Anatolians seems to be at least 25% of the unearthed tablets. Most of the Anatolian archives are still unpublished, but we observe that they contained predominantly loan and purchase contracts as well as some family contracts. The tablets produced by the Anatolians are less regular, and they present some characteristic features and mistakes (unusual syllabic sequences, lengthened vowels, confusion of genres, etc.). Either the Anatolians were not well trained in the scribal art, or, as speakers of a different language they had some difficulties with typical Akkadian features (gender, number, cases).

In fact, oral communication between Assyrians and local communities do not seem to have been a problem. Very few translators are mentioned, and the existence of a "chief of the translators" (rabi targumannē) imply that these persons were useful to the administration for commercial and diplomatic relationships between the local palace and the Assyrians or other foreigners visiting Anatolia.[30] Anatolians

learned the basics of the Old Assyrian dialect and Assyrians learned some Hittite words so that both communities were able to communicate. As several Assyrians got married to Anatolian women and some Assyrian widows married Anatolians, communication between couples was no problem. Children got exposed to both languages so that the next generation was certainly bilingual.

The Old Assyrian written dialect served as the diplomatic language in use between the Anatolian kingdoms, and it is most likely that texts which originate from the chanceries were written by the official scribes appointed by the palace. Some Assyrian scribes were certainly paid by Anatolians to produce family contracts dealing with brotherhood and joint households, and these are very nicely written with very few mistakes. Likewise, all the contracts supervised by the local ruler may have been written by an official scribe, perhaps an Assyrian. But it is clear that some Anatolians did learn the Old Assyrian dialect and cuneiform script and were able to write simple documents, although so far no school text has been found in the Anatolian houses. As for the language, we can imagine that some Assyrian educated men, married to Anatolian women, could have taught their wives and children the basics of cuneiform writing. The Anatolians had first to learn the Old Assyrian dialect, then to read and to write it. The spread of this knowledge took some time so we have very few Anatolian archives for level II. The increase in mixed marriages could have facilitated the access to the Assyrian language and writing, and in fact, there are many more Anatolian archives from level Ib. The Anatolians did not feel it necessary to adapt the cuneiform script to their own language, even if it could have been a very good tool in their own administration.

Two different levels of writing

The Old Assyrian script has been several times described as archaic. The form of the signs is borrowed from the Akkadian tradition of Ur III, at the end of the IIIrd millennium BC. It preserves its characteristics till the end of kārum Kanesh with very small developments. This script has been compared to some Mari administrative documents dating to the end of the 19th century BC, just before when the writing system reform was imposed by king Yahdun-Lim, who adopted the script and language from Eshnunna.[31] As the Eshnunna style was then used by Šamši-Adad, who ruled Assur during the first quarter of the 18th century, one wonders why Assyrian merchants kept their own written dialect during all this period. Several local styles of writing survived next to the Akkadian chancery-style borrowed from Ešnunna, and among them was the Old Assyrian dialect. It was used in a homogeneous community represented by merchants, and it held up during the 19th and 18th centuries. However, some patterns found in the incantations and the scholarly texts were borrowed from Akkadian and Sumerian literature, perhaps via the Old Babylonian educational material also used in Assur.[32]

More generally, the cuneiform production of ancient Mesopotamia shows at least two levels in the writing practice. The trained scribes who are often found in royal courts went through the whole educational program. They were able to write official letters, to compose literary texts, to compile astrological or divinatory treaties. Others, having completed only the elementary level, could read and write private letters, family or commercial contracts.

COUNTING IN ASSUR AND KANESH

The Old Babylonian educational program, as it has been reconstructed, shows that arithmetic was taught together with writing, by way of lists, tables and exercises.[33] At the elementary level the pupil copied and memorized metrological series, learning the various measurement systems according to a fixed order: capacity, weight, areas and length, then sexagesimal numerical tables. Reciprocal and multiplication tables were the first to be learned, before square numbers or square and cube roots that came later. The arithmetic exercises on small round tablets were introduced at the end of the first level at Nippur and were developed into complex exercises during the advanced level. Both concerned concrete works such as the settlement of accounts, loan interest calculations, administrative accountings, division of property, delimitation of a field, metal work, brick construction, etc., and they served to teach arithmetic practices that could be used during the professional life.

Old Assyrian weights and measures

The Assyrian merchants used, to count objects, a decimal system. The numbers 100, and 1000 were usually written with the Akkadian words: meat and lim (table 3).[34]

Number	1	10	60	100	1000
Cuneiform sign				me-at	li-im

The Old Assyrian merchants also preferred fractions to the conversion of a regular number into a smaller unit. They had the usual Akkadian signs for each of the following fractions (table 4):

1/3	1/2	2/3	5/6

and created two more signs (table 5):

1/4	1/6

They could express 3/4 with the help of a subtraction (1 – 1/4), but they ignored 1/5 or any other fraction in the form of n/5.[35]

The weight system was used for all the products they were trading: metals, textiles and other objects. For example, the tin exported to Anatolia was counted according to the classical Mesopotamian sexagesimal weight system in talents, minas and šekels (table 6).

GÚ talent (ca. 30 kg)		*ma-na* mina		*GÍN* šekel		*SE* grain
60 x 60	→	60	→	1	→	1/180

Beyond the talent, the decimal system was applied. Thus, "410 talents and 11 minas of tin" were written: 4 *me-at* 10 GÚ 11 *ma-na* AN.NA.[36] In Anatolia, sometimes, enormous amounts of copper were expressed only in minas as a basic unit: 2,670 minas of copper.[37] This might reflect two different practices: the Anatolians would have borrowed the system of the Assyrians and adapted it. A document from level Ib gives the correlation between the Assur mina and the Kanesh mina: 840 Anatolian minas corresponded to 760 Assyrian minas, thus, the Assyrian mina was 10% heavier than the Anatolian mina.[38]

Other metrological systems were less frequently used by the Assyrian merchants. The capacity system was used to measure liquids (oil, beer) or solids (cereal and dry fruits). It was constructed over the standard capacity containers (table 7):

naruqqum		*karpatum/ şimdum*		*sutum* container		*qûm*
bag (120 l.)	4	jar (30 l.)	3	(10 l.)	10	≈1 litre
60 x 60	→	60	→	1	→	1/180

Another container called *šaršarānum* (15 liters) corresponded to half a *karpatum*. Other types of jars, as the *kirrum*, usually containing beer, were sold, but we do not know their capacity (fig. 7).

The length system is rarely attested by the documents. It consisted of an inch (*ubānum*, 1,67 cm), half a cubit (*ūṭum*, 22,5 cm), a cubit (*ammatum*, c. 1/2 m), or an arm (*idum*, c. 1/2 m). We find also a foot (*kabistum*, perhaps between 2/3 and 3/4 cubits).[39] Likewise, for the surface area measures, since the house sale contracts almost never give the size of the building, only the *šubtum* and the šekel are attested.[40] The *šubtum* measure, known only from the Old Assyrian corpus, probably corresponds to the SAR, well known by the Old Babylonian tablets, and would amount to 36 m^2.

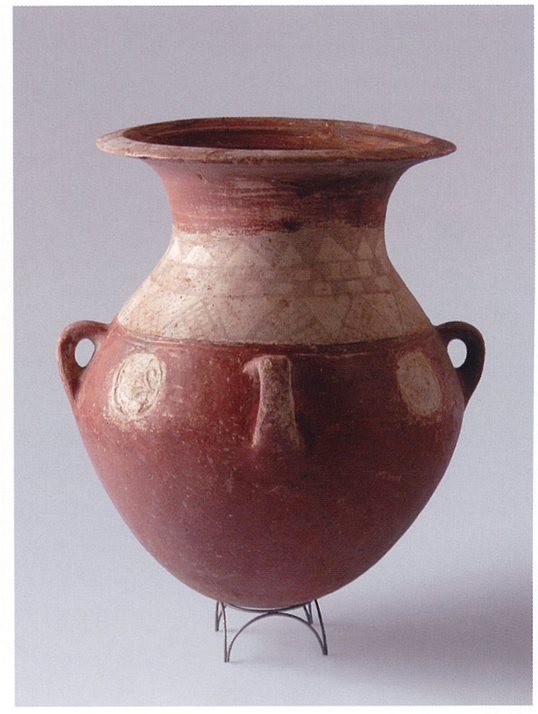

fig. 7 Storage jar from Kültepe (cat. 124)

fig. 8 Kt 83/k 83; Game board in clay with 61 holes from *kārum* II (cat. 159).

Old Assyrian arithmetic exercises

Most of the round Old Assyrian school tablets are coming from Assur. In some of them, the student gave a wrong answer:[41]

2! GÙ 14 *ma-na* URUDU
e-li-a-tum 1/2 *ma-na*
5 GÌN.TA KÙ.BI$_4$ 2 *ma-na*
6 1/2 GÌN 15 ŠE

"2 talents 14 minas of copper at a rate of 1/2 mina 5 šekels for each top-pack. Its price in silver: 2 minas 6 1/2 šekels 15 grains"
The weight of top-pack was 30 minas and the correct answer is 2 1/2 minas 6 1/3 šekels.

The knowledge of arithmetic enjoyed by the Assyrian merchants can be compared with that of traders at the end of the medieval time. Moreover, the organization of the long distance Assyrian trade presents several similarities with the commercial exchanges kept up by the Occident with the Byzantine and Muslim Orient between the 12th and the 15th centuries AD. Inhabitants of Venice created commercial partnerships similar to the Old Assyrian ones, selling textiles and metals and bringing back from the Orient luxury products such as silk, spices and dyes. Big families had firms all around the Mediterranean Sea and merchants settled themselves in several places in the Levant. The extent of trade created a numerous correspondence and a precise and detailed accountability, which was possible only after a specific training in mathematics.[42] We have several arithmetic treaties dating to the 14th and 15th centuries, showing similar features to the Old Assyrian arithmetic.

How did the Assyrian merchants realize their calculations?

The exercises in the published school texts can easily be solved with the numerical tables found in Old Babylonian sites, even if sometimes some complex exercises needed intermediary steps. These can explain the errors found in some calculations or approximations. When the variables and the result of multiplications contain fractions, we seem to find more mistakes: the lack of some fractions, as 1/5, implied some approximations. We have no proof that the Assyrian merchants were using tables, and, in fact, we have not found any numerical table at Kültepe among the thousands of tablets discovered in the kārum area. The fact that intermediate steps in calculations were never written on cuneiform tablets leads us to suppose the existence of a computing tool, which would have left no archaeological trace or which would have been interpreted in another way.

The Assyrian merchants might have used a computing tool, just like the medieval merchants used an abacus. In the houses of Kanesh and of several Anatolian trading posts, we find some game boards with 61 holes in which one can put small pins (fig. 8).

This type of game board, but with 58 holes, is well attested from the end of the 3rd millennium to the middle of the 1st millennium BC, in Egypt, Elam, Mesopotamia, the Levant and Anatolia and was popular among merchants. Most of the samples found in Anatolia, Kültepe, Acemhöyük, Konya Karahöyük and Boğazköy, date to the beginning of the 2nd millennium BC and they all seem to bear 61 holes (13 big and 48 small) and not 58.[43] The positions of the holes, their number, and their two different sizes suggest that these game boards could perhaps have been used as computing tools or to note intermediary values during a mental computation in the sexagesimal system (fig. 9).

To sum up, because of his commercial activities, the Assyrian merchant travelled a great deal, and could not always have a scribe at hand to write down his correspondence, his transactions and memoranda. So, many traders had to be able to read and write. While their husbands were on the roads, the women kept the family house and the archives. Often, they were asked to consult some documents. Hence at least some of them were able to read.

Instead of adopting the official Akkadian from Ešnunna in use in the Northern Mesopotamia, the merchants kept their Old Assyrian dialect, using a limited syllabary to write it. The populations from Central Anatolia, since they did not have a writing system, borrowed for their own use the Old Assyrian script and dialect. Whatever the period considered, the young merchant had to learn arithmetic. For this, he must have used a computing tool which has not been identified yet.

The Old Assyrian school texts correspond to the documents produced by the Babylonian schools: lexical and metrological lists, exercises, etc. But while the formation in Old Babylonian schools seems very academic, the one of the young Assyrian merchants corresponds more to a professional formation with clear practical applications.

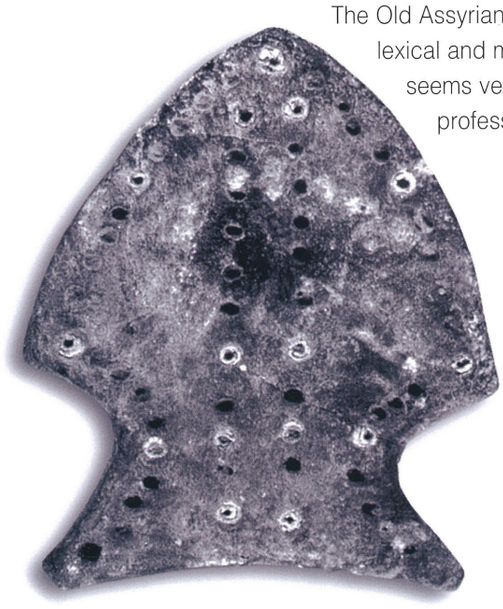

fig. 9. Game board in dark-gray tufa with 61 holes from kārum Ib. Kt f/k 329.

FOOTNOTES

[*] Dr., *ArScAn-HAROC*, CNRS, Nanterre, France.
[1] Michel 2003; 2006a; in press.
[2] Veldhuis 1997; Tinney 1998; Charpin 2004; Tanret 2002. The pupil learned how to make a tablet and to write signs, then he copied list of signs and words, metrological lists and numerical tables. This first level ended with copies of proverbs and contract models. The advanced level included copies of the main literary texts and resolutions of mathematical problems dedicated to algebra and geometry.
[3] Donbaz 1985.
[4] Hecker 1993. Other documents have been classified among school tablets by some authors, see the list in Michel 2008a. But these texts look more like accounting drafts.
[5] Michel 1998.
[6] The last 2 columns are too fragmentary to be read.
[7] Donbaz 2004: 185.
[8] Michel 2010.
[9] Hawley 2008.
[10] Pedersén 1989.
[11] Landsberger-Balkan 1950.
[12] Larsen 1976: 150.
[13] Veenhof 2003; Günbattı 2008a; Günbattı 2008b.
[14] Günbattı 1998; van de Mieroop 2000.
[15] Hecker 2001, 58-60.
[16] Foster 2002.
[17] Dercksen 2005.
[18] Cavigneaux 2005.
[19] Alster-Oshima 2007.
[20] Veenhof 2003; Kryszat 2004.
[21] Larsen 1976: 304-307.
[22] CCT 4: 6e.
[23] Michel 2001, 419-511. For women in Old Assyrian sources, see C. Michel's article entitled "Women in Assur and Kanesh" in this volume.
[24] Michel 2008b.
[25] Larsen 2001.
[26] Michel 2009.
[27] Tessier 1994: 49-50.
[28] Michel 2001, n°290, 342 and 398.
[29] TC 3 269, 9-12: *tuppē ša* 1 *mana* KÙ. BABBAR, *ša šat-Ištar aššat Aššur-taklāku, talputunni šēṣiam*.
[30] Ulshöfer 2000.
[31] Durand 1985.
[32] Michel 2008a.
[33] Proust 2008.
[34] The vertical wedge for "60", common in the Old Babylonian texts, was used in very few documents. See for example KTS 1, 58a: 10, 2 *li-im* 6 *me-at* 60+10 for 2,670. But in other documents, a hundred could be abbreviated with a vertical wedge, 1(00) as in ICK 1, 134: 2-5. See Michel 2006b.
[35] Michel 1992.
[36] VS 26 155: 39-40.
[37] CCT 6 34a. Some texts mention up to 30,000 minas of copper (KTK 20: 35). But we find also some amounts of copper expressed in talents: 100 talents (CCT 3 16b: 12) or 195 talents (KTS 1 54d:1-2).
[38] Kt u/k 3, cf. Dercksen 1996, 87.
[39] Powell 1990, 473; Veenhof 2007.
[40] TC 2, 11.
[41] Ass 13058k (Donbaz 1985: 16).
[42] Benoit 1988.
[43] Özgüç, T. 2003, 266-267.

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