Operations and languages

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Seminar HPM – “**Questioning operations. Writing calculations and operations: Language pointers and environment”**

Two languages were used in Mesopotamia in the Old Babylonian period: Sumerian and Akkadian.

What are the effects of the use of a particular language on the expression of operations?
What is the meaning of shifts of language in texts?
How do the various uses of langauges reflect the way of working of a community of scholars?

Sumerian and Akkadian

More on Sumerain and Akkadian :

- Sumerian was spoken in southern Mesopotamia during the 3rd millennium. This language has probably disappeared as mother tongue in the late third millennium. The writing is ideographic, with phonetic grammatical elements.

- Akkadian is a Semitic language, which was spoken in Mesopotamia during the third and second millennium. The writing is syllabic. However, Sumerian characters or group of characters (Sumerograms) were often used in Akkadian texts. These Sumerograms were probably read in Akkadian.

Sumerian and Akkadian are both used in OB mathematical texts.
But the way in which the two languages are used, for example the frequency and intensity of the use of Sumerograms, varied depending on period, region, style, and genre.

For example:

- In mathematical school texts, only Sumerian is used. The vocabulary is very limited, and grammatical elements are very few, or absent.

- The texts of problems are often written in Akkadian, with a more or less intensive use of Sumerograms, but sometimes written in Sumerian.

In fact, it is not always easy to decide in which language a mathematical texts was supposed to be pronounced. Surprisingly enough, there is a kind of continuum between pure Akkadian texts and pure Sumerian texts, as we’ll see.

Tranliteration and Transcription : see CDLI
http://cdli.ucla.edu/wiki/doku.php/sumerian/transliteration_and_the_diacritics:
"Whereas transliteration attempts to mimic the written form of the cuneiform signs in question, often misrepresenting the linguistic or grammatical structure to some degree, transcription focuses on the grammatical or linguistic structure at the expense of the written orthography."

Usually, in transliterations
- italic letters are used for Akkadian syllables
- expanded plain letters are used for Sumerian words
- majuscule plain letters are used for Sumerograms and for signs whose pronunciation or meaning is uncertain.

In addition, for clarity, I'll use italics for translation of syllabic Akkadian words, and plain letters for translation of Sumerograms and Sumerian words.

Example (VAT 8547, #1, *l.* 9, handhout p. 3)
ba-si 3.36 *mi-nu-um*
The cube root of 3.36 *is what?*

This talk is divided into three parts.
- First, I'll show various examples of uses of languages in mathematical texts. All of these examples deal with volumes and cubic roots.
- Second, I'll analyze with more detail a text where shifts of language seem to have a precise meaning in relation to operations and arguments.
- Third, I'll focus on a text whose language is ambiguous. In this text, the written language seems to be quite independent from the spoken language. It appears to be a technical language elaborated for expressing complex sequences of operations.

I'll conclude with some hypotheses about the link between language and milieu.

Phenomena linked to languages in mathematical cuneiform texts: examples

1- Eshnunna Kingdom (Akkadian text)

IM 54478 is a mathematical tablet from Tell Harmal (Shaduppum) published by Baqir (1951 Sumer 7 p. 30)
The shape of the tablet is completely different form the southern counterparts. Like the other mathematical tablet from Tell Harmal, it is a single column landscape oriented tablet. The tablet contains only one problem with its complete solution.
The aim of this problem is the calculation of the edge of a cube-shaped excavation, the volume being given.

IM 54478 (after Baqir 1951, Sumer 7, p. 30)

Face

1. *šum-ma ki-a-am i-ša-al-ka um-ma šu-u$_2$-ma*
2. *ma-la uš-ta-am-hi-ru u$_2$-ša-pi$_2$-il-ma*
3. *mu-ša-ar u$_3$ zu-uz$_4$ mu-ša-ri*
4. *e-pe$_2$-ri a-su-uh ki-ia uš-tam-hi-ir*
5. *ki ma-ṣi$_2$ u$_2$-ša-pi$_2$-il*
6. *at-ta i-na e-pe$_2$-ši-ka*
7. [1.30 *u$_3$*] 12 *lu-pu-ut-ma i-gi* 12 *pu-ṭu$_2$-ur-ma*
8. [5 *ta-mar* 5 *a-na* 1].30 *e-pe$_2$-ri-ka*

Revers

1. *i-ši-ma* 7.30 *ta-mar* 7.30
2. *mi-nam* ib$_2$-si$_8$ 30 ib$_2$-sa$_2$ 30 *a-na* 1
3. *i-ši-ma* 30 *ta-mar* 30 *a-na* 1 *ša-ni-im*
4. *i-ši-ma* 30 *ta-mar* 30 *a-na* 12
5. *i-ši-ma* 6 *ta-mar* 30 *mi-it-ha-ar-ta-ka*
6. 6 *šu-pu-ul-ka*

Translation

Obverse

1 *If one asks you this:*
2 *As much as I made (the sides of the base) confront themselves, I dug (the depth) then*
3 *a mušarum and half a mušarum* (= 1 ½ sar),
4. *my volume, I removed. How much (the sides) I made confront themselves?*
5 *How much (the depth) I dug?*
6 ***You, in your doing,***
7 [1.30 *and*] 12 *inscribe and the reciprocal of* 12 *detach:*
8 [5 *you see.* 5 *to* 1].30 *your volume*

Reverse

1 *raise.* 7.30 *you see.* Of 7.30
2 *what is the* cubic root? 30 is the cubic root. 30 *to* 1
3 *raise:* 30 *you see.* 30 *to the second* 1
4 *raise:* 30 *you see.* 30 *to* 12
5 *raise:* 6 *you see.* 30 *is your side*,
6 6 *is you depth.*

Remarks

Structure

The text is divided into two parts:

- Statement + question (obverse, lines 1-5)
- Procedure, introduced by the formula « you, in your doing » + answer (obverse, lines 6-8, and reverse)

Language

The text is almost entirely written in Akkadian.
Particularly remarkable is the use of Akkadian syllabic words for

- the units of measures: obverse, line 3, *a mušarum and half a mušarum* (= 1 ½ sar)
- the reciprocal: the usual sumerogram “igi” is written phonetically as *i-gi*.

These uses are unusual in OB mathematical texts; they are specific to the Eshnunna Kingdom.

The unique Sumerogram is ib$_2$-sa$_2$, here in the meaning of cubic root (in southern texts, where ib$_2$-sa$_2$ is generally used for square root or side – but not always, as shown by the following text).

Numerical values
In the statements, numerical values are given as measures (line 3)
In the procedure and answer, numerical values are given as SPVN.

The correspondence between measures and SPVN is provided by metrological tables:
mušarum and half a mušarum (= 1 ½ sar) → 1.30

This contrast between statement and procedure in the way in which data are managed is a general phenomenon in mathematical cuneiform texts.

Arithmetical operations and geometrical meaning
The edge 30 of the cube-shaped excavation appears in two places, with different terms and different meaning:
In the procedure (reverse, line 2), the edge 30 appears as an arithmetical cubic root of 7.30: "30 is the cubic root (ib$_2$-sa$_2$)", since the cubic root of 7.30 is 30.
In the answer (reverse, line 5), the edge 30 appears as the side of the square base "30 *is your side* (*mithatum*)".
For the arithmetical operation, a Sumerogram is used (ib$_2$-sa$_2$).
For the name of the corresponding magnitude, an Akkadian word is used (*mithatum*).

2- Nippur (Sumerian text)
CBS 12648 is a mathematical tablet from unknown provenance (probably southern Mesopotamia, early OB period), published by Hilprecht (1906)
The tablet is of type M(2,2), that is, multi-column with 2 columns on the obverse and 2 columns on the reverse. It contains several problems with detailed procedure. Only section 2 is well preserved.
Section 2 contains a problem similar to the previous one: find the dimensions of a rectangular prism, its volume and two linear relations between its edges being given.

CBS 12648, obverse, column i, lines 5-20

5.	2 še igi-12 gal_2 [sahar]*	2 še 12th [the volume]
6.	2/3-bi uš-a-kam sag	2/3 of the length is the width
7.	šu-ri-a sag-ga_2-kam	The half of the width is
8.	bur_3-bi	its depth.
9.	uš-bi sag-bi	Its length, its width,
10.	u_3 bur_3-bi [en-nam]	*and* its depth [is what ?]
11.	uš [sag]	The length, [the width],
12.	u_3 bur_3-bi	*and* its depth
13.	ub-te-gu_7-*ma*	make hold, *then*
14.	igi-bi e-du_8-*ma*	its reciprocal detach, *then*
15.	sahar-$še_3$ ba-e-il_2-*ma*	to its volume raise, *then*
16.	ib_2-si_8	the cubic root of
17.	15.37.30	15.37.30
18.	e_{11}-de_3*	extract.
19.	ib_2-si_8 15.37.30	The cubic root of 15.37.30
20.	[2.30]	[is 2.30]
	[broken]	[…]

Remarks

Structure

As the previous one, the text is divided into two parts:

- Statement + question (lines 5-10)
- Procedure, with no introducer (lines 11-20)

Language

The text is almost entirely written in Sumerian. Grammatical elements are present, especially in verb forms (ub-te-gu_7, ba-e-il_2, ba-zu-zu-un…).

The unique Akkadian elements are:

- the copule –*ma*, and or ":"
- u_3 = and

These elements do not exist in Sumerian, but are commonly used in all categories of mathematical texts.

Numerical values

In the statements, numerical values are given as measures (line 5: 2 še 12^{th} = 2 1/12 še).
In the procedure and answer, numerical values are given as SPVN (lines 17 and 19: 15.37.30).

The correspondence between measures and SPVN is provided by metrological tables:
2 1/12 še-volume → 41.40 (2 še → 40; 1/12 še → 20/12 = 20×5 = 1.40)
This correspondence does not appear directly, but implicitly in the result 15.37.30:

The procedure can be reconstructed by false position (as suggested by Friberg) or by comparison with a reference prisme (TMN): the unknown length is supposed to be 1 ninda (false length or reference length).

Length = 1 ninda	→ 1	(table L)
Width = 2/3 of length = 2/3 ninda	→ 40	(table L)
Depth = ½ of 2/3 of length = 1/3 ninda	→ 4	(table Lh)

False volume: 1×40×4 = 2.40

Coefficient true volume / false volume: 41.40 / 2.40 = 41.40×22.30 = 15.37.30
Coefficient true length / false length: cubic root of 15.37.30 = 2.30
The length is 2.30 (1/2 $kuš_3$)

This confirms the previous observation, namely the contrast between statement and procedure in the way in which data are managed: measures in statement, SPVN in procedure.

Arithmetical operations and geometrical meaning
Different terms for operations depending if they are

- geometrical (line 13: ub-te-gu_7 = make hold) or
- arithmetical (ib_2-sa_2 = cubic root in lines 16 and 19).

The edge 30 of the cube-shaped excavation appears in two places, with different terms and different meaning:
In the procedure (reverse, line 2), the edge 30 appears as an arithmetical cubic root of 7.30: "30 is the cubic root (ib_2-sa_2)", since the cubic root of 7.30 is 30.
In the answer (reverse, line 5), the edge 30 appears as the side of the square base "30 *is your side* (*mithatum*)".
For the arithmetical operation, a Sumerogram is used (ib_2-sa_2).
For the name of the corresponding magnitude, an Akkadian word is used (*mithatum*).

3- Sud (mixte)

VAT 8547 is a mathematical tablet from unknown provenance published by Sachs (1952, BMT III: 153)
The tablet is single-column (type S) and contains a list of 4 calculations of cubic roots by a method of factorization (cubic root of 27, 1.4, 2.5, 3.36, that is, 3, 4, 5, 6; the cubic roots are in fact already known by the scribe as they belong to the standard memorized tables).

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Obverse

1. ⌜ba⌝ -si 27 [*mi*]-*nu*-[*um*]
2. ⌜*at*⌝ -*ta i-na* 27 7.30 *u*$_2$-*su*(sic)-*uh-ma*
3. 26.52.30 *te-zi-ib* 7.30 *ša ta-as-su*$_2$(sic)-*hu*
4. *ša-pa-al* 26.52.30 gar-ra-ma
5. 26.52.30 7.30 ba-si 7.30 *mi-nu-um* 30
6. igi 7.30 *pu- ṭur-ma* 8
7. 8 *a-na* 26.52.30 7.30 il_2 3.36
8. ba-si 3.36 *mi-nu-um* 6
9. 6 *a-na* 30 ba-si il_2 3
10. 27-e 3 ba-si

Translation by A. Sachs (1952, BMT III: 154)
Obverse
1) [Wh]at is the cube root of 27?
2) As for you - subtract 0;7,30 from 27.
3) You will leave 26;52,30. The 0;7,30 which you subtracted
4) place below 26;52,30:
5) 26;52,30 0;7,30. What is the cube root of 0;7,30? (Answer:) 0;30.

6) Find the reciprocal of 0;7,30, (namely,) 8.)
7) Multiply 8 by 26;52,30 0;7,30 (sic). (The result is) 3,36.
8) What is the cube root of 3,36? (Answer:) 6.
9) Multiply 6 by 0;30, the (above-mentioned) cube root. (The result is) 3.
10) 3 is the cube root of 27.

My translation

1. The cube root of 27 *is what?*
2. *You in your <doing>, from* 27, 7.30 *tear out, then*
3. 26.52.30 *you leave.* 7.30 *that you tore out*
4. *below* 26.52.30 place:
5. 26.52.30. The cube root of 7.30 *is what?* 30
6. The reciprocal of 7.30 *detach:* 8
7. 8 *to* 26.52.30 {7.30} raise: 3.36
8. The cube root of 3.36 *is what?* 6
9. 6 *to* 30 the cube root (of line 5) raise 3
10. The cube root of 27 is 3.

Structure

As the previous ones, the text is divided into two parts:

- Statement + question (lines 1)
- Procedure, introduced by the formula « you, in your doing » written in Akkadian + answer (lines 2-10)

Language

The text is in Akkadian with Sumerograms.

ba-si	cubic root
gar-ra	place
igi	reciprocal
il_2	raise (multiplication)

Numerical values

This is a pure arithmetic text, and all the numbers are SPVN.

4- Series texts (pseudo Sumerian)

Tablet from unknown provenance (probably central Mesopotamia, end of the OB period), published by Neugebauer (MKT I p. 389 ss.)
The type is M(3/3). The tablet contains a list of 60 statements dealing with piles of bricks, with no procedure.
The tablets ends with a colophon providing the number of sections and the serial number (1 šu-ši im-šu / ⌈dub⌉ 1-kam-ma = 60 sections / tablet number 1). This means that this tablet ist he first of a series of several numbered tablets.
The two first sections read as follows:
YBC 4708, Face, col. i

#	li.	
1	1.	[sig_4]-⌈anše⌉ 5 ninda uš-bi
	2.	[1 1/2] ninda sag 1/2 ninda sukud-bi
	3.	sig_4-bi en-nam
	4.	sig_4-bi 3(iku) GAN_2 24 sar
2	5.	sig_4 sig_4-anše 3(iku) GAN_2 24 sar
	6.	1 1/2 ninda sag 1/2 ninda sukud-bi
	7.	uš-bi en nam 5 ninda uš

YBC 4708 [1]

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538 *[ama]rum* [2] *5* NINDA *šiddašu*
[1 mišil] NINDA *pûtum mišil* NINDA *mêlûšu*
libittašu minûm
libittašu 3 ikû 24 s a r

„[Un tas de bri]ques. Son flanc est 5 NINDA. Le front est [1] NINDA [et demi]. Sa hauteur est un demi-NINDA. Que sont ses briques?
Ses briques sont 3 *ikû* 24 s a r [3])."

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539 *libitti amarim 3 ikû 24* s a r
1 mišil NINDA *pûtum mišil* NINDA *mêlûšu*
šiddašu minûm 5 NINDA *šiddum*

Structure
Here, the statements are given, as well as the questions and the answers, but not the procedure.
Language
The text seems to be written in Sumerian. But this is a controversial point:
- Thureau-Dangin thought that the Sumerograms represented Akkadian words (see his transcription). This is also the opinion of Antoine Cavigneaux.
- Walter Sallaberger, the editor of ZA, where I published other series texts, thinks that this text is really written in Sumerian.
- Neugebauer thought that this language is neither Akkadian nor Sumerian, but symbolic.

Numerical values
The data are given as measures.

Bilingual text
Until now, the examined texts were written in a language or in another.
We'll see now a bilingual text, that is, a text with a part written in Sumerian, and another in Akkadian.

YBC 4663 is a procedure text from unknown provenance (probably southern Mesopotamia). It contains 8 problems dealing with the excavation of a trench by workers and the cost of this work. Each problem include the procedures.
The problem 4 reads as follows:

Procedure text: YBC 4663 #4
20. 9 gin$_2$ ku$_3$ ki-la$_2$ 5 ninda uš 1 1/2 ninda sag 10 <gin$_2$> sahar eš$_2$-gar$_3$ 6 še a$_2$-bi$^!$
21. bur$_3$-bi- en-nam za-e in-da-zu-de$_3$
22. uš sag gu$_7$-gu$_7$-ta 7.30 *i-na-di-ku* igi eš$_2$-gar$_3$ *pu-ṭu-ur*
23. *a-na* 7.30 *i-ši* 45 *i-na di-ku* 45 *a-na i-di i-ši*
24. 1.30 *i-na-di-ku* igi 1.30 *pu-ṭu-ur* 40 *i-na-di-ku*
25. 40 *a-na* 9 ku$_3$ *i-ši* 6 bur$_3$-bi *i-na-di-ku* 1/2 ninda bur$_3$-bi <*ki-a-am ne$_2$-pe-šu*>

20. 9 gin_2 the (total expenses in) silver for a trench. 5 ninda the length, 1 1/2 ninda the width. 10 (gin_2) the assigned volume. 6 še (silver) the wage (per worker).
21. Its depth how much ? You, in your procedure :
22. The length and the width make hold. 7.30 *will be given to you. The reciprocal of the* assigned volume *detach*,
23. *to* 7.30 *raise*. 45 *will be given to you*. 45 *to the wage raise*.
24. 1.30 *will be given to you*. *The* reciprocal *of* 1.30 *detach*. 40 *will be given to you*.
25. 40 *to* 9, the (total expense in) silver, *raise*. 6, the depth, *will be given to you*. 1/2 ninda its depth.

Structure

The text is divided into three parts:

- Statement + question (lines 20-21)
- Procedure, introduced by the formula « you, in your doing » written in Sumerian (lines 22-25)
- Answer (line 25)

Language

- The statement is written in Sumerian
- The procedure is written in Akkadian, with some Sumerograms
- The answer is written again in Sumerian.

Here, the language shifts twice: after the statements and after the procedure. We'll see the meaning of these shifts.

Numerical values

In the statements, numerical values are given as measures.
In the procedure, numerical values are given as SPVN.
In the answer, numerical values are given again as measures.

The correspondence between measures and SPVN is provided by metrological tables:

9 gin_2	→ 9	(table W)
5 ninda	→ 5	(table L)
1 1/2 ninda	→ 1.30	(table L)
10 gin_2-volume	→ 10	(table S)
6 še silver	→ 2	(table P)

The correspondence between SPVN and measure of the depth is provided by the metrological table for vertical dimensions:

6	→ ½ ninda	(table Lh)

The shifts in the language correspond to the shifts in the notation of numerical data:
Statement: Sumerian, measures
Procedure: Akkadian, SPVN
Answer: Sumerian, measures

Thus the shift in the language underlines the shift in the notations conveyed by metrological tables.

Moreover, the lexicon of statement + answer is not the same as the lexicon of procedure:
Statement: measures, names of the magnitudes.
Procedures: SPVN, names of the magnitudes, operations.

Answer: measures, names of the magnitudes.

The names of the magnitudes are in Sumerian in the statement, as well as in the procedure. However, in one case, the Sumerian term used in the statement is translated in Akkadian for the procedure:

Statement, line 20 wage = a$_2$-bi
Procedure, line 23 wage = *idum*

Several procedure texts of this kind are known. These texts were compiled to produce the so called "catalogue texts", with bring together the statements of the problems. Thus, catalogues texts are written in Sumerian.

Groups in catalogue YBC 4657		**Procedure texts**	**Mathematical content**
I	#1-8	YBC 4663	Volume of a prism (direct and reverse problems), simple proportionality, homogeneous quadratic equations.
II	#9-18	?	Volume of a prism (direct and reverse problems), homogeneous and non-homogeneous quadratic equations.
III	#19-28	YBC 4662	Simple and double proportionality
IV	#29-31	?	Varia
Colophon: 31 sections on a trench (31 im-šu ki-la$_2$)		No colophon	

Catalogue : YBC 4657, #4
YBC 4657 is a catalogue from unknown provenance (probably southern Mesopotamia). It contains 31 statements of problems dealing with the excavation of a trench by workers and the cost of this work. The tablet ends with a colophon providing the number of sections and the subject of the problems (label): 31 problems on excavations (31 im-šu ki-la$_2$).
The problem 4 reads as follows:

4 8. ku$_3$ ki-[la$_2$ 9 gin$_2$] 5 ninda uš-bi 1 1/2 ninda sag 10 gin$_2$ eš$_2$-gar$_3$
9. 6 še a$_2$-bi lu$_2$-huğ-ga$_2$ bur$_3$-bi en-nam [1/2 ninda] bur$_3$-bi

4 8. L'argent (total) pour la tranchée [est 9 gin$_2$]. 5 ninda sa longueur, 1 1/2 ninda sa largeur. 10 gin$_2$ la tâche assignée.
9. 6 še (d'argent) le salaire (d'un ouvrier). Sa profondeur combien ? [1/2 ninda] sa profondeur.

4 8. The (total expenses in) silver for a trench is 9 gin$_2$. 5 ninda the length, 1 1/2 ninda the width. 10 (gin$_2$) the assigned volume.
9. 6 še (silver) the wage (per worker). Its depth is what ? [1/2 ninda] its depth.

Comparison of the statements in catalogue and procedure text : The texts are almost exactly the same. However, in the catalogue, the place of « ku$_3$ ki-la$_2$ » is changed: it is put in the first place, in such a way that the label of the catalogue appears as the entry of the section (and again in the colophon).

Pseudo Sumerian in series texts

AO 9071 is from unknown provenance (probably central Mesopotamia, end of the OB period), published in Proust 2009, "Deux nouvelles tablettes mathématiques du Louvre : AO 9071 et AO 9072." *Zeitschrift für Assyriologie und Vorderasiatische Archäologie* 99:167–232.

The type is M(3/3). The tablet contains a list of 95 statements dealing a rectangle. The tablets ends with a colophon providing the number of sections and the serial number (1(geš2) 35 im-šu / dub 7-kam-ma = 95 sections / tablet number 7). This means that this tablet ist he seventh of a series of several numbered tablets. Other tablets of the same series are probably AO 9072, YBC 4695, YBC 4711.

AO 9071, #45

Face, col. ii, 12^{e} section (E_1)

35a*	15.	uš a-ra$_2$ [3-e] tab	The length 3 times repeated,
	16.	sag a-ra$_2$ 2-[e] tab	the width 2 times repeated,
	17.	gar-gar-ma igi-13-gal$_2$-bi	I accumulated, its 13th,
	18.	uš dah-ma [40]	to the length I added : 40.

[…]

Face, col. ii, 12^{e} section (P)

37*	25.	uš 5 ninda bi$_2$-dah	The length to 5 ninda I added,
	26.	igi-7-gal$_2$-bi u$_3$ 1(geš$_2$) ninda zi	its 7th from 60 ninda I subtracted
	27.	igi-11-gal$_2$-bi a-ra$_2$ 6-e tab	its 11th 6 times repeated
	28.	1.35 ba-zi	from 1.35 I subtracted
	29	igi-13-gal$_2$-bi	its 13th,

[…]

Face, col. iii, 5^{e} section (S)

42	5.	a-na uš ugu sag diri	to what the length exceeds the width
	6.		

[…]

Face, col. iii, 8^{e} section (relation entre P et S)

45	9.	a-ra$_2$ 2-e tab ba-sa$_2$	2 times repeated: I made equal.

$$\begin{cases} (\text{uš}\times 3+\text{sag}\times 2)+\text{uš}=40 \\ \left\{-\left[-\left(\text{uš}+5\ \text{ninda}\right)\frac{1}{7}+60\ \text{ninda}\right]\frac{1}{11}\times 6+1.35\right\}\frac{1}{13}\times 2=\text{uš - sag} \end{cases}$$

A characteristic feature of series texts is their complex architecture. The list of statements is produced by successive variants of different segments of an initial simple statement. This produced a tree structured list. The information is highly compacted, and the resulting statements are very elliptic.

Conclusion : the series texts may reflect a *new mathematical culture between antiquarism and innovation*

It seems that the series texts do not fulfil the same intellectual project as other OB mathematical texts as procedure texts or catalogues. They do not target the same groups of readers, nor do they pursue the same objectives. Catalogues seem to reflect archival practices, while series texts bear witness to speculative inquiry, which produces new material.

These issues could be important for the intellectual history of Mesopotamia at the end of the Old Babylonian period.

Evidence such as paleography, serialization and the use of an artificial language imitating Sumerian argue for a quite late dating of the mathematical series texts, that is, the end of the Old Babylonian period (Høyrup 2002: 351). The authors of the series texts were familiar with the mathematical tradition of Southern Mesopotamia developed in scribal schools. Certainly they knew very well the language and topics of this ancient tradition, and see to have tried to imitate its style. At the same time, series texts are completely innovative in their language as well as in their mathematical content.

From these remarks, some hypotheses about the context of the series texts could be suggested. It is possible that these texts come from communities of scribes who had fled southern Mesopotamian cities, such as Ur, Uruk and Larsa, after they were destroyed at the end of the 18th century. The authors of the series texts may have been members of these new scribal communities of Kish or Sippar, impregnate by southern culture.