UNTOUCHABLE OR UNREPEATABLE? THE UPPER END OF THE OLD BABYLONIAN METROLOGICAL SYSTEMS FOR CAPACITY AND AREA

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This article re-examines the cuneiform evidence for the upper end of the Old Babylonian metrological systems for capacity and area. We demonstrate that the reading 1(šar$_2$) gal šu nu-tag "one large šar$_2$ that the hand cannot touch" is not supported by that evidence, and show instead that the phrase's final sign is not tag but gi$_4$ "return" or "repeat". We then consider several likely interpretations of this reading, arguing that the size of the largest units in both systems is probably sixty times smaller than previously assumed, but nevertheless more than adequate for practical needs. Editions of two important metrological cuneiform texts are appended.

In the past decade there has been a resurgence of interest in metrological systems, both as taught in Old Babylonian scribal schools (e.g. Robson 2002; Proust 2008b) and as implemented by traders and regulatory authorities (Chambon 2011). The relationships between mathematical word problems and Ur III and Old Babylonian administrative praxis have been relatively well explored (e.g. Nemet-Nejat 1993; Robson 1996; 1999: 138–67; Friberg 2001). However, it is rare for studies of metrological systems to consider the interactions between the theoretical metrologies of the school texts and their practical counterparts in the administrative and legal record. In this article we consider the very largest capacity and area measures, as learned by trainee scribes and used by professional surveyors and accountants in early Mesopotamia.[1]

Untouchable?

It is often presented as an established historical fact that the classic Old Babylonian capacity and area systems each ended with the entry 1(šar$_2$) gal šu nu-tag,[2] literally "one large šar$_2$ that the hand cannot touch" or "reach", and that this was a unit sixty times larger than the immediately preceding entry 1(šar$_2$) gal "one large šar$_2$" (e.g. Friberg 1982: 14; 1986: 15; 1987–90: 538; Proust 2007: 102–3, 2008a: 13). Indeed, Christine Proust (2000: 302) even suggests that this unit was the largest possible quantity representable on a hypothetical abacus board which was somehow constrained to just five sexagesimal places.[3]

The existence of a metrological "unit" 1(šar$_2$) gal šu nu-tag seems to stem from a reading of CBS 10990, a large compilation of metrological lists from Nippur first published in copy by Hilprecht (1906: no. 29), which would now be described as a Type I tablet in Civil (1969: 27–28) and Veldhuis's (1997: 28–40) classification of Old Babylonian elementary school tablets. However, the reading and interpretation of 1(šar$_2$) gal šu nu-tag does not seem to be Hilprecht's, for he postponed discussion of the metrological tablets in *BE* 20/1 to the never-to-appear *BE* 20/2 (Hilprecht 1906: 35). As Friberg (1982: 17) notes, shortly afterwards Barton (1909: 16) suggested a reading ŠAR$_2$-GAL

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[1] We are very grateful to Professor Eva Cançik-Kirschbaum and colleagues on the TOPOI project of the Freie Universität Berlin for facilitating and funding our first work session on this topic in July 2009.

[2] There are many ways of transliterating early Mesopotamian metrological units. Here we follow the conventions of the Cuneiform Digital Library Initiative = CDLI (http://oracc.org/doc/builder/numbers/numref.pdf), in which the notations such as 3(bur$_3$) mean three repetitions of the sign BUR$_3$ (i.e. bur$_3$ bur$_3$ bur$_3$). However, instead of CDLI's 1(šargal)^{gal} we write 1(šar$_2$) gal because the frequent writing gal-la(-am$_3$), as shown below, demonstrates that—in Old Babylonian school contexts, at least—the sign GAL is not a determinative.

[3] Proust (2000: 302) also dismisses the possibility of Old Babylonian "dust abaci"—namely *ad hoc* counting surfaces drawn out on any convenient flat surface—on the grounds of work by Høyrup (2000: 4; Proust cites a preprint). In fact Høyrup argues there for "*calculi* placed on a counting board and not ... *written numbers* on a dust abacus" (our emphasis), that is, for calculations using counters instead of numerals, not for or against formal apparatus of any particular sort. The evidence for Mesopotamian counting boards remains scant at best, while Netz (2002) has argued convincingly for the ubiquity of dust abaci used with counters in antiquity. There is no reason why the arguments put forward by Høyrup (2000) should not hold as well for informal dust abaci as for formal counting boards.

šu-nu-šum "the great šar, its double". He derived a noun *šunnû* from *šanû* "to do twice, repeat" but without attempting to explain the erroneous substitution of the dative verbal suffix *-šum* "to/for him, it" for the nominal suffix *-šu* "his, its". Neugebauer and Sachs (1945: 102–3) did not mention this phrase in their consideration of the equation tag = *šaqālu(m)*, while Powell (1972: 176, 219) assumed that both CBS 10990 and the early Mesopotamian area, capacity and weight systems all stopped at 1(šar$_2$) gal.

The first relevant readings of this phrase we have been able to identify are Friberg's ŠÁR×GEŠ.GAL šu-nu-taga$_x$ (1982: 14) and šár-gal šu-nu-taga$_x$ "the great *šár* the hand does not reach" (1986: 14–15), which he links with the much earlier Eblaite phrase in 6(šar'u$_x$) gal nu-da-šid, a number that "cannot be counted", in TM.75.G.1693 (Friberg 1986: 10).[4] Note, though, that this Ebla text appears to be a list of large numbers in the discrete counting system, not capacities or areas, and is from a city on the edge of cuneiform culture, with its own very particular writing and counting conventions. It is *prima facie* unlikely to be pertinent to Old Babylonian educational practice.

The relevant passages of CBS 10990 are both badly damaged. They read:

1. CBS 10990 obv. iii (Fig. 1a–b)
   1. 8(šar$_2$) ⌜gur⌝
   2. 9(šar$_2$) ⌜gur⌝
   3. 1(šar$_2$×u) ⌜gur⌝
   4. 1(šar$_2$×man) gur
   5. 1(šar$_2$×eš) gur
   6. 1(šar$_2$×ilimmu) gur
   7. 1(šar$_2$×ninnu) gur
   8. 1(šar$_2$) gal gur
   9. 1(šar$_2$) gal šu nu-*x* ⌜gur⌝

2. CBS 10990 rev. iii (Fig. 1c–d)
   1'. [. . .] ⌜GANA$_2$⌝
   2'. [. . .] GANA$_2$
   3'. [. . .] GANA$_2$
   4'. [. . .] GANA$_2$
   5'. 1(šar$_2$×ilimmu) GANA$_2$
   6'. 1(šar$_2$×ninnu) GANA$_2$
   7'. 1(šar$_2$×geš$_2$) gal GANA$_2$
   8'. 1(šar$_2$×geš$_2$) gal šu nu-*y* GANA$_2$

As photographed and drawn in Fig. 1a–d, the two damaged signs *x* and *y* that occur in the closing lines of these excepts could well be tag (ŠUM); the first is badly abraded, the second compressed into a very full line. However, there are at least four further Old Babylonian metrological lists from Nippur which preserve the same lines more clearly and unequivocally show a different reading:[5]

3. CBS 8214 rev. ii' (Type II; unpublished; Fig. 1e–f)
   1'. [. . .] ⌜gur⌝
   2'. [. . .]+1(šar'u) gur
   3'. [. . .]+3(šar'u) gur
   4'. [. . .] gal-la gur
   5'. [. . .] ⌜gal⌝-la ⌜šu⌝ nu-⌜gi$_4$⌝ gur

4. CBS 10181+CBS 10207+Ist Ni 10135 rev. i (Type II; Proust 2007: 353, pls. XLII–XLIII; Fig. 1g–i)[6]
   1'. [1(šar'u)] ⌜8(šar$_2$) gur⌝
   2'. 1(šar'u) 9(šar$_2$) gur
   3'. 1(šar$_2$×man) gur

   4'. 1(šar$_2$×eš) gur
   5'. 1(šar$_2$×ilimmu) gur
   6'. 1(šar$_2$×ninnu) gur
   7'. 1(šar$_2$) gal gur
   8'. 1(šar$_2$) gal šu nu-gi$_4$ gur

5. HS 249 obv. iv (Type I; Proust 2008a: no. 3; Fig. 1j–k)
   4. ⌜1(šar'u) 9(šar$_2$)⌝ gur
   5. ⌜1(šar$_2$×man)⌝ gur
   6. ⌜1(šar$_2$×eš)⌝ gur
   7. ⌜1(šar×ilimmu)⌝ gur
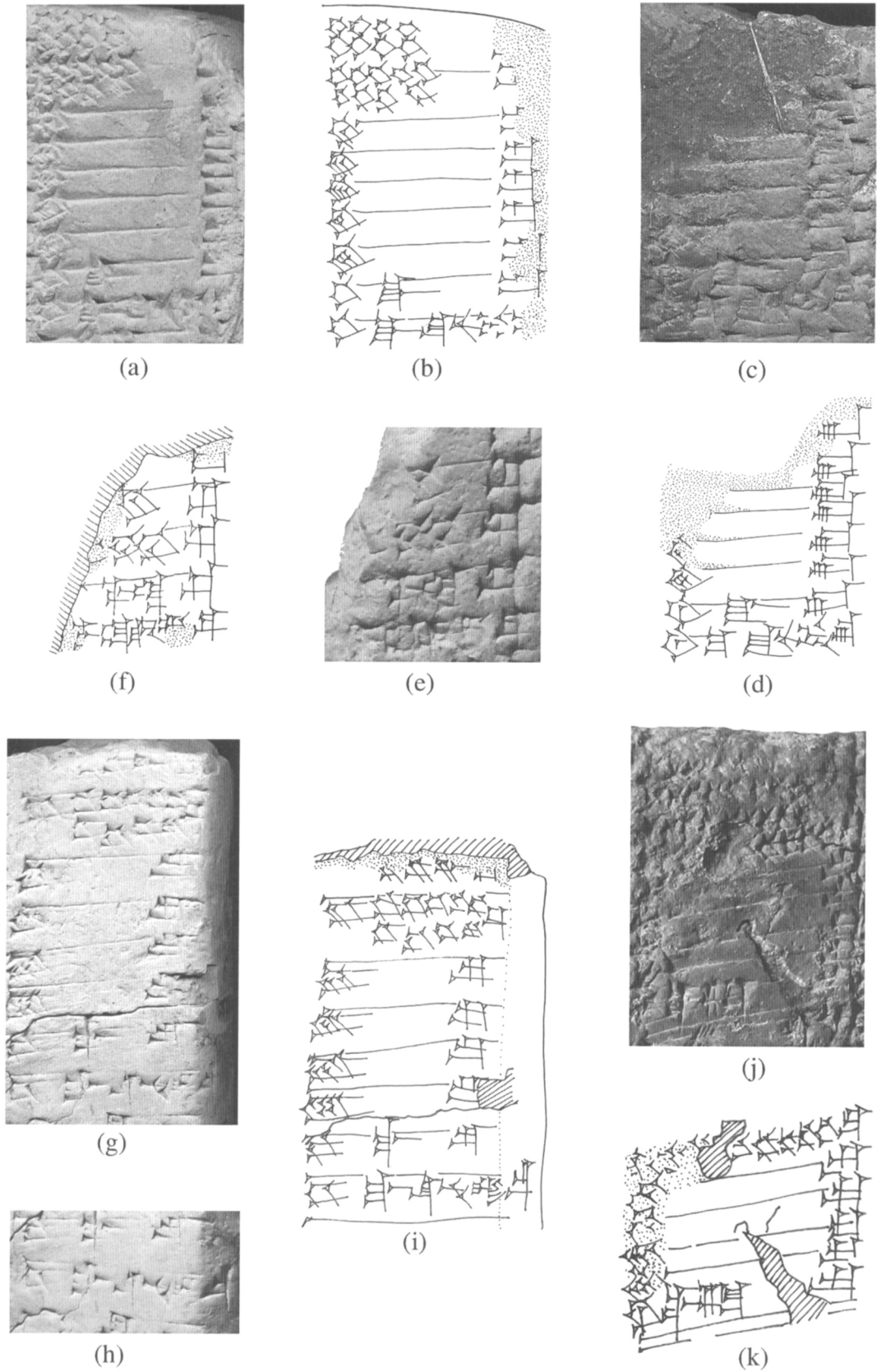   8. 1(šar$_2$×ninnu) gur
   9. 1(šar$_2$×geš$_2$) gal-la gur[7]

Fig. 1   Metrological lists Nos. 1–5. Photographs from CDLI, copies by Eleanor Robson.

6. HS 249 rev. ii (Type I; Proust 2008a: no. 3;
   Fig. 2a–b)
   33'. 1(šar'u) 9(šar$_2$) GANA$_2$
   34'. 1(šar$_2$×man) GANA$_2$
   35'. 1(šar$_2$×eš) GANA$_2$
   36'. 1(šar$_2$×ilimmu) GANA$_2$
   37'. 1(šar$_2$×ninnu) GANA$_2$
   38'. 1(šar$_2$×geš$_2$) gal-⌐la⌐ {la} GANA$_2^!$(DIŠ)
   39'. 1(šar$_2$×geš$_2$) gal-la$^!$ šu nu-gi$_4$[8]

7. Ist Ni 4840+UM 29-13-711 rev. v (Type II;
   Proust 2007: 343, pl. XXVI; Fig. 2c–e)[9]
   17'. ⌐1(šar'u) 9(šar$_2$) gur⌐
   18'. ⌐1(šar$_2$×man)⌐ gur
   19'. [1(šar$_2$×eš)] gur
   20'. [1(šar$_2$×ilimmu)] gur
   21'. [1(šar$_2$×ninnu)] gur
   22'. [1(šar$_2$)] gal-la gur
   23'. 1(šar$_2$) šu nu-gi$_4$

In each instance, the sign following NU is clearly GI$_4$, a reading that would also comfortably fit the traces on both entries in CBS 10990 (Fig. 1a–d).[10] As Mittermayer (2006: no. 214) shows, Old Babylonian cursive forms of GI$_4$ may omit the central upright wedges, as on CBS 10990 (see in particular Mittermayer's final two examples).

Unrepeatable?

What, then, does šu nu-gi$_4$ mean in this context? The basic sense of the Sumerian compound verb šu—gi$_4$ is "to repeat" (Karahashi 2000: 160). It is often equated with the Akkadian verb *šanû* "to do twice, repeat", and also with *šullumu* "to repay" and *gimilla turru* "to avenge". It is difficult to imagine a pertinent sense for the latter two translations within a metrological list, so we are left with the basic idea that 1(šar$_2$) šu nu-gi$_4$ is "unrepeatable", i.e. cannot be reduplicated or multiplied.

But is the entry 1(šar$_2$) gal šu nu-gi$_4$ itself a metrological unit, as previous commentators have assumed, or just a comment on the unit 1(šar$_2$) gal(-la) in the preceding line? In two of the lists quoted above, Nos. 6 (HS 249) and 7 (UM 29-13-711, which also omits the word gal-la) the line does not end with a metrological unit as all the other lines in the text do, suggesting that this is a comment, not a unit. Conversely, the comparable lines in lists Nos. 3 (CBS 8124) and 4 (CBS 10181), as well as Nos. 1–2 (CBS 10990), do end with metrological units. The presence or absence of such a unit can easily be seen in Table 1.

Note too that the capacity list No. 5 (on HS 249) ends with 1(šar$_2$×geš$_2$) gal-la gur while the area list No. 6 (also on HS 249) ends with 1(šar$_2$×geš$_2$) gal-la GANA$_2$, 1(šar$_2$×geš$_2$) gal-la šu nu-gi$_4$. That is, the šu nu-gi$_4$ line is not entered consistently from list to list, even on the same tablet. Similarly, there is little consistency in the writing of the numeral before the GAL sign. While most tablets show 1(šar$_2$), lists Nos. 5–6 (HS 249 obv. iv and rev. ii), and No. 2 (CBS 10990 rev. iii, in contrast to obv. iii) clearly write 1(šar$_2$×geš$_2$), namely 1(šar$_2$) with the sign for sixty inscribed inside it.[11]

Collectively these data thus suggest that the status of the šu nu-gi$_4$ line was ambiguous—or at least unclear to the trainee scribes of Old Babylonian Nippur. The apparent redundancy of the writing 1(šar$_2$×geš$_2$) gal-la in lists Nos. 6 (HS 249) and 7 (CBS 10990) highlights the confusion. However, it also appears significant that no known metrological list or table has any intermediate lines between 1(šar$_2$) gal(-la) and 1(šar$_2$) gal(-la) šu nu-gi$_4$, even though one could potentially add entries from 2(šar$_2$) gal to 5(šar'u) gal. On present evidence, then, it appears that the scribes who added a metrological unit to the end of the latter line did so inappropriately, and that we (and they) should really understand it as a statement that capacity and area metrologies were not extensible beyond 1(šar$_2$) gal. In other words, the phrase šu nu-gi$_4$ may have been a comment as much on the systems as a whole as on the particular unit with which they ended.

Looking at the Old Babylonian sources from places other than Nippur, we find substantial evidence to corroborate this hypothesis (see Table 2). BM 96949 is a Type I list of capacities, written

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[8] Proust (2008a: 24) reads ll. 38'–39' as: 1(šar$_2$) gal-la GAN$_2$, 1(šar$_2$) gal-la šu-nu-tag? GAN$_2$. However, in the published photograph we see traces of the head of GEŠ$_2$ inside both ŠAR$_2$ signs, a duplicated LA in l. 38' and no GANA$_2$ at the end of l. 39'.

[9] These lines are on the fragment UM 29-13-711. Proust's copy (2007: pl. XXVI) shows very little in this final column, although most signs are in fact legible.

[10] Proust (2007: 103) states that the tablet HS 224, a Type

III table of weights, also ends 1(šar$_2$) gal šu nu-tag gu$_2$. However, HS 224 is in fact at Type III table of square integers (Proust 2008a: no. 61) and none of the other Hilprecht Sammlung tablets published by her (Proust 2008a) fits this description; nor do any of the other known Old Babylonian Type III tablets from Nippur.

[11] However, for convenience, in general statements we shall continue to write 1(šar$_2$) gal for both 1(šar$_2$) gal and 1(šar$_2$×geš$_2$) gal.
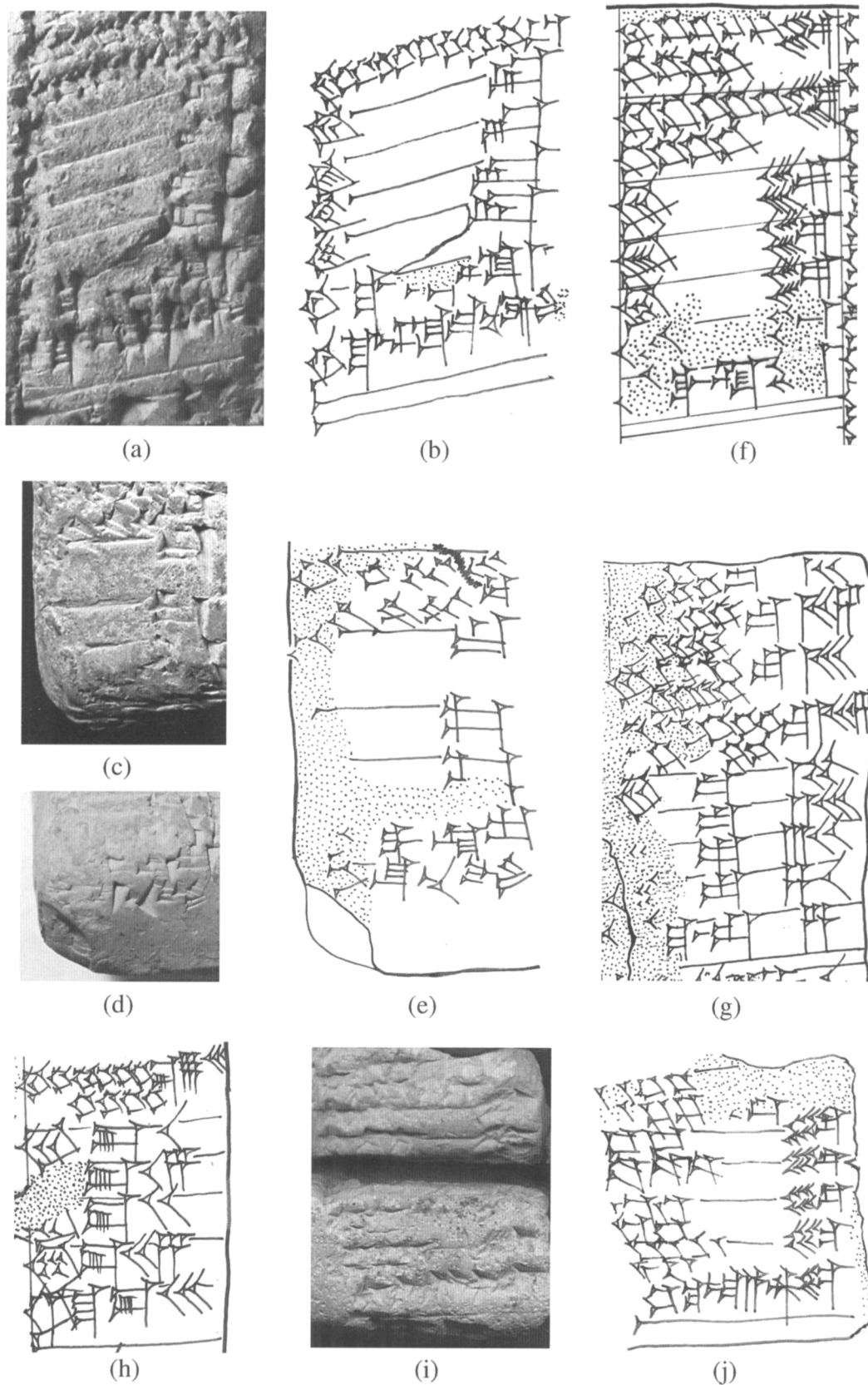
Fig. 2   Metrological lists Nos. 6–11. Photographs from CDLI, copies by Eleanor Robson.

TABLE 1: šu nu-gi$_4$ phrases in capacity and area lists from Old Babylonian Nippur, with and without a metrological unit.

Phrase	Source
1(šar$_2$×geš$_2$) gal šu nu-gi$_4$ UNIT	No. 2 (CBS 10990 rev. iii)
1(šar$_2$) gal šu nu-gi$_4$ UNIT	Nos. 4 (CBS 10181), 1 (CBS 10990 obv. iii)
[. . .] gal-la šu nu-gi$_4$ UNIT	No. 3 (CBS 8214)
1(šar$_2$×geš$_2$) gal-la šu nu-gi$_4$	No. 6 (HS 249 rev. ii)
1(šar$_2$) šu nu-gi$_4$	No. 7 (UM 29-13-711)

TABLE 2: The final entries of Old Babylonian capacity and area lists known from places other than Nippur.

Phrase	Source
1(šar$_2$×geš$_2$) gal UNIT	Nos. 9–10 (YBC 2392); No. 14 (Ash 1931.137)
1(šar$_2$×geš$_2$$^?$) gal-la UNIT	No. 8 (BM 96949)
1(šar$_2$) gal-la-am$_3$ UNIT	Nos. 11–12 (CBS 472)
1(šar$_2$) šu-ši UNIT	No. 15 (VA 2596)

by a scribe named Ṭarīdum,[12] "Fugitive", in Samsu-iluna year 14 (*ca* 1735 BCE by the middle chronology) probably in Sippar. It ends, like the capacity list No. 5 (HS 249 obv. iv), without a šu nu-gi$_4$ statement:

8. BM 96949 rev. iii (Type I; Robson 2004: 35–7; Fig. 2f)
  1. 1(šar'u) 8(šar$_2$) še-gur
  2. 1(šar'u) 9(šar$_2$) še-gur
  3. 1(šar$_2$×man) še-gur
  4. 1(šar$_2$×eš) še-gur
  5. 1(šar$_2$×ilimmu) še-gur
  6. ⌈1(šar$_2$×ninnu)⌉ še-gur
  7. ⌈1(šar$_2$×geš$_2$$^?$)⌉ gal-la še-gur

The capacity and area tables on the Type I prism YBC 2392 (Appendix 1), which may be from Larsa, similarly end with [1(šar$_2$×geš$_2$$^?$)] gal gur and 1(šar$_2$×geš$_2$) gal GANA$_2$ respectively:

9. YBC 2392 col. v (Appendix 1; Fig. 2g)

4.	1(šar'u) 9(šar$_2$) gur	1 35
5.	⌈1(šar$_2$×man)⌉ gur	1 40
6.	⌈1(šar$_2$×eš)⌉ gur	2 30
7.	⌈1(šar$_2$×ilimmu)⌉ gur	3 20
8.	⌈1(šar$_2$×ninnu)⌉ gur	4 10
9.	[1(šar$_2$×geš$_2$$^?$)] gal gur	5

10. YBC 2392 col. xi (Appendix 1; Fig. 2h)

24.	1(šar'u) 9(šar$_2$) GANA$_2$	9 30
25.	1(šar$_2$×man) GANA$_2$	10
26.	[1(šar$_2$×eš)] GANA$_2$	15
27.	[1(šar$_2$×ilimmu)] GANA$_2$	20
28.	1(šar$_2$×ninnu) GANA$_2$	25
29.	1(šar$_2$×geš$_2$) gal GANA$_2$	30

Further, the relevant lists on the unpublished Type I tablet CBS 472+ (from the Khabaza collection, perhaps from late Old Babylonian Sippar but certainly not from Nippur) end with 1(šar$_2$) gal-la-am$_3$ še-gur and 1(šar$_2$) gal-la-am$_3$ GANA$_2$ a-ša$_3$ respectively:

11. CBS 472+ obv. iii (unpublished; Fig. 2i–j)
  31'. ⌈1(šar'u$_x$) 9(šar$_2$) še-gur⌉[13]
  32'. 2(šar'u$_x$) še-gur
  33'. 3(šar'u$_x$) še-gur
  34'. 4(šar'u$_x$) še-gur
  35'. 5(šar'u$_x$) še-gur
  36'. 1(šar$_2$) gal-la-am$_3$ še-gur

12. CBS 472+ rev. iv (unpublished; Fig. 3a–b)
  14. 1(šar'u$_x$) 9(šar$_2$) GANA$_2$ a-ša$_3$
  15. 2(šar'u$_x$) GANA$_2$ a-ša$_3$
  16. 3(šar'u$_x$) GANA$_2$ a-ša$_3$
  17. 4(šar'u$_x$) GANA$_2$ a-ša$_3$
  18. 5(šar'u$_x$) GANA$_2$ a-ša$_3$
  19. 1(šar$_2$) gal-la-am$_3$ GANA$_2$ a-ša$_3$

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[12] Not Ardum, as tentatively proposed in Robson (2004: 35). We are grateful to Frans van Koppen (pers. comm., 20 October 2009) for the correct reading.

[13] On this tablet, the sign šar'u$_x$ is not ŠAR$_2$×U but simply a larger version of ŠAR$_2$.
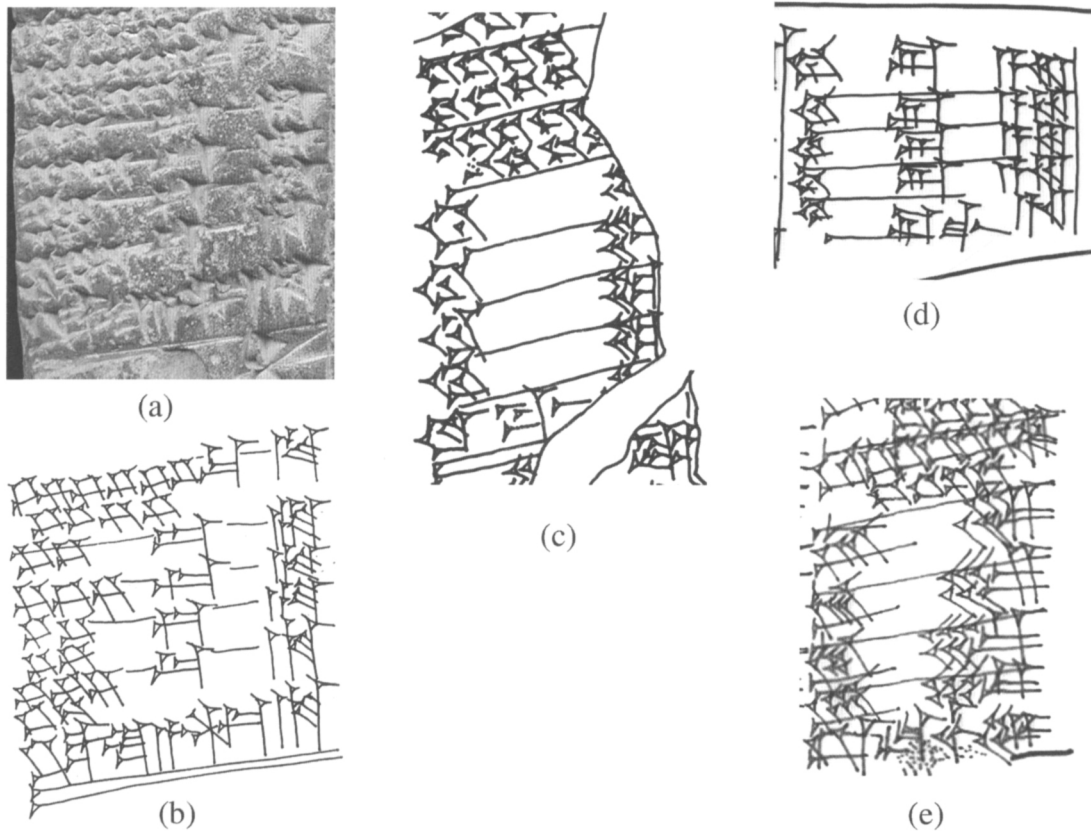
Fig. 3   Metrological lists Nos. 12–15. Photographs from CDLI, copies by Eleanor Robson.

The capacity and area lists on the Type I tablet Ashmolean 1931.137 (Robson 2004: 30–35), possibly from Kish, are not very competently written. The former finishes with 1(šar$_2$×man)+diš gal gur and the latter with 1(šar'u) GANA$_2$ gal a-ša$_3$, both after four or five repetitions of 1(šar'u) UNIT. However badly the scribe misinterpreted the sequence of numerals represented by lists Nos. 1–2 (CBS 10990), 4 (CBS 10181), 5–6 (HS 249), 8 (BM 96949) and 9–10 (YBC 3292), it is clear that he took a unit equivalent to 1(šar$_2$) gal to be the largest unit of both the area and the capacity systems.

13. Ash 1931.137 obv. iv (Robson 2004: 31; Fig. 3c)

23. 8(šar$_2$) [še-gur]
24. 9(šar$_2$) [še-gur]
25. 1(šar'u) še-[gur]
26. 1(šar'u) še-⌈gur⌉
27. 1(šar'u) še-gur
28. 1(šar'u) še-gur
29. 1(šar$_2$×man)+diš gal ⌈še-gur⌉

14. Ash 1931.137 left edge iii (Robson 2004: 34; Fig. 3d)

1.   1(šar'u) GANA$_2$ a-ša$_3$
2.   1(šar'u) GANA$_2$ a-ša$_3$
3.   1(šar'u) GANA$_2$ a-ša$_3$
4.   1(šar'u) GANA$_2$ a-ša$_3$
5.   1(šar'u) GANA$_2$ gal a-ša$_3$

Finally, and perhaps most interestingly, the capacity list on the unprovenanced Type I cylinder VA 2596 (Meissner 1893: pl. 58 and below, Appendix 2), writes 1(šar$_2$) 1 *šu-ši* gur "sixty šar$_2$ gur" as an alternative writing for 1(šar$_2$) gal gur:

15. VA 2596 col. viii (Fig. 3e)

10. 1(šar'u) 9(šar$_2$) še-gur
11. 1(šar$_2$×man) še-gur
12. 1(šar$_2$×eš) še-gur

13. 1(šar$_2$×ilimmu) še-gur
14. 1(šar$_2$×ninnu) še-gur
15. 1(šar$_2$×geš$_2$) ⌈šu⌉-*ši* še-gur

In sum, then, it appears that the upper ends of the Old Babylonian capacity and area systems were not, after all, considered to be "untouchable" but rather "unrepeatable"; and that the "large šar$_2$", at sixty times the šar$_2$, was their largest unit, not any unit sixty times bigger than that. This brings them back into line with the weight system which, it is agreed (e.g. Proust 2007: 313), also stops at 1(šar$_2$) gal.

Unsurpassable?

Finally, we should consider these units in real-world terms, in relation to modern measures and to early Mesopotamian school and scribal practice. In the area system, 1(šar$_2$) gal is 3600 (60^2) times larger than 1(bur$_3$), roughly 235 km^2 (Powell 1987–90: 480–81). In the capacity system, 1(šar$_2$) gal is 216,000 (60^3) times larger than 1 gur, just over one million litres or 1000 m^3 (Powell 1987–90: 497–98). These units would have been more than adequate for all possible practical needs, as evidenced by the fact that they rarely, if ever (to our knowledge), appear in early Mesopotamian training exercises and administrative records.

Within the small Sargonic mathematical corpus, comprising around twenty tablets, three word-problems from Girsu or its vicinity involve finding the areas of very large squares, using the 1(šar$_2$) gal unit (Foster and Robson 2004: 2; Robson 2008: 56, 303–4).[14] In the much larger Old Babylonian corpus of over a thousand tablets, by contrast, the largest square area calculated is just 1(bur$_3$) 2(eše$_3$) 4(iku) GANA$_2$ (NCBT 1913, ed. Neugebauer and Sachs 1945: 10; Robson 2008: 18). There are no Sargonic or Old Babylonian word-problems or calculations about particularly large capacity measures.

A similar pattern appears in the early Mesopotamian administrative record. A search of the CDLI database revealed no usages of the phrases šu nu-tag or šu nu-gi$_4$ in metrological contexts, and no especially large capacity measures.[15] Sargonic accounts apparently use no area or capacity units larger than the šar$_2$.[16] From the Ur III period just fifteen or so agricultural accounts from Girsu record area measures in units of 1(šar$_2$) gal, the largest of which—over 9(šar$_2$) gal—is in fact the total area of land cultivated over a decade, not in a single year.[17] In the absence of a unified online corpus, the administrative documents of the Old Babylonian period are harder to survey with confidence, and an exhaustive search of the relevant literature would go far beyond the constraints of this article, but, just as in the Sargonic period, we have found no area units larger than the šar$_2$. Indeed, given the decentralised nature of administration at this time, and the concomitantly smaller areas of land managed institutionally, we should not expect to find metrological units in use that were larger than those of the Ur III period.[18]

[14] A 5443 (Whiting 1984: 60) finds a square area of over 1(šar$_2$) gal, or just under 280 km^2. PUL 28 (*DPA* 37, Limet 1973) finds an area of more than 2(šar$_2$) gal, roughly 550 km^2. Ash 1924.689 (*MAD* 5 112) finds an area larger than 7(šar$_2$) gal, written erroneously as 7(šar$_2$).LIL$_2$, approximately 1800 km^2.

[15] http://www.cdli.ucla.edu/cdlisearch/search/index.html, accessed 1 January 2011.

[16] The largest area recorded on the Obelisk of Maništušu (*OIP* 104 40) is 9(šar$_2$) 3(iku) GANA$_2$. The tablet YBC 8460 (*BIN* 8 198, unprovenanced) totals three areas as rather more than 7(šar$_2$), written erroneously as 1(bur'u) 6(šar$_2$), while IM 50603 (*HSS* 10 133) from Gasur apparently records a capacity measure of at least 2(šar$_2$) 6(geš$_2$). As both are badly written and lack administrative detail it is possible that they are not in fact administrative records but scribal exercises (see Robson 2008: 58 for relevant criteria).

[17] BM 18060 (Maekawa 1981: 50 no. 1) is a 10-year summary of agricultural accounts, from Shulgi 42 to Amar-Suen 3, over a total area of more than 9(šar$_2$) gal or about 2,200 km^2. Similarly, all the other very large units appear to be theoretical areas—expressions of agricultural work owed

or completed—rather than actual areas under cultivation (see Englund 1991 on the principles and practice of Ur III labour accounts; Maekawa 1981; 1990 on Ur III agricultural accounts; Robson 2008: 69–73 for a worked example). AO 3448 (*RTC* 407; Nissen, Damerow and Englund 1993: 140–42), also a Girsu agricultural account, calculates a theoretical amount of grain owed at over 3(šar'u) 4(šar$_2$) gur, about 440,000 litres.

[18] We are very grateful to Frans van Koppen for his help on this matter; he draws our attention to *UET* 5 666, an account of the god Nanna's estate near Ur, which records an area of 3(šar$_2$) 5(bur$_3$) GANA$_2$ (Butz 1979: 323–25). Similarly, *BIN* 7 161 from Larsa describes a field of 3(šar$_2$) GANA$_2$ exactly (Walters 1970: no. 24), while Mauer (1987) no. 50, from Sin-kashid's palace in Uruk, lists an area of 2(šar$_2$) 4(bur'u) 3(bur$_3$) GANA$_2$ (Renger 1995: 158). These areas are all in the range 11–14 km^2. The largest Old Babylonian area measure known to van Koppen is in *ARMT* 23 464 from Mari, where 37,890 iku (just under 140 km^2) is written decimally as 3 GAL 7 *li-mi* 8 ME 90 IKU, equivalent in Old Babylonian metrological units to 3(šar'u) 5(šar$_2$) 5(bur$_3$).

It turns out, then, that it was not strictly true that 1(šar$_2$) gal was "unrepeatable" in the sense of "unsurpassable". On rare occasions, in both training and professional contexts, the ŠAR$_2$ sign could be replicated up to nine times—but could never, it appears (on current evidence), be followed by a larger unit. It was, for all intents and purposes, the upper end of the area and capacity measuring systems in both theory and practice in early Mesopotamia.

Conclusion

On re-examination, the large metrological unit 1(šar$_2$) šu nu-tag, "1 šar$_2$ that the hand cannot touch", appears to be an artefact of the mid-twentieth century, not a historically attested area or capacity measure of the Old Babylonian period. It seems to have been created through a desire to create continuity with the still-enigmatic Eblaite phrase nu-da-šid "uncountable" or "unsayable", attested several hundred years earlier and from a very particular culture of cuneiform literacy. Now that further, better-preserved examples of the phrase have come to light, and we have the means to relate school exercises to contemporary scribal practice, this apparently "untouchable" metrological unit recedes further from our grasp. Instead we are left with a rather smaller area or capacity measure, which is neverthless at the upper end of professional utility, and the comment that it is (usually) "unrepeatable" or as large as one practically needs.

Further, it is now clear that in Old Babylonian school contexts—but not in earlier administrative practice—the correct (or at least majority) sequence of the six very largest units comprises a single ŠAR$_2$ sign inscribed with the numerals 10, 20, 30, 40, 50 and 60 (i.e. u, man, eš, ilimmu, ninnu, geš$_2$) respectively. Thus an alternative (or additional) hypothesis presents itself: the "unrepeatability" may equally refer to the way these signs are written. In the middle and upper ranges of the area and the capacity series, quantity and unit are bundled into a single grapheme, just as must have been the case with their precursors, the preliterate accounting tokens (cf. Nissen, Damerow and Englund 1993). The bundled graphemes are repeated as needed; for instance, the quantity "five šar$_2$" is not written with the numeral 5 followed by the unit sign ŠAR$_2$ but as five ŠAR$_2$ signs one after another (transliterated as 5(šar$_2$)). By contrast, the correct writing of "twenty šar$_2$" seems not to have been the repeated 20(šar$_2$) or 2(šar'u) but the unrepeated 1(šar$_2$×20). Could the phrase šu nu-gi$_4$ have simply been a reminder to the trainee scribes of Nippur that at the upper end of the area and capacity series they were not to carry on as before? If so, it seems that it was only the scribe of list No. 3 (CBS 8214, Fig. 1e–f) who did not do as he was told.

We have proposed several possible meanings for the phrase šu ni-gi$_4$: graphical, conceptual and utilitarian. On current evidence, much of it written by learners with varying degrees of scribal competence, we are reluctant to choose definitively between them. Indeed, the definitive, "correct" interpretation of šu nu-gi$_4$ may never be found, just as it is futile to try recover the "original" meanings of other multivalent scribal exercises of early Mesopotamia, whether lexical or literary. The wide variety of writing conventions we have presented here suggests likewise that šu nu-gi$_4$ took on different meanings for different individuals and scribal groups, depending on their degree of literacy and numeracy, and on local traditions of interpretation.

Appendix 1: YBC 2392

YBC 2392 is a four-sided prism, approximately 22 cm high and 10 cm wide, with a cylindrical hole of *ca* 15 mm diameter running through its centre. The top of the prism is badly abraded but the bottom is lightly marked with four lines, each running from the hole to a corner of the tablet (Fig. 4).

Each of the four faces is divided into two or three columns containing three Old Babylonian metrological tables in the standard order (Figs. 5–8): capacity measures (i 1–v 8), weights (v 9–viii 13), and areas (viii 14–end). It concludes with a catchline to the next table in the series, that on lengths, and the date 26 Ṭebētu but otherwise has no colophon. The numerals 4, 7 and 8 are written "non-mathematically" in both sides of the table: that is, with two rows of wedges, not three.

The tablet was copied and photographed by Eleanor Robson in November 2006. We are grateful to Professor Benjamin R. Foster for permission to publish and to Ulla Kasten for her ever-generous assistance in the Babylonian Collection at Yale University.

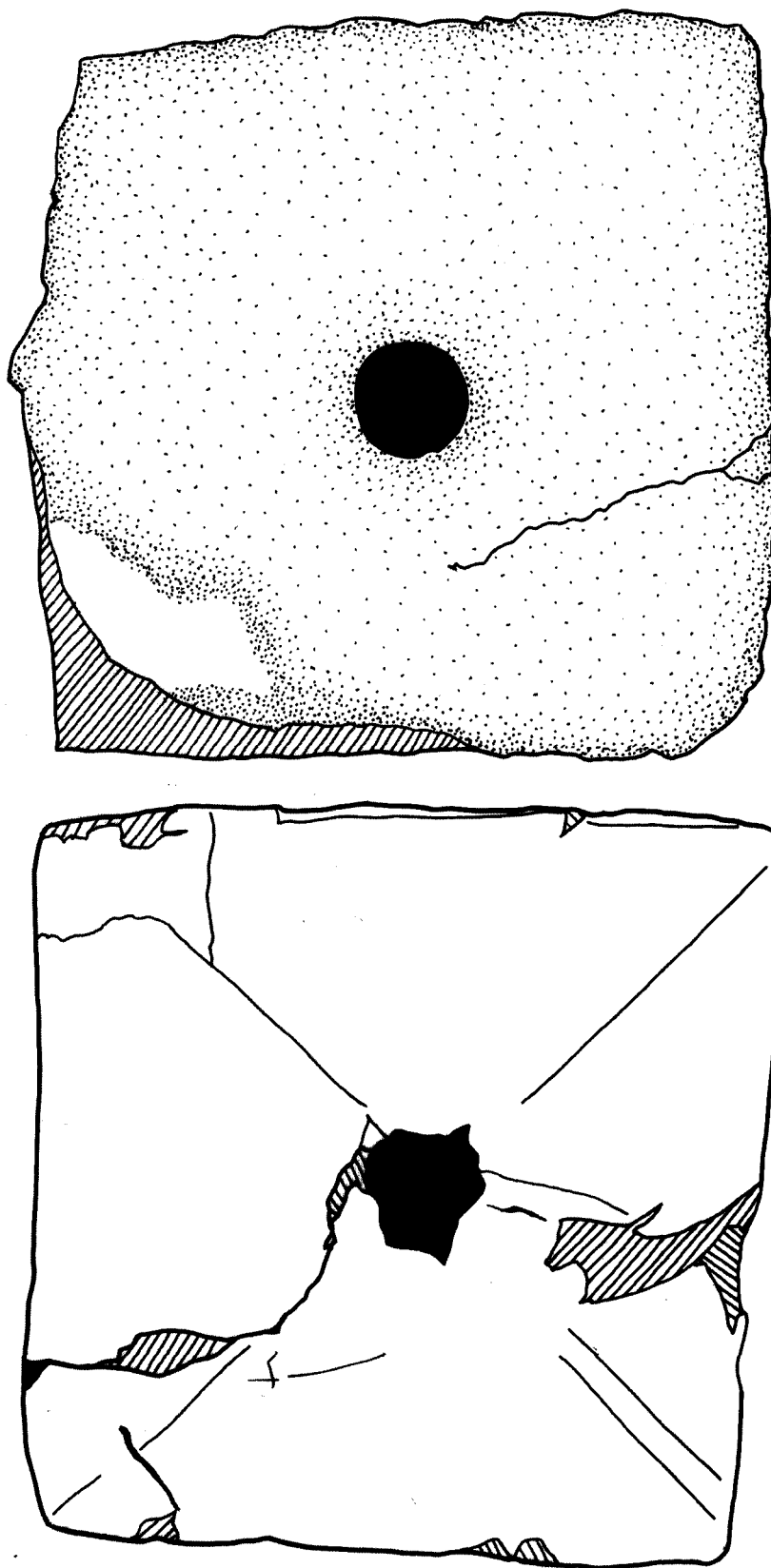GRÉGORY CHAMBON AND ELEANOR ROBSON

Fig. 4   Prism YBC 2392 top and bottom. Copy by Eleanor Robson.
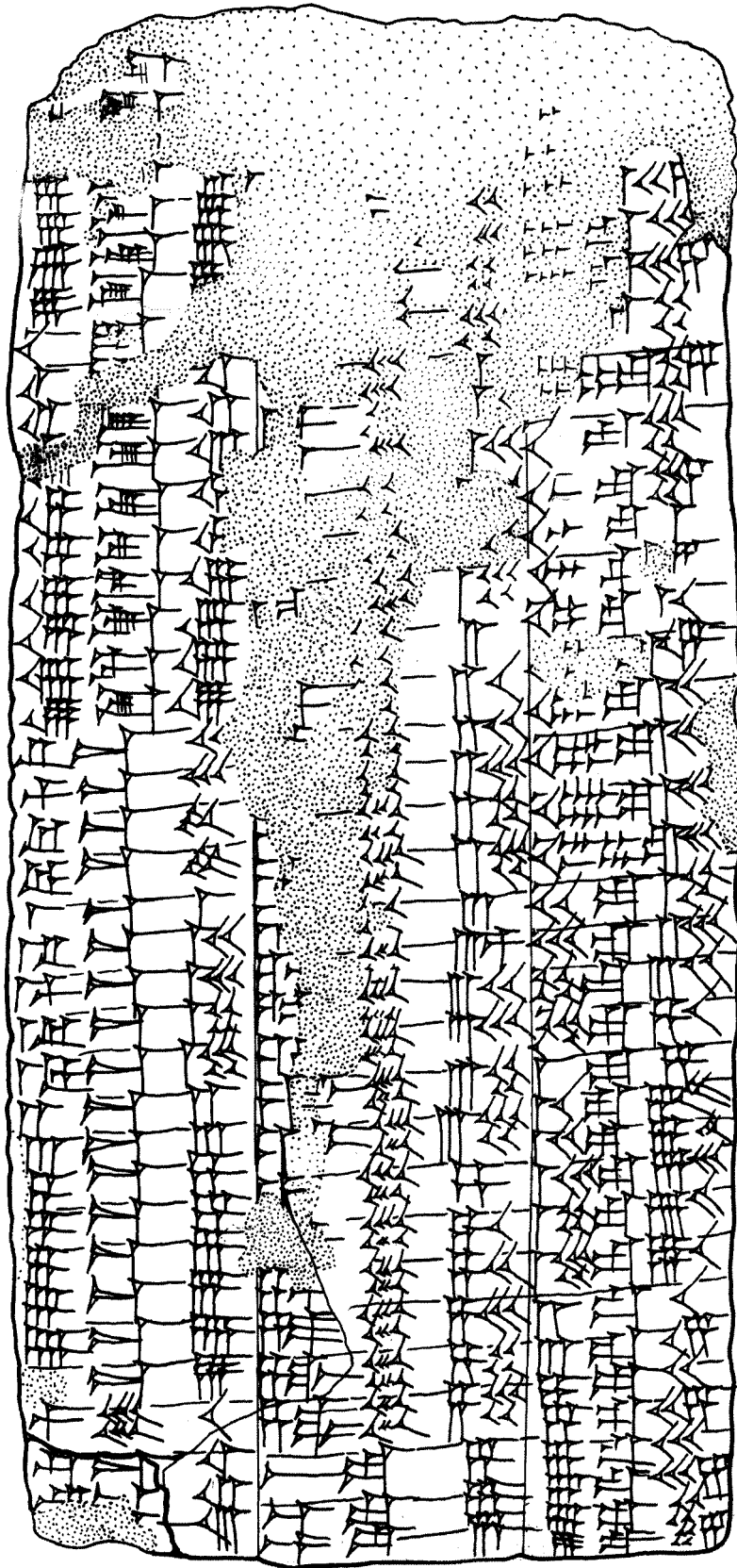
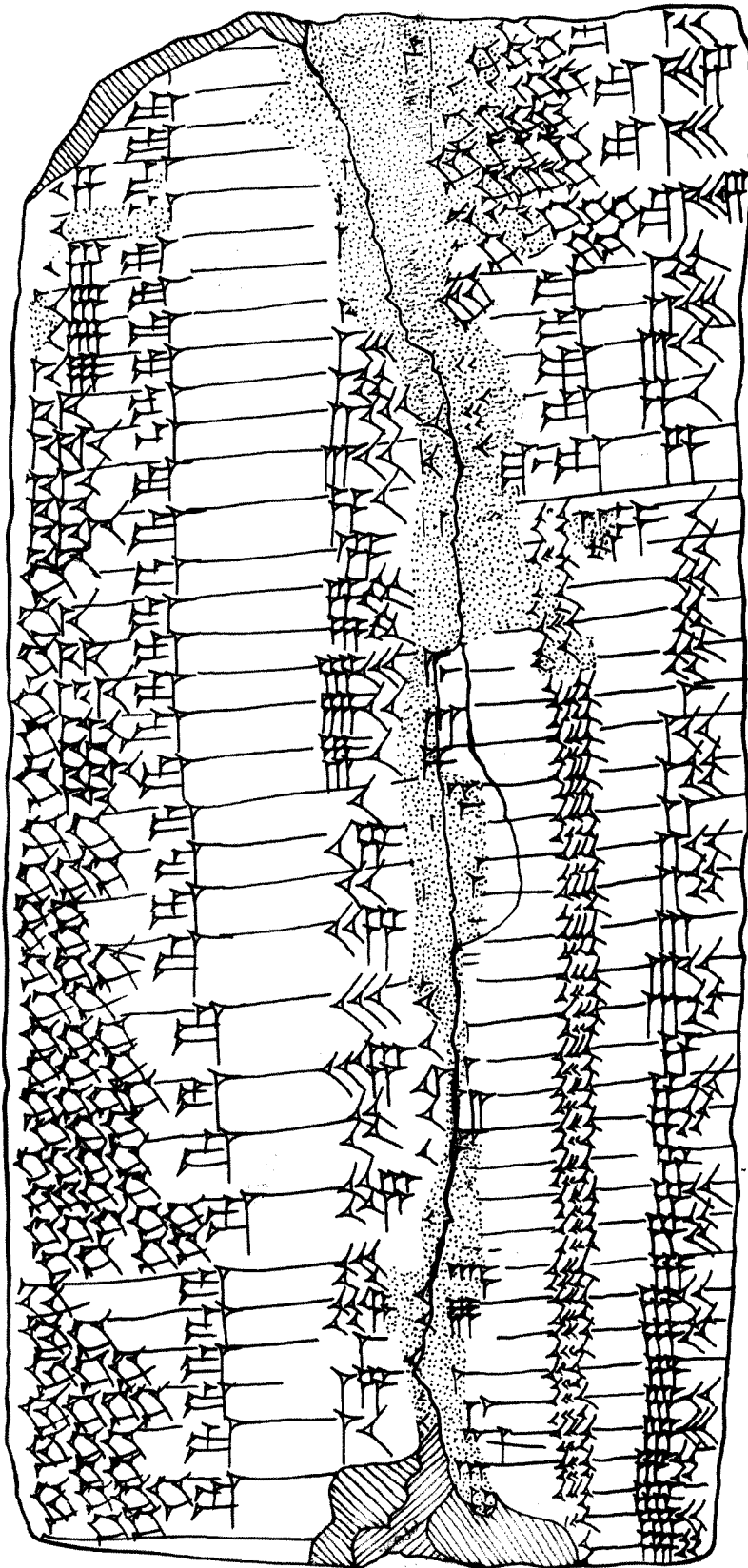Fig. 5   Prism YBC 2392 side a cols. i–iii. Copy by Eleanor Robson.

Fig. 6   Prism YBC 2392 side b cols. iv–v. Copy by Eleanor Robson.

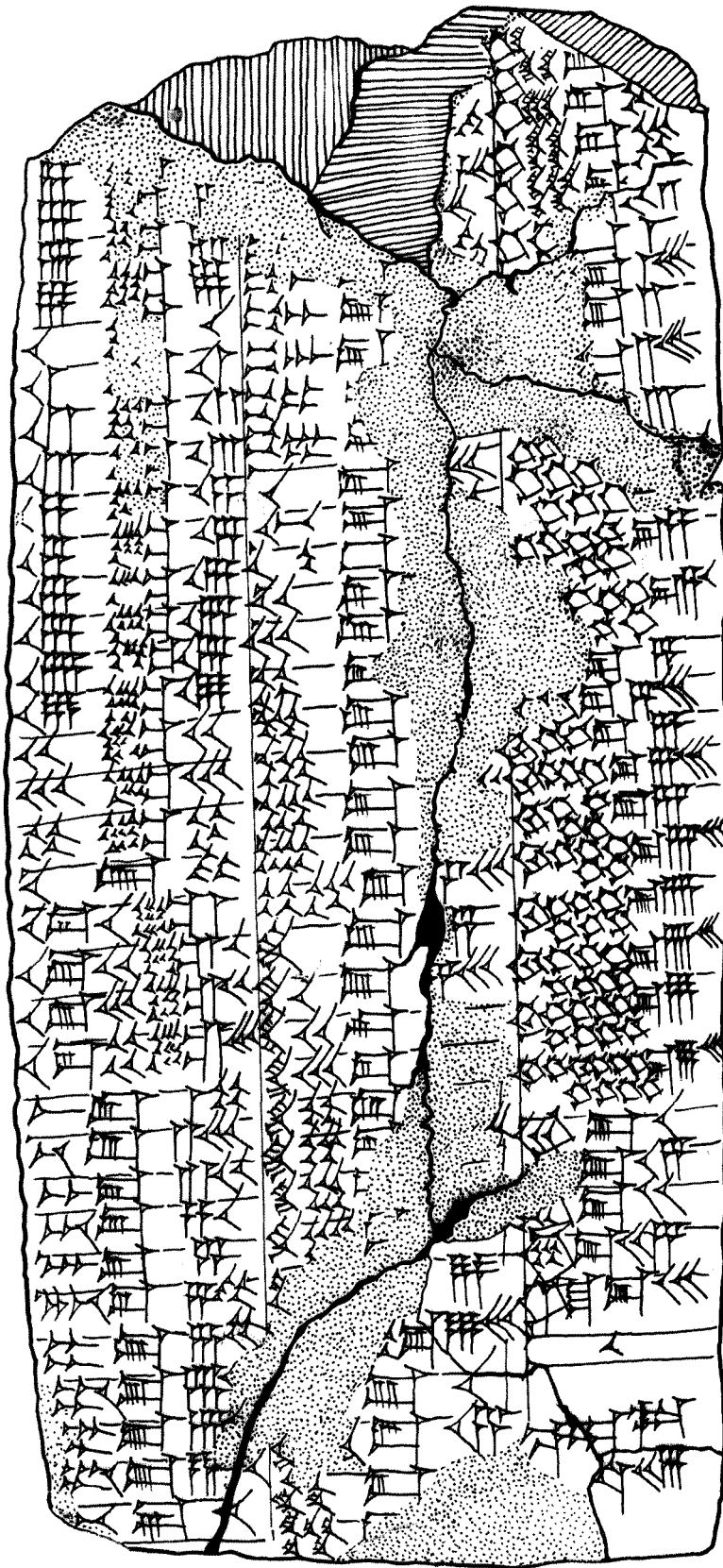Fig. 7   Prism YBC 2392 side c cols. vi–viii. Copy by Eleanor Robson.

Fig. 8   Prism YBC 2392 side d cols. ix–xi. Copy by Eleanor Robson.

Side a col. i	
[1 gin$_2$	1]
[2] ⌜gin$_2$⌝	[2]
[3] ⌜gin$_2$⌝	[3]
[4] ⌜gin$_2$⌝	[4]
5 ⌜gin$_2$	5⌝
6 gin$_2$	6
7 gin$_2$	7
8 gin$_2$	8
9 gin$_2$	9
10 gin$_2$	[10]
11 ⌜gin$_2$⌝	11
12 gin$_2$	12
[13] gin$_2$	13
14 gin$_2$	⌜14⌝
15 gin$_2$	⌜15⌝
16 gin$_2$	16
17 gin$_2$	17
18 gin$_2$	18
19 gin$_2$	19
⅓ sila$_3$	20
½ sila$_3$	30
⅔ sila$_3$	40
⅚ sila$_3$	50
1 sila$_3$	1
1 ⅓ sila$_3$	1 20
1 ½ sila$_3$	1 30
1 ⅔ sila$_3$	1 40
1 ⅚ sila$_3$	1 50
2 sila$_3$	2
3 sila$_3$	3
4 sila$_3$	4
5 sila$_3$	5
6 sila$_3$	6
7 sila$_3$	7
8 sila$_3$	8
⌜9⌝ sila$_3$	9
1(ban$_2$) še	10
1(ban$_2$) 1 sila$_3$	11
1(ban$_2$) 2 sila$_3$	12
1(ban$_2$) 3 sila$_3$	13

Side a col. ii	
Top of column badly abraded	
[1(ban$_2$) 4 sila$_3$	14]
[1(ban$_2$) 5 sila$_3$	15]
[1(ban$_2$) 6 sila$_3$	16]
[1(ban$_2$) 7 sila$_3$	17]
[1(ban$_2$) 8 sila$_3$	18]
[1(ban$_2$) 9 sila$_3$	19]
[2(ban$_2$) še	20]
[3(ban$_2$) še	30]
[4(ban$_2$) še	40]
[5(ban$_2$) še	50]
[1(barig) še	1]
[1(barig) 1(ban$_2$) še	1 10]
[1(barig) 2(ban$_2$) še	1 20]
[1(barig) 3(ban$_2$) še	1 30]
[1(barig) 4(ban$_2$) še	1 40]
[1(barig) 5(ban$_2$)] ⌜še	1 50⌝
[2(barig)] ⌜še	2⌝
[2(barig)] ⌜1(ban$_2$) še⌝	2 10
[2(barig) 2(ban$_2$)] ⌜še⌝	2 20
[2(barig) 3(ban$_2$)] ⌜še⌝	2 30
⌜2(barig) 4(ban$_2$) še⌝	2 40
2(barig) ⌜5(ban$_2$)⌝ še	2 50
3(barig) ⌜še⌝	3
3(barig) [1(ban$_2$)] še	3 10
3(barig) [2(ban$_2$)] še	3 20
3(barig) [3(ban$_2$)] še	3 30
3(barig) ⌜4(ban$_2$)⌝ še	3 40
3(barig) ⌜5(ban$_2$)⌝ še	3 50
⌜4(barig)⌝ še	4
[4(barig)] ⌜1(ban$_2$)⌝ še	4 10
4(barig) ⌜2(ban$_2$)⌝ še	4 20
4(barig) 3(ban$_2$) še	4 30
4(barig) 4(ban$_2$) še	4 40
4(barig) 5(ban$_2$) še	4 50
1(aš) gur	5
1(aš) 1(barig) gur	6
1(aš) 2(barig) gur	7

Side a col.iii	
[1(aš) 3(barig) gur	8]
[1(aš) 4(barig) gur˙	9]
[2(aš) gur	10]
[3(aš) gur	15]
[4(aš) gur	20]
[5(aš) gur]	⌜25⌝
[6(aš)] ⌜gur⌝	30
7 ⌜gur⌝	35
8(aš) ⌜gur⌝	40
⌜9(aš)⌝ gur	45
[1(u)] ⌜gur⌝	50
⌜1(u) 1(aš) gur⌝	55
⌜1(u) 2(aš) gur	1⌝
⌜1(u) 3(aš) gur	1 05⌝
⌜1(u) 4(aš) gur	1 10⌝
⌜1(u) 5(aš) gur	1 15⌝
⌜1(u) 6(aš) gur	1 20⌝
1(u) 7(aš) ⌜gur	1 25⌝
1(u) 8(aš) gur	1 30
1(u) 9(aš) gur	1 35
2(u) gur	1 40
3(u) gur	2 30
4(u) gur	3 20
5(u) gur	4 10
1(geš$_2$) gur	5
1(geš$_2$) 1(u) gur	5 50
1(geš$_2$) 2(u) gur	6 40
1(geš$_2$) 3(u) gur	7 30
1(geš$_2$) 4(u) gur	8 20
1(geš$_2$) 5(u) gur	9 10
2(geš$_2$) gur	10
3(geš$_2$) gur	15
4(geš$_2$) gur	20
5(geš$_2$) gur	25
6(geš$_2$) gur	30
7(geš$_2$) gur	35
8(geš$_2$) gur	40
9(geš$_2$) gur	45

Side b col. iv	
[1(geš'u) gur	50]
[11(geš$_2$) gur	55]
1(geš'u) 2(geš$_2$) ⌜gur⌝	[1]
1(geš'u) 3(geš$_2$) ⌜gur⌝	[1 05]
1(geš'u) 4(geš$_2$) ⌜gur⌝	[1 10]
[1(geš'u) 5(geš$_2$)] ⌜gur⌝	[1 15]
⌜1(geš'u) 6(geš$_2$)⌝ gur	[1 20]
1(geš'u) 7(geš$_2$) gur	[1 25]
1(geš'u) 8(geš$_2$) gur	[1 30]
1(geš'u) 9(geš$_2$) gur	⌜1 35⌝
2(geš'u) gur	1 40
3(geš'u) gur	2 30
4(geš'u) gur	3 20
5(geš'u) gur	4 10
1(šar$_2$) gur	5
1(šar$_2$) 1(geš'u) gur	5 50
1(šar$_2$) 2(geš'u) gur	6 40

Side b col. v	
1(šar'u) 6(šar$_2$) gur	1 20
1(šar'u) 7(šar$_2$) gur	1 25
1(šar'u) 8(šar$_2$) gur	1 30
1(šar'u) 9(šar$_2$) gur	1 35
⌜1(šar$_2$×man)⌝ gur	1 40
⌜1(šar$_2$×eš)⌝ gur	2 30
⌜1(šar$_2$×ilimmu)⌝ gur	3 20
⌜1(šar$_2$×ninnu)⌝ gur	4 10
[1(šar$_2$×geš$_2$?)] gal gur	5
[½] ⌜še kug-babbar⌝	10
[1] še	20
[1 ½] še	30
[2] še	40
[2 ½] še	50
[3] še	1
[4] še	1 20
[5] še	1 40

Side b col. iv		Side b col. v	
1(šar$_2$) 3(geš'u) gur	7 30	[6] še	2
1(šar$_2$) 4(geš'u) gur	8 20	[7] še	2 20
1(šar$_2$) 5(geš'u) gur	9 10	[8] še	2 40
2(šar$_2$) gur	10	⌈9⌉ še	3
3(šar$_2$) gur	15	⌈10⌉ še	3 20
4(šar$_2$) gur	20	⌈11⌉ še	3 40
5(šar$_2$) gur	25	⌈12⌉ še	4
6(šar$_2$) gur	30	⌈13⌉ še	4 20
7(šar$_2$) gur	35	[14] še	4 40
8(šar$_2$) gur	40	[15] še	5
9(šar$_2$) gur	45	[16] še	5 20
1(šar'u) gur	50	[17] še	5 40
1(šar'u) 1(šar$_2$) gur	55	⌈18⌉ še	6
1(šar'u) 2(šar$_2$) gur	1	⌈19⌉ še	6 20
1(šar'u) 3(šar$_2$) gur	1 05	[20] še	6 40
1(šar'u) 4(šar$_2$) gur	1 10	[21] še	7
1(šar'u) 5(šar$_2$) gur	[1 15]	[22] še	7 20
		[22] ½ še	7 30
		[23] še	7 40
		[24] še	8
		[25] še	8 20
		[26] še	8 40

Side c col. vi		Side c col. vii		Side c col. viii	
27 še	9	1 [ma-na	1]	[1(u) 2(aš) gu$_2$	12]
28 še	9 20	1 ⅓ [ma-na	1;20]	[1(u) 3(aš) gu$_2$	13]
29 še	9 40	1 ½ ma-na	⌈1;30⌉	⌈1(u) 4(aš)⌉ [gu$_2$	14]
igi-6-gal$_2$	10	1 ⅔ ma-na	1;40	⌈1(u) 5(aš)⌉ [gu$_2$	15]
igi-6-gal$_2$ 5	11 40	1 ⅚ ma-na	1;50	1(u) 6(aš) gu$_2$	16
igi-6-gal$_2$ 10	13 20	2 ma-na	2	1(u) 7(aš) gu$_2$	17
igi-4-gal$_2$	15	3 ma-na	3	1(u) 8(aš) gu$_2$	18
igi-4-gal$_2$ 5	16 40	4 ma-na	4	1(u) 9(aš) gu$_2$	19
igi-4-gal$_2$ 10	18 20	5 ma-na	5	2(u) gu$_2$	20
⅓ gin$_2$	20	6 ma-na	6	3(u) gu$_2$	30
½ gin$_2$	30	7 ma-na	7	4(u) gu$_2$	40
⅔ gin$_2$	40	8 ma-na	8	5(u) gu$_2$	50
⅚ gin$_2$	50	9 ma-na	9	1(šar$_2$) gu$_2$ kug-babbar	1
1 gin$_2$	1	10 ma-na	10	1 gin$_2$ ⌈sar⌉	1
1 gin$_2$ igi-6-gal$_2$	1 10	11 ma-na	11	2 gin$_2$	2
1 gin$_2$ igi-4-gal$_2$	1 15	12 ma-na	12	3 gin$_2$	3
1 ⅓ gin$_2$	1 20	13 ma-na	13	4 gin$_2$	4
1 ½ gin$_2$	1 30	14 ma-na	14	5 gin$_2$	5
1 ⅔ gin$_2$	1 40	15 ma-na	15	6 gin$_2$	6
1 ⅚ gin$_2$	1 50	16 ma-na	16	7 gin$_2$	7
2 gin$_2$	2	17 ma-na	17	8 gin$_2$	8
3 gin$_2$	3	18 ma-na	18	9 gin$_2$	9
4 gin$_2$	4	19 ma-na	19	10 gin$_2$	10
5 gin$_2$	5	20 ma-na	20	11 gin$_2$	11
6 gin$_2$	6	30 ma-na	30	12 gin$_2$	12
7 gin$_2$	7	40 ma-na	40	13 gin$_2$	13
8 gin$_2$	8	50 ma-na	50	14 gin$_2$	14
9 gin$_2$	9	1(aš) gu$_2$	1	15 gin$_2$	15
10 gin$_2$	10	1(aš) gu$_2$ 10 ma-na	1 10	16 gin$_2$	16
11 gin$_2$	11	1(aš) gu$_2$ 20 ma-na	1 20	17 gin$_2$	17
12 gin$_2$	12	1(aš) gu$_2$ 30 ma-na	1 30	18 gin$_2$	18
13 gin$_2$	13	1(aš) gu$_2$ 40 ma-na	1 40	19 gin$_2$	19
14 gin$_2$	14	1(aš) gu$_2$ 50 ma-na	1 50	⅓ sar	20
15 gin$_2$	15	2(aš) gu$_2$	2	½ sar	30
16 gin$_2$	16	3(aš) gu$_2$	3	⅔ sar	40

Side c col. vi	
17 gin$_2$	17
18 gin$_2$	18
19 gin$_2$	19
1/3 ma-na	20
1/2 ma-na	30
2/3 ma-na	40
5/6 ma-na	50

Side c col. vii	
4(aš) gu$_2$	4
5(aš) gu$_2$	5
6(aš) gu$_2$	6
7(aš) gu$_2$	7
8(aš) gu$_2$	8
9(aš) gu$_2$	9
1(u) gu$_2$	10
1(u) 1(aš) gu$_2$	11

Side c col. viii	
5/6 sar	50
1 sar	1
1 1/3 sar	1;20
1 1/2 sar	1;30
1 2/3 sar	1;40
1 5/6 sar	1;50

Side d col. ix	
[2 sar	2]
[3 sar	3]
[4 sar	4]
[5 sar	5]
⌜6⌝ [sar	6]
7 ⌜sar⌝	[7]
8 ⌜sar⌝	[8]
9 sar	9
10 ⌜sar⌝	10⌝
11 ⌜sar⌝	11
12 sar	12
13 sar	13
14 sar	14
15 sar	15
16 sar	16
17 sar	17
18 sar	18
19 sar	19
20 sar	20
30 sar	30
40 sar	40
1/2(iku) GANA$_2$	50
1/2(iku) GANA$_2$ 10 sar	1
1/2(iku) GANA$_2$ 20 sar	1 10
1/2(iku) GANA$_2$ 30 sar	1 20
1/2(iku) GANA$_2$ 40 sar	1 30
1(iku) GANA$_2$	1 40
1 1/2(iku) GANA$_2$	2 30
2(iku) GANA$_2$	3 20
2 1/2(iku) GANA$_2$	4 10
3(iku) GANA$_2$	5
3 1/2(iku) GANA$_2$	5 50
4(iku) GANA$_2$	6 40
4 1/2(iku) GANA$_2$	7 30
5(iku) GANA$_2$	8 20
5 1/2(iku) GANA$_2$	9 10
1(eše$_3$) GANA$_2$	10

Side d col. x	
[1(eše$_3$) 1(iku) GANA$_2$	11 40]
[1(eše$_3$) 2(iku) GANA$_2$	13 20]
[1(eše$_3$) 3(iku) GANA$_2$	15]
[1(eše$_3$) 4(iku) GANA$_2$	16 40]
[1(eše$_3$) 5(iku) GANA$_2$	18 20]
[2(eše$_3$) GANA$_2$	20]
[2(eše$_3$) 1(iku) GANA$_2$	21 40]
[2(eše$_3$) 2(iku) GANA$_2$	23 20]
⌜2(eše$_3$) 3(iku) GANA$_2$⌝	[25]
⌜2(eše$_3$) 4(iku) GANA$_2$⌝	[26 40]
2(eše$_3$) 5(iku) ⌜GANA$_2$⌝	[28 20]
1(bur$_3$) ⌜GANA$_2$⌝	[30]
1(bur$_3$) ⌜1(eše$_3$) GANA$_2$⌝	[40]
1(bur$_3$) ⌜2(eše$_3$) GANA$_2$⌝	[50]
2(bur$_3$) GANA$_2$	[1]
3(bur$_3$) GANA$_2$	[1 30]
4(bur$_3$) GANA$_2$	[2]
5(bur$_3$) GANA$_2$	[2 30]
6(bur$_3$) GANA$_2$	[3]
7(bur$_3$) GANA$_2$	[3 30]
8(bur$_3$) GANA$_2$	[4]
9(bur$_3$) GANA$_2$	4 30
1(bur'u) GANA$_2$	5
1(bur'u) 1(bur$_3$) GANA$_2$	5 30
1(bur'u) 2(bur$_3$) GANA$_2$	[6]
1(bur'u) 3(bur$_3$) GANA$_2$	[6 30]
1(bur'u) 4(bur$_3$) GANA$_2$	[7]
1(bur'u) 5(bur$_3$) GANA$_2$	[7 30]
1(bur'u) 6(bur$_3$) ⌜GANA$_2$⌝	[8]
⌜1(bur'u) 7(bur$_3$) GANA$_2$⌝	[8 30]
⌜1(bur'u) 8(bur$_3$)⌝ [GANA$_2$]	9
[1(bur'u) 9(bur$_3$)] GANA$_2$	9 30
[2(bur'u)] GANA$_2$	10
⌜3(bur'u)⌝ GANA$_2$	15
4(bur'u) GANA$_2$	[20]
5(bur'u) [GANA$_2$	25]

Side d col. xi	
[1(šar$_2$) GANA$_2$	30]
1(šar$_2$) 1(bur'u) [GANA$_2$	35]
1(šar$_2$) 2(bur'u) GANA$_2$	[40]
1(šar$_2$) 3(bur'u) GANA$_2$	⌜45⌝
1(šar$_2$) 4(bur'u) GANA$_2$	50
1(šar$_2$) 5(bur'u)	⌜55⌝
2(šar$_2$) GANA$_2$	1
[3(šar$_2$)] GANA$_2$	1 30
[4(šar$_2$)] GANA$_2$	2
[5(šar$_2$)] GANA$_2$	2 30
⌜6(šar$_2$) GANA$_2$⌝	3
⌜7(šar$_2$)⌝ [GANA$_2$	3 30]
8(šar$_2$) GANA$_2$	4
9(šar$_2$) GANA$_2$	4 30
[1(šar'u)] GANA$_2$	5
1(šar'u) 1(šar$_2$) GANA$_2$	5 30
1(šar'u) 2(šar$_2$) GANA$_2$	6
1(šar'u) 3(šar$_2$) GANA$_2$	6 30
1(šar'u)4(šar$_2$) GANA$_2$	7
1(šar'u) 5(šar$_2$) GANA$_2$	7 30
1(šar'u) 6(šar$_2$) GANA$_2$	8
1(šar'u) 7(šar$_2$) GANA$_2$	8 30
1(šar'u) 8(šar$_2$) GANA$_2$	9
1(šar'u) 9(šar$_2$) GANA$_2$	9 30
1(šar$_2$×man) GANA$_2$	10
[1(šar$_2$×eš)] GANA$_2$	15
[1(šar$_2$×ilimmu)] GANA$_2$	20
1(šar$_2$×ninnu) GANA$_2$	25
1(šar$_2$) gal GANA$_2$	30
10	
^{iti}ab-e$_3$-[a] ud 26-[kam]	

1 šu-si 10?

Appendix 2: VA 2596

VA 2596 (not VAT 2596, as it is sometimes cited) is a slightly convex clay cylinder, almost perfectly preserved, just under 12 cm high and 8 cm in diameter at its widest extent (Fig. 9). A cylindrical hole of *ca* 2 cm diameter runs down its centre parallel to the cylindrical surface. There are no signs of rotational wear inside it, but there are a few fine vertical striations around the edges of the hole, in particular at the bottom of the cylinder, where the hole is slightly distorted to one side. About half-way down this central hole there is a trapezoidal depression, slightly smaller than a fingertip but with straight edges. The flat surfaces of the top and bottom are each divided into quadrants by four lines radiating from the central hole; top and bottom lines align with each other but not with any of the column rulings on the cylindrical writing surface. This surface is divided exactly into eight columns
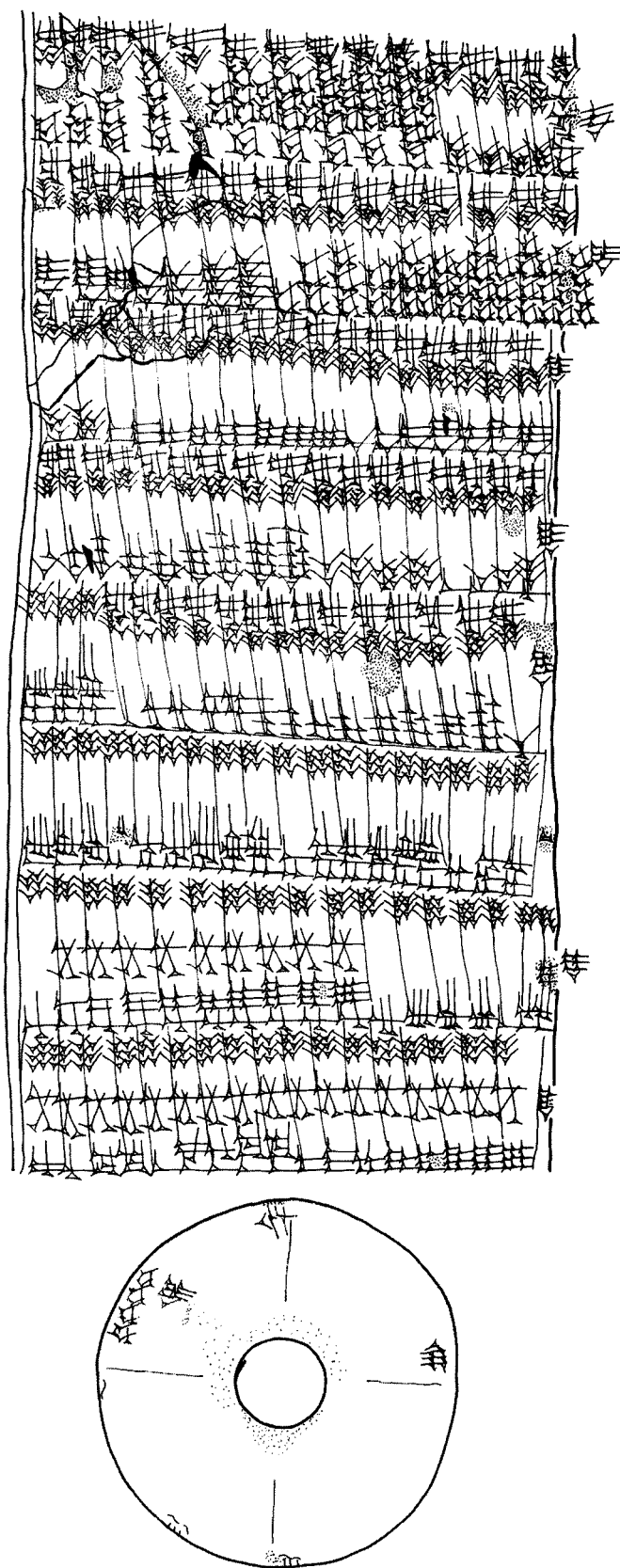
Fig. 9   Cylinder VA 2596. Copy by Eleanor Robson.

of almost equal width, each containing fifteen to eighteen lines of text plus a line-count at the end of each. The metrological list of capacities it contains fits almost perfectly on to it, except in col. vii where the final line spills on to the bottom surface. It is a quiet masterpiece of the scribal art.

The text was first copied by Meissner (1893: Taf. 58), long before cuneiform metrology was fully understood, and has been cited regularly in the literature ever since (e.g. Friberg 1987–90: 542). However, we felt that a new copy was needed in order to represent the material form and textual contents of the cylinder more accurately than Meissner could, given the fledgling state of mathematical Assyriology in the late nineteenth century.

The tablet was copied and photographed by Eleanor Robson with the assistance of Grégory Chambon in July 2010. We are very grateful to Joachim Marzahn and his team at the Vorderasiatisches Museum, Berlin, for their kind assistance and permission to republish it.

Col. i		Col. ii		Col. iii		Col. iv	
$\frac{1}{3}$ sila$_3$	še	1(ban$_2$)	še	1(barig) 3(ban$_2$)	še	4(barig) 3(ban$_2$)	še
$\frac{1}{2}$ sila$_3$	še	1(ban$_2$) 1 sila$_3$	še	1(barig) 4(ban$_2$)	še	4(barig) 4(ban$_2$)	še
$\frac{2}{3}$ sila$_3$	še	1(ban$_2$) 2 sila$_3$	še	1(barig) 5(ban$_2$)	še	4(barig) 5(ban$_2$)	še
$\frac{5}{6}$ sila$_3$	še	1(ban$_2$) 3 sila$_3$	še	2(barig)	še	1(aš)	še-gur
1 sila$_3$	še	1(ban$_2$) 4 sila$_3$	še	2(barig) 1(ban$_2$)	še	1(aš) 1(barig)	še-gur
1 $\frac{1}{3}$ sila$_3$	še	1(ban$_2$) 5 sila$_3$	še	2(barig) 2(ban$_2$)	še	1(aš) 2(barig)	še-gur
1 $\frac{1}{2}$ sila$_3$	še	1(ban$_2$) 6 sila$_3$	še	2(barig) 3(ban$_2$)	še	1(aš) 3(barig)	še-gur
1 $\frac{2}{3}$ sila$_3$	še	1(ban$_2$) 7 sila$_3$	še	2(barig) 4(ban$_2$)	še	1(aš) 4(barig)	še-gur
1 $\frac{5}{6}$ sila$_3$	še	1(ban$_2$) 8 sila$_3$	še	2(barig) 5(ban$_2$)	še	2(aš)	še-gur
2 sila$_3$	še	1(ban$_2$) 9 sila$_3$	še	3(barig)	še	3(aš)	še-gur
3 sila$_3$	še	2(ban$_2$)	še	3(barig) 1(ban$_2$)	še	4(aš)	še-gur
4 sila$_3$	še	3(ban$_2$)	še	3(barig) 2(ban$_2$)	še	5(aš)	še-gur
5 sila$_3$	še	4(ban$_2$)	še	3(barig) 3(ban$_2$)	še	6(aš)	še-gur
6 sila$_3$	še	5(ban$_2$)	še	3(barig) 4(ban$_2$)	še	7(aš)	še-gur
7 sila$_3$	še	1(barig)	še	3(barig) 5(ban$_2$)	še	8(aš)	še-gur
8 sila$_3$	še	1(barig) 1(ban$_2$)	še	4(barig)	še	9(aš)	še-gur
9 sila$_3$	še	1(barig) 2(ban$_2$)	še	4(barig) 1(ban$_2$)	še	1(u)	še-gur
				4(barig) 2(ban$_2$)	še		
17		**16** [sic]		**⌈18⌉**		**17**	

Col. v		Col. vi		Col. vii		Col. viii	
1(u) 1(aš)	še-gur	1(geš$_2$) 4(u)	še-gur	1(geš'u) 7(geš$_2$)	še-gur	1(šar'u)	še-gur
1(u) 2(aš)	še-gur	1(geš$_2$) 5(u)	še-gur	1(geš'u) 8(geš$_2$)	še-gur	1(šar'u) 1(šar$_2$)	še-gur
1(u) 3(aš)	še-gur	2(geš$_2$)	še-gur	1(geš'u) 9(geš$_2$)	še-gur	1(šar'u) 2(šar$_2$)	še-gur
1(u) 4(aš)	še-gur	3(geš$_2$)	še-gur	2(geš'u)	še-gur	1(šar'u) 3(šar$_2$)	še-gur
1(u) 5(aš)	še-gur	4(geš$_2$)	še-gur	3(geš'u)	še-gur	1(šar'u) 4(šar$_2$)	še-gur
1(u) 6(aš)	še-gur	5(geš$_2$)	še-gur	4(geš'u)	še-gur	1(šar'u) 5(šar$_2$)	še-gur
1(u) 7(aš)	še-gur	6(geš$_2$)	še-gur	5(geš'u)	še-gur	1(šar'u) 6(šar$_2$)	še-gur
1(u) 8(aš)	še-gur	7(geš$_2$)	še-gur	1(šar$_2$)	še-gur	1(šar'u) 7(šar$_2$)	še-gur
1(u) 9(aš)	še-gur	8(geš$_2$)	še-gur	2(šar$_2$)	še-gur	1(šar'u) 8(šar$_2$)	še-gur
2(u)	še-gur	9(geš$_2$)	še-gur	3(šar$_2$)	še-gur	1(šar'u) 9(šar$_2$)	še-gur
3(u)	še-gur	1(geš'u)	še-gur	4(šar$_2$)	še-gur	1(šar$_2$×man)	še-gur
4(u)	še-gur	1(geš'u) 1(geš$_2$)	še-gur	5(šar$_2$)	še-gur	1(šar$_2$×eš)	še-gur
5(u)	še-gur	1(geš'u) 2(geš$_2$)	še-gur	6(šar$_2$)	še-gur	1(šar$_2$×ilimmu)	še-gur
1(geš$_2$)	še-gur	1(geš'u) 3(geš$_2$)	še-gur	7(šar$_2$)	še-gur	1(šar$_2$×ninnu)	še-gur
1(geš$_2$) 1(u)	še-gur	1(geš'u) 4(geš$_2$)	še-gur	7(šar$_2$) [sic]	še-gur	1(šar$_2$×geš$_2$) ⌈šu⌉-ši	še-gur
1(geš$_2$) 2(u)	še-gur	1(geš'u) 5(geš$_2$)	še-gur	8(šar$_2$)	še-gur		
1(geš$_2$) 3(u)	še-gur	1(geš'u) 6(geš$_2$)	še-gur				
17		**17**		**16**		**15**	

Bibliography

Barton, G. A. 1909. *The Haverford Library Collection of Cuneiform Tablets, or Documents from the Temple Archives of Telloh*, vol. 2. Philadelphia: The John C. Winston Co.; London: Headley Brothers.

Butz, K. 1979. "Ur in altbabylonischer Zeit als Wirtschaftsfaktor", in *State and Temple Economy in the Ancient Near East* (Orientalia Lovaniensia Analecta 5–6), ed. E. Lipínski, 257–409. Leuven: Departement Oriëntalistiek.

Chambon, G. 2011. *L'Homme, la mesure et l'écriture en Mésopotamie* (Berliner Beiträge zum Vorderen Orient 21). Berlin: de Gruyter.

Civil, M. 1969. *The Series lú = ša and Related Texts* (Materials for the Sumerian Lexicon 12). Rome: Pontifical Biblical Institute.

Englund, R. K. 1991. "Hard work—where will it get you? Labor management in Ur III Mesopotamia", *Journal of Near Eastern Studies* 50: 255–80.

Foster, B. R. and E. Robson, 2004. "A new look at the Sargonic mathematical corpus", *Zeitschrift für Assyriologie* 94: 1–15.

Friberg, J. 1982. A Survey of Publications on Sumero-Akkadian Mathematics, Metrology and Related Matters (1854–1982). Unpublished research report, Department of Mathematics, Chalmers University of Technology, University of Gothenburg.

Friberg, J. 1986. "Three remarkable texts from ancient Ebla", *Vicino Oriente* 6: 3–25.

Friberg, J. 1987–90. "Mathematik", in *Reallexikon der Assyriologie*, vol. 7, ed. D. O. Edzard, 531–85. Berlin: de Gruyter.

Friberg, J. 2001. "Bricks and mud in metro-mathematical cuneiform texts", in *Changing Views on Ancient Near Eastern Mathematics* (Berliner Beiträge zum Vorderen Orient 19), ed. J. Høyrup and P. Damerow, 61–154. Berlin: Reimer.

Hilprecht, H. V. 1906. *Mathematical, Metrological and Chronological Tablets from the Temple Library of Nippur* (Babylonian Expedition of the University of Pennsylvania. Series A: Cuneiform Texts 20/1). Philadelphia: University of Pennsylvania.

Høyrup, J. 2000. "A note on Old Babylonian computational techniques", *Historia Mathematica* 29: 1–6.

Karahashi, F. 2000. Sumerian Compound Verbs with Body-Part Terms. Unpublished PhD dissertation, University of Chicago.

Limet, H. 1973. *Étude de documents de la période d'Agadé appartenant à l'Université de Liège* (Bibliothèque de la Faculté de Philosophie et Lettres de l'Université de Liège 206). Paris: Société d'Éditions "Les Belles Lettres".

Maekawa, K. 1981. "The agricultural texts of Ur III Lagash of the British Museum (I)", *Acta Sumerologica* 3: 37–61.

Maekawa, K. 1990. "Cultivation methods in the Ur III period", *Bulletin on Sumerian Agriculture* 5: 115–45.

Mauer, G. 1987. "W 20038,1–59: ein Tontafelarchiv aus dem Palast des Sin-kašid in Uruk", *Baghdader Mitteilungen* 18: 133–98.

Meissner, B. 1893. *Beiträge zum altbabylonischen Privatrecht* (Assyriologische Bibliothek 11). Leipzig: Hinrichs.

Mittermayer, C. 2006. *Altbabylonische Zeichenliste der sumerisch-literarische Texte* (Orbis Biblicus et Orientalis, Sonderband). Fribourg: Academic Press and Göttingen: Vandenhoeck and Ruprecht.

Nemet-Nejat, K. R. 1993. *Cuneiform Mathematical Texts as a Reflection of Everyday Life in Mesopotamia* (American Oriental Series 75). New Haven: American Oriental Society.

Netz, R. 2002. "Counter culture: towards a history of Greek numeracy", *History of Science* 40: 321–52.

Neugebauer, O. and A. J. Sachs 1945. *Mathematical Cuneiform Texts* (American Oriental Series 29). New Haven: American Oriental Society.

Nissen, H. J., P. Damerow and R. K. Englund 1993. *Archaic Bookkeeping: Early Writing and Techniques of Administration in the Ancient Near East*. Chicago: Chicago University Press.

Powell, M. A. 1972. "Sumerian area measures and the alleged decimal substratum", *Zeitschrift für Assyriologie* 62: 165–221.

Powell, M. A. 1987–90. "Masse und Gewichte", in *Reallexikon der Assyriologie*, vol. 7, ed. D. O. Edzard, 457–517. Berlin: de Gruyter.

Proust, C. 2000. "La multiplication babylonienne: la part non écrite du calcul", *Revue d'histoire des mathématiques* 6: 293–303.

Proust, C. 2007. *Tablettes mathématiques de Nippur. I: Reconstitution du cursus scolaire. II: Édition des tablettes conservées à Istanbul* (Varia Anatolica 18). Istanbul: IFEA-De Boccard.

Proust, C. 2008a (with M. Krebernik and J. Oelsner). *Tablettes mathématiques de la collection Hilprecht* (Texte und Materialen der Frau Professor Hilprecht Collection 8). Leipzig: Harrassowitz.

Proust, C. 2008b. "Les listes et tables métrologiques, entre mathématiques et lexicographie", in *Proceedings of the 51st Rencontre Assyriologique Internationale Held at the University of Chicago, July 18–22, 2005* (SAOC 62), ed. R. D. Biggs, J. Myers and M. T. Roth, 137–55. Chicago: Oriental Institute of the University of Chicago.

Renger, J. 1995. "Zu den Besitzverhältnissen am Ackerland im altbabylonischen Uruk: Bemerkungen zu den Texten aus dem 'Archiv' W 20038,1–59", *Altorientalische Forschungen* 22: 157–59.

Robson, E. 1996. "Building with bricks and mortar: quantity surveying in the Ur III and Old Babylonian periods", in *Houses and Households in Ancient Mesopotamia* (Comptes Rendus du·40ᵉ Rencontre Assyriologique Internationale, 1993), ed. K. R. Veenhof, 181–90. Leiden: Nederlands Historisch-Archaeologisch Instituut te Istanbul.

Robson, E. 1999. *Mesopotamian Mathematics, 2100–1600 BC: Technical Constants in Bureaucracy and Education* (Oxford Editions of Cuneiform Texts 14). Oxford: Clarendon Press.

Robson, E. 2002. "More than metrology: mathematics education in an Old Babylonian scribal school", in *Under One Sky: Mathematics and Astronomy in the Ancient Near East* (Alter Orient und Altes Testament 297), ed. J. M. Steele and A. Imhausen, 325–65. Münster: Ugarit-Verlag.

Robson, E. 2004. "Mathematical cuneiform tablets in the Ashmolean Museum, Oxford", *SCIAMVS— Sources and Commentaries in Exact Sciences* 5: 3–65.

Robson, E. 2008. *Mathematics in Ancient Iraq: A Social History*. Princeton and Oxford: Princeton University Press.

Veldhuis, N. 1997. Elementary Education at Nippur: The Lists of Trees and Wooden Objects. Unpublished PhD dissertation, University of Groningen. Available online at http://socrates.berkeley.edu/~veldhuis/EEN/EEN.html

Walters, S. D. 1970. *Water for Larsa: An Old Babylonian Archive Dealing with Irrigation* (Yale Near Eastern Researches 4). New Haven: Yale University Press.

Whiting, R. M. 1984. "More evidence for sexagesimal calculations in the third millennium B.C.", *Zeitschrift für Assyriologie* 74: 58–66.

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