A Commentary Text to *Enūma Anu Enlil* 14

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The fourteenth tablet of the celestial omen series *Enūma Anu Enlil* (EAE), edited most recently by Al-Rawi and George,[1] contains a set of four lunar tables. It is sandwiched in the series between omens concerning the appearance of the moon and omens drawn from lunar eclipses.[2] Accompanying their edition of EAE 14, Al-Rawi and George also identify and edit BM 45821+46093+46215, a commentary text concerning two of its tables. We have recently identified BM 45900 as another manuscript of this commentary and publish it here.[3] This tablet fills in several lacunæ in BM 45821+46093+46215 and these additions help in understanding the contents of this commentary. In addition, as an appendix we publish a small fragment of a table giving the length of daylight according to the ratio 2:1 for longest to shortest day.

1. Farouk Al-Rawi and Andrew George, “Enūma Anu Enlil XIV and Other Early Astronomical Tables,” *Archiv für Orientforschung* 38–39 (1991–92): 52–73. See also Hermann Hunger and David Pingree, *Astral Sciences in Mesopotamia* (Leiden: Brill, 1999), 44–50, with references to earlier works.

2. For EAE 1–13 (lunar omens), see Lorenzo Verderame, “Enūma Anu Enlil Tablets 1–13,” in *Under One Sky: Astronomy and Mathematics in the Ancient Near East*, eds. John M. Steele and Annette Imhausen. Alter Orient und Altes Testament, vol. 297 (Münster: Ugarit, 2002), 447–57 and Lorenzo Verderame, *Le Tavole I-VI della Serie Astrologica Enūma Anu Enlil*. NISABA, vol. 2 (Rome: Grafica Cristal, 2002), and for EAE 15–22 (lunar eclipse omens), see Francesca Rochberg-Halton, *Aspects of Babylonian Celestial Divination: The Lunar Eclipse Tables of Enūma Anu Enlil* (Horn: Berger and Söhne, 1985).

3. BM 45900 is published by kind permission of the Trustees of the British Museum. John Steele’s work on the tablet has been supported by the Royal Society and Lis Brack-Bernsen’s by Deutsche Forschungsgemeinschaft.

As reconstructed by Al-Rawi and George, the four tables on EAE 14 contain the following:

Table A	Duration of lunar visibility in the equinoctial month expressed in UŠ, tradition of Nippur.
Table B	Duration of lunar visibility in the equinoctial month expressed in *mina*, tradition of Babylon.
Table C	Seasonal variation in the length of day and night.
Table D	Monthly variation in lunar visibility at New Moon, and in lunar invisibility at Full Moon.

In all cases the tables work with the schematic calendar of twelve 30-day months. Tables A and B provide essentially the same information; however, in Table A the duration of lunar visibility is given in UŠ, whereas Table B uses the weight of water in a clepsydra given in *mina*, taking 1 *mina* of water to be equal to 60 UŠ. More significantly, however, while the duration of lunar visibility in Table B increases uniformly between day 1 and day 15 (and decreases uniformly during the second half of the month), in Table A for the first and last five days of the month, the duration of visibility proceeds according to geometrical progession (see table 18.1). Between days 5 and 25, the duration of visibility changes linearly in accordance with the scheme presented in Table B. The commentary tablet attempts to rationalize the difference between the schemes of Tables A and B.

Table 18.1: Duration of Lunar Visibility in UŠ during an Equinoctial Month according to EAE 14 Tables A and B

Day	Table A	Table B	Day	Table A	Table B
1	3;45	12	16	2,48	2,48
2	7;50	24	17	2,36	2,36
3	15	36	18	2,24	2,24
4	30	48	19	2,12	2,12
5	1,0	1,0	20	2,0	2,0
6	1,12	1,12	21	1,48	1,48
7	1,24	1,24	22	1,36	1,36
8	1,36	1,36	23	1,24	1,24
9	1,48	1,48	24	1,12	1,12
10	2,0	2,0	25	1,0	1,0
11	2,12	2,12	26	30	48
12	2,24	2,24	27	15	36
13	2,36	2,36	28	7;30	24
14	2,48	2,48	29	3;45	12
15	3,0	3,0	30	0	0

BM 45900 (= 1880–7–6, 332) is a fragment from the upper right corner of a tablet. The preserved part probably comprised about $\frac{1}{2}$ the width and about $\frac{1}{3}$ the height of the original tablet. In the following we transcribe the two wedge separation mark as ":" and have attempted to emulate the original layout of the tablet. For ease of comparison our translation largely follows Al-Rawi and George's translation of BM 45821+46093+46215. Our edition has benefitted from additional collations and suggestions for readings made by Eleanor Robson. We gratefully acknowledge her generous assistance in this work. Any deficiencies that remain are our responsibility alone.

Figure 18.1: BM 45900 Obv.

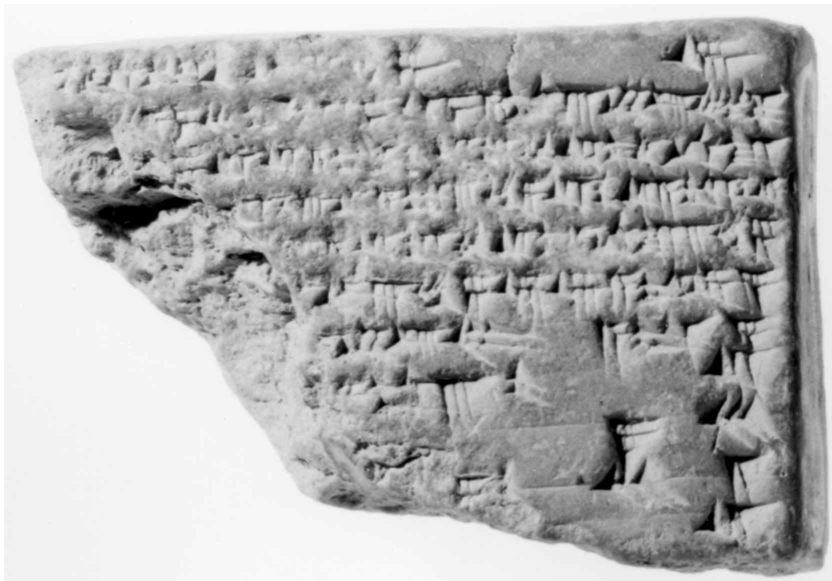
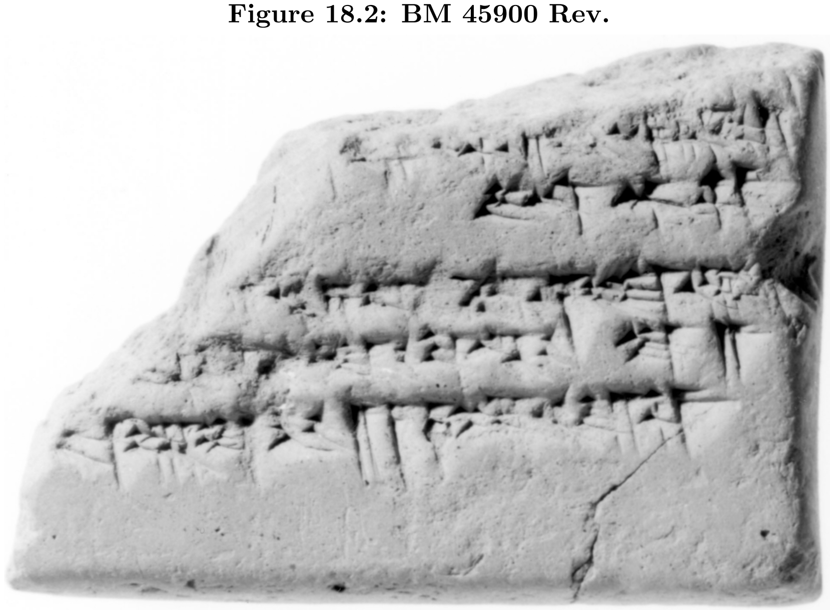


Figure 18.2: BM 45900 Rev.



Transliteration

OBVERSE

1	[. . .] X *šá* DU BA X X X ⌜3,4⌝5		16
2	[. . . IGI.D]U$_8$.A *šá sin* ⌜GIN-*ma*⌝ 1,4 : 1,4 A-RÁ 3 EN.NUN GE$_6$-*ka*		
3	[. . . 3,4]5(?) 12 12 A-RÁ 1(?) : 12 UD-1-KAM 12 UŠ NA-*su*		
4	[. . . 3,1]2 : 3,12 A-RÁ 3,45 12 : 12 A-RÁ 1 : 12		
5	[. . .] X X UD-1-KAM 12 ⌜UŠ⌝ NA-*su* 3,45		
6	[. . .] IGI 3,45 16 16 A-RÁ 15 4		
7	[. . .] EN-NUN GE$_6$	A-RÁ	4
8	[. . .] ⌜A⌝-RÁ 3 :		12
9	[. . . . .]	7	30
10	[. . . . . X+]5+X :	30	2
11	[. . . . .] X		12

Remainder lost.

REVERSE

1' [. . .] ⌜X *ù*⌝ 12 X *ina*(?) 18 EN(?) GE$_6$ MIN

2' [. . .] *i-na* AN-*e*

3' [. . .] ⌜3⌝,45 ⌜GUB :⌝ IM-14-KAM-MA IGI-DU$_8$-[A] 30

4' [. . .] ⌜X X X X⌝-*ṭúr* : *ba-ri* : LA(error for AG)-A

5' [. . .] X ^{Id}EN-AD-ŠEŠ A *šá* ^{Id}EN-TIN-*su*-E

Translation

OBVERSE

1 [Day 1, the moon is visible for 3,45 UŠ] . . . [The reciprocal of] 3,45 is 16.

2 [16 multiplied by 4, the coefficient of visib]ility of the moon, [is 1],4. 1,4 multiplied by 3, the watch of your night,

3 [is 3,12. 3,12 multiplied by 3,4]5 is 12. 12 multiplied by 1 is 12. Day 1 (the moon) is visible for 12 UŠ.

4 [Second time: the reciprocal of 3,45 is 16. 16 multiplied by 12 is 3,1]2. 3,12 multiplied by 3,45 is 12. 12 multiplied by 1 is 12.

5 [Day 1 (the moon) is visible for 12 UŠ. Alternately, $\frac{1}{16}$ multiplied by 3,12 is] 12. Day 1 (the moon) is visible for 12 UŠ. 3,45

6 [is $\frac{1}{16}$. You raise it sixteenfold to get 1.] The reciprocal of 3,45 is 16. 16 multiplied by 15 is 4.

7 [4 is the coefficient of lunar visibility. 3], your watch of the night, multiplied by 4
8 [is 12, . . .] multiplied by 3: 12.
9 [. . . . .] 7, 30
10 [. . . . . x+]5+x 30 2
11 [. . . . .] x 12

Remainder lost.

REVERSE

1' [. . .] . . . .
2' [. . .] . . . heaven.
3' [. . . Commentary on "On Day 1 (the moon) is] visible for 3,45"; Tablet 14 of the Periods of Visibility of the Moon.
4' [. . . writ]ten, collated, made good.
5' [. . .] Bel-aba-uṣur, son of Bel-balāt-su-iqbī.

Textual Commentary

OBVERSE

1 We do not know what to make of the first part of this line.

2 The coefficient of visibility of the moon, 4, is known from MUL.APIN and many other sources. The present tablet indicates that Al-Rawi and George were mistaken in restoring lines 1–2 of BM 45821+46093+46215 as [16 A.RÁ *a b : b* A.RÁ (X),] 30 where *a* times X,30 equals 4. Instead the preserved 30 should be read *sin* and taken as the last word of the description of 4 as the cofficient of visibility of the moon. The second coefficient used in calculation, 3, is here revealed to be the length of the watch of the night, again paralleling MUL.APIN, etc.

5 The 5 in [3,4]5 looks more like a 6, but 5 is required by the context. The duration of lunar visibility is denoted here and in line 5 by the logogram NA with the possessive suffix *-su*. NA is used in the Astronomical Diaries and related texts for the time interval between sunset/sunrise and moonset at the beginning and middle of each month (two of the so-called "Lunar Six"). Thus the use of NA in our text is understandable. However, BM 45821+46093+46215 consistently denotes this interval either GUB-*su* or GUB-*zu*. Al-Rawi and George read this as *izzaz-zu*, 'is present,' which is also an appropriate term; given the use of *-su* as a possessive suffix in the present text; however, they may not be justified in correcting *-su* to *-zu* throughout 45821+46093+46215.

10 We are uncertain whether to read 30,2 or 32 at the end of this line.

Reverse

1' We are uncertain how to read this line.

4' LA-A must be an error for AG-A 'made good.' LA and AG are very similar in Late Babylonian script. (Collation and commentary courtesy of Eleanor Robson.)

General Commentary

The preserved fragment of the new manuscript of the commentary to EAE 14 covers only the first day of the month. Two methods are given for deriving the duration of visibility of the moon on that day found in the EAE Table B (12 UŠ) from the value given in Table A (3;45 UŠ). It is followed by a method for doing the reverse. Our fragment fills two important lacunæ in the description of the first method, which can now be summarized as follows:

> Take a from Table A.
> Take reciprocal of $a = b$.
> Multiply b by 4 (coefficient of visibility of the moon) $= c$.
> Multiply c by 3 (the watch of the night) $= d$.
> Multiply d by $a = e$ $(= 12)$.
> Multiply e by the day number.

This method can now be seen to be identical to the second method, except that here the multiplication of b by 12 to give d is separated into two steps, a multiplication by the coefficient of visibility of the moon followed by a multiplication by the length of the night. This parallels MUL.APIN 2.3.13–14.[4]

> 4 *igi-gub-bé-e* IGI.DUḪ.A *šá* ᵈ*sin* 3 MA.NA EN.NUN GI$_6$ *ana* 4 ÍL-*ma* 12 IGI.DUḪ.A *šá* ᵈ*sin* IGI

> '4 is the coefficient for the visibility of the Moon; you multiply 3 minas, the watch of the night, by 4, and you find 12, the visibility of the moon.'

In both the first and second methods of the commentary the author is simply playing around with numbers to disguise the central procedure in the process: a piece of sharp mathematical practice akin to the children's games in which one "predicts" the result of mathematical operations in

4. Hermann Hunger and David Pingree, MUL.APIN*: An Astronomical Compendium in Cuneiform*, Archiv für Orientforschung, vol. 24 (Horn: Berger, 1989), 107–08. We have altered the transliteration slightly in the light of George and Al-Rawi's discussion of the meaning of 3 MA.NA EN.NUN GI$_6$.

which the beginning number has been kept secret by subtracting that beginning number somewhere during the process. In this case, the author's slight of hand is to have taken the reciprocal of a number at the beginning and then multiplying by that same number later on. Expressing this method using modern notation we simply have $\frac{1}{a} \times 4 \times 3 \times a = 12$. Thus the variable a is redundant in calculating the final result.

The scribe Bel-aba-uṣur, son of Bel-balāt-su-iqbī, is not known from other texts but is plausibly the Bel-aba-uṣur, son of (. . .), descendant of Ea-ēpuš-ilāni mentioned in the colophon to ACT no. 123a.[5] If so, this identification would present another interesting example of the range of activities of astronomical scribes. Anu-bēl-šunu, a well known scribe from Uruk, for example, is known to have owned and written ritual texts, mathematical texts, an illustrated astrological text, and administrative documents.[6] However, several other scribes called Bel-aba-uṣur are known from Babylon, including many employed in the Esagil temple,[7] so it is not certain that the scribe of ACT No. 123.a is the same person mention in BM 45900.

Appendix BM 99745 (=1883-1-21, 2107)

Figure 18.3: BM 99745

5. Otto Neugebauer, *Astronomical Cuneiform Texts: Babylonian Ephemerides of the Seleucid Period for the Motion of the Sun, the Moon, and the Planets* (London: Lund Humphries, 1955), colophon Zka. Perhaps the scribe mentioned in colophon Zl = ACT No. 603 is also the same individual.

6. See John M. Steele, "A 3405: An Unusual Astronomical Text from Uruk," *Archive for History of the Exact Sciences* 55 (2000): 103–35 and Laurie Pearce and Lawrence Doty, "The Activities of Anu-bēl-šunu, Seleucid Scribe," in *Assyriologica et Semitica: Festschrift für Joachim Oelsner anläßich seines 65. Geburtstages am 18. Februar 1997*, eds. Joachim Marzahn and Hans Neumann (Münster: Ugarit, 2000), 331–41.

7. See, for example, the lists of temple workers in Tom Boiy, *Late Achaemenid and Hellenistic Babylon* (Leuven: Peeters, 2004), 268–75.

BM 99745 is a small flake measuring only 1.5 cm by 2 cm from the left edge of a tablet. The traces read as follows:

1' 4 ⌜u_4⌝[-*mu* ...]
2' 3;40 u_4-*mu* [...]
3' 3;20 u_4-*mu* [...]
4' 3 u_4-*mu* [...]
5' 2;40 u_4-*mu* [...]
6' 2;20 u_4-*mu* [...]
7' [2] u_4-*mu* [...]

The numbers can be interpreted as the length of daylight varying month–by–month according to the assumption that the ratio of the longest day to the shortest day is 2:1. This interpretation is confirmed by the word u_4-*mu* 'day-(length).'

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