Tablettes mathématiques de la collection Hilprecht by Christine Proust with Manfred Krebernik and Joachim Oelsner

Texte und Materialen der Hilprecht Collection 8. Wiesbaden: Harrassowitz Verlag, 2008. Pp. x + 166, 44 plates, CD-ROM. ISBN 987–3–447–05705–9. Cloth € 74.00

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In the late 19th century, the University of Pennsylvania sponsored a series of excavations at the ancient city of Nippur on the banks of the Euphrates. Among the finds were some 50,000 cuneiform tablets or fragments, of which almost 1000 were mathematical. Under the laws of the time, the finds were divided equally between the state (the Ottoman Empire) and the excavators. Consequently, most of the tablets ended up in Istanbul or at the University of Pennsylvania. Hilprecht, the excavation leader, retained some tablets for his personal collection; and after his death, they passed to the University of Jena, where they remain.

Hilprecht [1906] himself published some of the mathematical texts in his excavation reports, one of the earliest attempts to understand Old Babylonian mathematics; the remainder have largely rested undisturbed in the museum collections until recently. Eleanor Robson [2001, 2002] has published some of the Philadelphia Nippur tablets from later excavations and is preparing a full text edition of the Hilprecht Nippur tablets with I. Marquez. Christine Proust [2007] published the tablets in Istanbul;[1] here she treats those at Jena. In the earlier volume, Proust used the occasion to provide an in-depth overview and update of the current understanding of Old Babylonian mathematics and the conclusions that she drew there were based on the complete corpus of Nippur tablets. In this volume, she is principally concerned with presenting a classic, comprehensive, text edition of the collection; and so she limits herself to providing fairly

[1] See my review, Melville 2008.

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brief introductory remarks orienting the reader along with a useful set of appendices containing composite texts of the metrological and numerical lists and tables, glossaries, and word indices.

The core of the volume is a meticulous edition of the 81 tablets that have not already appeared as joins to tablets in other collections. Each tablet is presented with a full-size copy (black and white line drawing) as well as several color photographs on the accompanying CD[2] All except the numerical tables are given complete transliterations (this is unnecessary for the numerical tables, given the hand copies), a physical description, and commentary on noteworthy points. Several of the tables mix mathematical or metrological content with literary and lexical exercises; the non-mathematical content is treated in a separate chapter.

The first two of the tablets are from earlier periods than Old Babylonian (*ca* 2000–1600 BC). Both of these tablets have been published before; but Proust republishes them in full, summarizes previous commentary, and adds her own observations. The first is a Sargonic tablet containing an exercise in calculating the width of a rectangular field, given the length and area. This exercise belongs in a collection of similar problems that have sparked a heated debate concerning mathematical procedures in the Sargonic period. The issue revolves around whether the problems were conceived as arithmetical procedures and so provide indirect evidence for the use of sexagesimal notation or were considered from a more geometrical, cut-and-paste point of view. Proust summarizes the arguments on both sides and judiciously declares the available evidence to be inconclusive.

The second earlier tablet is an Ur III (*ca* 2100–2000) table of inverses, recently published by Oelsner [2001]. This is one of a very small corpus of tablets that have conclusively demonstrated the introduction of the sexagesimal place-value system in the Ur III period. Proust has had access to some more unpublished exemplars and establishes a typology to differentiate these tablets from those in the succeeding Old Babylonian period. As a consequence of her analysis, she makes the intriguing suggestion that these early inverse tables belonged in the province of scholars but had not yet passed into use in general education.

[2] These photographs are also available at the Cuneiform Digital Library Initiative website at http://cdli.ucla.edu/.

The remaining 79 tablets are Old Babylonian, and include one that Hilprecht apparently bought that did not come from Nippur. As these formed part of Hilprecht's personal tablet collection, one can imagine that the selection was not arbitrary. There are quite a few extremely nice specimens here; and the contents of the tablets span the known range of metrological and mathematical lists and tables and include some calculations, but no problem texts. Proust organizes the tablets according to the standard sequence of the reconstructed Nippur curriculum. The derivation of this curriculum is detailed in her earlier book. The division falls into the categories of metrological lists; metrological tables; numerical tables; calculations; and small, unidentifiable fragments. As noted above, the lexical and literary material is treated in a separate chapter.

The bulk of a student's elementary education at this time consisted of learning Sumerian, then a dead language, mostly by writing out long lists of Sumerian words, phrases, and sentences. Within this context, the first exposure to quantitative information came with the metrological lists. There were four such lists: capacity (called 'grain', where the units are not derived from length units), weight (called 'silver'), area (called 'field'), and length (apparently unnamed). In each case, the list proceeded from the smallest unit on up to multiples of the largest unit. The notation for quantity was not abstract but depended on the type of unit being counted. The current volume contains 16 examples of such metrological lists, ranging from a large tablet that (originally) contained the complete set of all four lists to small fragments that have only a few entries.

The next phase of elementary education, which may not have been pursued by all students, began the bridge between metrology and computation. The metrological tables contain all the same entries as the metrological lists, but in each case the metrological quantity is also written down as a multiple of a base unit using the abstract sexagesimal system. The metrological tables add a fifth set to the four of the lists, with a collection of heights used for the computation of volumes. Old Babylonian units for volume had the same names as units for area, but were 1 *kuš* or cubit thick. Heights and depths thus had a different base unit from that of lengths, and so had a new table. The Hilprecht collection features 15 tablets with metrological tables with some very fine exemplars, such as HS 242 (a table of

weights) and HS 243 (a table of heights) as well a number of other nice, clear examples.

The next two chapters of Proust's book cover what she refers to as 'numerical tables'. The sexagesimal place-value system facilitated computation, principally multiplication and division, of abstract numbers. The information was organized into 'inverse tables' giving inverse pairs whose product was (a power of) 60, a long series of multiplication tables giving multiples of some principal number, as well as a smaller set of squares and square roots. Students gained familiarity with the system by copying out the tables, practicing each one, and then reviewing by writing out long series of tables in abbreviated form on large tablets. The Hilprecht collection includes 37 tablets of these types. Due to the repetitive nature of multiplication tables and the fact that complete copies of each tablet are given in the plates, Proust merely summarizes the content in the her text, showing the organization of multiplication tables on large tablets while giving the smaller tablets in full. Among these tablets, the large HS 246 is unusual in that the multiplication tables are written out in the full style rather than the more usual abbreviated form. HS 208, containing multiplication tables for 12, 10, 9 along with 8,20 ($8\frac{1}{3}$) and 8, is a particularly fine specimen. Meanwhile, HS 209 shows the human side of mathematics instruction. It starts out with beautifully clear, nicely laid out entries on the obverse and ends with rushed, cramped entries in the last columns of the reverse. Perhaps the student was running out of time as well as space. The collection also includes a good selection of well-preserved smaller tablets containing just one multiplication table as well as two tables of squares and four of square-roots.

Exactly how calculations were performed in the Old Babylonian period is still something of a mystery. Sources and solutions tend to get preserved better than intermediate computations. However, at least parts of some computations were noted on palm-sized tablets, of which this collection contains four. These tablets are often frustratingly difficult to interpret. One of the four is a very nice example of a well laid-out multiplication, in fact a squaring, similar to a number of other exemplars. Another is just a fragment that Proust suggests possibly contains an inverse pair. The traces are unclear and there is an error, but it is an intriguing suggestion as the proposed pair is not in the standard table nor in the usual sequence of larger pairs.

The third tablet contains numerous numbers, some of which may belong together as an attempted square root extraction by factorization. The fourth is another example of the difficulties presented by this type of source. The tablet bears numerous traces of erasures and has obviously been re-used. Proust does not see a relationship between the numbers. If some of the 'ones' are interpreted as the heads of column dividers, as seems plausible from the photograph, then we are left with the sequence 10, 20, 30, 40, and 50 on the next line. The layout of the tablet, however, leaves the purpose opaque.

The section on the lexical and literary extracts is of lesser mathematical import. The entries provide some new and variant readings, although most of the texts come from standard compositions.

Christine Proust is to be commended for having produced a handsome volume revealing for the first time the Hilprecht collection of mathematical tablets from Nippur. Together with her earlier publication of the Istanbul tablets and the hoped-for publication of the Philadelphia tablets, this important collection of Old Babylonian sources can finally be studied as a whole, more than a century after excavation.

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