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Mathematics in Ancient Iraq: A Social History

by Eleanor Robson

PRINCETON AND OXFORD: OXFORD UNIVERSITY PRESS, 2008, XXVII + 472 PP., BIBLIOGRAPHY, INDEXES OF TABLETS, AND SUBJECTS.
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REVIEWED BY JENS HØYRUP

Ever since Moritz Cantor, typical general histories of mathematics have contained an initial presentation of “Babylonian mathematics”. As a rule, the tenor of these presentations has followed the author’s overall view of what constitutes *mathematics*, and what constitutes *history of mathematics*. Accordingly, Morris Kline [1], strongly engaged in ancient Greek and post-Renaissance demonstration-based mathematics, dismissed anything pre-Greek as not really mathematics; Dirk Struik [2], highly aware of the connection between mathematics and its technological context, was much more balanced; Struik even started with a chapter on what would today be labelled “ethnomathematics” (he himself called it “Stone Age mathematics”). Still, for the mathematical substance of the Babylonian tradition, Struik only skimmed the 1941 edition of Neugebauer’s *Exact Sciences in Antiquity*, and his general historical framework dissolved any specificity of the Babylonian world in a postulated “continuity and affinity of the Oriental civilizations,” regarding the distinction between “Egyptian, Babylonian, Chinese, Indian, and Arabian cultures” as “mechanical divisions” (p. xii).

The majestic source collections of Neugebauer [3], Thureau-Dangin [4], and Neugebauer and Sachs [5] certainly give a much more differentiated picture of Babylonian mathematics (I do not include in this list E. M. Bruins’ and M. Rutten’s publication of the important mathematical texts from Susa [6], since the picture this publication offers is often terribly distorted by Bruins’ editorial commentary). However, none of them tries to present a *history* (neither “internal” nor in broader context)—as Neugebauer says explicitly [3: III, 79], “development of the consequences that can be drawn from the text material is not among the aims I have set myself”. In recent decades, much work has also been published about the mathematics of single periods or about specific aspects of Mesopotamian mathematics (now transcending the period where the concept “Babylonian” is adequate). All in all, the only genuine history of Babylonian/Mesopotamian mathematics was published by Kurt Vogel in 1959 [7] and aimed at the gymnasium level (possibly A. A. Vajman’s book from 1961 [8] should also be understood as history). Given both this target group (with all respect for the German *höhere Schule*

and for Vogel's historical insight) and the immense progress in Assyriological knowledge and understanding attained since then, Vogel's book is obviously outdated by now.

This situation has now been happily changed by Eleanor Robson. Her book, though claiming to be a "social history", is indeed more than that—it is better characterized as a basic history of mathematics as embedded in its social context and function. Omitting discussion of the most sophisticated topics, she gives the reader a good account of almost everything mathematical going on in ancient Iraq between the outgoing fourth and the late first millennium (BCE, as all unqualified dates in what follow) in as far as it is documented in surviving sources—the most obvious exception being the techniques of mathematical astronomy, examination of which might indeed be an overwhelming task.

In her delimitation of "mathematics", Robson comes closer to Dirk Struik than to Morris Kline; often, she broadens the subject to "numeracy" and presents, for instance, the contents of private household computations. This notwithstanding, a large part of her evidence consists of those texts that are conventionally considered as "properly mathematical": those connected to the school training of scribes.

Robson's Iraq is neither "Babylonia"—which is only meaningful from the moment Babylon becomes an important polity in the early second millennium and would in any case exclude the Assyrian north—nor "Mesopotamia", a word borrowed from classical Greek (with a cognate in Biblical Hebrew) and unconnected to the geographical realities of our own days. Instead, she emphasizes that present-day Iraq corresponds roughly to a region that was as much of a cultural unity some 4000 years ago as was "Italy" around 1100 CE. I suspect (and sympathize with) an implicit argument against those who claim Iraq to be merely an artificial, post-WWI creation that is better cut into three statelets whose oil resources it would be easier to grab.

The large majority of known "properly mathematical" texts are from the Old Babylonian period (2000–1600, according to the "middle chronology")—with a handful of exceptions, from its second half. Until the 1970s, the only other known mathematical texts were from the Seleucid era (third and second centuries), apart from a few tables of reciprocals tentatively ascribed to the Ur III period (21st century). As a rule, these texts had been bought by museums on the antiquity market, and neither place of origin nor precise date were known—which obviously contributed to making any writing of history impossible (just imagine how it would be to write the history of early modern mathematics from nothing but a pell-mell of undated and unlocated mathematical manuscripts ranging from Cardano to Abel, and from school to academy level!). Since then, a small number of mathematical texts from the late fourth, third, and mid-first millennia have been discovered; some terminological grouping of the Old Babylonian corpus has been achieved; and Eleanor Robson herself has found firm evidence that the tables of reciprocals in question are indeed of Ur III date. Still, most presentations of "Babylonian/Mesopotamian mathematics" concentrate on the periods from which many texts are known—these, at least, allow us to make a portrait of the mathematical culture of specific moments or periods (actually, only of the Old Babylonian period).

Robson has chosen a radically different way, forcing the presentation into a different scheme allotting more or less equal space to each approximate half-millennium. Occasionally, this compels her to treat a topic that might just as well or more naturally have been dealt with elsewhere under a half-millennium for which other material is scarce (e.g., "tabular accounting", reaching from the third into the first millennium, dealt with in the context of the later second millennium). On the whole, however, the system works astonishingly well; this is evidently only possible because Robson is not a historian of mathematics who has specialized in cuneiform mathematics but a fully trained all-round Assyriologist (first trained as a mathematician, however, which is also important).

Robson offers a picture in which numeracy (and, when this word is appropriate, mathematics) is always bound up with the scribal function—the treatment of symmetry and general visual culture as aspects of geometry being partial exceptions. On the other hand, the use of numeration as a literary device in epics and royal inscriptions hardly counts as an exception to the rule, both literary genres being products of scribal culture. Until the mid-second millennium this compound is further linked to state administration and to the idea of mathematically determined social justice guaranteed by the king—even much later, the iconography of rulers exhibits the measuring rod and rope as royal insignia, but how long their role in the division of land was really remembered is unclear (not to speak of "just" distribution). Venerated symbols, as we know, often survive their original meaning—how many Christians remember today that "God's lamb" does not stand for the supposed tenderness of the Saviour but for the butchered sacrificial animal whose blood buys off the wrath of the heavenly Father? Contrary to Robson, I actually doubt that Old Babylonian scribal calculators saw work on advanced "algebraic" problems dealing with areas as connected to their administration of royal "justice". No second-millennium source I know of (and none cited by Robson) contains any hint of such a view.

From the Old Babylonian period through the earlier first millennium, documents also reflect the application of scribal mathematics in private merchant households. However, in the final phase, first in the Assyrian north, everyday administration, statal as well as private, was increasingly performed on ephemeral supports (wax tablets, papyrus, parchment), and probably in Aramaic; when its outcome needed duration, however, for instance in contracts, it might be transferred to clay and written in either Akkadian cuneiform or in alphabetic Aramaic, albeit without the calculations. (This omission was no new trend: intermediate calculations are almost exclusively known from the school genre—"good scribes never showed their working", as Robson observes (p. 78) in the context of the 21st century, where wax tablets are first spoken of.)

In the south, Robson can still point to a mid-first-millennium cuneiform curriculum encompassing metrological lists and tables of square numbers (and hardly much more mathematics) as well as tablets reflecting household numeracy (money, interest, metrology, land measurement). As the two (Assyrian and Babylonian) dialects of the Akkadian language died as vernaculars after the mid-first millennium, cuneiform culture was maintained only by a narrow environment of

scholar-scribes, identifying themselves as exorcists, copyists of omen series, incantation- and lamentation-priests, and the like. As Robson shows, they belonged to a small, interconnected circle of (real, namely blood, not apprenticeship-cum-adoption) families. This environment also created mathematical astronomy; finally, it produced the small number of surviving Seleucid non-astronomical mathematical texts.

An appendix of 46 pages lists all published mathematical texts.

Robson's work is amply richer in detail than can be rendered in a review—and history can only be written on the basis of documented details, hopefully to be fitted together into a meaningful pattern of general conclusions. Nothing comparable has been done before, and it has been a great pleasure to read the book, from which I have learned much. But although clay tablets survive the millennia better than most other media, readers should remain aware that only a small part of the evidence we would like to have has survived, that much less has been excavated—and that many of the tablets that *have* been excavated are still waiting to be read. As Assyriologists sometimes say, the best place to dig is in the Museum cellars. Any pattern that can be constructed on the basis of the evidence we do possess is therefore a *reconstruction*, an extrapolation building in part on what its author sees as reasonable assumptions. It is therefore no wonder that some of Robson's general conclusions can be disputed, just as she herself objects in her book to conclusions drawn by previous workers—including some of mine.

Detailed discussions of such doubts belong in the context of Assyriological or historical journals if not in private letter exchanges—just explaining to a nonspecialist audience what they are about would require pages and pages of background information. I shall therefore only air such doubts as are of general character, without going into details with my arguments.

Robson concentrates on what can be documented in the cuneiform record itself. Although she does recognize the existence of nonliterate or at least not cuneiform-literate numerate activities in the area, she tends to not take them into account in her historiography, implicitly supposing that the development of the literate mathematical tradition took place inside a closed scribal environment. This is of course no different from the way the history of other mathematical periods is mostly written; but the approach might be unduly restrictive here no less than elsewhere.

When discussing possible links to Greek mathematics, Robson restricts herself, on one hand, to sweeping arguments (of a kind which might prove that Descartes did not ultimately draw on medieval abacus algebra, and which in any case collapse in front of the indubitable connection between Seleucid and Egyptian Demotic mathematics)—on the other, to rather unspecific references to renowned publications that take the pertinence of these for granted in a way that unwittingly supports the myth of the Greek genius that invented everything on its own without interaction with other cultures. The indubitable links to Islamic practical geometry and to Jaina geometry go wholly unmentioned; there is only a general exhortation (p. 288) to “explore

[the place of cuneiform mathematics] within the sciences in the Middle East, and Asia more generally”. This almost sounds like Struik's “affinity of the Oriental Civilizations”.

Post Scriptum

I would like to add a personal historical note for the record. On page 7, Robson suggests that “it is perhaps no coincidence that ‘Algebra and naïve geometry’, Jens Høyrup's seminal work on the language of Old Babylonian algebra” was published in 1990, the year in which Neugebauer and Bruins died. Coincidence in fact it is. The manuscript was submitted in 1986 to one of the pertinent editors of *Archive for the History of Exact Sciences* (not van der Waerden, which in retrospect I regret); after a full year this editor refused it, accompanying the refusal with a question showing that he had not read up to line 7 on the first page. The manuscript was then invited in 1988 by *Altorientalische Forschungen*, but typographical composition was difficult and took a long time. Preliminary presentations of my results had already appeared in *Erdem* (1986) and *Mathematische Semesterberichte* (1989). I had also sent a first extensive but very preliminary university print to Neugebauer in 1984 and had received a kind but noncommittal postcard together with some offprints on the calendar topic on which he was working at that moment. I am happy to be able to say that I did not celebrate the departure of a giant by kicking his teeth while standing on his shoulders (that is certainly not what Robson wants to insinuate, I should say). Nor had I been so scared by Bruins that I dared not criticize him in writing while he was alive and spitting flames.

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