Updating Our Understanding of Algorithms in the Ancient World: A Babylonian Astronomy Case Study

The specter of algorithms has haunted research into Babylonian mathematics and science for decades. Since computer scientist Donald Knuth's under-informed analysis in the '70s, some scholars have wrestled with its ahistoric application, while others adapted easily to its unexamined use (Knuth 1972). Previous research has reflected on the value of treating ancient mathematics as algorithms by focusing on an algorithmic vs. demonstrative mathematics (Høyrup 2018a and Høyrup 2018b). Proponents of the idea have used algorithms as a method of translation and an aid in cross-cultural comparison and analysis (Ritter 2004 and Imhausen 2003). Those opposed suggest that early Babylonian mathematics is not algorithmic and calling it thus is at best anachronistic. Yet modern algorithmic studies and research out of sociological and anthropological fields have complicated the term, providing a wealth of material for re-examining the applications of "algorithm" to ancient Babylonia (Ames and Massimo 2023, Seaver 2017, and Striphas 2023). The study of the history of science in Babylonia is primed for a new, robust examination of the presence of algorithms within these ancient tablets and the value of looking for them.

This presentation examines how modern algorithmic studies can inform the current understanding of ancient astronomy. Drawing from recent research out of sociology and anthropology, the concept of "algorithm" is defined and dissected in order to determine its place in discussions of antiquity. Focusing on Late Babylonian astronomical procedure texts, this presentation demonstrates what an algorithmic analysis might look like when informed by recent advancements in algorithm studies and awareness of the nuances of ancient mathematics. This demonstration highlights the benefits of complicating the idea of "algorithm" and applying it to ancient science. Earlier work in this field has shown the value of algorithms as a lens for analysis, providing case studies for how their informed use invites modern scholars to rethink traditional interpretations (Meszaros forthcoming). This broader analysis provides a deep dive into how

modern algorithmic studies can apply in the ancient world so that future translation and interpretation work can be more fully informed.

Works Cited

Ames, Morgan G. and Massimo Mazzotti, *Algorithmic Modernity: Mechanizing Thought and Action, 1500–2000* (United Kingdom: Oxford University Press, 2023).

Høyrup, Jens, "Was Babylonian Mathematics Algorithmic?," in: *Grenzüberschreitungen Studien zur Kulturgeschichte des Alten Orients.* Festschrift für Hans Neumann zum 65. Geburtstag am 9. Mai 2018, ed. Kristin Kleber, Georg Neumann, and Susanne Paulus (Münster: Zaphon, 2018a), 297–312.

Høyrup, Jens, "When Is the Algorithm Concept Pertinent – and When Not? Thoughts about Algorithms and Paradigmatic Examples, and about Algorithmic and Non-Algorithmic Mathematical Cultures," *AIMS Mathematics* 3.1 (2018b): 211–232.

Imhausen, Annette, *Ägyptische Algorithmen: Eine Untersuchung zu den mittelägyptischen mathematischen Aufgabentexten* (Wiesbaden: Harrassowitz Verlag, 2003).

Knuth, Donald E., "Ancient Babylonian Algorithms," *Communications of the ACM* 15, no. 7 (1972): 671–677.

Meszaros, E.L. "Algorithmic Relationships in Babylonian Astronomical Procedure Texts," *Berichte zur Wissenschaftsgeschichte* (forthcoming).

Ritter, Jim, "Reading Strasbourg 368: A Thrice-Told Tale," in *History of Science, History of Tex*t, ed. Karine Chemla (Boston: Kluwer Academic, 2004): 177–200.

Seaver, Nick, "Algorithms as Culture: Some Tactics for the Ethnography of Algorithmic Systems," *Big Data & Society* 4, no.2 (2017): 1–12.

Striphas, Ted, *Algorithmic Culture Before the Internet*, (New York: Columbia University Press, 2023).