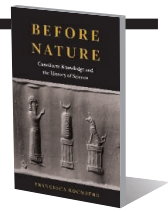
HISTORY OF SCIENCE

Divining science

A new tome argues that the ancient Babylonians deserve greater recognition in scientific histories

By **Andrew Robinson**



Before Nature
Cuneiform Knowledge and the History of Science
Francesca Rochberg
University of Chicago Press, 2016. 379 pp.

"The eternal mystery of the world is its comprehensibility," Albert Einstein famously mused in 1936. "The fact that it is comprehensible is a miracle." The understandability of the natural world is all the more impressive when one considers the fact that fundamental human assumptions about time and space—the idea that there are 60 minutes in an hour, and that a circle can be broken down into 360 degrees—come from a time with "no articulated sense of nature … no reference or word for it," according to Francesca Rochberg, professor of Near Eastern studies at the University of California, Berkeley.

These concepts were borrowed by the ancient Greek philosophers from the mathematicians and astronomers of ancient Babylon, whose sexagesimal calculations first appeared in the cuneiform script—the world's oldest writing system—in the Old Babylonian period, circa 2000 to 1600 BCE.

The Babylonians' understanding of the heavens—including astronomical predictions—did not derive from any physical framework. They employed no classification of the Moon and planets as natural phenomena and conceived no physical laws of nature governing those bodies' cyclical appearances. Neither had they any concept of a geometrical geocentric cosmos. On Earth, the cuneiform "determinative" sign for stone—a logogram today written as NA_4—denoted not merely natural stone but also beads manufactured from stone, from metals (gold and silver), and from shell. This incongruous variety of natural substances was classified under one sign because Babylonians perceived all as hard yet workable into artifacts.

Apart from the sexagesimal system, little else from the cuneiform world has been generally viewed as part of modern science, a view challenged by Rochberg. Throughout *Before Nature*, she argues that this pre-Greek world deserves to be included in scientific history. "In doing so," according to the book's final sentence, "we will allow that our history of science can and should be inclusive of yet more variations on the scientific imagination."

Rochberg argues that the cuneiform world's preoccupation with divination, ritual, and incantation was motivated by a determination to establish "norms and anomalies within meaningful categories" and that this goal is inherently scientific. In a chapter entitled, "The Babylonians and the Rational," she also argues that "magic" should not be used as a tool for separating science from nonscience because, in the cuneiform world, magic belonged neither to the natural nor to the supernatural. Three subsequent chapters develop these theses.

A clay model inscribed in Babylonian cuneiform maps the prognostications derived from each part of a sheep's liver, 2050-1750 BCE.

PHOTO: SCIENCE MUSEUM LONDON

In "Causality and World Order," Rochberg proposes that cuneiform scholars viewed nature as beholden to a set of laws. In "Observation of Astral Phenomena," she maintains that the cuneiform world was capable of engaging systematically with astronomical phenomena. In "Prediction and Explanation in Cuneiform Scholarship," she asserts that the cuneiform world's emphasis on celestial divination reveals a commitment to prognostication and interpretation.

The underlying difficulty of the project emerges plainly from a well-known critique of Etruscan divination written by the ancient Roman philosopher Seneca and quoted twice by Rochberg: "While we believe that lightning is released as a result of the collision of clouds, they believe that clouds collide so as to cause lightning. For since they attribute everything to the gods' will, they believe not that things have a meaning insofar as they occur, but rather that they happen because they must have a meaning."

Seneca was both critical and respectful of Etruscan sophistication. This attitude provides a key, suggests Rochberg, to a proper present-day understanding of the cuneiform world's view of divination. She cites a typical example of cuneiform divination known as extispicy, in which the entrails of sacrificial animals were used to make predictions: "If the gall bladder is turned and has wrapped around the 'finger': The king will seize the enemy country." Here, omen and prognostication are linked by association or analogy and conform to the rule of inference, "if P, then Q."

Links were not limited to conceptual or empirical categories but were often phonetic or semantic in nature. "If the coils of the intestine look like the face of Huwawa: it is the omen of the usurper king who ruled all the lands." Here, "face of Huwawa" is written logographically as ḪUM.ḪUM, whereas "usurper king" is written phonetically as *ḫammā'u*, in a phonic echo.

Before Nature's formidable erudition will fascinate cuneiformists while daunting nonspecialists and disturbing scientists, who will likely recoil from regarding divination as part of science. For noncuneiformists, the book's most compelling parts will be its discussions of western civilization's philosophical attempts to define "nature," postdating the cuneiform world—from Aristotle to Einstein and his successors. "Real and independent as we may think nature and its orderliness are, the very notion of physical phenomena being subject to laws is a profoundly cultural claim, one that imparts a human value to the world external to human society," argues Rochberg. ■

The reviewer is the author of The Story of Writing (Thames & Hudson) and Writing and Script: A Very Short Introduction *(Oxford University Press). Email: andrew@andrew-robinson.org*

10.1126/science.aal1557

Divining science
Andrew Robinson (December 22, 2016)
Science **354** (6319), 1539. [doi: 10.1126/science.aal1557]

Editor's Summary

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published weekly, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005.