BOOK REVIEWS

Mercury, by William Sheehan (London, Reaktion Books, 2018). Pp. 183. ISBN 978-1-7891-4012-5 (hardback), 175 × 225 mm, US $40.

This book on Mercury by William Sheehan is part of the Solar System series currently being published by Reaktion Press. Titles on the Sun and the Moon were reviewed in the last issue of the *JAHH*. As an historian of astronomy Sheehan gives us a thorough survey of the early telescopic observations of Mercury. This is an unrelieved tale of hope and delusion related in such an engaging way that much of the book is a genuine page-turner.

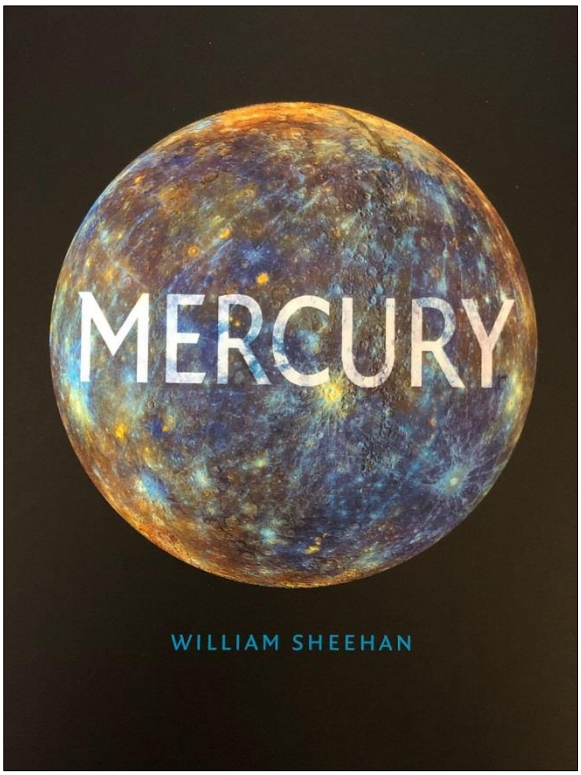
Sheehan begins with rare transit observations in the seventeenth century and Johann Schroeter's study of Mercury which did not get published until 1881, long after his death in 1816 (note that he spelled his own name 'Schroeter', not 'Schröter' as in Sheehan's book). The real missed opportunity of the nineteenth century came when the study of Karl Zöllner was overlooked. He wrote that Mercury, like our Moon, is an airless body, in contradict-tion to the widely held view that it had an atmosphere. But "Later observers would pay dearly for their failure to take heed of his findings," laments Sheehan (p. 40).

After more than a century of Mercurian studies, the telescopic era culminated in the work of Eugene Antoniadi who approached his study of Mercury with the belief that Schiaparelli's Martian canals had "… a basis in reality." (p. 69). After five years of observing Mercury, Antoniadi published his results in 1929. He confirmed the results of Schiaparelli (who also studied Mercury) on the rotation period of Mercury, its libration and the existence of clouds. "Since, as we now know, all of these conclusions were wrong, it was a remarkable performance …" deadpans Sheehan (p. 73). A perfect way to express a total rout of the best telescopic observations of Mercury!

With decades of study relegated to the waste bin of history (but not before misleading the public in its perception of Mercury), it was left to radio astronomy to give us our first real data on Mercury. "The clincher came in 1965 …" Sheehan writes (p. 77). That is when a good value for the period of rotation of the planet, 59 days, put the 88-day period believed until then in the best-forgotten file. In 2018 Europe launched the BepiColumbo spacecraft to study Mercury. It was named after an expert in celestial mechanics who realised from this early radio data that Mercury was in a 3:2 resonance with the Sun, making its rotation period 58.65 days.

This "… rotation period came as a complete shock to planetary astronomers." (p. 79). Sheehan describes his own forensic study of what he terms the 'Schiaparelli case', by tracking down Schiaparelli's original logbooks at Brera Observatory in Milan. He teamed up with John Boudreau who spent several years obtaining CCD images that could be matched up with the 150 sketches of Mercury found in the archives. I would like to have seen more detail on this fascinating piece of detective work, which is condensed into just 2 pages.

A chapter on spacecraft observations of Mercury is very finely illustrated, with numerous colour images. The author gives us an excellent idea of our current physical understanding of the



planet, including its internal iron core, weak magnetic field, and existence of ice in some crater floors where the Sun never shines to heat it up.

A final 21-page chapter deals with trying to explain the precession of Mercury's orbit that violated the Newtonian law of gravitation. Starting with an image of a statue of LeVerrier and ending with a description of planetary migration, this is an all-encompassing explanation of how the great problem was solved by Einstein. Sheehan aptly describes LeVerrier's final work on the problem in military terms as a "… ten-year siege." (p. 133). Unable to solve the problem, he was forced in 1859 to postulate "… additional mass inside the orbit of Mercury …" and thus began one of the most quixotic

episodes in the history of astronomy: the search for the planet Vulcan. Here Sheehan draws on his 1997 book with Richard Baum, *In Search of Planet Vulcan*.

The book concludes with three appendices: a glossary, basic data comparing Mercury with Earth, and a 4-page list of craters with their diameters, coordinates and origin of each name. It is an intriguing list, as we see the Indian poet Vyasa from 1500 BCE mingling with the likes of Sophocles, Rembrandt, Tolstoy and Mark Twain.

I noticed just three small glitches. On page 124 a Messenger photograph of the crater Raditladi has a caption indicating the image is color coded, but it is reproduced in B&W. On page 158 the equatorial inclination of Mercury is given as 0°, whereas the current NASA Solar System website gives a figure of 2°. On page 159, the (highly rarified) constituents of Mercury's atmosphere are missing.

With its up-to-date results and historical perspective, this is certainly the finest and most readable book available on our innermost planet.

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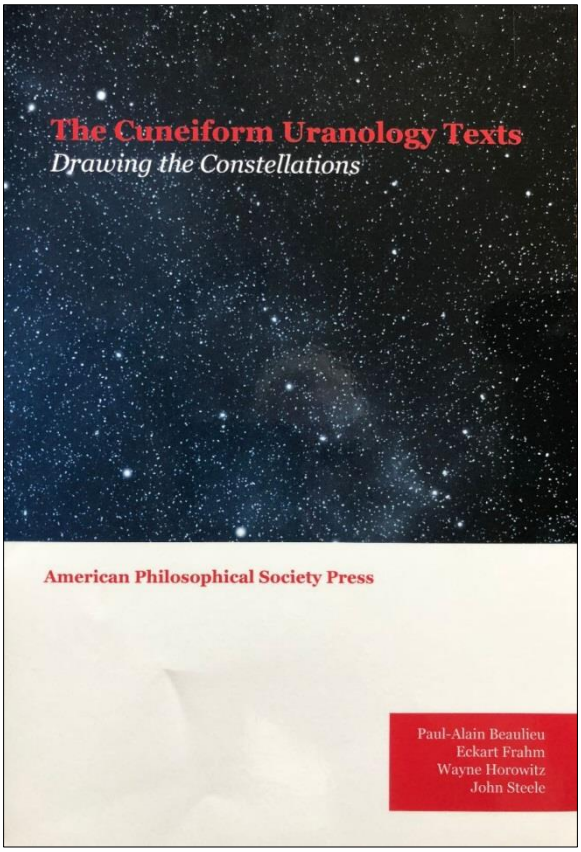
The Cuneiform Uranology Texts: Drawing the Constellations, by Paul-Alain Beaulieu, Eckart Frahm, Wayne Horowitz, and John Steele. Transactions of the American Philosophical Society 107, Part 2. (Philadelphia, American Philosophical Society Press, 2017). Pp. x + 122, 17 plts. ISBN 978-1-60618-072-3 (paperback), 254 × 171 mm, US $37.

The Mesopotamian fixed star heaven is far less understood than its Greek successor. While records of astronomical practices involving the sun, moon, and planets are much more proliferate in cuneiform sources, our understanding of the fixed stars mostly revolves around schematic constructs of risings and settings as well as using the fixed stars as points of reference in the sky. The identification of many stars still remains uncertain or even unknown. In particular, the imagery and composition of the constellations have proven elusive. This is partly due to the Mesopotamian designation of celestial objects, written with the logogram MUL, which can refer to stars, planets, constellations, parts of constellations, and other celestial objects such as comets.

Despite the many thousands of astronomical texts from Mesopotamia, up until recently only one text was known to describe how to draw the constellations. Published by Ernst Weidner (1927), for nearly a century it was a unique text. The choice of the verb "draw," as it appears in the subtitle of the book under review, is intentional. It reflects a long Mesopotamian tradition that refers to the constellations as being drawn in the skies by the gods (p. 2–4; see also Rochberg, 2009: 64–69). Recently, however, four more texts describing the constellations in a similar fashion were discovered, three at Yale University and one at the British Museum. Originally the result of work done independently by Paul-Alain Beaulieu and Wayne Horowitz, they later collaborated and were joined by the late John Britton. With Britton's passing, John Steele joined Beaulieu and Horowitz to provide his expertise in astronomy. Eckart Frahm later joined the group and provided contributions, particularly on the tablets at



Yale University. This book provides a full textual edition of the five texts, referred to as the Uranology group. It includes photos and copies (found in the plates at the end of the book), transliteration, translation, and commentaries, with the exception of the text originally published by Weidner, which lacks a copy.

Chapter 1 introduces the texts, dates them, and examines the possible connections between the five texts as well as their relationship to other astronomical texts that refer to constellations, such as MUL.APIN, Enūma Anu Enlil, the Astrolabe tradition, and the microzodiac texts containing graphic representations of the constellations. When comparing the repertoire of stars mentioned in the Uranology group to

other known listings of stars, the authors ascertain that "[t]here is good reason to believe that the repertoire of constellations in our group ultimately derives from Mul.Apin." (p. 12). Out of the five texts, three of them are near parallels and together are called the Simple Group. Source A, the text published by Weidner, is the most well preserved of the three as well as the earliest, dating to the Neo-Assyrian period. Sources B and C, whose stars partially overlap with Source A but not with one another, are dated to the Neo-Babylonian or Late Babylonian period and Late Persian or Early Hellenistic period respectively. The Late Babylonian Source D offers a much more intricate and elaborate description of the constellations and is dubbed the Expanded Version. Lastly, the poorly preserved Source E is also Late Babylonian. Geographically, with the exception of Source A from Assur and Source B from Babylon, the other texts can be traced to Uruk (p. 6–11). Source B and E contain uranology text only on one side of the tablet. The other side of both sources are unrelated to ways of drawing the constellations and their editions are given in appendices B and C respectively. The authors

> ... admit that at present we know very little about the genesis and history of our group, although we can say that the group must have been popular, at least in limited circles. (page 20),

given the long chronological and wide geographical distribution of the texts.

Chapters 2, 3, and 4 consist of the text editions of the Simple Group, Source D, and Source E respectively. Each chapter provides a transliteration, translation and commentary in a consecutive manner. As opposed to having the translation opposite the transliteration, the layout of the book as it is makes it occasionally difficult to examine the authors' work, as one has to page to three different locations in the book, if one also reviews the commentary simultaneously. Since chapter 2 encompasses Source A, B, and C, the transliteration is offered as a score, with no composite. By and large, the authors' edition of source A is similar to Weidner's, but they were able to restore some of the missing sections based on the parallels in the other Uranology sources,[1] as well as a better understanding of the vocabulary associated with these texts, developed since Weidner's1927 publication.[2]

The book concludes with chapter 5, in which the authors contemplate the impact the Uranology texts have on the wider understanding of Babylonian astronomy. They note that the group

> … provides a bridge between the mainstream astronomical cuneiform text traditions of the Neo-Assyrian period … and the small group of drawings of constellations on the later micro-zodiac texts ... [and] that the basic outline of the Mesopotamian sky as known in the Persian and Hellenistic period was already in place centuries before regular contact is documented between the cuneiform writing and the Greek-speaking worlds. (page 67).

The Uranology texts also confirm tentative identification of several star groups, such as the Wagon and the Wagon of Heaven as the Big Dipper and the Little Dipper respectively. The authors refer to the recent publication by Kurtik (2007) on star names multiple times, a work that has been critiqued to be incomplete and outdated by the time of its publication (Soltysiak, 2009). Yet this does not impede the valuable insight gained in analyzing the constituent elements of the constellations. The authors leave off with questions for future research, such as the unclear terminology used to describe some elements of the constellations and the exact modern equivalents of the Mesopotamian star names.

Three appendices help navigate the book. The first lists the Sumerian and Akkadian star names (when available), their translation, modern equivalents, and list of attestation in the Uranology group. It also includes a glossary of the technical terms used to describe parts and elements of the constellations such as different body parts or various items that are carried by or set next to the constellations. Appendix B is a text edition of the other side of Source B, since only one side of the tablet is related to drawing the constellations. The authors suggest that the side presented in Appendix B is a collection of observations of the heliacal phenomena of an inner planet, though due to the fragmentary nature of this side, it is not possible to date the observations (pages 82–83). Lastly, Appendix C discusses Source E, presenting its likely provenance and providing a textual edition of the side of the tablet that does not deal with drawing the constellation. Instead, the text seems to deal with the topography of the city of Uruk, its temples and watercourses. While the connection to the uranology text found on the opposite side of the tablet is unclear, it is important to remember that the chief deity of Uruk was the sky-god Anu, who experienced a major cult revival during the Late Babylonian period. Not surprisingly, the temple of Anu in Uruk was also a locus of production of astronomical knowledge (Rochberg, 1993).

The book excels in providing high quality editions of texts that, with the exception of Source A, have been previously unknown. While the authors contemplate the interconnection with other astronomical cuneiform texts, they do not delve deeper into the Uranology

group's place within Mesopotamian scholarship in general. For example, the book notes the order of presentation of the constituent elements that make up the constellations, such as human figure constellations described from top to bottom, or the preference of first describing the right side and then left (page 12). Yet how that relates to similar concepts of ordering found in other Mesopotamian sources such as lexical lists or divinatory literature lies beyond the scope of the book. Nonetheless, this volume serves as a substantial contribution to the study of Babylonian astronomy, particularly due to the lack of sources that deal with the fixed stars and the perception of the starry skies in Mesopotamian thought. It is a useful tool for Assyriologists and other scholars who are interested in the history of astronomy alike, especially those who wish to investigate the transmission of astronomical knowledge between the Mesopotamian world and the Greek. In particular, Source D provides new evidence for the transformation of the constellation "The Hired Man" into the Greek Aries by means of sign play (pages 45–46).[3]

Notes

1. E.g., Source A obv. 11-12 and obv. 14.
2. E.g., Source A rev. 9 for the authors' *i-maš-al* instead of ... *-maš-šá-* ... which is found in Weidner's edition.
3. Source D, column i, line 13: MUL.LÚ.LU.HUN.GÁ MUL.LU.HUN.GÁ ... The first sign sequence is the traditional way of writing the constellation's name, albeit with a superfluous, yet homophonous LU sign. The second omits the LÚ sign, the determiner for human beings or professions. Another reading of the LU sign is UDU, Akkadian *immeru*, "sheep." Note also the associations of this constellation in line 14 and the different spellings of the name in lines 14 and 15.

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