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Simulating Lunar Motions: Gıyās ed-Din Ibn Fath-Allah al-Baghdādī's Heart-Shaped Diagram in the Context of Ottoman Volvelles

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This study explores the role of volvelles in Ottoman astronomy, focusing on Gıyās ed-Din Ibn Fath-Allah al-Kātib al-Baghdādī's heart-shaped figure within a circular diagram in *Ta'rib Tāj al-Madākhil fī 'Ilm al-Nujūm*. Until now, Ottoman volvelles have primarily been encountered in practical works, such as calendars, with available information mainly limited to their usage. However, al-Baghdādī's heart-shaped diagram appears to function as an intermediate layer of a volvelle, aiding in the simulation of various aspects of lunar motion—including the phases of the Moon, the Moon's distance from the Sun, solar eclipses, and lunar eclipses—thus offering a deeper perspective on the theoretical foundations of volvelles used in 16th- and 17th-century Ottoman astronomy.

Although the origins of the Ottoman volvelle tradition remain insufficiently documented, al-Baghdādī's theoretical explanations provide valuable insights into their design's symbolism and astronomical functions. By situating this diagram within the broader context of Ottoman astronomical practices, this study sheds light on the symbolic and scientific roles of Ottoman volvelles and enhances our understanding of paper instruments in Ottoman astronomy.

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Short Biography

Gaye Danişan is a member of the Department of the History of Science at Istanbul University. Her research focuses on various aspects of Ottoman astronomy, including calendars, portable astronomical instruments, volvelles, navigation, astrology, and astrometeorology.

She earned her Bachelor's (2005) and Master's (2009) degrees in Astronomy and Space Sciences from Istanbul University and completed her PhD in the History of Science at the same institution in 2016, with a dissertation titled "Ottoman Nautical Astronomy and Astronomical Instruments in the 16th Century."

Danişan's academic experience includes postdoctoral research at the History of Science Museum, Oxford University (2017-2018), where she worked on the project "Ottoman Portable Astronomical Instruments and Their Use: A Comparative Study for the 16th Century," funded by the TUBITAK-2219 program. She also led a

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Currently, she is leading the research project, Portable Astronomical Instruments: The Processes of Adaptation and Diffusion of Medieval Islamic and Early Modern European Examples in Ottoman Geography (1500-1700), funded by the Turkish Academy of Sciences—Outstanding Young Scientists Awards Program (TUBA-GEİP).

Keywords

Paper instruments, Ottoman volvelles, lunar motions, heart-shaped diagram, 16th-17th centuries

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