

Kaveh Niazi, *Qutb al-Dīn al-Shirāzī and the Configuration of the Heavens: A Comparison of Texts and Models* (Archimedes. New Studies in the History and Philosophy of Science and Technology, volume 35), Dordrecht & Heidelberg & New York & London: Springer, 2014. 188 pages. ISBN: 978-94-007-6998-4.

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Niazi's book on the great thinker and scientist Quṭb al-Dīn al-Shirāzī (1236-1311) is a welcome and thought-provoking study of a particularly rich period in the history of Islamic science. A short but dense book (153 pages, excluding appendices and bibliography), it covers a wide variety of issues pertaining to Arabic and Persian astronomy during the Ilkhanid period. At this time, a host of astronomers collectively known as the Marāgha School were conducting a remarkable program of astronomical observations and interpreting and revising the Ptolemaic astronomical legacy. This is also the period when Avicennian philosophy was diffused to various groups in Islamic society, notably among Shi'ite scholars and various Sunni madrasas. As a result, discussions and debates revolving around Avicennian logic, epistemology, physics, and metaphysics were occurring within the Islamic East's learned circles, a reality that sometimes blurred the line between the traditional Islamic disciplines and the sciences inherited from Antiquity.

The issue of the compatibility of Avicenna's philosophy with other spheres of Islamic learning and erudition—notably law and theology, but also traditional astronomy, astrology, and medicine—arose and eventually generated various new syntheses, as can be seen, for example, in the works of 'Abd al-Laṭīf al-Baghdādī. In the specific case of astronomy, however, the Avicennian heritage was overshadowed by the even greater influence and authority of the Ptolemaic corpus, which lay at the core of Islamic astronomy. It is primarily this tradition of interpreting, criticizing, and elaborating upon the Ptolemaic astronomical edifice that Shirāzī pursued in his own works, partly as a result of the influence of his master Naṣīr al-Dīn al-Ṭūsī. These two scholars fine-tuned and modified some of the Ptolemaic astronomical theories and models in light of their own observations and theoretical improvements.

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The book is divided into six brief chapters. Chapter 1 discusses methodological issues and key notions relevant to the history of Arabic and Persian science. Chapter 2 consists of a political and social survey of the Ilkhanid dynasty in Persia, with a focus on their scientific patronage. Chapter 3 investigates the various sources containing information about Shīrāzī's biography. Chapter 4 introduces Shīrāzī's astronomical sources and works. Chapter 5 analyzes the content and interrelationship of his Arabic and Persian astronomical works. In chapter 6, the author provides some valuable concluding remarks on the core conceptual issues raised throughout the study. In addition, the book contains five appendices, an index, and a bibliography. As can be inferred from the foregoing, it combines a technical analysis of astronomical material found in Shīrāzī's works with social, literary, and cultural musings. The general impression is a compelling discussion of the evidence pertaining to his astronomical activity against the cultural and social background of this period.

The study provides a rich picture of Muslim scholars' scientific accomplishments under Ilkhanid rule by using the works of Shīrāzī as a window into this fascinating period. The author provides detailed background information on the patronage networks that supported and informed this thinker's scientific activity and professional trajectory and also locates his life and work within the backdrop of his era's political and social dynamics (chapters 1-3). This part sets the stage for the second part's (chapters 4-6) examination of Shīrāzī's astronomical works, where the author provides a comparative analysis of their content, structure, and form. These works consist of the *Nihāya* and the *Tuḥfa*, both composed in Arabic, and of the *Ikhtiyārāt*, composed in Persian.

Niazi investigates key questions pertaining to these works' chronology and textual interrelationships, paying particular attention to literary genre and categorization. In this regard, one crucial motivating objective is his desire to expose the interface between astronomical content and literary form in Shīrāzī's oeuvre so that he can assess the extent to which language—Arabic or Persian—and literary genre—short, propaedeutic works as opposed to longer and more technical works and commentaries—impacted the scientific content and argumentation deployed in these works. Niazi seeks to expose a potential correlation between linguistic and textual factors on the one hand, and astronomical theories on the other, by conducting a comparative analysis of the evidence. His starting-point is the claim that Persian astronomical works have been unfairly assessed and inadequately studied by modern historians of astronomy and, hence, that our picture of this specific tradition as a whole is skewed and in need of revision. As Niazi writes, the “blanket claims as to the mediocrity of *hay'a* texts that were written in Persian are utterly unwarranted” (p. 126).

His main argument in this connection is that Shīrāzī's Persian-language *Ikhtiyārāt*, which has traditionally been regarded as a derivative and lesser item of his scientific output, in fact contains interesting and valuable material that should be subjected to careful analysis and comparative scrutiny. Accordingly, it should not be regarded merely as a popular and simplified translation of his Arabic-language *Nihāya*, but rather as an independent treatise that contains original astronomical material. In fact, the author opines that its interpretation enables a better understanding of the astronomical models and hypotheses that Shīrāzī posited to explain celestial motion. Although it is tempting to extrapolate Niazī's analysis of the *Ikhtiyārāt* to the broader production of Persian *hay'a* works of the post-classical period of Islamic intellectual history, the author is conscious that more research needs to be carried out to vindicate his findings. Regardless, the book examines little-studied Persian astronomical sources and contributes to rehabilitating them while simultaneously providing a fresh interpretation of Shīrāzī's astronomical activity.

Niazī's exploration of the interrelationship of language, literary genre, and astronomical content is only one of this book's appealing aspects. In addition, the author provides a technical and meticulous review of Shīrāzī's main theoretical innovations and departure from earlier astronomical accounts. This makes it easier to situate his astronomical contribution, both with regard to the previous Ptolemaic tradition in Islam and to later scientific activity up to the Renaissance. The bulk of the analysis in this regard focuses on Shīrāzī's elaboration of astronomical models or hypotheses (*uṣūl*), geometric devices posited to explain the planets' particular motions. In the case of Shīrāzī and many other scientists who wrote in Arabic, however, these planetary models also assumed a physical, concrete form since they were thought to correspond to celestial bodies, whether concentric or eccentric orbs and spheres, that supported and carried the planets through the firmament.

This point raises the key issue of the relationship between mathematics and physics in the pursuit of astronomy, which post-classical astronomers like Shīrāzī spent much time and effort trying to clarify. The crux of the issue revolved around the place of physical laws and concepts in the astronomical method and on the connection between (what appeared to be) purely abstract geometrical models hypothesized by human observers to predict the planets' trajectories and actual physical constitution and nature. Philosophical and scientific reflection on this topic, which had flourished in Antiquity and Late Antiquity, resurfaced in the works of early philosophers and scientists who wrote in Arabic (e.g., al-Kindī, al-Fārābī, Thābit ibn Qurra, Ibn Sinā, and Ibn al-Ḥaytham). Shīrāzī shares this crucial methodological feature and conceptual concern with the Greek tradition and these earlier luminaries.

Niazi's discussion of this particular aspect is interesting and important, given its ramifications for the history of classical Islamic science. However, given its centrality to Shīrāzī's astronomical thought and its general significance for Islamic intellectual history, one wishes the author had provided a more extensive treatment of this topic and a more detailed contextualization of the main issues, not only with regard to the Ptolemaic tradition, but, more immediately, to the works of earlier Arabic and Persian thinkers. In other words, the book merely touches upon some of the fundamental questions pertaining to Greek and Islamic astronomy that require deeper analysis.

In this connection, the author appears to have been undecided as to whether to write a book on the social and cultural history of science under the Ilkhanids or a more technical work exclusively devoted to analyzing Shīrāzī's planetary models and views about the astronomical method. As it stands, the book partially achieves both aims but at considerable expense, since readers acquainted with the main theoretical issues raised will be left wanting additional clarifications. Having devoted more than sixty pages to background historical information and Shīrāzī's biography, the author then investigates the intricate and rich astronomical problems outlined above in the remaining sixty or seventy pages (pp. 85-152; however, pages 145-52 are concluding remarks). Unfortunately these two tendencies are not thoroughly integrated and therefore hinder a full analysis of the main conceptual issues identified by the author.

These problems stem, presumably, from the fact that he did not sufficiently revise his doctoral dissertation before publishing the book. The process of transforming the dissertation into a printable monograph is apparent not only in the book's somewhat artificial structure, but also in a clumsy reference (p. 9, "the goal of this thesis..."). The book's structure and main chapters could have been more thoroughly reworked: the forty-page survey of Mongol history is too long and adds nothing substantial to the analysis of Shīrāzī's astronomical contribution. Although chapters 2 and 3 do provide interesting background information on his patronage and the cultural, social, and political background within which he operated, these are not essential to the technical discussion of his astronomical output. Conversely, the core analytical sections of the book, namely, chapters 4 and 5, could have been expanded, particularly when it comes to the crucial issue—not only in Shīrāzī, but also with regard to most astronomers and philosophers who wrote in Arabic—of the place of physics in the astronomical method. Finally, the book could have definitely benefited from better editing; there are typos galore and even a few incoherent sentences (e.g., p. 11.8-9, p. 11.27, and p. 146.23).

In spite of these points, Niazi's monograph represents a valuable addition to the corpus of modern studies on Islamic astronomy and intellectual history. It also raises a host of fascinating questions that should be investigated in greater depth.