***Teaching and Learning the Sciences in Islamicate Societies (800-1700)*,** by Sonja Brentjes (Turnhout, Belgium: Brepols, 2018), 334 pp., ISBN: 978-2-503-57445-5, $59.00USD, €45.00 (pb)

Studies on science in Islamic societies have been on the rise for a while. The book in question takes as its subject the learning and teaching of the sciences in Islamic (or "Islamicate," as the author adopts Marshall Hodgson's conceptualization) societies prior to the eighteenth century. It is penned by Sonja Brentjes, who has written extensively on various aspects of the mathematical sciences in Islamic societies. Her book is not a comprehensive account but rather "an erratic process, broken by many gaps and interrupted by too many questions I could not answer or perhaps not even ask," but it should also be added that she skillfully engages with the large number of primary and secondary sources (p. 262).

The main focus of the book is the mathematical sciences, but medicine, the occult sciences, and philosophical disciplines such as logic and natural philosophy are also covered. Brentjes's account is clear and reader-friendly, generally speaking. The subjects of the chapters seem to be determined on the basis of what Brentjes considers the major themes that inform the characteristics of science education in Islamic history. Having said this, one also detects a chronological order within each chapter. Covering the period of almost a millennium (800-1700), the book addresses numerous subjects, texts, scholars, and scientific currents from different geographies and periods, but Brentjes's account relies largely on scientific experiences in intellectual settings that can be geographically located in the areas of modern-day Egypt, Syria, Iraq, and Iran. While Muslim scholars are the main actors of the book, there are also references to science education in non-Muslim communities in Islamic societies.

In addition to the introduction, appendices — including lists of dynasties, scholars, and rulers mentioned in the book — and a bibliography, the book is composed of eight chapters. Chapter 1, "Contextualizing Learning and Teaching of the Sciences in Islamicate

Ilahiyat Studies p-ISSN: 1309-1786 / e-ISSN: 1309-1719
Volume 11 Number 1 Winter / Spring 2020 DOI: 10.12730/13091719.2020.111.203

To cite this article: Umut, Hasan. "Teaching and Learning the Sciences in Islamicate Societies (800-170), by Sonja Brentjes." *Ilahiyat Studies* 11, no. 1 (2020): 147-150 https://doi.org/10.12730/13091719.2020.111.203

Societies," aims to present an introductory overview to various contexts within which the education of science and philosophy emerged, as they were inherited from antiquity and then underwent several transformations until the late sixteenth century. This chapter also includes helpful maps to acquaint the reader with the geographical contexts of the developments in question. Chapter 2, "Teachers and Students at Courts and in Private Homes (Eighth-Twelfth Centuries)," deals with the pre-madrasah period during which the loci of teaching are mostly private homes and courts. By referring to several scholars and texts, Brentjes explains various forms of education that were prevalent during this period, namely, reading, writing, commenting, and compiling short treatises for answering specific questions. Chapter 3, "Schools of Advanced Education," is concerned with the formation and structure of advanced education, highlighting that the sciences were studied in such institutions as madrasahs, mosques, hospitals, houses for timekeepers, libraries, tombs, and Sufi lodges. Specialization and professionalization in science education are also mentioned as important processes observed in various parts of the Islamic world. Chapter 4, "The Sciences at Madrasas," is a continuation of the subject covered in the previous chapter, providing many examples of textbooks and various forms, topics, and methods of education as well as examples of teaching patterns related to the mathematical sciences, the medical sciences, natural philosophy, and the occult sciences. Chapter 5, "Other Teaching Institutions," deals with "other formalized kinds of" science education in Islamic societies, such as education in families and hospitals (p. 113). Also included is travelling as a form of teaching and learning. Again, Brentjes provides examples from various intellectual settings during the pre-modern and early modern periods. Chapter 6, "Teaching and Learning Methods," contains biographical sources, as well as scientific and philosophical texts, many of which have yet to be edited, providing information regarding the methods and prerequisites of studying various sciences in Islamic societies. Brentjes also introduces commentaries and glosses as crucial vehicles of education in the postclassical period. Chapter 7, "Encyclopedias and Classifications of the Sciences," deals with the importance of these genres in terms of the organization and representation of knowledge. In introducing the different types of sciences in terms of their content or the method of their compilation, this chapter points out transformations observed in those genres with respect to their format and length, as well as to the intellectual and

social backgrounds of their writers. Finally, Chapter 8, "Teaching Literature and Its Temporal Geographies," provides historical and content-based information, derived from a number of scientific and philosophical texts that were taught after the twelfth century in various places already introduced in previous chapters, such as institutions of learning and teaching.

As far as its place within the literature on the history of education in Islamic societies is concerned, Brentjes's book is a welcome contribution to the field, since unlike many other works, learning and teaching sciences is its main focus. Since the publication of George Makdisi's scholarship, Islamic education and its institutionalization have sparked a number of discussions with various approaches and interpretations. Makdisi identified the educational, administrative, and pedagogical characteristics of the madrasah as a well-defined and hierarchically structured model, and several studies published after him, including those of Brentjes, have attempted to challenge his theory by emphasizing the informal and teacher-oriented character of education in Islamic societies. According to this approach, education in Islamic history was not necessarily linked to an institution.

In the beginning of the book, Brentjes asserts "the individualistic and informal character of education in Islamicate societies before the introduction of modern Western systems to the Middle East, North Africa, and South Asia during the nineteenth century," but also notes that "this is not to say that no institutions of learning and teaching existed" (pp. 10-11). One wonders, then, how education could be individualistic and informal within an institutional context. According to Brentjes, the informal and individual character of teaching "means that teachers were socially more important in a scholar's self-representation than institutions" (p. 72). Moreover, she also concludes that this informality and teacher-centered model "combined to work against a systematic, sequential, disciplinary teaching of knowledge" (p. 111). In a similar vein, Brentjes also claims that philosophy and the mathematical sciences were "a matter of personal choice" (p. 147). Yet she also states that the mathematical and medical sciences, as well as natural philosophy and logic, "were the main beneficiaries of this fundamental change in which learning and teaching were institutionalized" (p. 11).

If I understand correctly, these seemingly contradictory arguments rely on the assumption that teachers for the most function

independently of their affiliated institutions. Of course, it may not be reasonable to propose a meta-theory that can be applied to all experiences of science education throughout Islamic history, and I do not claim that Brentjes does so. However, taking the opportunity that writing this review offers me, I would like to express the hope that future studies on education in Islamic societies be less interested in pitting the institution against the individual and focus more on proposing dynamic models that consider the institution as a nexus in which various agencies of education including teachers, students, physicians, and patients in the case of hospitals, texts and their disciplines, patrons, intellectual, social, and political/bureaucratic challenges, intellectual and scientific outlooks, and various kinds of networks are interrelated and embedded. In this respect, the example of the Ottoman experience might serve better to understand, in part, education in the early modern period, since a good number of Ottoman primary sources related to this subject has come down to us. As a growing number of new studies has observed, the Ottoman madrasah model should be understood with reference to various dynamics, including teachers, students, political and bureaucratic elites, and the institutionalization and hierarchization of the higher education system.

With its clarity and attempt to introduce the reader to a number of scholars, institutions, and texts on well-selected subjects, Sonja Brentjes's book is to be highly recommended for those interested in learning about the history of science and intellectual history within an Islamic context. I hope this work will attract more attention to the history of science education in Islamic societies.

ACKNOWLEDGMENTS

I am grateful to Dr. Sally P. Ragep for her feedback on a draft of this review.

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