



# CEEMSA

CHANGING EPISTEME IN EARLY  
MODERN SANSKRIT ASTRONOMY



KØBENHAVNS  
UNIVERSITET

*A conference on*

## Transmission, Translocation, and Transcreation *A cultural kinematics of astral knowledge*

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as a part of the

Project *Changing Episteme in Early Modern Sanskrit Astronomy* (CEEMSA, 2022–23)  
funded by the **GERDA HENKEL STIFTUNG** (grant agreement no. AZ 2 I/F/2 I)

hosted at the

Department of Cross-Cultural and Regional Studies  
University of Copenhagen  
13–15 November 2023

*Schedule of the talks*



*Book of titles and abstracts*

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This conference is generously supported by the **GERDA HENKEL STIFTUNG** as a part of the research project *Changing Episteme in Early Modern Sanskrit Astronomy* (grant agreement no. AZ 21/F/21).

*A conference on*

## Transmission, Translocation, and Transcreation

*A cultural kinematics of astral knowledge*

Copenhagen, 13–15 November 2023

THE MOVEMENT OF KNOWLEDGE ABOUT THE ASTRAL SCIENCES among and between its historical practitioners is a phenomenon driven by resolute adventurism insofar as adventure is understood as the journey of navigating the complex and ever-changing relationship between society, history, philosophy, and science. Through their bold voyages across political borders and historical times, these professional pundits have allowed us to glimpse at the ways in which language, logic, and structure get adopted and adapted to suit the changing paradigms of discourse in scientific societies. It is in their writings, then, that we can look for the mechanisms of transmission, translocation, and transcreation that shape the kinematics of knowledge exchange between cultures that have historically discoursed on the heavens at great length.

As a step in this direction, we have gathered a diverse group of scholars who are experts on various aspects of the history of astral sciences in the second millennium, from the material to the mathematical, in order to

1. describe the sociocultural milieu in which the astral sciences were discussed;
2. explain the linguistic adaptations, conceptual innovations, and philosophical arguments made in translating the astral sciences in those milieu; and
3. show how structural changes in the knowledge systems of societies are both conservative and transformative phenomena.

### INVITED SPEAKERS

1. [Matthieu HUSSON](#), CNRS, Observatoire de Paris, France
2. [Yoichi ISAHAYA](#), Slavic-Eurasian Research Center, Hokkaido University, Japan
3. [Divna MANOLOVA](#), Université PSL-Observatoire de Paris, SYRTE, CNRS, France
4. [Eva ORTHMANN](#), Institute of Iranian Studies, University of Göttingen, Germany
5. [Adrian PIRTEA](#), Austrian Academy of Sciences, Austria
6. [Pouyan REZVANI](#), Bavarian Academy of Sciences and Humanities, Germany
7. [Scott TRIGG](#), Observatoire de Paris, France
8. [Dror WEIL](#), University of Cambridge, United Kingdom

## SUMMARY OF THE TALKS

THE ORIGINS OF THIS CONFERENCE lie in the workings of the project *Changing Episteme in Early Modern Sanskrit Astronomy* that examines the reception of medieval Islamicate (Arabic and Persian) ideas in the practices of Sanskrit astral sciences of early-modern Mughal India. And hence, by way of the inaugural presentation (jointly presented by Jean Arzoumanov and Anuj Misra) highlighting the project's findings, we first learn of the linguistic and cognitive intimacy with which a seventeenth-century Hindu astronomer writing in Sanskrit at the court of Mughal Emperor Shāh Jahān (r. 1628–58) translates the astronomical tables (*zīj*) of his Muslim colleague written in Persian. ↓

*Session 1* Expanding on this culture of courtly astronomy, we are then led (by Eva Orthmann) to discover the rich tapestry of astrological texts and practices thriving in the Mughal world, with special attention to their interwoven connections with astral magic and occult sciences. ↓ And going further, as if to voyage beyond the shores of India carrying its stories, we hear (from Adrian Pirtea) about the cosmopolitan conversations on pseudo-planets and eclipse deities in medieval Eurasia. ↓

*Session 2* Staying momentarily in medieval Byzantium, we are given a glimpse (by Divna Manolova) of how a complex cluster of mathematical, astral, and exegetical texts related to the Greek didactic poet Aratus of Soli (d. ante 239 BCE) came to be utilised in teaching and learning from the late thirteenth century on in ever-changing ways. ↓ And then venturing forth, we arrive in late-medieval Europe where we learn (from Matthieu Husson) how the awareness of the historicity of astronomical practices found its expression in the Latin Alfonsine tradition, and how such expressions can indeed be seen as characteristics of individual astronomical cultures. ↓

*Session 3* Returning eastwards, we are taken (by Yoichi Isahaya) to the Mongol empire (1206–1368) where the dialogues between Islamicate and Chinese astral sciences revolved around horoscopic astrology to overcome an incommensurability in the astro-calendrical traditions prevalent in the East and West of Eurasia. ↓ And then, in an apparent antithesis, we learn (from Dror Weil) how Arabo-Persian astral knowledge came to be adaptively institutionalised in the imperial and plebeian settings of early-modern China. ↓

*Session 4* Stepping back in time to the early-medieval Abbasid world, we are led (by Pouyan Rezvani) into examining the very concept of translation by way of two ninth-century Arabic translations of Ptolemy's *Almagest* that formulate the same text in mutually distinguishable ways. ↓ And finally, arriving in early-modern Samarqand, we learn (from Scott Trigg) about the role of fifteenth-century Arabic commentaries in the study of theoretical astronomy (*ilm al-bay'a*) within the context of institutionalised pedagogy. ↓

## SCHEDULE OF THE TALKS

*Transmission, Translocation, and Transcreation: A cultural kinematics of astral knowledge*

Copenhagen, 13–15 November 2023

(All times indicated are Central European Time, GMT+1)

<i>Day 1</i>		(13 November)
12:00–12:15	Welcome address <i>Inaugural presentation</i>	
12:15–13:00	Jean ARZOUMANOV and Anuj MISRA <i>On the Changing Episteme in Early Modern Sanskrit Astronomy</i> ↓	
13:00–13:15	Refreshments	
	<i>Session 1</i>	Chaired by Divna MANOLOVA
13:15–14:30	Eva ORTHMANN <i>Astrology at the Mughal Court</i> ↓	
14:30–14:45	Pause	
14:45–16:00	Adrian PIRTEA <i>Pseudo-Planets and Eclipse Deities in the Astral Sciences of Medieval Eurasia</i> ↓	
16:00–16:15	Refreshments	
	<i>Special presentation of the <a href="#">Kenneth G. Zysk Indological Manuscript Collection</a></i>	
16:15–17:00	Jacob SCHMIDT-MADSEN <i>Passage To India: South Asian Manuscripts at Copenhagen University</i>	
<i>Day 2</i>		(14 November)
09:00–09:15	Introduction to the day's talks	
	<i>Session 2</i>	Chaired by Scott TRIGG
09:15–10:30	Divna MANOLOVA <i>Aratus in Byzantine Schools: The Case of Vaticanus graecus 191</i> ↓	
10:30–10:45	Pause	
10:45–12:00	Matthieu HUSSON <i>Historicalities as Components of Astronomical Cultures: A Case Study from Alfonsine Astronomy</i> ↓	
12:00–13:15	Lunch	
	<i>Session 3</i>	Chaired by Matthieu HUSSON
13:15–14:30	Yoichi ISAHAYA <i>Beyond Commensurability: Chinese Calendar in Islamicate Astronomical Handbook in the Period of the Mongol Empire (1206–1368)</i> ↓	
14:30–14:45	Pause	
14:45–16:00	Dror WEIL <i>The Naturalisation of Arabo-Persian Astral Knowledge in Early-Modern China</i> ↓	
16:00–16:30	General discussions	

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09:00–09:15 Introduction to the day's talks

*Session 4*

Chaired by Dror WEIL

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09:15–10:30 Pouyan REZVANI

*A Comparative Survey of Two Ninth-Century Arabic Translations of Ptolemy's Almagest: Their Methods and Terminology* ↓

10:30–10:45 Pause

10:45–12:00 Scott TRIGG

*"I have discerned the flame in the deserts of these mathematical sciences": Qāḍīzādah al-Rūmī's Sharḥ al-Mulakhkhaṣ and the Transmission of Knowledge in Fifteenth-Century Islamicate Astronomy* ↓

12:00–12:15 Closing address

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*Inaugural presentation*

***On the Changing Episteme in Early Modern Sanskrit Astronomy***

*Jointly presented by*

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RECENT STUDIES HAVE HIGHLIGHTED the complex and dynamic nature of scientific discourses at the Mughal courts, where political and personal preferences influenced the admission and admonition of ideas across cultural lines. The biographical studies of Mughal royals and elites have shown us their proclivity for sponsoring scholarship in various disciplines; however, the institutionalisation of scientific patronage in the Mughal world, and its larger impact upon the knowledge systems of the societies that thrived in its ambit, remains a relatively understudied topic.

The project *Changing Episteme in Early Modern Sanskrit Astronomy* (Jan 2022–Dec 2023, funded by the [Gerda Henkel Stiftung](#), grant agreement no. AZ 21/F/21) set out to attempt this by first

1. examining the lives of the historical authors who were benefactors of this royal patronage, and then
2. understanding the language and structure of their arguments in appropriating, assimilating, or approximating peregrine ideas.

Our focus has been on the practice of astronomy in seventeenth-century Mughal India as Sanskrit Hindu astronomers conversed with their Persianate Muslim counterparts in an increasingly amalgamative world of language and culture. Here, as the astronomical theories of the Marāgha and Samarqand schools found voice in the metrical compositions of courtly Sanskrit astronomers, we find an epistemic shift in the standards of presenting and evaluating foreign scientific discourse.

And to discuss this transformation better, we present our findings on the Persian works of Mullā Farīd (d. 1629) and his brother Mullā Ṭayyīb, more specifically, the *Zīj-i Shāh Jahānī*, the astronomical tables they (co-)composed for the Mughal emperor Shāh Jahān (r. 1628–58), and on its near-contemporaneous Sanskrit translation, the *Siddhāntasindhu* of Nityānanda (fl. 1630/50).

By first presenting an overview of the lives and works of these Muslim astronomers, we highlight the more salient features of their compositions that typify the richness of cross-cultural discourses; in particular, their borrowings of Indian astrological concepts. This is then followed by a critical appraisal of the cultural stratagems in Nityānanda's *Siddhāntasindhu* to appropriate Islamic(ate) writings for Sanskrit readers; for example, in his renderings of the Islamic *ḥamd* (praise to Allah) and *na't* (praise of the Prophet) into Sanskrit.

*Keywords* Mughal India, Sanskrit astronomy, Islamicate astral sciences, language of translation.



## *Historicalities as Components of Astronomical Cultures: A Case Study from Alfonsine Astronomy*

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IN THE PAST YEARS AND IN VARIOUS (JOINT) PUBLICATIONS AND COMMUNICATIONS, I have explored with colleagues the temporal dimensions of the astronomical practices of computations, observations, and manipulation of instruments. Considering, in some details, the ways in which the sequentiality of these practices are presented in the sources that attest them, have offered a fruitful approach to gain insights which are otherwise difficult to obtain. Following on this idea, I would like to experiment here with a similar proposition at a broader level.

The means and tools used by astronomers in a given context for their practices generally have a long history—e.g., observation records, numerical tables, or instruments often constitute long-term traditions—which gets expressed in various ways in the sources: both explicitly (e.g. using the *Almagest* observations of Mars) or implicitly (e.g., *not* using the *Almagest* observations of Mars in spite of them being known). I want to try to grasp clues in the sources which would allow us to understand how an awareness of the historical dimension of astronomical practices is expressed in a given context, and how astronomers rely on this to develop their knowledge of celestial phenomena.

In the context of Alfonsine astronomy, I will first follow the thread of ‘computations tools’ and compare the *Parisian Alfonsine Tables* with the *Tabule Resolute*—two Alfonsine table sets with a very different relation to this historical dimension. This will lead me to the question of mean motions and observations, especially for very slow motion like precession, a topic on which Alfonsine astronomers also developed some peculiar views. Finally, I will also consider how some Alfonsine astronomers developed forms of historiographical discourses on astronomy.

Overall, these different series of clues constitute a kind of specific profile of historicity that might be characteristic of a given astronomical culture. Of course in different contexts, one will have to rely on different clues in the sources and an entirely different range of attitudes from astronomers are likely to be found. I hypothesise that shifts, contrasts, and overlaps between the different historicalities thus revealed may prove fruitful markers to understand deep and important changes in the history of astronomy.

*Keywords* Historicity, astronomical cultures, Latin Alfonsine astronomy.

*Beyond Commensurability: Chinese Calendar in Islamicate Astronomical Handbook in the Period of the Mongol Empire (1206–1368)*

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THE POLITICAL UNIFICATION OF CENTRAL EURASIA by the Mongol empire (1206–1368) lowered social, economic, and cultural barriers on an Afro-Eurasian scale. However, even in this age of high mobility, there were only a few cases of direct cross-cultural collaboration between astronomers/astrologers from the western and eastern Eurasia against the backdrop of the high, often unbridgeable, differences between the Islamicate and Chinese astral sciences. These premises have emphasised the historical importance of the Chinese calendar in Persian (Cathay calendar), which appears in the *Zīj-i ilḡānī* (Ilḡānīd astronomical handbook) by Naṣīr al-Dīn al-Ṭūsī (1201–74) as a result of his ‘astronomical dialogue’ with Fu Mengzhi 傅孟質 (fl. 1250s).

Investigation into the contents reveals that the Cathay calendar relied on an ‘official’ astronomical system (*Chongxiu daming li* 重修大明曆) of the same period in China for its astronomical constants, while at the same time, used simplified calculation method based on an ‘unofficial’ astronomical system (*Futian li* 符天曆) compiled in the Tang period (618–907) to obtain various numerical values. In the Chinese world, the *Futian li* was used for horoscopic astrology which purposed to predict a person’s life on the basis of a diagram of planetary positions at a peculiar moment—usually the time of one’s birth. The ‘astronomical dialogue’ might have revolved around the horoscopic astrology on the grounds that only this kind of astrology enabled to overcome the ‘incommensurability’ between the two astral traditions in the East and West of Eurasia, as casting horoscopes was very popular in the Islamicate world and also known in the Chinese world.

In this paper, I focus on this ‘astronomical dialogue’, paying due attention to the ‘disconnectivity’ in addition to the ‘connectivity’. In fact, the encounter between Eastern and Western astronomical knowledge in Mongol Eurasia cannot be simply divided into possible and impossible in terms of its (in)commensurability; the phenomena had the following four levels of gradation: (i) understood and connected, (ii) understood but did not connect due to underestimation, (iii) understood (to some extent) but did not connect, and (iv) neither understood nor connected. What kind of traditions and structures existed in the ‘astronomical knowledge’ of the East and West? Which parts of them were connected or not connected to each other? By considering these questions, I aim to provide a glimpse into the world history of astral sciences in the course of this talk.

*Keywords* Chinese astronomical system (*li* 曆), Islamicate astronomical handbook (*zīj*), Mongol Empire (1206–1368), commensurability, Naṣīr al-Dīn al-Ṭūsī (1201–74).

## *Aratus in Byzantine Schools: The Case of Vaticanus graecus 191*

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A READER'S NOTE IN A TWELFTH-CENTURY BYZANTINE MANUSCRIPT, now preserved in Milan, reports on the educational context and importance of two didactic poems, namely the astronomical *Phaenomena* by Aratus of Soli (d. before 239 BCE) and the geographical *Periegesis* or *Description of the Known World* by Dionysius of Alexandria (second century CE). While the *Periegesis* described the geographical map, the *Phaenomena* dealt with the celestial sphere. Thus, the medieval reader underscored, the two poems complemented each other in their engagement with nature and the cosmos. As shown by Pérez Martín and Cruz Andreotti, the *Periegesis* and the *Phaenomena* were very popular in Byzantium and were continually used for instructional purposes.

The *Phaenomena*, much like the introductory cosmological and astronomical Stoic work *The Heavens* by Cleomedes (written at some point before 200 CE and certainly after c. 50 BCE), is not only preserved and commented upon in Byzantine manuscripts but also, in effect, 'reactivated' from the thirteenth century onwards, in Byzantine schools for the purposes of their curricula. In other words, while in the twelfth century the *Phaenomena* was grouped with other didactic poems based on its form, from the late thirteenth century, the context of its preservation and circulation changes. Its form is no longer the leading criterion, and the pattern of its textual associations diversifies. Indeed, the *Phaenomena* and *The Heavens*, texts in verse and in prose, are from then on put side by side in multiple-text manuscripts. Richard Goulet has even proposed that one was meant to serve as an introduction to the other.

My contribution takes its cue from the corpus of c. 60 medieval Greek manuscripts preserving the *Phaenomena* as well as related Aratean material such as commentaries, excerpts, introductions, doxography, and albeit very rarely, diagrams and illustrations. It focuses on a late-thirteenth-century codex, namely Biblioteca Apostolica Vaticana, *Vat. gr.* 191. This multiple-text codex contains works on subjects within the thematic scope of both the mathematical and the astral sciences (optics, spherics, astronomy, astrology, harmonics). It also includes a cluster of introductory exegetical literature related to Aratus' *Phaenomena* such as (i) Aratus' *Life* (ff. 203v–204r), featured as part of (ii) an introduction which, in turn, claims to be excerpted from Achilles Tatius' *On the Universe* (ff. 194v–203r, 204r–205r), (iii) commentaries on the *Phaenomena* by Eratosthenes and Hipparchus, as well as (iv) scholia and diagrams (ff. 207r–228v). Of special importance is a diagrammatic map of the *oikoumene* or the inhabited world on f. 209v. This map is preserved in three other Aratean manuscripts dating respectively to the thirteenth, fourteenth, and the sixteenth centuries.

In my paper, I examine the Aratean cluster preserved in *Vat. gr.* 191 (ff. 194v–228v) for evidence of its use in teaching and learning. My goal is to propose an explanation for the detected change in the way the Aratean material was utilised in Byzantium from the late thirteenth century onwards, and to see if this development correlates with changes in the educational infrastructures, curricula, and the imperial and private sponsorship of the study of the astral sciences. Finally, I will discuss the diagrammatic map as a test case for interrogating the idea of an *oikoumene*, of 'our world', of the inhabited world, to elucidate how Byzantine scholars of the period positioned themselves in relation to the other inhabitants of the known world and to their respective pursuits of knowledge.

*Keywords* Aratus, didactic poetry, Byzantium, education, *oikoumene*.

## *Astrology at the Mughal Court*

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IN THE MUGHAL EMPIRE (1526–1857), astrology played an important role from early on. As the Timūrid tradition—best testified to in the splendid horoscope prepared for Iskandar Sulṭān—and the Indian tradition merged, both Hindu and Muslim astrologers were soon present at the royal court. During the reign of Humāyūn (r. 1530–40), astrology and astronomy were not only promoted, but also practised by the Emperor himself. We know that Humāyūn was actively involved in the interpretation of horoscopes, and also learn about a miscellany prepared by him containing, *inter alia*, an introduction into astronomy.

Under Humāyūn's successors, both astrology and astronomy continued to maintain their importance. Often, practitioners were asked to calculate the right moment for the entering a city, the beginning of a journey, or to predict the outcome of an illness. At the birth of princes, astrologers were usually present and drew the horoscope (natal chart) immediately after delivery. From early on, we find teams of Hindu and Muslim astrologers working together. However, their calculations were often based on different astronomical tables, for which reason, their horoscopes were also not the same. In the case of Akbar (r. 1556–1605), we even find four different natal horoscopes, since the exact astronomical constellation at the time of his birth was repeatedly recalculated during his lifetime and its interpretation adapted to the Emperor's life and politics.

In this talk, I will investigate the contexts in which astrologers are mentioned in Mughal sources, and to what extent their advice and their calculations were of practical relevance. The talk will also look into astrological texts produced in the early Mughal period, and any references therein to translations of Sanskrit text. The use of astrology in the context of astral magic will also be duly taken into account in this talk.

*Keywords* Astrology, Mughal India, Indo-Islamic influences, contexts and praxis, astral magic.

## *Pseudo-Planets and Eclipse Deities in the Astral Sciences of Medieval Eurasia*

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ALTHOUGH NATURALISTIC EXPLANATIONS OF SOLAR AND LUNAR ECLIPSES were widely known in the Middle Ages, by the eleventh century most traditions of astral knowledge in Eurasia and North Africa had incorporated a series of closely related notions of an eclipse deity/demon/dragon (or a pair thereof) into their calculations and predictions. In many instances, these deities were either identified with the two lunar nodes or described as real celestial bodies (called ‘pseudo-planets’ by some modern scholars). Probably the oldest attestation of this notion is the eclipse demon Rāhu, first mentioned in early Sanskrit treatises on astral science from the first centuries of the CE. From the Indian subcontinent, this understanding of eclipses gradually spread to other parts of Eurasia and North Africa, where it experienced multiple reinterpretations and adaptations. The reception of this peculiar ‘eclipse-planet theory’ (EPT) thus represents not only an extraordinary case of the transmission of astral knowledge during Late Antiquity and the Middle Ages, but also one of on-going cultural transcreation.

As part of a larger project to retrace the history of EPT in the astral sciences of pre-modern Eurasia, this paper will study how the interplay between different religious worldviews, cosmological systems and scientific traditions influenced the development of EPT in various historical and cultural contexts. After a brief history of research on the subject of eclipse deities and pseudo-planets, I will focus on a few lesser-known case studies which illustrate the complexity of this process.

First, I will discuss the reception of the Indian EPT in Central Asia, by looking at a Sogdian planetary omen text from Dunhuang (Pelliot sogdien 22). I will then turn to the writings of the Muslim polymath al-Bīrūnī (d. c. 1050), who was among the first authors to investigate the connections between the Arabo-Persian and the Indian versions of EPT. Finally, I will study how the Byzantine and Latin reception of Arabic and Persian astrology from the eleventh century onward enabled the introduction and popularity of EPT in the Mediterranean cultural sphere.

*Keywords* Eclipses, pseudo-planets, celestial dragon, Sanskrit astral literature, Arabo-Persian astrology, Central Asia, Byzantium, Medieval Mediterranean.

## *A Comparative Survey of Two Ninth-Century Arabic Translations of Ptolemy's Almagest: Their Methods and Terminology*

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AMONG THE NUMEROUS SECULAR GREEK TEXTS that were directly translated into Arabic during the eighth to the tenth centuries of the CE, Ptolemy's *Almagest* was one of the most well-received works. According to historical accounts, at least five Arabic translations of the *Almagest* were prepared in the ninth century, all under the patronage of the Abbasid caliphs. The complete texts of two of these translations have survived in manuscripts. The earlier one is a translation by al-Ḥajjāj ibn Yūsuf ibn Maṭar (786–833) with the collaboration of Sirjūn ibn Hiliyya al-Rūmī that was commissioned by the caliph al-Ma'mūn (r. 813–33) in 827–28. The later one is a translation by Ishāq ibn Ḥunayn (c. 830–c. 911), revised by Thābit ibn Qurra (836–901), for Ismā'īl ibn Bulbul, the minister of the caliph al-Mu'tamid 'alā Allāh (r. 870–92). The latter became the most widespread medieval Arabic translation of the *Almagest*. In spite of the importance of the text, none of these translations has been thoroughly studied yet.

In this talk, I will compare selected passages of these two translations in order to show how different translators had distinguishable approaches in formulating the same text, focusing on the syntax and vocabulary. These passages contain both technical and general sentences, and are aimed at examining the role of the background knowledge of the translators in astronomy and mathematics, and the familiarity of their addresses with the subject in the formal aspects and quality of the translations. In the course of this comparison, also considering the original Greek text, I will discuss to what extent these translations are text-centred or reader-oriented, in order to provide a better picture of the concept of 'translation' in the ninth century.

*Keywords* *Almagest*, Graeco-Arabic translation, al-Ḥajjāj's translation, Ishāq-Thābit's translation, Ptolemy.

***“I have discerned the flame in the deserts of these mathematical sciences”: Qāḏīzādah al-Rūmī’s Sharḥ al-Mulakhkhaṣ and the Transmission of Knowledge in Fifteenth-Century Islamicate Astronomy***

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ULUGH BEG’S FIFTEENTH-CENTURY SAMARQAND OBSERVATORY, with its associated madrasa, is one of the most famous premodern scientific institutions, producing a new set of astronomical tables on the basis of astronomical observations that were not equalled until Tycho Brahe. Less is known, however, about the process of research and education at Samarqand, but a number of texts and commentaries produced by Samarqand scholars promise to shed light on the production and transmission of astronomical knowledge in this period. The first director of the observatory, Qāḏīzādah al-Rūmī, was also Ulugh Beg’s personal tutor and head of the madrasa. Qāḏīzādah dedicated his commentary on the early-thirteenth-century astronomical treatise *al-Mulakhkhaṣ fī al-ḥay’ā al-basīṭa* of al-Jaghmīnī to Ulugh Beg, and it later became one of the most popular intermediate-level astronomy textbooks read in Ottoman madrasas. Qāḏīzādah’s commentary itself was the subject of a super-commentary by his student Faḥallāh al-Shirwānī, which Shirwānī dedicated to the Ottoman Sulṭān Mehmed II after the conquest of Constantinople. With the recent publication of a critical edition of Jaghmīnī’s *Mulakhkhaṣ*, the time is ripe for the analyses of the subsequent commentary tradition.

In this paper, I delve into Qāḏīzādah’s commentary and Shirwānī’s super-commentary to explore the ways in which commentaries presented the discipline of theoretical astronomy (*ilm al-ḥay’ā*) in terms of its subject matter, sources, methods, and open problems or unresolved questions. Through the movement of scholars and texts, including these commentaries, we can trace the influence of the Samarqand observatory and madrasa on Ottoman science. Since they were intended for intermediate-level students, these texts do not present detailed critiques of Ptolemaic planetary models or new models that had been proposed in the advanced works of scholars such as Ṭūsī and Shīrāzī. Nevertheless, I show how these commentaries reflect an awareness of, and critical engagement with, problems in theoretical astronomy appropriate for madrasa students who may not have intended to become professional astronomers. I present these works as a case study in how commentaries functioned as a means of making as well as transmitting astronomical knowledge, highlighting how they served to fulfil both research and teaching goals within the context of an Islamic educational institution.

*Keywords* Islamicate astronomy, astronomical commentarial tradition, madrasas and observatories, Ottoman science, *ilm al-ḥay’ā* (theoretical astronomy).

## *The Naturalisation of Arabo-Persian Astral Knowledge in Early-Modern China*

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THE ESTABLISHMENT OF IMPERIAL OFFICES to accommodate Arabo-Persian sciences at China's Yuan court in the thirteenth century ushered in a period of almost four centuries of China's accommodation of Arabo-Persian astral knowledge. The changing sociopolitical landscape in China during that long period transformed the contexts in which Arabo-Persian astral theories and practices were studied and put into practice in China, both at court and in wider society.

In this talk, I will chart the various paths by which Arabo-Persian astral knowledge was received, translated, expanded, re-created, and embedded in local practices and discourses between the thirteenth and seventeenth centuries. My talk will discuss the institutional settings that facilitated the accommodation of different forms of Arabo-Persian astral knowledge at the imperial court and in local communities, as well as the processes of translation and naturalisation that endowed new currencies to such knowledge.

*Keywords* Sino-Islamicate astronomical exchange, early-modern China, courts and politics, science and translation, imperial dynasties of Yuan, Ming, and Qing.



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