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a cura di
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SOMMARIO

Alexandre M. Roberts

The Crossing Paths of Greek and Persian Knowledge in the 9th-century Arabic 'Book of Degrees'

The 8th-century Christian astrologer Theophilos of Edessa, probably writing in Greek, instructed his son to be steadfast in practicing astrology in the face of hostility. "You should with all attention and care cling to the science of astrology," he wrote, "and not waver in defending it from any slander, for it is the choicest and most eminent, the queen of all knowledge, even if it is for the most part mocked and ridiculed by many, and especially by some Church leaders."[1] Whatever attacks astrology suffered,

* I am grateful to Maria Mavroudi for her comments, guidance and advice throughout my work on this project, and to Susanna Elm and Massimo Pampaloni for inviting me to present my work in Rome. A Mellon Travel Grant from the Center for Middle Eastern Studies at UC Berkeley and a travel stipend from the UC Mediterranean Studies Multi-Campus Research Project made the trip possible. I would also like to thank Martin Schwartz for his comments on my discussion of Middle Persian derivations under the heading "Vocabulary" below (where his specific comments are noted). — This paper uses the following abbreviations: Agapius = A. A. Vasiliev. "Kitab al-'unvan: Histoire Universelle écrite par Agapius (Mahboub) de Menbidj [= Agapius, *Kitāb al-'unwān*]," *Patrologia Orientalis* 5 (1910): 561-692; CCAG = *Catalogus Codicum Astrologorum Graecorum*, 12 vols. (Bruxelles: Lamertin, 1898-1953); EI2 = *Encyclopedia of Islam*, [2nd] revised ed.; EI3 = *Encyclopedia of Islam, THREE*; EIr = *Encyclopedia Iranica*; GAL = Carl Brockelmann, *Geschichte der arabischen litteratur* (Leiden: Brill, 1943-); GAS = Fuat Sezgin, *Geschichte des arabischen Schrifttums*, 15 vols. (Leiden: Brill, 1967-); Graf, *GCAL* = Georg Graf, *Geschichte der christlichen arabischen Literatur*, 5 vols. (Biblioteca Apostolica Vaticana, 1944-1953); NP = *Der Neue Pauly* (Stuttgart, 1996-2003); ODB = *Oxford Dictionary of Byzantium*; Ptol.*Tetr.* = Ptolemy. *Claudii Ptolemaei opera quae exstant omnia. Volumen III, 1, Apotelesmatika*, ed. E. Boer and F. Boll (Leipzig: Teubner, 1940); ZDMG = *Zeitschrift der Deutschen Morgenländischen Gesellschaft*.

[1] Theophilos (d. 785) worked as an astrologer for the caliph al-Mahdī (775-785): D. Pingree, ODB s.v. "Theophilos of Edessa." While some of the texts attributed to Theophilos were in all likelihood written originally in Greek, others may be translations from Arabic: Maria Mavroudi, "Occult Sciences and Society in Byzantium: Considerations for Future Research," in *The Occult Sciences in Byzantium*, ed. Paul Magdalino and Maria Mavroudi (La Pomme d'or, 2006), 87 n. 148, who suggests that the particular text quoted here (CCAG 5.1:234-8) "could be an original composition in Greek because it quotes Genesis word-for-word in the version of the Septuagint." Quote: CCAG 5.1:235.10-14 [cited by Manfred Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (Leiden: Brill, 1972), 277]: δεῖ οὖν σε μετὰ πάσης προσοχῆς καὶ ἐπιμελείας ἔχεσθαι τῆς ἀστρολογικῆς ἐπιστήμης καὶ μὴ ἐνδοιάζειν ἴσχειν τὸ οἱονδήποτε σκάνδαλον ἀπ' αὐτῆς, διότι αἱρετή ἐστι καὶ ἐξοχωτάτη καὶ πάσης ἐπιστήμης δέσποινα, εἰ καὶ τὰ μάλιστα ὑπὸ πλειόνων σκώπτεται καὶ διασύρεται, κατεξαίρετον δὲ ὑπό τινων τῶν ἐκκλησιαστικῶν καθηγεμόνων.

this "queen" was avidly courted under Theophilos' patron al-Mahdī and other early Abbasid caliphs, and ever more texts on astral divination and its auxiliary discipline, astronomy, were translated into Arabic at the behest of private patrons and the caliph's court.[2] To lend it credibility in the eyes of its sponsors, astrology came to require a pedigree suitable to its new context, a history of the discipline as would establish that astrology's pronouncements were not arbitrary, as its detractors might allege, but based on an authoritative tradition of empirical observation.

This paper will examine one particular unpublished Arabic text of genethlialogical astrology, the 9th-century *Book of Degrees*, arguing that while it presents itself as heir to a Greek science deriving from India, it is also a testament to the pervasive role played by *Sasanian* intellectual culture in the 8th- to 10th-century Greek-Arabic translation movement. After a description of the *Book of Degrees* and its manuscripts (§1), I will turn to its technical vocabulary, focusing in particular on what its use of a Middle Persian technical term betrays about the text's origins and the intellectual tradition in which it is to be situated (§2). Finally, I will argue that the tension between the text's self-presentation as part of the ancient Greek astrological tradition and its Persian vocabulary can be resolved by considering how the text promotes itself: as a gateway to true knowledge through ancient science (§3).

1. *The Text: Manuscripts and Self-Presentation*

The *Book of Degrees*, or *Kitāb al-daraj*, is preserved in at least four manuscripts:[3] *Princeton Garrett Islamic* 501H (13th century), 66 ff. [= **P**];[4] *Nuruosmaniye* 2800 (13th century), 173a-189b [= **N**];[5] *Petersburg Asian Mu-*

Which domain of knowledge could claim the title of queen was not an uncontroversial topic; philosophy might also be chosen out, as in Ignatios the Deacon's 9th-century *Life* of Nikephoros (ed. C. de Boor [1880], 150 ll. 13-14; previous line cited by I. Ševčenko in *American Historical Review* 79.5 [1974] 1532-3). On ancient astrology, to which Abbasid astrology was largely heir, see Roger Beck, *A Brief History of Ancient Astrology* (Oxford: Blackwell, 2007).

[2] Dimitri Gutas, *Greek Thought, Arabic Culture: the Graeco-Arabic Translation Movement in Baghdad and Early 'Abbāsid Society (2nd-4th/8th-10th centuries)* (Routledge, 1998), 1-8.

[3] GAS 7.130.

[4] Before 659/1260-1. The text fills 65 folios, leaving one blank folio at the end. Cf. Philip K. Hitti, ed., *Descriptive Catalog of the Garrett Collection of Arabic Manuscripts in the Princeton University Library* (Princeton, 1938), #968.

[5] **N**'s text of the *Book of Degrees* was finished on 5 Ṣafar 659 = 9 January 1261 in Tokat, in Eastern Anatolia, near Trebizond, according to the colophon (**N**, f. 189b). Cf. Max Krause, "Stambuler Handschriften islamischer Mathematiker," *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik. Abteilung B: Studien* 3 (1936): 449; also GAS 7.130 (on the Banū Mūsā), 7.196 (on Abū Naṣr Aḥmad b. Sulaymān al-Munajjim, whose text appears in the

seum D.171/3 (17th century), ff. 44a-74a [= **R**];[6] and *Bankipore* 2476 (ca. 17th-18th century), 30ff. [= **B**].[7] In these four manuscripts, the text is ascribed to the Banū Mūsā, "Sons of Mūsā," three brothers of Persian descent famous for commissioning translations of scientific works into Arabic in the 9th century.[8] Each manuscript gives the book a slightly different title; in this paper I call it the *Book of Degrees* in accordance with **P**'s title, *Kitāb al-daraj*.[9] While the text is now bound with others in **R**[10] and **N**,[11] it appears on its own in **P** and **B**.

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same ms.); GAL S 1.868 (also on Abū Naṣr). Krause, 449 considers the text to end on f. 192a, but after the colophon on f. 189b, f. 190a is blank, then ff. 190b-191a contain a short text.

[6] Dated to before 1053/1643-4: Victor Rosen, *Collection scientifique de l'Institut des Langues Orientales du Ministère des affaires étrangères. I. Les manuscrits arabes de l'Institut des Langues Orientales* (Petersburg, 1877), 121-4, #191.

[7] 'Aẓīm al-Dīn Aḥmad et al., *Catalogue of the Arabic and Persian manuscripts in the Oriental public library at Bankipore. Vol. XXII: Science.* (Patna: Prepared for the government of Bihar, 1937), 110: "Written in Nasta'lîq. Not dated; apparently 12th century A.H."

[8] The text is ascribed to the Banū Mūsā in **P** ("… *li-Banī Musā*"; f. 1a [title page]), **R** ("*bi-Banī Mūsā b. Shākir*"; Rosen, 121-4, #191), **B** ("… *li-Banī Mūsā b. Shākir*"; Aḥmad et al., 110) and **N** ("… *bi-Banī Mūsā b. Shākir*"; ff. 172a and 189b).

[9] **B**'s title: *Darajāt al-kawākib*. **N**'s title: *Kitāb al-darajāt fī ṭabā'i' al-burūj* [Krause, 449]. **R**'s title: *Kitāb darajāt al-ma'rūf bi-Banī Mūsā b. Shākir fī ṭabā'i'i l-daraji manqūlan min kutubi l-Hind wa-ḥukamā'i l-Hind*. This title appears to be derived from the beginning of **N**'s colophon (*tamma kitābu darajāti l-ma'rūfi bi-Banī Mūsā b. Shākir fī ṭabā'i'i l-daraji, manqūlan min kutubi l-Hind wa-ḥukamā'i l-Hind*; **N**, f. 189b), which is consistent with **R** being copied from **N**. Rosen corrects *darajāt* to *al-darajāt*, but I believe the intended meaning is "The book of degrees by the one known as Banū Mūsā…" Since the Banū Mūsā are three people, not one, perhaps this derives from an earlier reading such as *Kitāb darajāt al-ma'rūfīn bi-Banī Mūsā* (the scribe of **B** also treats the Banū Mūsā as a single person when writing in the colophon "*mawlānā al-ma'rūf bi-Banī Mūsā b. Shākir*"). Alternatively, if Rosen's reading is used, then *bi-Banī* must become *li-Banī* — otherwise we have "The book of degrees (also) known as the Banū Mūsā…"

[10] **R**'s contents: (1) *Ikhtiyārāt mimmā allafahu Muḥammad b. Ya'qūb b. Nawbakht* (3 pp.); (2) an astrological work by Tekelsha, *Kitāb S-k-l-w-sh-' al-Qufāy min ahli Bābil fī ṣuwari daraji l-falaki wa-ba'ḍi dalā'ilihā 'alā mā ukhidha 'an al-qudamā'* (3a-15a, 17a-44a); (3) the *Book of Degrees* (ff. 44a-74a; for title, see n. 9 above); (4) Ps.-Ptolemy, *K. al-thamara* (= *Centiloquium*), with a commentary by the 10th-century courtier of the Tulunids, Aḥmad b. Yūsuf Ibn al-Dāya (ff. 74a-98b); several folios are missing from the end: Rosen, 123; for *K. al-thamara* and Aḥmad b. Yūsuf, cf. C. Burnett, EI3 s.v. "Astrology."

[11] **N**'s contents (not necessarily in this order; from the descriptions, it is not clear to me how the manuscript is arranged): (1) Ptolemy, *Kitāb al-thamara* (= *Centiloquium*), Arabic text with Persian translation and commentary, 30 ff. [Krause, 504-5]; (2) 'Alī b. Abī l-Rijāl al-Kātib [GAL 1.224] a poem in the *rajaz* meter "about astrology, with commentary by an unknown author," 70 ff. [Krause, 481]; (3) the *Book of Degrees*, 18 ff. [Krause, 449]; (4) 'Alī b. Muḥammad al-Khurāsānī, *Risāla fī l-ikhtiyārāt*, ff. 3-12 [Krause, 514]; (5) Abū Naṣr Aḥmad b. Sulaymān al-Munajjim, *Kitāb fī taḥāwīl sinī l-mawālīd*, 14 ff. [Krause, 514; there is further information about the scribe in this entry]; (6) Aḥmad b. Yūsuf, *Tafsīr kitāb al-thamara li-Bṭlmyws* (commentary on Ptolemy's *Kitāb al-thamara*/*Centiloquium*), 14 ff., incomplete and misbound [Krause, 460]; (7) Zaradusht's chapter on the fixed stars [on which see Paul Kunitzsch, "The chapter on fixed stars in Zarādusht's Kitāb al-Mawālīd," *Zeitschrift für Geschichte der arabisch-*

The ascription to the Banū Mūsā and a corresponding 9th-century date are given added plausibility by the evidence of the manuscripts. While **P** is dated paleographically and from the title-page dedication to the time of the Ayyubid prince al-Nāṣir Yūsuf (r. AH 634-659 = AD 1236-7 to 1260-61),[12] a collation of the translator's preface in **P** (ff. 1b-2a(8)) with **N** shows that the two witnesses are mutually independent, so that we can posit at least one common ancestor prior to **P**. Thus, the text must at least predate **P**. A collation of **N** with the transcription of this preface given in the catalog entry for **R** makes it highly plausible that **R** is a copy of **N** or otherwise directly descended from it (cf. n. 10). In this paper I will refer to the text as found in **P**, except for the preface, for which I use my own (unpublished) edition of the text based on **P**, **N** and a transcription of **R**.[13]

The *Book of Degrees* was intended as a beginner's reference guide for carrying out the particular brand of genethlialogical astrology which it promotes, as a comment near the end of the book makes clear.[14] The bulk of the book consists of a catalog of the characteristics of the seven "wandering stars" (i.e., planets, including the sun and the moon) and of all 360 degrees of the zodiac, intended to be used in interpreting a newborn's horoscope.[15] A translator's preface (§1, about 2 pages)[16] is followed by a two-part introduction to the book's contents, also by the translator[17] (§2, about 3 pages).[18] The Introduction announces that the book can explain why sometimes people born under the same sign have vastly different fortunes, going on to allege that the astrologers who seek to work without the book's contents come up with false predictions. Next, the translated book

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islamischen Wissenschaften 8 (1993): 241-249] = the fifth part of *Kitāb Zarādusht fī ṣuwar darajāt al-falak*, 14 ff. [Krause, 471; GAS 7.85].

[12] Dates for al-Nāṣir Yūsuf, son of al-'Azīz: Cl. Cahen, EI2 s.v. "Ayyubids."

[13] The transcription is that of Rosen, #191.

[14] There, the Banū Mūsā refer to another book which they translated, noting that, "most of the present book is included in that other book; the reader (*nāẓir*) should read this one first because of its lightness and small size, and because it is an introduction to that one": **P**, f. 65a.

[15] Hence, a later hand has written on **P**'s opening flyleaf: "The book of judgments/predictions of the degrees for newborns (for the) 12 zodiacal signs, by the Banū Mūsā" (*Kitāb aḥkāmi l-daraji li-l-mawālīdi ithnā 'ashara burjan li-Banī Mūsā*). Beside that is written: "An abridgment on the knowledge of measurements (of latitude and longitude?) in astronomy by one of the learned" (*Kitāb al-mukhtaṣari fī ma'rifati l-taqāwīmi fī 'ilmi l-falaki li-ba'ḍi l-fuḍalā'*). Perhaps this second book was originally bound with the *Book of Degrees*; or else this note is referring to the final section in which measurements and observations are discussed.

[16] **P**, ff. 1b-2a(8).

[17] The text introduces this section with the words "the book's authors said," *qāla aṣḥābu l-kitāb*: **P**, f. 2a(9). These "authors" should probably be understood to be the translators, since the section ends with the words "and this is the first thing which we translated from the book": **P**, f. 3b(5).

[18] **P**, ff. 2a(9)-2b(7), 2b(7)-3b(5). These parts are marked with rubrics in **P**.

itself begins, with a proem describing the division of the heavenly sphere into 360 degrees (§3, about 1 page).[19] Then come "the characteristics of the wandering stars" (§4, about 7 pages),[20] followed by the book's distinctively systematic description of the characteristics of every single degree of the zodiac (§5, over 100 pages).[21] The book ends with the translator's Afterword (§6, about 3 pages).[22]

The book's unusual genethlialogical table, which, to be of any use, requires extremely precise knowledge of the cosmological configuration at the moment of the nativity, appears to reflect a method similar to degree-by-degree methods already in use in the 2nd century.[23] This method's history, however, lies outside the scope of the present paper; instead, we turn now to the Banū Mūsā themselves.

Mūsā b. Shākir al-Munajjim was a Persian astrologer who joined the entourage of the caliph-to-be al-Ma'mūn at Marv, in Khurasan.[24] He had three sons, named Muḥammad, Aḥmad and al-Ḥasan, who were referred to collectively as the Banū Mūsā, "Sons of Mūsā." They received a top-notch technical education in Baghdad, after al-Ma'mūn took up residence in that city. After al-Ma'mūn's death in 833, his successors continued to fund their endeavors. While scientists in their own right — for example, they wrote a famous "Book of Ingenious Devices"[25] and on one occasion measured the circumference of the Earth[26] — the Banū Mūsā also became patrons of science, keeping translators of scientific texts, most famously the Sabian Thābit b. Qurra and the Nestorian Christian Ḥunayn b. Isḥāq, on their payroll.[27] In this way they played an important role in the 8th- to 10th-century translation movement, in which "practical" literature was translated into Arabic from Greek, Syriac and Persian — even if translations of Greek texts have tended to be stressed by modern scholars, in part because the impetus

[19] **P**, ff. 3b(6)-4a(2). This section is also separated from the text by a rubric in **P**.

[20] **P**, ff. 4a(3)-7a(4). Quote at **P**, f. 4a(3-4): *khawāṣṣ al-kawākib al-mutaḥayyira*.

[21] **P**, ff. 7a(5)-64a(7). This fourth and main section is organized by the 12 zodiacal signs, beginning, as is conventional, with Aries (*al-Ḥamal*), and for each of the signs there are 30 entries, numbered in red from 1 to 30. The entries range in length from 1 to about 10 lines, with most falling somewhere in the middle.

[22] **P**, ff. 64a(8)-65b.

[23] Ptolemy (2nd century) refers to a degree-by-degree method with disapproval. A 1st-century horoscope preserved in P.Lond. I 130 (cited by Simonetta Feraboli, ed., *Claudio Tolomeo: Le previsioni astrologiche (Tetrabiblos)* ([Milan]: Fondazione Lorenzo Valla, 1985), 395) gives precise descriptions of planetary positions, providing both degrees and minutes.

[24] Donald Routledge Hill, *The Book of Ingenious Devices (Kitāb al-ḥiyal) by the Banū Mūsā bin Shākir* (Dordrecht; Boston: D. Reidel Pub. Co., 1979), 3.

[25] *Kitāb al-ḥiyal*: ed. Hill.

[26] Hill, 4.

[27] D. R. Hill, EI2 s.v. "Mūsā, Banū" (7.640); M. Rekaya, EI2 s.v. "al-Ma'mūn…" (6.331).

for studying Arabic science has come largely from classicists seeking to recover scientific literature lost in the original.[28]

This modern-day emphasis on Arabic science's debt to the Greeks finds confirmation in the narrative of the history of astrology which the Banū Mūsā adopt in their Preface to the *Book of Degrees*, which begins:

> The ancients from among the Greeks obtained most of their astral sciences from India, and they arranged them by virtue of their cleverness and great talents… The most beneficial and generally useful thing in which they took an interest was astrology…[29]

While the Indians in this narrative are the originators of astral science, the Greeks are its elaborators. It is to this Greek elaboration that the Banū Mūsā seek to return us, since, as they explain, "… when we looked in the books available nowadays on … astrology, we found most of them deviating from correctness and from what the first of them" — presumably the Greeks — "wrote." The Greeks had perfected the art, but now contemporaries had made a muddle of it; but fortunately the Banū Mūsā have been diligent. The text continues, "and I found books by the ancients from among them" — again, presumably the Greeks —

> which later (authors) forsook because of their ignorance of how to use the books' contents and because of the books' distance from their minds; so I burdened myself with great weariness in translating them into the language of the Arabs. In that (endeavor), we sought the aid of the best translators of our time that we could find…[30]

We are not told explicitly in what language these old books were written, only that they were books containing the knowledge of the Greeks and that they were translated into Arabic. So far the Banū Mūsā have been speaking in general terms. Moving next to the *Book of Degrees* itself, they

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[28] G. Strohmaier, NP s.v. "Arabisch-islamisches Kulturgebiet (RWG)": "Seit dem E(nde) des 19. Jh. fungieren die sog(enannten) Graeco-Arabica als Hilfswiss(enschaft) der Klass(ischen) Philol(ogie) und der Philos(ophie)-, der Medizin- und Wissenschaftsgeschichte" (13.171).

[29] **P**, f. 1b: *inna l-qudamā'a min ahli l-yūnānīyati tasallamū akthara 'ulūmihimu l-nujūmīyati mina l-Hindi, fa-dabbarūhā bi-faḍli fiṭnatihim wa-qarā'iḥihim … wa-min ablaghi mā waqafū 'alayhi naf'an wa-a'ammihi fā'idatan 'ilmu aḥkāmi l-nujūm…*

[30] **P**, f. 1b: *wa-lammā naẓarnā fī l-kutubi l-mawjūdati l-āna fī ma'rifati aḥkāmi l-nujūmi, wajadnā aktharahā ḥā'idan 'ani l-ṣawābi wa-'an mā saṭarahu awwalūhum; wa-wajadtu li-qudamā'ihim kutuban qad hajarahā l-muta'akhkhirūna li-jahlihim bi-kayfīyati sti'māli mā fīhā, wa-bu'dihā 'an adhhānihim; fa-takallaftu l-ta'ba l-shadīda fī naqlihā ilā lughati l-'arabi, wa-sta'annā fī dhālika bi-afḍali man wajadnāhu mina l-nāqilīna fī zamāninā…*

announce, "We found three books by them," again referring, as it seems, to the ancient Greeks. These "three books," the third of which they only possess in incomplete form, are, they explain, to be collected together in the present volume.[31]

The narrative of scientific transmission which the Banū Mūsā espouse, then, is simple, neat and unidirectional: Indians to Greeks and now directly into the "language of the Arabs."

2. *Vocabulary*

This straightforward narrative is called into question by the Banū Mūsā's prominent use of a single word: the technical term *bābānī* (fem./pl. *bābānīya*), of Middle Persian origin, used to describe stars where a native Arabic word would have sufficed. This word will be the subject of this section, along with another Persian technical term, *namūdhār*, to be treated at the end.[32]

The word *bābānī* appears in both the translator's Preface and in the final section of the text. In the Preface, the Banū Mūsā use it in describing the book's contents: the first "book" which they translated is on "the natures and special characteristics of the degrees" and what happens when they are inhabited by "the small stars which are called the wandering (stars)," that is, the planets; whereas the second "book" is "a large book" on "the natures and special characteristics of the degrees" when they are inhabited by "the great stars, being those which are called the *bābānīya*."[33] Here, the "*bābānī* stars," *al-kawākib al-bābānīya* appear in opposition to the "wandering stars," *al-kawākib al-mutaḥayyira*; from context it is clear that *al-kawākib al-bābānīya* must mean "the fixed stars."

This is indeed the case, as the word's etymology shows: *al-bābānī* is a variant of *al-biyābānī*, which is itself derived from the Middle Persian word *awiyābānīg* (literally "not wandering") to describe the fixed stars.[34]

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[31] The third fragmentary book may correspond to the beginning of the translator's Afterword (**P**, ff. 64a(8)-64b(8)).

[32] At this point, the reader may be wondering: what is the *real* narrative? is the text a translation from Greek or Persian? The present paper will leave this question open and instead address the less tangible question of the text's intellectual milieu. Knowing the language of the translator's exemplar would doubtless help us in this task, but ignorance of it should not unduly hamper our efforts.

[33] **P**, f. 2a: *wa-l-thānī kitābun kabīrun… fī ṭabā'i'i l-daraji wa-khawāṣṣihā idhā ḥallathā l-kawākibu l-'aẓīmatu, wa-hiya llatī tusammā al-bābānīya*; the word appears again right after, in the description of the "third book."

[34] The word *awiyābānīg* is formed from the prefix *a-*, "not," plus *wiyābānīg* (which means "wandering"): D. Neil MacKenzie, *A Concise Pahlavi Dictionary* (Oxford, 1971), s.vv. *awiyābānīg*, p. 14; *wiyābānīg*, p. 92. In 1942, Walter B. Henning suggested that the Middle

The *Book of Degrees* shares the use of this Middle Persian technical term with Arabic astrological texts of the 8th to the 13th century at the least.[35] These texts may have formed a loose group of similar texts whose authors would have been aware of the other texts of the group, since they are unlikely to have independently imported the same foreign word,[36] and in later times, a number of these texts sometimes circulated together, as is the case in two of the manuscripts containing the *Book of Degrees*, **R** (17th century)[37] and **N** (13th century).[38] More importantly, the two earliest texts we know of which use the term link themselves explicitly to the Sasanian astrological tradition.

The first text is the chapter on the fixed stars from the *Kitāb al-mawālīd*

Persian word was itself a translation of the Greek technical term used to describe the fixed stars, ἀπλανής, which also bears the literal meaning "not wandering"; Walter Henning, "An Astronomical Chapter of the Bundahishn," *Journal of the Royal Asiatic Society* 3 (1942): 229-248, 232 n. 3. I owe my awareness of this article and of the equivalence of *al-biyābānīya* and *awiyābānīg* to Kevin van Bladel, *The Arabic Hermes: from pagan sage to prophet of science* (Oxford, 2009), 27 n. 21. The phonetic change of *w* > *b* is likely to have occurred already in late Middle Persian: Martin Schwartz interprets the Arabic word *ab'mrh* as the broken plural of "late MPers. *bēmār*" (Martin Schwartz, "Qumran, Turfan, Arabic Magic, and Noah's Name," in *Charmes et sortilèges: magie et magiciens*, ed. Rika Gyselen (Bures-sur-Yvette, 2002), 236); I thank Professor Schwartz for a discussion about this phenomenon and other Persian matters, in the course of which he explained to me that he considers *bēmār* to be a *late* Middle Persian word because it must post-date the *w* > *b* transformation in Middle Persian.

[35] Paul Kunitzsch's list of instances of this word includes texts from the 10th to the 13th century; "Stelle beibenie … Nachtrag," 263-4. He lists (and I paraphrase closely): *Kitāb al-thamara*, commented upon by Aḥmad b. Yūsuf Ibn al-Daya (d. 951); al-Bīrūnī, *Kitāb al-tafhīm* (date: 1029); Azarquiel (d. 1100); Ibn Abī l-Rijāl (d. between 1041 and 1061); Jābir b. Ḥayyān; Abraham bar Ḥiyya (d. ca. 1136); Abū l-Qāsim Muḥammad b. Aḥmad al-'Irāqī (ca. mid 13th c.); al-Zanātī (ca. 12th/13th c.).

[36] Kunitzsch, who does not seem to have been aware of the appearance of *b(iy)ābānī* in the *Book of Degrees*, takes texts which use the word to be following the lead of the Hermetic *Kitāb asrār al-nujūm* in this usage: he implied this opinion when he wrote in his discussion of that Arabic text, "Diese auffällige Bezeichnung [*al-kawākib al-bābānīya*] wurde im folgenden von mehreren anderen astrologischen und astronomischen Autoren übernommen" ["Stelle beibenie … Nachtrag," 263], and he has since stated it explicitly: "Hermes' treatise on the astrological virtues of the fixed stars seems to have been widely spread in the Arabic-Islamic world, because the term *bābānī* (or *biyābānī*) introduced here was later cited by many authorities" ["*Liber*," 17].

[37] **R**'s contents (see n. 11 above) include the *Book of Degrees* and ps.-Ptolemy's *Kitāb al-thamara* with Ibn al-Dāya's commentary.

[38] **N**'s contents (see n. 12 above) include the *Book of Degrees*, ps.-Ptolemy/Ibn al-Dāya, a poem by 'Alī b. Abī l-Rijāl al-Kātib (who used *biyābānīya* in one of his works [see A. R. Nykl, "*Libro conplido en los juizios de las estrellas*," *Speculum* 29 (1954): 85-99, cited by Paul Kunitzsch, "Neues zum 'liber hermetis de stellis beibeniis'," *ZDMG* 120 (1970): 126-130, 64 n. 10], and Zarādusht's chapter on the fixed stars. Furthermore, Zarādusht's "Pentateuch," of which this last text forms a part, was much cited in Ibn Abī l-Rijāl's *Kitāb al-Bāri'*; Ullmann, 295.

("Book of Nativities") ascribed to Zarādusht (= Zoroaster), which was part of a five-book compilation.[39] The text's translation by Sa'īd b. Khurāsānkhurra into Arabic (from Middle Persian, probably through a New Persian intermediary) is dated to between 747 and 754 on the basis of the text's own self-description.[40] "Zarādusht," or rather Sa'īd b. Khurāsānkhurra, uses both *biyābānī* and the native Arabic word for "fixed," *thābit*, in reference to stars. The two terms appear to be used interchangeably in Kunitzsch's edition of the text,[41] but the two manuscripts on which the edition is based — **N** (whose text of Zarādusht is dated to 658/1259-60)[42] and *Escorial* 939 (dated 511/1117-8)[43] — diverge in the word they use for "fixed."

The Escorial manuscript has no title for the chapter, while **N** has the heading, "Description of a Number of the Fixed Stars (*al-kawākib al-biyābānīya*)."[44] Then, the text in both manuscripts begins by naming a star and saying that it is "the most excellent fixed star (*kawkab thābit*) in the heavenly sphere."[45] On the next line in the Escorial manuscript, but present in **N** only in the margin, is the oddly-phrased descriptions of one of the star names as being equivalent to the Arabic star "the Flying Eagle, a northern, purely lucky, fixed star (*baybānī*)."[46] Then, describing another star, **N** reads, "Zarādusht said: in the heavenly sphere there is no fixed (*thābit*) star more unlucky than it"; the Escorial manuscript leaves out the word *thābit*.[47] Finally, most telling of all, when the text says about a star that "of these lucky fixed stars it has the best influence," the Escorial manuscript uses the word *al-thābita* where **N** reads *al-biyābānīya*.[48]

This comparison[49] suggests a text which in its earlier forms used the

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[39] An "astrological Pentateuch" (Kunitzsch, "The chapter … Zarādusht," 242; GAS 7.84). On this text, see David Pingree, *From astral omens to astrology: from Babylon to Bīkāner* (Rome: Istituto italiano per l'Africa et l'Oriente, 1997), 44-45; Kunitzsch, "The chapter … Zarādusht"; GAS 7.81-6; Ullmann, 294-5.

[40] David Pingree, "Classical and Byzantine Astrology in Sassanian Persia," *Dumbarton Oaks Papers* 43 (1989): 254; cited by Kunitzsch, "The chapter … Zarādusht," 241-2.

[41] I use the edition (with apparatus) in Kunitzsch, "The chapter … Zarādusht," 246-9, basing my translation on Kunitzsch's.

[42] Krause, 471: it was copied in 658 AH in Sivas (Sebasteia), Central Anatolia ("658 h Siwas").

[43] Kunitzsch, "The chapter … Zarādusht," 242: "presumably copied in 511 H = 1117-18, in Maghribi script."

[44] Kunitzsch, "The chapter … Zarādusht," 246: *na't 'iddatin min al-kawākib al-biyābānīya*.

[45] *ajallu kawkabin thābitin fī l-falak*; ln. 1.

[46] *wa-huwa l-nasru l-ṭā'iru shamālīyun, sa'dun ṣirfun, baybānīyun*; ln. 2.

[47] *qāla Zarādusht: laysa fī l-falaki kawkabun thābitun anḥasu minhu*; ln. 9.

[48] … *aḥsan hādhihi l-su'ūdi l-biyābānīya [E: l-thābita] ta'thīran…*; ln. 14.

[49] In sum: **title** *al-biyābānīya* N: om. E **1** *thābit* NE **2** *baybānī* etc. E: om. N **9** *thābit* N: om. E **14** *al-biyābānīya* N: *al-thābita* E.

word *biyābānī* as an ordinary term interchangeably with *thābit*, reflected more closely in **N**,[50] and later emended, at least in the branch of the tradition represented by the Escorial manuscript.[51] If this reading is correct, then it suggests the currency of the term *biyābānī* in the mid 8th century *alongside* the term *thābit*, perhaps with only a slight distinction in usage, if one can extrapolate from **N**'s version: *thābit* in the singular, *biyābānī* in the plural (*al-kawākib al-biyābānīya*).

Let us turn now to the *Kitāb asrār al-nujūm*, "Book of the Secrets of the Stars," ascribed to Hermes. This text represents one stage in a series of translations of a treatise on the fixed stars. The earliest extant version of this book is in Greek, where the ascription to Hermes is absent.[52] The Greek text was translated into Middle Persian, but that version does not survive.[53] The Middle Persian text was in turn translated into Arabic (perhaps with a New Persian intermediary), and then excerpted by Abū Ma'shar (787-886)[54] and possibly by the Jewish astrologer Māshā'allāh (d. ca. 810)[55] and translated into Latin around the 13th century.[56] This would appear to make the Arabic version's *terminus ante quem* 886.

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[50] **N** uses the word *al-biyābānīya* twice (title and ln. 14) and the word *thābit* twice (ln. 1, 9).

[51] The Escorial manuscript uses the words *thābit* (ln. 1) — along with **N** — and *al-thābita* (ln. 3) — where **N** uses *al-biyābānīya*, and then uses, in an interpolation (probably from a marginal note, since part of the interpolation appears in the margin of **N**), a corrupt form of the Persian technical term, *b-y-bānī*, probably to be vowelled *baybānī*.

[52] Paul Kunitzsch, "*Liber de stellis beibeniis*," in *Hermetis Trismegisti astrologica et diuinatoria* (Brepols, 2001), 12.

[53] David Pingree showed that Rhetorius (fl. ca. 600) had access to the same source used by this (reconstructed) Middle Persian text; van Bladel, 27 n. 22, citing David Pingree, "From Alexandria to Baghdād to Byzantium. The Transmission of Astrology," *International Journal of the Classical Tradition* 8.1 (2001): 6-13.

[54] Kunitzsch, "*Liber*," 21.

[55] Ibn al-Nadīm says that Māshā'allāh practiced astrology both in the time of al-Manṣūr and al-Ma'mūn; he was certainly alive in 762, when helped cast Baghdad's horoscope, and in 809, since he indicates knowledge of Hārūn al-Rashīd's death: J. Sams, EI2 s.v. "Māshā' Allāh b. Atharī or b. Sāriya" (6.710). On the basis of incorrect predictions he makes for the years after 809, Pingree ("Byzantine Translations of Māshā'allāh," 232) places his death "shortly after 809," "in about 810."

[56] Kunitzsch, "*Liber*," 12. Kunitzsch (with others) worked out this picture over many years. In 1968, Kunitzsch, with only Salio of Padua's Latin translation of the text, the *Liber de stellis beibeniis*, before him, argued that the text was a translation from Arabic which was itself a translation from Greek through a Middle Persian intermediary [Paul Kunitzsch, "Zum 'liber hermetis de stellis beibeniis'," *ZDMG* 118 (1968): 62-74]. This view was proved correct when Manfred Ullmann came across the Arabic version in Dublin, *Chester Beatty* 5399 [Kunitzsch, "Neues zum … beibeniis"]. Finally, Kunitzsch realized that *beibeniis*/*al-biyābānīya* did not mean "desert stars" but rather "fixed stars" and clarified the matter in a third publication [Paul Kunitzsch, "Stelle beibenie — *al-kawākib al-biyābānīya*. Ein Nachtrag," *ZDMG* 131 (1981): 263-267].

Like the *Book of Degrees*, this Hermetic text uses the form *bābānī*, a word it uses many times because the text's purpose is to describe the consequences of being born under a number of different fixed stars; each time it refers to another of these fixed stars, it introduces that star with phrases like: "And also another *bābānī* which is called" such-and-such.[57] Thus, the *Kitāb asrār al-nujūm* uses the adjective *bābānī* with no attempt to define the term and no sign of discomfort with it, no sign that it would need to be defined. It is simply the term one uses to describe the fixed stars. The native Arabic word for "fixed," *thābit*, appears only once in the text, and there it does not refer to stars but rather to the human characteristic of steadfastness.[58]

By the late 9th century, the word also appeared outside of technical astrological literature, though in a slightly distorted form. Al-Azharī (895-981) included an entry for it in his lexicon *al-Tahdhīb fī l-lugha*, in which he quoted a 9th-century expert, Abū l-Haytham, who probably died in 276/889-90.[59] Al-Azharī's entry begins:[60]

> Al-Mundhirī reported to me that Abū l-Haytham said: *al-kawākib al-bābānīyāt* are those (stars) in which the sun and the moon do not take up residence; rather, one is guided by them on land and sea. They are northern, and the North Wind blows from their direction.[61]

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[57] *wa-ayḍan bābānī ākhar yuqāl lahu …*: e.g., ln. 56 (§ II) = f. 207v = Kunitzsch, "*Liber*," 66.

[58] ln. 34 (§ I) = f. 207r = Kunitzsch, "*Liber*," 62: "… steadfast in friendship, high-aspiring, much-marrying, he loves women" (*… thābit al-mawadda, baʿīd al-hamma, kathīr al-nikāḥ, yuḥibb al-nisāʾ*).

[59] Kunitzsch, "Stelle beibenie … Nachtrag," 265 n. 20.

[60] This entry is also quoted by Ibn Manẓūr (1232-1311) in his *Lisān al-ʿarab*, al-Zabīdī (1732-3 to 1791) in his *Tāj al-ʿarūs*, and partially by al-Fīrūzābādī (1326-1414) in *al-Qāmūs al-muḥīṭ*. On al-Azharī (born in Hemat in Khurasan, studied philology and the Islamic sciences in Baghdad) and the fragmentary state of his lexicon: John A. Haywood, *Arabic Lexicography* (Leiden: Brill, 1965), 53-4. Ibn Manẓūr, al-Fīrūzābādī and al-Zabīdī: Haywood, 77, 83, 89. My discussion here is based on Kunitzsch, "Stelle beibenie … Nachtrag," 265-6.

[61] Text provided by Kunitzsch, "Stelle beibenie … Nachtrag," 265 n. 18 from the edition of al-Azharī's *Tahdhīb al-lugha* printed in Cairo, 1964-7. This text is also given in Ibn Manẓūr, *Lisān al-ʿarab*, ed. ʿAbdallāh ʿAlī al-Kabīr, Muḥammad Aḥmad Ḥasab Allāh, and Hāshim Muḥammad al-Shādhilī, 6 vols. (Cairo: Dār al-Maʿārif, [1981]), vol. 1, p. 203 (s.v. *bbn*) and Muḥammad Murtaḍā al-Ḥusaynī al-Zabīdī, *Tāj al-ʿarūs min jawāhir al-qāmūs*, ed. ʿAbd al-Sattār Aḥmad Farrāj, 40 vols. (Kuwait: Maṭbaʿat Ḥukūmat al-Kuwayt, 1965-2001), vol. 34, p. 228 (s.v. *b-b-n*): *qāla Abū l-Haytham: al-kawākibu l-bābānīyātu hiya llatī lā yanzilu* [*tanzilu* in *Tahdhīb al-lugha* cited by Kunitzsch] *bihā shamsun wa-lā qamarun, innamā yuhtadā bihā fī l-barri wa-l-baḥri, wa-hiya shāmīyatun wa-mahabbu l-shamāli minhā* (in translating the last part I follow Kunitzsch, who has "und der Nordwind weht aus ihrer Richtung"). Al-Zabīdī also quotes this passage with slight variations — namely *al-bayānīyāt*, *al-shams* and *al-qamar* — under *byn*, vol. 34, p. 306; Kunitzsch, "Stelle beibenie … Nachtrag," 265 only mentions this

Abū l-Haytham defined *al-kawākib al-bābānīyāt* as the stars through which the sun and moon do not pass and by which one navigates, and the rest of this entry makes clear that the fixed stars which are *not* on the ecliptic are meant.[62] Abū l-Haytham arrived at a semantically good but technically imprecise definition *al-kawākib al-bābānīyāt*, equivalent to the phrase *al-kawākib al-biyābānīya*.[63] In the 9th century, then, this expression was widely enough used in Arabic as to interest a lexicographer, but it was still a distinctly foreign word whose meaning and origins could easily be misconstrued. According to al-Zabīdī, the 18th-century lexicographer who used al-Azharī as a source, al-Azharī misread the word as *bayānīyāt*[64] and so took it to derive from *bayn*, meaning "between, in the midst of," since *al-kawākib al-bābānīyāt* as Abū l-Haytham defined them were "in the midst of" the Pole.[65] Thus we can infer that the word was in use in Arabic when the Banū Mūsā wrote, but an easy familiarity with it must have been restricted to a fairly narrow group of specialists.

By the 11th century, *biyābānī* had ceased to be a standard term even among practicing astrologers. In 1029, al-Bīrūnī (b. 973, d. 1048 or after 1050),[66] the polymath from Khwārizm, wrote his *al-Tafhīm li-awā'il ṣinā'at al-tanjīm* ("Instruction in the principles of the art of astrology") in Ghazna, in modern-day Afghanistan.[67] In this introductory manual, al-Bīrūnī

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location, not the entry under *bbn*. Al-Fīrūzābādī quotes the beginning of this entry with the same variants as al-Zabīdī.

[62] "The first of them is the Pole, which is a star which does not set, and (next are) Judayy (the Pole Star) and Farqadān; it (Judayy?) is in the Pole's midst (*bayna l-quṭb*) and in it are the stars of Ursa Minor" (*awwaluhā l-quṭbu, wa-huwa kawkabun lā yazūlu, wa-l-judayyu* [corr. Kunitzsch; *al-jady* ed.] *wa-l-farqadān, wa-huwa bayna l-quṭbi wa-fihi banātu na'shin al-ṣughrā*). For these star names, see Kunitzsch, "Stelle beibenie … Nachtrag," 266.

[63] Cf. Kunitzsch, "Stelle beibenie … Nachtrag," 266-7. We should remember, of course, that the lexicographer's task was different from that of the scientist laying out a technical vocabulary: he sought to describe how words were actually used. In practice, one might refer to stars on the ecliptic as "zodiacal constellations" (*burūj*), using the word "fixed" to describe stars not on the ecliptic; at least in the 1st century it was possible for Ptolemy — respected and translated in the 9th century — to distinguish between constellations in the zodiac and those "among the fixed stars"; Ptol.*Tetr.*2.7 (trans. F. E. Robbins, Loeb 170-173): "Constellations of human form, both in the zodiac and among the fixed stars …" (τὰ μὲν γὰρ ἀνθρωπόμορφα τῶν ζῳδίων τῶν τε περὶ τὸν διὰ μέσων τῶν ζῳδίων κύκλον καὶ τῶν κατὰ τοῦς ἀπλανεῖς ἀστέρας …). Al-Bīrūnī, however, is careful to refer to constellations "on the ecliptic," "in the North," and "in the South"; Abū al-Rayḥān Muḥammad b. Aḥmad al-Bīrūnī, *Kitāb al-tafhīm li-awā'il ṣinā'at al-tanjīm = The Book of Instruction in the Elements of the Art of Astrology*, ed. R. Ramsay Wright (London, 1934), 69, §158: *'alā minṭaqati l-burūj … fī l-shimāl … fī l-janūb*.

[64] An easy mistake to make, as al-Zabīdī points out: the difference between *by'ny't* and *bb'ny't* (< *b'b'ny't* < *by'b'ny't* = *biyābānīyāt*) is a single dot.

[65] al-Zabīdī, vol. 34, p. 306; Kunitzsch, "Stelle beibenie … Nachtrag," 266 n. 25.

[66] D. J. Boilot, EI2 s.v. "al-Bīrūnī (Bērūnī) Abu 'l-Rayḥān …" (1.1236).

[67] Charles Burnett, EI3 s.v. "Astrology."

writes: "The fixed stars (*al-thābita*) … are called *biyābānīya* in Persian because finding the right way in open deserts depends on them…"[68] Al-Bīrūnī refers to the term *biyābānī* here as a foreign word, not a loan word: by saying that the fixed stars are called *biyābānīya* in Persian, he implies that this is not the way to refer to them in Arabic; his own term of choice is *al-kawākib al-thābita*.[69]

Al-Bīrūnī's etymology of the term is also misleading, if not altogether wrong; it certainly led modern scholars astray, including R. Ramsay Wright, who, in his translation of al-Bīrūnī's *Tafhīm*, rendered *al-biyābānīya* as "desert stars."[70] Al-Bīrūnī seems to have taken the word to derive from the New Persian word for "desert," *biyābān*.[71] By the 11th century, then, if we take al-Bīrūnī as our guide, the term *biyābānī* was no longer considered current astronomical vocabulary in Arabic but was a foreign word which was worth mentioning, since it was liable to show up here and there.

There is plenty of evidence that the native Arabic word *thābit* was already the standard way to refer to the fixed stars in the 10th century.[72] This can be seen, for instance, in the writings of Abū 'Abdallāh al-Khwārizmī (10th century),[73] the Ismā'īlī *Epistles of the Brethren of Purity* (probably

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[68] al-Bīrūnī, *Tafhīm*, 46, §125: *mā al-kawākib al-thābita wa-l-sayyāra. al-thābita hiya … wa-summiyat bi-l-fārisīya biyābānīya li-anna l-ihtidā' fī l-falawāt yakūnu bihā*.

[69] Al-Bīrūnī uses a different word for the planets than the Banū Mūsā's word of choice: where the latter has *al-kawākib al-mutaḥayyira* (the equivalent of πλάνητες ἀστέρες, the standard phrase in Greek), he has *al-kawākib al-sayyāra* (which, rendered literally in Greek, might be κινούμενοι ἀστέρες).

[70] See al-Bīrūnī, *Tafhīm*, 46, §125. In his earlier work on the *Liber de stellis beibeniis* (a Latin translation of the Hermetic *Kitāb asrār al-nujūm* mentioned above), Kunitzsch also followed al-Bīrūnī's etymology; Kunitzsch, "Zum … beibeniis," 63-64.

[71] Kunitzsch, "Stelle beibenie … Nachtrag," 264: "al-Bīrūnī … hatte die Bezeichnung in Anlehnung an neupers. *biyābān* 'Wüste' erklärt." On the other hand, it seems possible that al-Bīrūnī did not, in fact, completely misunderstand the word; after all, it makes perfect sense that only in an open desert without roads or other markers would one need to orientate by the stars — and of course in such a situation one would depend on the "non-wandering" (*awiyābānīg*) stars and not on those fickle planets. The Middle Persian word *wiyābān* can mean either "desert" — whence, the New Persian *biyābān* — or "astray, wandering"; *awiyābānīg* derives from the latter sense (and so also New Persian and Arabic *biyābānī*): MacKenzie, s.vv. *wiyābān*, *wiyābānīg*, p. 92.

[72] But see the use of *biyābānī* in ps.-Ptolemy/Ibn al-Dāya; Kunitzsch, "Stelle beibenie … Nachtrag," 263. See also n. 36 above.

[73] Abū 'Abdallāh Muḥammad b. Aḥmad b. Yūsuf al-Kwārizmī, *Liber Mafâtîh al-Olûm [Mafātīḥ al-'ulūm] explicans vocabula technica scientiarum tam Arabum quam peregrinorum*, ed. G. van Vloten (Leiden: Brill, 1895), 210, in defining terms pertinent to *'ilm al-nujūm*, defines *al-kawākib al-sayyāra* (planets) and *al-kawākib al-thābita* (fixed stars), making no mention of the phrase *al-kawākib al-biyābānīya* — and not because he is uninterested in Persian astronomy either, for he provides the planets' names in both Arabic and Persian. On Abū 'Abdallāh al-Khwārizmī, see A. I. Sabra, EI2 s.v. "al-KH^{w}ārazmī, Abū 'Abd Allāh," 4.1068-9. (This

early 10th century),[74] and in the non-technical work of Agapius-Maḥbūb, Bishop of Manbij (mid 10th century).[75] The 10th-century book about the constellations by ʿAbd al-Raḥmān al-Ṣūfī (291-376/902-986) bears the title *Kitāb ṣuwar al-kawākib al-thābita*, "Book on the images of the fixed stars," using the "native" Arabic expression *al-kawākib al-thābita*.[76]

To summarize (along with Table 1): in the mid 8th century, Saʿīd b. Khurāsānkhurra used the word *biyābānī* without hesitation as part of the set phrase *al-kawākib al-biyābānīya* and may have used it in other contexts as well, and the pre-886 *Kitāb asrār al-nujūm*, probably translated into Arabic long before 886, uses the word *bābānī* to mean "fixed star," never using the native Arabic *thābit* for that purpose. But in the 10th century *thābit* was the standard adjective to describe fixed stars, and by the early 11th century, *biyābānī* had ceased to be a standard term, as al-Bīrūnī's *Tafhīm* attests.

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secretary from Bukhārā is not to be confused with with the the poet Abū Bakr Muḥammad b. al-ʿAbbās al-Khwārizmī, 934-93 [cf. Ch. Pellat, EI2, 4.1069], or with the early-9th-century mathematician Abū Jaʿfar Muḥammad b. Mūsā al-Khwārizmī [cf. J. Vernet, EI2, 4.1070-71].)

[74] The date of these anonymous treatises is somewhat controversial, but they were probably composed in the first half of the 10th century; Y. Marquet, EI2 s.v. "Ikhwān al-Ṣafāʾ" (3.1071ff.). The Ikhwān al-Ṣafāʾ consistently describe the fixed stars as *al-kawākib al-thābita* in their epistle on the stars, *al-risāla al-thālitha min al-qism al-riyāḍī al-mawsūma bi-l-asṭrunūmīyā fī ʿilm al-nujūm wa-tarkīb al-aflāk*: Ikhwān al-Ṣafāʾ, *Rasāʾil Ikhwān al-Ṣafāʾ wa-khillān al-wafāʾ*, ed. Khayr al-Dīn al-Ziriklī, 4 vols. (Cairo: al-Maṭbaʿa al-ʿArabīya, 1928), 1.73ff. For example: "Seven of the stars are called the wandering (stars) … and the rest are called fixed …" (*sabʿatu yuqālu lahā l-sayyāratu … wa-l-bāqiyatu yuqālu lahā thābitatun…*; 1.73); "and know, O brother, that the first power which emanates from the Universal Soul towards the world is in the virtuous luminous persons which are the fixed stars, then after that in the moving stars…" (*wa-ʿlam yā akhī anna awwala quwwatin tasrī mina l-nafsi l-kullīyati naḥwa l-ʿālam fa-hiya fī l-ashkhāṣi l-fāḍilati l-nayyirati llātī hiya al-kawākib al-thābita, thumma baʿda dhālika fī l-kawākibi l-sayyārati…*; 1.99 ult.; similarly at 1.100.7). On the other hand, they freely use arabized Persian words, e.g., *al-jawzahr*: 1.102.22; *al-nawbaharāt*: 1.102.24.

[75] In his *Kitāb al-ʿunwān*. Agapius-Maḥbūb, Bishop of Manbij, writing "sometime in the second quarter of the tenth century" (van Bladel, 172; Graf, *GCAL* 2.39-41) in what is not a technical discussion, speaks of God's revelation to Enoch (equated explicitly with Idrīs) using the native Arabic expression for fixed stars, *al-kawākib al-thābita*: "Manetho, the Egyptian sage and astrologer, claimed that God raised Enoch until he touched the turning celestial sphere and discovered the signs of the zodiac that are in it, the stars, fixed (*al-thābita*) and moving (*al-jāriya*)…" (*wa-zaʿama Mānāthūn al-ḥakīmu l-miṣrīyu l-munajjimu anna llāha rafaʿa ʾ-kh-n-w-kh* [Enoch] *ḥattā māssa l-falak al-dāʾir wa-ʿarafa l-burūja llātī fīhi wa-l-kawākiba l-thābitata wa-l-jāriyata…*); Agapius 1.35.10-12; ed. A. A. Vasiliev, "Kitab al-ʿunvan: Histoire Universelle écrite par Agapius (Mahboub) de Menbidj [= Agapius, *Kitāb al-ʿunwān*]," *Patrologia Orientalis* 5 (1910): 561-692; translated by van Bladel, 172. I have used van Bladel's translation except that I translate *māssa* (printed *mīm-alif-sīn* by Vasiliev, 591 and van Bladel) as "touched," not "strode."

[76] Paul Kunitzsch, EI3 s.v. "ʿAbd al-Raḥmān al-Ṣūfī."

Table 1

Author/Translator	Text	Date	"Fixed"	Notes
* Sa'īd	Zoroaster's *al-Mawālīd*	747-754	*biy.*, *th.*	MP > (NP?) > Ar
* "Hermes"	*Asrār al-nujūm*	*ante* 886	*bāb.*	Gk > MP > (NP?) > Ar
* Banū Mūsā	*Book of Degrees*	9th c.	*bāb.*	India > Gk > ? > Ar
* Abū l-Haytham	*apud* al-Azharī's *Tahdhīb*	late 9th c.	*bāb.*	(lexicography)
al-Khwārizmī	*Mafātīḥ al-'ulūm*	10th c.	*th.*	
Brethren of Purity	*Epistles*	early 10th c.?	*th.*	
Agapius-Maḥbūb	*al-'Unwān*	mid 10th c.	*th.*	
al-Ṣūfī	*Ṣuwar al-kawākib al-thābita*	10th c.	*th.*	
* al-Bīrūnī	*Tafhīm*	1029	*th.*	*biy.* as Persian term

Texts using the word *thābit* (*th.*), *biyābānī* (*biy.*) and *bābānī* (*bāb.*); an asterisk (*) designates texts containing some form of the word *b(iy)ābānī*.

Although a more systematic examination of all known texts in which *biyābānī* appears would put us on firmer lexicographical ground, even now we may begin to situate the vocabulary of the *Book of Degrees* by the Banū Mūsā in a wider context. Like Sa'īd b. Khurāsānkhurra, the Banū Mūsā are happy to use the term. Like the translator of *Kitāb asrār al-nujūm*, they always use it in the form *al-biyābānīya*, denoting all the fixed stars at once. The Banū Mūsā differ from Sa'īd and the translator of *Kitāb asrār al-nujūm* in that, like al-Bīrūnī, they make a point of introducing the reader to the term, but where al-Bīrūnī treats the word as foreign, the Banū Mūsā introduce the word without suggesting that it is anything but an Arabic technical term and without defining it, simply referring to "the great stars, being those which are called the *bābānī* stars."[77] In short, they introduce the term prominently, signaling to the novice that this is a term of note, but despite the interest in the history of astrology which they betray in their preface, they make no mention of the word's Persian origins.

Why was a Middle Persian word chosen over the native Arabic word which could just as well have been used? As the preceding discussion has indicated, it may well be that while the word *thābit* could in theory have been applied to the stars, that simply wasn't the practice in the circles which the Banū Mūsā frequented. The concept of "fixed stars" is slightly more complicated than it may seem: the stars are not fixed with reference

[77] See n. 33 above.

to the observer or the earth, but only with reference to each other. To someone used to using the word *biyābānī* to describe stars which move but are fixed relative to each other, the word *thābit* might have seemed to imply that the stars were not moving at all, which is not the case for *any* heavenly body, with the possible exception of the Pole Star.[78] Still, if *thābit* could be used as the technical term for a "fixed star" in the 740s or 750s, it would probably not have seemed out of the question to use it in the 9th century. The Banū Mūsā *chose* to use the Persian word — a sensible choice, but a choice nonetheless.

In addition to the word *al-biyābānīya*, the Banū Mūsā use at least one other word from Persian, *namūdhār* (or *nimūdhār*). Although I can offer no detailed discussion of the term at present, it is worth pointing out that it likewise places the text in a Persian intellectual context. In the *Book of Degrees*, *namūdhār* appears in a discussion of the mistakes that certain astrologers commit. Such sloppy practitioners do not like to pay attention to the individual degrees because the increased precision required is difficult to achieve, "and also, at most births they rely on the *namūdhār*, and that can miss the truth by many degrees."[79]

The word *namūdhār* here refers to a method for deriving the ascendant of a nativity in the absence of a proper observation using an astrolabe; in other words, it is a method for deriving the precise moment of birth from a rough estimate. In Arabic astrology there were several variant *namūdhār*s, that of Ptolemy (dating back at least to the 2nd century, when Ptolemy de-

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[78] We may derive a similar answer by analogy with Henning's suggestion (Henning, 232 n. 3) that Sasanian astronomers preferred to use the word *awiyābānīg*, derived from ἀπλανής, to described their fixed stars rather than the Middle Persian word for a fixed star, *axtar*, which could also mean "constellation" or "zodiacal sign"; MacKenzie, 14. Abū 'Abdallāh al-Khwārizmī (10th century; referenced above, n. 73) feels the need to explain why stars which move would be called "fixed": "The science of the stars is called *tanjīm* in Arabic and *aṣṭrunūmīyā* in Greek; *'ṣṭr* is 'star' and *nūmīyā* is 'science.' The moving stars: Saturn, Jupiter, Mars, the Sun, Venus, Mercury and the Moon. Their names in Persian are: Kaywān, Hurmuz, Bahrām, Khawr, Nāhīd, Tīr and Māh. The fixed stars (*al-kawākib al-thābita*) are all the stars in the sky except for the seven moving ones which were just mentioned; they were called 'fixed' because they preserve their distances according to one arrangement, and they do not move latitudinally; and it is (also) said (that they are so called) because if their movement is compared with the movement of the seven, it is quite negligible" (*'ilm al-nujūm yusammā bi-l-'arabīya al-tanjīm wa-bi-l-yūnānīya aṣṭrunūmīyā, wa-'ṣṭr huwa al-najm wa-nūmīyā huwa al-'ilm. Al-kawākib al-sayyāra: Zuḥal wa-l-Mushtarī wa-l-Mirrīkh wa-l-Shams wa-l-Zuhra wa-'Uṭārid wa-l-Qamar; wa-asmā'uhā bi-l-fārisīya: Kaywān Hurmuz Bahrām Khawr Nāhīd Tīr Māh. Al-kawākib al-thābita hiya al-nujūm kulluhā allātī fī l-samā' mā khalā al-sab'ata l-sayyārata llātī taqaddama dhikruhā; wa-summiyat thābita li-annahā taḥfuẓu ab'ādahā 'alā niẓāmin wāḥidin, wa-lā tasīru 'arḍan, wa-qīla li-anna sayruhā idhā qīsa bi-sayri l-sab'ati fa-huwa yasīrun jiddan*).

[79] **P**, f. 65a(2-3): *wa-ayḍan fa-innahum fī akthari l-mawālīdi yu'awwilūna 'alā l-namūdhāri, wa-huwa qad yafūtu l-ḥaqqa bi-darajin kathīratin*.

scribes the method, though without attaching a name to it), that of Hermes (dating back at least to the 3rd century when Proclus ascribed it to Petosiris, and also appearing in Ps.-Ptolemy's *Centiloquium*), and that of Vettius Valens (dating back to the 2nd century when that Antiochian astrologer lived).[80] In other words, whichever of these methods the *Book of Degrees* is referencing, it was known to late antique Greek astrologers. Somewhere between late antiquity and the 9th century, then, these methods came to be called *namūdhār*s.[81]

In texts later than the *Book of Degrees*, this technical meaning of the word *namūdhār* is certainly intended. The 11th-century Andalusian text on astrology refers to one of the methods using the term *namūdār* (with a *dāl*), probably that of Hermes,[82] and in the same century al-Bīrūnī uses the term (with a *dhāl*) to argue against Hermes' method: "For the one who agrees with Hermes the Egyptian concerning *namūdhār*s, Christ's ascendant must be the end of Aries and the beginning of Taurus," i.e., around April 20; al-Bīrūnī discusses several problems with this chronology to demonstrate "the invalidity of *namūdhār*s."[83] Al-Bīrūnī also seems to have written a book which included *namūdhār*s.[84] In Latin astrology, the term appears as *animodal* or *animodar* and seems to carry the same meaning.[85]

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[80] E. S. Kennedy, "Treatise V of al-Kāshī's Khāqānī Zīj: Determination of the Ascendent," *Zeitschrift für Geschichte der arabisch-islamischen Wissenschaften* 10 (1995-6): 140-144 (where the Namūdār of Zoroaster is also mentioned), cited by Julio Sams and Hamid Berrani, "World Astrology in Eleventh-Century al-Andalus: the Epistle on *Tasyīr* and the Projection of Rays by al-Istijjī," *Journal of Islamic Studies* 10.3 (1999): 307. Ptolemy's description: Ptol.*Tetr.*3.3. Proclus: Kennedy, 140. Approximate equivalence of Vettius Valens' method to what Islamic sources ascribe to him: Kennedy, 144.

[81] A plausible etymology is that a *namūdār* is what "makes manifest" (*namūdān*) the previously unknown horoscope; Kennedy, 139.

[82] Sams and Berrani, 307-8.

[83] Abū al-Rayḥān Muḥammad b. Aḥmad al-Bīrūnī, *[Al-Āthār al-bāqiya 'an al-qurūn al-khāliya] Chronologie Orientalischer Völker von Albêrûnî*, ed. C. Eduard Sachau (Leipzig: Deutsche Morgenländische Gesellschaft, 1878), 294-5.

[84] D. J. Boilot, "L'oeuvre d'al-Beruni: essai bibliographique," *Mélanges [Institut Dominicain d'Études Orientales du Caire]* 2 (1955): 161-256, 202, #77, who considers the text, called "On guiding towards the correction of the principles, with *namūdhār*s included" (*Fī l-irshād ilā taṣḥīḥi l-mabādi'i shtamala 'alā l-namūdhārāt*), to be a book which al-Bīrūnī had elsewhere promised to write.

[85] The *Libellus ysagogicus* by "Alcabitius," a translation of a work by al-Qabīṣī (d. 967) calls it *animodar*, as does Leopold of Austria in his *Compilatio* (written around the end of the 13th century), while an entry — stiched together from Alcabitius and a line from Leopold (who himself is paraphrasing Alcabitius) — in an astrological glossary preserved in a 15th-century Wolfenbüttel manuscript reads, "*Animodal* is an examination of the degree of the ascendant; it is greater than all the degrees of the circle (Animodal [ms: *Animodalis* with the abbreviation *-l'* at the end] est cognicio gradus ascendentis id est dignior omnibus gradibus circuli"); Paul Kunitzsch, *Mittelalterliche astronomisch-astrologische Glossare mit arabischen Fachaus-*

But what was the word's history prior to the *Book of Degrees*? It is clearly derived from Persian — but which Persian? In New Persian, *namūdār* (with a *dāl*) can mean "exemplar," "model" and "argument," but it also has the more technical sense of "an astronomical artifice for verifying the exact date of a birth" (i.e. the Arabic meaning of the word),[86] while in Middle Persian *nimūdan*, means "show, guide."[87] Was the technical meaning already attached to the Middle Persian word? Or is there any other indication that the word in Arabic derives from Middle, rather than New, Persian, so that it might seem plausible that the word had its technical meaning in a Sasanid tradition, before appearing in the Arabic script?

This paper does not presume to come to a definitive answer on the question, but two considerations tentatively suggest a Middle Persian derivation. First, while I have been voweling the Arabic word as *namūdhār*, it could just as well be voweled *nimūdhār*; the latter voweling is, in turn, supported by the Latin transcription *animodal* and a variant spelling in Arabic which inserts *ī*/*ay* in the first syllable to make it *nī*-/*nay*-.[88] Second, the *dhāl* (as opposed to *dāl*) appearing in the *Book of Degrees*'s spelling of the word would be consistent with its rendering a Middle Persian word.[89] However, it should be stressed that both of these phonetic arguments are conjectural; even taken together, they hardly settle the question of when the word as it appears in the *Book of Degrees* entered the Arabic language.[90]

The word *namūdhār* provisionally corroborates what we learned from *al-bābānīya*. The *Book of Degrees*, in accordance with its emphasis on degree-precision in the interpretation of a horoscope, rejects a method which it describes as highly imprecise. In rejecting this method, the *Book of De-*

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drücken (Munich: Bayerische Akademie der Wissenschaften, 1977), 31 (text), 33 (apparatus), 34-35 (comm.) As Kunitzsch points out, this makes more sense in Alcabitius, from which the part after 'id est' was drawn: "sed inuenitur per eundem dignior omnibus gradibus circuli post gradum ascendentis."

[86] Francis Joseph Steingass, *A Comprehensive Persian-English Dictionary* (London, 1957), 1427.

[87] MacKenzie, 60. Likewise, using an earlier transliteration system, Sheriarji Dadabhai Bharucha, *Pahlavî-Pâzend-English glossary and English Pahlavî-Pâzend glossary* (Bombay, 1912), 322 defines *namḍann* as "to show, to exhibit."

[88] This variant appears in the title of one Escorial manuscript, *Kalām fī l-nīmūdār li-taṣḥīḥi ṭawāli'i l-mawālīd*, "Discourse on the *nīmūdār* for correcting the ascendants of natives"; cf. Hartwig Derenbourg, Evariste Lévi-Provençal, and Henri-Paul-Joseph Renaud, *Les manuscrits arabes de l'Escurial* (Paris, 1903), 54-57, #939; see also #966, pp. 110-111.

[89] I thank Professor Martin Schwartz for raising this possibility.

[90] In the words of Professor Schwartz, the *dhāl* here "is not a smoking gun." Only a close study of this word's usage in Persian and Arabic astrological literature *before* as well as after the 9th century would be able to give a sense of its flavor and the cultural traditions with which it should be associated, as was possible with *al-bābānīya*.

grees calls it by a Persian name but makes no point of the etymology, as with *al-bābānīya*. But it does not even bother to explain what *namūdhār* is, assuming perhaps the reader's familiarity with the word, or else that the admonition is only necessary for those who have heard of the method; it was enough that the novice should know that *namūdhār* was something which was not to be practiced. Either way, the word is taken for granted as having a technical meaning; and while the method it signified had precedents in Greek astrology, this Persian word was the natural word to use for it.

What emerges, then, is that the *Book of Degrees* was translated into Arabic in an intellectual milieu where something close to Middle Persian was an important language of science.[91] This is not to downplay the well-known prevalence of translations from Greek and Syriac in the same milieu. We know from narrative sources that the Banū Mūsā themselves were much involved in translating Greek texts into Arabic, themselves traveling to the Byzantine empire to obtain Greek manuscripts.[92] The *Book of Degrees* itself could well be a translation from Greek. At the same time, however, this text supports those who have argued for the importance of Middle Persian texts in the early Islamic period, from Nallino to David Pingree.[93] If the translation of *sapere* into Arabic in early Abbasid times was largely driven by a revival of the Sasanian ideology which held that all knowledge originated

[91] Indeed, in other fields as well, translations from Persian into Arabic had been common practice in Baghdad since the mid 8th century, as the cultural and administrative apparatus were slowly Arabized. To say that a text written in 9th-century Baghdad arose from a Persian milieu is, in a sense, to state the obvious. Persian was widely spoken in the Abbasid capital by people from all social ranks, and translations from Persian, from Ibn al-Muqaffa' (d. 757; cf. Gutas, 30-31) onwards, were important for the shaping of classical Arabic literature. An anecdote reported in the 9th century by Ibn Abī Ṭāhir Ṭayfūr (d. 893), mentions translations from Persian made during al-Ma'mūn's reign: the narrator is surprised to hear his interlocutor speaking Persian, but the latter explains that he has in the past translated Persian books into Arabic while traveling in Iran: Ibn [Abī] Ṭāhir Ṭayfūr, *Kitāb Baghdād*, published as *Baghdād fī ta'rīkh al-khilāfa al-'Abbāsīya* (Baghdad: al-Muthannā, 1968), 86; cited by Michael Cooperson, *Classical Arabic Biography: the heirs of the prophets in the age of al-Ma'mūn* (Cambridge, 2000), 32 n. 51.

[92] George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge, MA: MIT Press, 2007), 48.

[93] Carlo Alfonso Nallino, "Tracce di opere greche giunte agli Arabi per trafila pehlevica," in *A volume of Oriental studies presented to Edward G. Browne*, ed. T. W. Arnold and Reynold A. Nicholson (Cambridge, 1922) [reprinted in: Carlo Alfonso Nallino, *Raccolta di scritti editi e inediti*, ed. Maria Nallino, 6 vols. (Rome, 1939-1948), vol. 6, pp. 285-303], who uncovered traces of Pahlavi in three Arabic translation of Greek originals (Cassianus Bassus, Vettius Valens, the Paranatellonta of Teukros); Pingree, *From astral omens*, ch. 4; Antonio Panaino, "Sasanian Astronomy and Astrology in the Contribution of David Pingree," in *Kayd: studies in history of mathematics, astronomy and astrology in memory of David Pingree*, ed. Gherardo Gnoli and Antonio Panaino (Rome, 2009).

in Persia,[94] it also relied on intellectuals from a Persian tradition, who understood the significance of the texts, to carry out the project. This would have been the case for translations from Persian, of course,[95] but the evidence of the *Book of Degrees* suggests that this was also the case with texts from the non-Persian traditions. It would seem, then, that Persian was not only the mother tongue of much of Baghdad's 9th-century elite, and plenty of its commoners to boot, but an important language of the city's scientific expression as well. Even when it was ostensibly Greek science that was being Arabized, and when Greek provenance was ideologically important, Persian terms, foreign to the Arab ear, could become part of an Arabic scientific vocabulary in the making. *Le vie del sapere* may have crossed in 9th-century Baghdad, but the interlocking paths, real and imagined, which any piece of *sapere* took to arrive wove tortuously through a spatio-temporal landscape whose complexities extended to within the city itself.

3. *Crossing Paths*

The *Book of Degrees* falls where paths cross. On the one hand, the Banū Mūsā provide in their Preface a general history of astrology — not a history of the treatise they translate but the discipline as a whole. In it, they depict India as the originator of astral knowledge and the ancient Greeks as the brilliant scientists who organized and developed it into fully fledged disciplines, including astrology. Persia, in this narrative, is absent.

But on the other hand, we have seen that they worked in an intellectual environment that was so indebted to the Persian tradition that they could use a Persian technical term without the slightest hesitation or apology. If the Persian contribution to Arabic astrology was so obvious, why not mention it at all in a history of the discipline?

The narrative given by the Banū Mūsā was certainly not the only one on offer in the 8th and 9th centuries. A case in point is the long account of the transmission of ancient astrology given by a contemporary or near-contemporary of the Banū Mūsā, Abū Sahl Ibn Nawbakht (8th or 9th century?).[96] This famous account of Ibn Nawbakht survives in Ibn al-Nadīm's *Fihrist* (completed 377/987-8) and can be summarized as follows: From the ancient Babylonians, science moved to the Egyptians and the Indians. Then Alexander conquered Babylonia and Persia, translated the contents of the "libraries and government offices of the city of Istakhr [near Persepolis] …

[94] Gutas, 53-60; D. Gutas and K. van Bladel, EI3 s.v. "Bayt al-ḥikma."

[95] Abū Ma'shar describes the discovery in Islamic times of old astrological texts written in Persian (*apud* Ibn al-Nadīm; translation and discussion in Saliba, 36-7).

[96] For a discussion of such narratives, including this one, see Saliba, chs. 1-2.

into Greek and Coptic," then burned the originals. The Persian kings managed to salvage some of this ancient knowledge and send it to India and China, but "learning in Iraq disappeared." Chaos ensued after Alexander's death, until "the reign of Ardashīr … of the dynasty of Sāsān" brought order again; Ardashīr and his successors systematically translated books from India, China and Greece "back" into Persian.[97] It was in this way that translating from Greek into Arabic could be viewed as an attempt, not to import foreign science, but to recover Iraq's ancient scientific heritage.[98]

The notion of Persian wisdom and Persian texts as a gateway to ancient knowledge was not, then, foreign to the 9th-century Iraqi milieu in which the Banū Mūsā lived and worked. Why did the Banū Mūsā, sons of a Persian astrologer, who worked as young men for the half-Persian caliph al-Ma'mūn at the *bayt al-ḥikma*, itself based on a Sasanian institution, not choose to give even a nod to the Iran-centered narrative of Ibn Nawbakht?[99]

Many factors must have been at work. Since we know that the Banū Mūsā were involved in politics, the ideological currents of the day may well have had some effect on how they characterized the disciplines in which they worked.[100] Al-Ma'mūn ideological program was essentially "Abbasid Shiism," in which he was the Muslim community's divinely-inspired Imam.[101] When he put his authority behind Hellenizing rationalism, an emphasis on "ancient" Greek thought became politically expendient.

Setting aside these and other external considerations, I will focus in the remainder of the paper on the internal evidence of the text, arguing from the Banū Mūsā's Preface, Introduction and Afterword that their neglect of Persia is closely tied to how they market the book: as a source of true knowledge through direct access to ancient science.

The Banū Mūsā make clear that the method propounded in the *Book of Degrees* is key to true, reliable predictions. In the Introduction, they write:

> Through this book and those books according with it which we have mentioned, prediction becomes consistent and enduring. Indeed, if the astrologer is instructed with what is in this book and is good at combination (*tamzīj*),[102] then

[97] Trans. Saliba, 31-33. Nallino, "Tracce di opere greche," 362-3, discussed this passage.

[98] Gutas, 46.

[99] On the *bayt al-ḥikma*: Gutas, 53-60.

[100] Hill, 4-5.

[101] Cooperson, ch. 2 e.g. p. 27; I owe the phrase and notion of "Abbasid Shiism" to discussions with Professor Cooperson.

[102] That is, the art, as the introduction explains, of properly combining all the different factors which go into a prediction. Ptolemy's use of the word κράσις, "mixing" or "combination," may help explicate *tamzīj*: at the beginning of *Tetr.*1.11, he explains that the constellations have the general "combinations" he has already referred to as well as "unmingled

> he will not come close to erring by any means. But as for the one who does not know what is in this book, limiting himself to the influences of the planets alone, his prediction is sometimes true and other times false.[103]

What made the book's method superior to other approaches to horoscopy? As the Banū Mūsā stress, it revived methods which were practiced in antiquity. In the Afterword, we are told that modern astrologers shun the degree-by-degree method because they are lazy and do not wish to carry out the precise measurements it requires. The ancients were not so sloppy, explain the Banū Mūsā, drawing attention to the ancient Indians, who used many simultaneous observers to be sure of an accurate measurement, and thus arrived at true predictions.[104] They certainly didn't use *namūdhār*s. Indeed, it was precisely by meticulously following the method put forth in the *Book of Degrees* that the ancients achieved their astrological prowess; summarizing the Introduction's discussion, the Banū Mūsā write:

> By all of these things [i.e., because of all this book's advantages], it fell to the share of the ancients to have the occult knowledge (*ghā'ibāt*) by which they reported (*yukhbirūn*) and prophesied (*yatakahhanūn*), for they saw that no one attains the art of combination (*tamzīj*) except he whose nature is most excellent and who also sets himself apart for training in combination and does not occupy himself with anything else.[105]

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powers" (τὰς κατὰ τὸ ἀμιγὲς... δυνάμεις). Likewise, after discussing the individual powers of the planets, he writes: "Such are the effects produced by the several planets, each by itself and in command of its own nature. Associated, however, now with one and now with another, in the different aspects, by the exchange of signs, and by their phases with reference to the sun, and experiencing a corresponding tempering of their powers, each produces a character, in its effect, which is the result of *the mixture of the natures* that have participated, and is complicated" (Ptol.*Tetr.*88 = 2.8; trans. F. E. Robbins, Loeb 188-9). On the same page, he uses the word διακρίσεις, "distinctions," which could also help explain *tamzīj*, since this is what Ptolemy tells us should be left up to the "astrologer" (μαθηματικός).

[103] **P**, f. 3a(1-5): *fa-bi-hādhā l-kitābi wa-mā yujārīhi mina l-kutubi* [*mina l-kutubi* **N**, *om.* **P**] *llatī dhakarnāhā, ṣāra l-ḥukmu lā yakhtalifu wa-lā yazāl* [*yazāl* **N**, *yazal* **P**]; *fa-inna l-munajjima idhā tahadhdhaba bi-mā fī hādhā l-kitābi, wa-aḥsana l-tamzīja, lam yakad an yaghlaṭa aṣlan; wa-innamā ṣāra man lā ya'lamu mā fī l-kitābi, fa-qtaṣara 'alā ta'thīrāti l-kawākibi l-mutaḥayyirati faqaṭ, yaṣduqu ḥukmuhu tāratan, wa-yakdhibu ukhrā*. This principle recurs at the end of the text: **P**, f. 64b.

[104] "The ancients of India did not rely on a single observer but rather on many who would observe. If they agreed or most of them agreed, they worked with that (observation), and so their degree and their prediction (*ḥukm*) proved true" (*wa-qudamā'u l-Hindi kānū lā yu'awwilūna 'alā rāṣidin wāḥidin bal 'iddatin mimman yarṣudu, fa-idhā ttafaqū aktharuhum 'amalū 'alā dhālika, fa-taḥaqqaqa lahumu l-darajatu wa-l-ḥukmu*); **P**, f. 65a; §3.

[105] **P**, f. 3a(9-13): *fa-bi-jamī'i hādhihi l-ashyā'i ṣaḥḥa li-l-qudamā'i mā kānū yukhbirūna bihi mina l-ghā'ibāti, wa-mā kānū yatakahhanūna bihi, wa-hum yarawna annahu lā yaṣilu ilā l-tamzīji illā man kānat ṭabī'atuhu fāḍilatan* [*fāḍalatan* **P**]*, wa-afrada nafsahu li-l-tadarrubi ma'a dhālika bi-l-tamzīji, wa-lā yashtaghilu bi-shay'in ghayrihi* [*ghayrahu* **P**].

Ancient success in astrology — celebrated, as we have seen, in the Preface — depended on training as well as correct method. The *Book of Degrees* promised the 9th-century novice the latter as the first step towards replicating ancient success. If the method's fruits could only be hoped for after long and rigorous training, it was surely comforting to know that this method had worked for the ancients — had been, indeed, the key to their success.

But how could the book's reader be sure that he was receiving an authentically ancient method? Many centuries had passed since the time of the "ancient Greeks," providing endless opportunities for textual corruption, interpolation and outright forgery. And if the method worked so well, why weren't modern scientists using it? The Banū Mūsā preempt these questions in the Preface by emphasizing the process of recovering ancient books. After explaining that their contemporaries were too stupid or ignorant to do so, they write of the "second book" to be translated (that is, the long degree-by-degree tabulation): "We found that book's organization was faulty and its arrangement mixed up, so we corrected it in a way that speaks for itself."[106] They do not say that the text's wording was corrupt, only the arrangement. While any mention of *textual* corruption or damage to the pages would have cast doubt on the information provided in the book, the faulty *arrangement* serves to underscore the deep antiquity of the physical exemplar and the neglect with which time has treated it, a neglect which the Banū Mūsā seek to overturn.

It thus becomes clearer why, regardless of political considerations, the Banū Mūsā did not choose to provide a narrative of transmission such as we find in manuscripts of Zarādusht's *Kitāb al-mawālīd* (translated ca. 747-754). There we are given the text's history, in which Persian figures prominently: its Middle Persian original[107] was translated into New Persian and then into Arabic.[108] Such a narrative worked well when one wished to stress the Persian origins of the knowledge — who would have been better guardians of Zoroaster's wisdom than the Sasanids? — but in the case of the *Book of Degrees*, it would have given far too much attention to the messy details of transmission, raising the spectre of textual corruption.

Even if transmission did not raise such questions, it would have diminished the sense, which the Banū Mūsā clearly cultivate in their reader, of direct access to the ancient past. Just as the neatness of modern transla-

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[106] **P**, f. 2a: *wa-wajadnā dhālika l-kitābi qadi khtalla naẓmuhu, wa-takhallaṭa waḍ'uhu, fa-aṣlaḥnāhu iṣlāḥan yashhadu li-nafsihi*.

[107] Itself based on a Greek text, although this is not part of the narrative; Kunitzsch, "The chapter … Zarādusht," 231.

[108] Kunitzsch, "The chapter … Zarādusht," 231; Kunitzsch, "*Liber*," 15 n. 20. For excerpts from this introduction as contained in **N**, see Krause, 471.

tions of ancient Greek classics can almost make us forget the rich centuries of transmission which separate us from Antiquity, the *Book of Degrees* encouraged the 9th-century reader to view it as a modern reconstitution of an ancient text. It is fitting, then, that the only scientist referred to by name in these discursive passages of the *Book of Degrees* is the 2nd-century physician Galen. Concluding their Introduction, the Banū Mūsā speak of the high rank which astrology achieved for itself in antiquity, turning to Galen to explain why. "By a certain justice," they write,

> this rank (*manzila*) was set above all ranks of the sciences, for it pertained to the level of inspiration (*waḥy*). Galen the Physician recounts that he saw many soothsayers and that he pondered until he hit upon their craft; he found that it was built upon two foundations: one of them was the tempering of the mind with sparseness and delicateness of food, and the second was knowing the position (*nuṣba*) of the celestial sphere at the moment of the inquiry.[109]

Access to the ancients is provided by the eyewitness testimony of one of the Greeks who was most celebrated in the Arabic translation movement.[110] On his authority, the reader can rest assured that ascetic training, the first of Galen's criteria, will pay off as long as one makes sure to know the exact celestial position "at the moment of inquiry," in this case the nativity — precisely the method which the *Book of Degrees* promotes.

Thus, with Galen's endorsement, the *Book of Degrees* provided a rigorous astrological method from a deep antiquity which required meticulous

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[109] **P**, f. 3a(13)-3b(5): *bi-ḥaqqin mā fuḍḍilat hādhihi l-manzalatu ʻalā jamīʻi manāzili l-ʻulūmi, idh kānat tadkhulu fī ṭabaqati l-waḥyi; wa-Jālīnūsu l-ṭabību yaḥkī annahu shāhada mina l-mutakahhinīna khalqan kathīran wa-annahu taḥayyala ilā an tawaqqafa ʻalā ṣināʻatihim, fa-wajadahā mabnīyatan ʻalā aṣlayni, aḥaduhumā talṭīfu l-dhihni bi-qillati l-ghadhāʼi wa-laṭāfatihi, wa-l-thānī maʻrifatu nuṣbati l-falaki fī waqti l-suʼāli*. This may derive from Galen's lost work on astrologers and other diviners to which he refers when discussing the school of thought which denies "the reasoning faculty": "They also look down upon dreams and birds (augury) and omens and all astrology, concerning (or: in defense of) which subjects we, in another book, carried out a longer examination, examining the opinions of Asklepiades the Physician" (καταφρονοῦσι δὲ καὶ τῶν ὀνειράτων καὶ τῶν οἰωνῶν καὶ τῶν συμβόλων καὶ πάσης ἀστρολογίας, ὑπὲρ ὧν ἡμεῖς μὲν ἰδίᾳ δι' ἑτέρων γραμμάτων ἐπὶ πλέον ἐσκεψάμεθα περὶ τῶν Ἀσκληπιάδου τοῦ ἰατροῦ σκοπούμενοι δογμάτων); Galen, *De naturalibus facultatis*, 1.12 = Kühn 2.29.8-12 (ed. G. Helmreich, J. Marquardt, and I. Müller, eds., *Claudii Galeni Pergameni scripta minora*, 3 vols. (Leipzig: Teubner, 1893), vol. 3, pp. 101-257). See the somewhat related discussion in the Arabic translation of Galen's *Ethics*: Franz Rosenthal, *The Classical Heritage in Islam*, transl. Emile and Jenny Marmorstein (New York: Routledge, 1975), 85-94. A text of medical astrology ascribed to Galen (ps.-Galen, *Prognostica de decubitu ex mathematica scientia*, C. G. Kühn, ed., *Claudii Galeni opera omnia*, 20 vols. (Leipzig: Knobloch, 1830), vol. 19, pp. 530-531) may carry slight hints of this passage quoted by the Banū Mūsā.

[110] One of the translators of Galen's work into Arabic was Ḥunayn b. Isḥāq, who worked for Muḥammad b. Mūsā and Aḥmad b. Mūsā; R. Walzer, EI2 s.v. "DJalīnūs" (2.402).

astronomical observations, giving its reader the sense of a direct connection with ancient wisdom while explaining the failures of modern astrologers as a result of declining methodological rigor. The book brings with it not only an ancient methodology but also notions about how to model one's way of life on the ancient mold so as to achieve true insight into the hidden secrets which the stars tell and the ancients understood.

The scientists who produced the *Book of Degrees* used Persian technical terms in their Arabic prose, but they were indifferent to Persia's role in the history of astrology, just as they were at best uninterested in drawing attention to the language of their exemplar. For the importance of the book lay not in the path it took to the reader's hand, but in the timelessness of its method. This method combined precision and inspiration, the rational observation of the complex multiplicity of the cosmos and the transcendent insight into how that multiplicity fit together, in such a way that the readers of the *Book of Degrees* might hope, like the ancients, to know something for certain.