Sanskrit Translations of Arabic and Persian Astronomical Texts at the Court of Jayasimha of Jayapura

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Between about 1725 and 1735 a substantial number of Arabic and Persian texts were translated into Sanskrit at the court of Jayasimha (1687-1743), first at Amber and then at the new city of Jayapura which the Mahārāja founded in 1727. Among these were:

1. Naṣīr al-Dīn’s Tahrīr kitāb ʿUṣūl al-ḥandsa (Euclid’s Elements), translated by Jagannātha Samrāt, Jayasimha’s guru, in or shortly before 1727 as the Rekhaṇganita.¹

2. Naṣīr al-Dīn’s Tahrīr al-Majisti (Ptolemy’s Almagest), translated by Jagannātha in, allegedly, 1732 as the Samrāṣiddhānta.²

3. Naṣīr al-Dīn’s Tahrīr Ukar (Theodosius’ Sphercs), translated by Nayanashopādhya with the assistance of Muḥammad Abidda in 1729

¹ See D. Pingree, Census of the Exact Sciences in Sanskrit (henceforth CESS), Series A, vols. 1-5, Philadelphia 1971-1994, A3, 56a-57a; A4, 95a; and A5, 113b-114a. It was edited by H. Dhruva and K. Trivedin, 2 vols., Bombay 1901-1902. Manuscript 35605 in the Sarasvatī Bhavana at Benares was copied for Jagannātha by Lokamani on June 1727.


Sahayāl 1 (2000)
as the Ukāra.³

4. Chapter 11 of book 2 of Naṣīr al-Dīn’s Tadhkira with the Sharḥ of al-Birjandī, translated by Nayanasukhopādhyāya with the assistance of Muhammad Ābidda in 1729 as the Šaraḥatājkara varjandī.⁴

5. Naṣīr al-Dīn’s Bīst bāb dar uṣṭurīb, apparently also translated by Nayanasukhopādhyāya as the Yantrarājarisālā.⁵

6. A treatise on the use of al-Zarqālū’s universal șafīhā, entitled Sarvadesṭīyararōkaṭīyantra: it may have been translated by Nayanasukhopādhyāya.⁶

7. A treatise on the retrograde motions of the planets said to be derived from chapter 9 of the Khākānijīca that is, from the Zīj-i-Khāqānī of Jamshīd al-Kāshī; it is entitled Vakramārgavicāra.⁷

8. The Yantraprakāra contains descriptions of the construction of various astronomical instruments translated from Arabic (or Persian) sources, such as Naṣīr al-Dīn’s Tahrīr al-Majisti. It was completed by

³ See CESS A3, 132a; A4, 122a; and A5, 159a. It was edited by V. Bhattācārya, Vārānasi 1978. The earliest manuscript of the Sanskrit translation, number 44 in the Jaipur Museum, was copied by Lākṣmīdhara in 1729.

⁴ See CESS, A4, 122a. An edition is being prepared by T. Kusuba and D. Pingree. Two Arabic manuscripts of the Sharḥ al-Tadhkira of Mullā Nizām Hasan al-Nisḥabhūrī, both acquired in 1725, are numbers 21 and 22 in the Arabic and Persian collection in the Mahārāja of Jaipur Museum Library. In the same library Sanskrit manuscript 46, copied by Kṛpārāma in 1729, is the unique copy of Nayanasukhopādhyāya’s translation.

⁵ See CESS A3, 145a, and A4, 125a under Naṣīr al-Dīn, and A5, 159a under Nayanasukhopādhyāya. Edited by V. Bhattācārya, Vārānasi 1979. Manuscript 42 in the Sanskrit collection of the Mahārāja of Jaipur Museum Library was copied by the Kṛpārāma who copied Nayanasukhopādhyāya’s translation of the Tadhkira in 1729.

⁶ See CESS A5, 159a-159b, and S.R. Sarma The Šafīhā Zargālīyya in India, in From Baghdad to Barcelona, ed. J. Casulleras and J. Samsó, Barcelona 1996, vol. 2, pp. 719-735. The beginning of the Sanskrit text, on constructing the instrument, is based on the text published by R. Puig in Los Tratados de Construcción y Uso de la Azafea de Azaquiel, Madrid 1987, but after the first chapter it diverges considerably.

⁷ Sanskrit manuscript 33 in the Mahārāja of Jaipur Museum Library is the only copy known to exist; it was transcribed by Lākṣmīdhara, who copied the Jaipur manuscript of the Ukāra in 1729.
Jayasimha in about 1729.  

The Jaipur copies of some of these seven versions of Arabic and Persian treatises and of the *Yantraprakāra* were produced in a uniform format imitative of Persian manuscripts - their writing is parallel to the shorter edge of the page; they are often still bound in cloth with a flap covering the opening; and they are all about 22 by 16 cm. These manuscripts are:

1(3) Mahārāja of Jaipur Museum 44. *Ukāra* of Sāvajūsayūsa (Theodosius). 1 blank f.; ff. 1-46; and 3 blank ff. 23×17.5 cm. 23 lines per page. Bound in cloth. Copied (by Lakṣmīdhara Lekhaka) on Thursday 13 *sūklapakṣa* of Kāṛttika in Sama. 1786 = 23 October 1729. After the post-colophon, on the next page (f. 45v), is written: *idam arabībhasāta āvidasamāṇḍīacakathitaṁ na(ya)nasukhopādhyaṁīh sanskṛtre gṛathitam* - "This was told (in a vernacular) by Ābida (translating) from the Arabic language, written down in Sanskrit by Nayanasukhopādhyaṁīh". Acquired in 1730.

2(4) Mahārāja of Jaipur Museum 46. *Śarahaṭṭakara varjandī* of Naṣīr al-Dīn al-Ṭūṣī and al-Birjanḍī. Ff. 1-56. 20.5×16 cm. 16/17 lines per page. Bound in cloth. Copied by Kṛpārāma on Tuesday 8 *sūklapakṣa* of Pauṣa in Sama. 1786, Śaka 1651 = 16 December 1729. Between the colophon and the post-colophon on f. 56 is written: *idam mahammadābīd-dasamāṇḍīhī karthitaṁ nayanāsuṅhopāḍhyāyaṁīh sanskṛtaśābdair vibad-dham* - "This was told (in a vernacular) by Muhammad Ābidda, encompassed by Sanskrit words by Nayanasukhopāḍhyāyaṁīh". Acquired in 1730.

3(5) Mahārāja of Jaipur Museum 42. *Yantrarājarisālā* of Naṣīr al-Dīn al-Ṭūṣī. 2 blank ff; ff. 1-28; and 2 blank ff. 22×16.5 cm. 16 lines per page. Copied by Kṛpārāma. After the colophon of manuscript 81865 in the Sarasvati Bhavana in Benares was written by a second scribe: *iti nayanāsuṅkhopāḍhyāyayakṛtāyantrarājāvicaravimsātyādhāyāyī aravītaḥ sanskṛtaṁ nītā* - "Thus the Investigation of the Astrolabe in twenty chapters composed by Nayanasukhopāḍhyāya was brought from Arabic into Sanskrit."

4(6) Kasmohor 5483 of the City Palace Library in Jaipur.

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8 See *CESS*, A5, 118a. It was edited by S.R. Sarma, New Delhi 1986/7.

9 Information from Bahura’s catalogue.
Jarakaṭiyana. Ff. 1-9, (10), 11-12 and (13); and 3 blank ff. 20 × 15 cm. 16 lines per page. Copied by a scribe whose script is similar to Kṛpārāma’s.


From among the manuscripts in this small library of texts translated into Sanskrit from Arabic and Persian -by no means all of such translations represented by copies that once belonged to Jayasimha- I shall in this paper concentrate on one of the rarest texts; in fact, its manuscript is unique. This is the Vakramārgavicāra, "Investigation of Retrograde Motion", said to exist in the ninth adhyāya of Jamshīd al-Kāshī’s Zīj-i-Khāqānī⁹⁹ atha vakramārgavicāraḥ khākāni jīcasya navamādhyāyastho. In fact, al-Kāshī’s zīj consists of just six maqālas. Kāshī’s discussion of retrogression presumably is to be found in maqāla 3, dar ma’rifat-i-mawādī-i-kawākib dar tāl u’cārd. Through the kindness of E.S. Kennedy I have been able to examine ff. 79v–81v of the London manuscript of the zīj, India Office Library Persian 430 (now in the British Library), which contain fasīl 5 on the theory of retrogressions and the stationary points; this must be from the first bāb. The second bāb should have the proofs in accordance with the

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⁹ See CESS A4, 57a-57b, and A5, 43b. It was edited by V. Bhāttācārya, Vāraṇaśi 1967. Judging from the lost manuscript which belonged to Śivasahāya of the Unao Zila in 1875 and which is dated A.D. 1694, one must conclude that this translation from Persian was made in the seventeenth century.

general arrangement of the zij.

It is the proofs that the Sanskrit version offers. These are ultimately derived from Ptolemy’s Almagest 12, 1-6, who in turn, for the fundamental theorem, draws upon Apolloniustes. The Sanskrit mentions Ablūnayūsa and faithfully repeats the third figure of Almagest 12, 1, which is for Apolloniustes’ preliminary lemma. It also reproduces, in somewhat simplified form, the fifth and sixth figures while introducing several other figures not found in Ptolemy. In presenting the geometry it stays remarkably close to Ptolemy’s lettering: A=a, B=ba, Γ=ja, Δ=da, E=ha, Z=jha, H=va, Θ=ta, K=ka, and Λ=la. The proof is more prolix than in Ptolemy; nothing is left for the reader to supply. But the language is far simpler than Ptolemy’s Greek, consisting of very simple sentences and using a very simple vocabulary.

Instead of computing the retrogressions of each of the five planets as Ptolemy does in Almagest 12, 2-6, Kāshi (at least according to the Sanskrit version) calculates them simultaneously for just one superior planet, Mars, and one inferior planet, Venus. At the beginning of these calculations it is explained: atha taccathāntaram uccasthānād vā nīcathānāt paṅcatārānām mijistigranthe dvādaśādhyāye niṣkāśitam asti/ punah sarvaśicagranaḥśeṣu tata eva likhitam/ atha bhaumasya nīcoccavṛt-tavyāśārdham sukraśya bhukendrapratiritṛtakendrayor antaram ca batima-jūṣavedhād yaj jñātaṁ yac ca yalkhānīvedhād āptam tayor ‘ntaram asti/ mayā anayor antarayor ganiṭam yalkhānīvedhānusārena kathyaṭe// "So the difference in that (stationary) point due to the distance or nearness of the five planets is set out in the twelfth chapter in the book Mijistī (Almagest). Moreover, it is copied from that in all the jīca (zīj) books. Then whatever radius of the epicycle of Mars and distance between the center of the earth and the center of the deferent of Venus is known from the observation of Batimajūsa (Ptolemy) and whatever is obtained from the observation of Yalkhānī (the Zīj-i-Īl-khānī)- there is a difference of those two from each other. The computation of those two distances (i.e., the farther and the nearer) is told by me in accordance with the observation of Yalkhānī.” Indeed, the Sanskrit text uses the parameters of the Zīj-i-Īl-khānī rather than those of Ptolemy.

However, it is not at all clear why this section of the Zīj-i-Khāqānt was chosen for translation. One may guess that this translation was made before
that by Jagannātha, allegedly in 1732, of the *Tahrīr al-Majisti*, where one would learn of Apollonius’ theorem and of Ptolemy’s calculations of the retrogressions of the planets at furthest and nearest distances. However, even if the *Vakramārgavicāra* preceded the *Samrāṭsiddhānta*, there is still a question of motivation, since the stationary points could be readily computed with either the methods of traditional Indian *siddhāntas* or with the tables of the *Zīj-i-jadīd* of Ulugh Beg, which were available to Jayasimha. The motivation, then, must have been the Mahārāja’s desire to understand the geometrical models that lie behind such tables—an interest in astronomical models that he manifested on other occasions—e.g., in his fifth question to the Jesuits at Candranagara as reported by Père Calmette on 24 January 1733. "Sur quel fondement M. de la Hire a-t-il établi sa troisième équation des mouvements de la lune, et de quelle manière pourroit-on la réduire en hypothèse, et la calculer géométriquement?"

12 *Samrāṭsiddhānta*, vol.2, pp. 949-966.