

A HISTORY OF THE KERALA SCHOOL  
OF HINDU ASTRONOMY

*(IN PERSPECTIVE)*

*By*

K. V. SARMA

VISHVESHVARANAND INSTITUTE  
HOSHIARPUR'

1972

While mathematical and astronomical studies suffered a setback in North India from the 13th century, such studies continued uninterrupted in pockets like Kerala, in the south, far removed from the vortex of political and other tribulations. A proper evaluation of these investigations and a full account of the literature thereof has, all along, been a desideratum.

The present *History of the Kerala School of Hindu Astronomy* attempts to depict, in perspective, the contribution of Kerala to mathematics and astronomy, in six chapters devoted, respectively, to : I. *Some salient features of Kerala astronomy* ; II. *Anticipation of modern mathematical discoveries by Kerala astronomers* ; III. *Major trends in Kerala Jyotiṣa* ; IV. *Kerala astronomers* ; V. *Bibliography of Kerala Jyotiṣa* and VI. *Bibliography of Kerala-based Jyotiṣa*. Of particular interest herein are ch. III, demonstrating the anticipation of several modern theorems, ch. IV, giving details of the lives and works of about eighty astronomers, and ch. V, identifying as many as 752 works and 111 authors, with full documentation such as manuscripts of the works, dates of authors and works, earlier writings and indication of the contents of the texts.

It is to be hoped that the present *History* will provide historians of mathematics with a fair idea of the contribution of Kerala to Hindu astronomy.

Price : Rs. 20

प्रधान-संपादक: — विश्वबन्धु:

Gen. Editor — VISHVA BANDHU

1000-10-99

Phone : 23606

Vishveshvaranand Book Agency

PUBLISHERS & BOOKSELLERS

P.O. Sadhu Ashram, HOSHIARPUR-146021  
( Punjab, India )

विश्वेश्वरानन्द पुस्तक भण्डार

प्रकाशक एवं पुस्तक विक्रेता  
डाकघर साधु-आश्रम, होशियारपुर (पंजाब, भारत)

To Sh. Arun K. Upadhyay, IPS,  
B-9, CB-9, Cantonment Road,  
Cuttack-753 001.

Bill No. A 9885 Date 30.11.2000



Order No. Letter Date 7.11.2000

PARTICULARS	Qty.	Rate	Amount	
			Rs.	P.
A History of Kerala School of Hindu Astronomy	1		20	00
Ksudrakalpasutra	1		42	00
Bhasikasutra	1		24	00
			86	00
Less 10%			8	00
			78	00
V.P.F. Charges			37	00
			115	00

भारते होशियारपुरे वि. वै. शो. सं. मुद्रागृहे ।

शास्त्रिणा देवदत्तेन मुद्राप्येदं प्रकाशयते ॥

Printed and published by DEVA DATTA, Shastri  
at the V. V. R. I. PRESS, Hoshiarpur (Pb., India)

**A HISTORY OF THE KERALA SCHOOL  
OF HINDU ASTRONOMY  
( IN PERSPECTIVE )**

*By*

**K. V. SARMA**

**Reader in Sanskrit,  
Vishveshvaranand Institute of Sanskrit  
and Indological Studies**

**होशियारपुरम्  
विश्वेश्वरानन्दसंस्थानम्  
HOSHIARPUR  
VISHVESHVARANAND INSTITUTE**

**1972**



सर्वेऽधिकाराः सुरक्षिताः

प्रथमं संस्करणम्, २०२६ वि.

प्रकाशकृत् — विश्वेश्वरानन्द-संस्कृत-भारतभारती-अनुशीलन-संस्थानम्,  
पंजाब-विश्वविद्यालयः

(पत्रगृहम्) साधु-आश्रमः, होशियारपुरम् (पं०, भारतम्)



All Rights Reserved

FIRST EDITION, 1972

*Publishers :*

**VISHVESHVARANAND INSTITUTE**

OF

**SANSKRIT & INDOLOGICAL STUDIES, PANJAB UNIVERSITY,  
P.O. Sadhu Ashram, HOSHIARPUR (Pb., India)**

# CONTENTS

	<i>Pages</i>
<b>PREFACE</b>	vii-x
<b>BIBLIOGRAPHY</b>	xi-xiii
<b>ABBREVIATIONS</b>	xiv
<b>CH. I. SOME SALIENT FEATURES OF KERALA ASTRONOMY</b>	1-10
Introduction (p. 1)—Spirit of enquiry (1-3)—Stress on observation and experimentation (3-4)—Concern for accuracy (4)—Researcher's outlook (4-5)—Continuity of tradition (5-6)—Basic features of Kerala astronomy (6-7)— <i>Parahita</i> system of astronomy (7-9)— <i>Dr̥k</i> system of astronomy (9-10)	
<b>CH. II. ANTICIPATION OF MODERN MATHEMATICAL DISCOVERIES BY KERALA ASTRONOMERS</b>	11-28
The background (11-12)—Tycho Brahe's Reduction to the ecliptic (12-14)—Newton-Gauss Interpolation formula (14-15)—Taylor Series for Sine and Cosine functions (15-16)—Newton's Power Series for Sine and Cosine (16-18)—Infinite G.P. Convergent Series (18-19)—Lhuiler's formula for the Circum-radius of the Cyclic quadrilateral (19-20)—Gregory and Leibnitz's Series for the Inverse tangent (20-22)—Leibnitz's Power series for $\pi$ (22-23)—Approximations to the value of $\pi$ (23-27)—Some other highlights (27-28)	
<b>CH. III. MAJOR TRENDS IN KERALA LITERATURE ON JYOTIṢA</b>	29-40
Introductory (29)—The classical texts (29-30)—Major works on astronomy (30-32)—Computation of the Moon (32)— <i>Veṅvāroha</i> method for the Moon (32-33)—Computation of eclipses (33)—Computation of the shadow (33-34)—Long-range almanacs (34)—Astronomical rationale (34-35)—Practical astronomy (35)—Revision of astronomical constants (35-36)—	

	<i>Pages</i>
<b>CH. III. MAJOR TRENDS (contd.)</b>	
Mathematics (36)—Horary astrology (36)—Auspicious times ( <i>Muhūrta</i> ) (36-37)—Astrological query ( <i>Praśna</i> ) (37)—Natural astrology (37-38)—Malayalam versions of Sanskrit texts (38)—Kerala Jyotiṣa outside Kerala (38-40)	
<b>CH. IV. KERALA ASTRONOMERS</b>	<b>41-81</b>
Introductory (41)—Earlier documentation (41-42)—Chronological account of Kerala astronomers and their main works (43-81)	
<b>CH. V. A BIBLIOGRAPHY OF KERALA JYOTIṢA LITERATURE</b>	<b>82-184</b>
Source material and method of presentation (82-84) — Annotated Bibliography of authors and works, with the documentation of manuscripts, editions, translations, studies and extracts (85-184)	
<b>CH. VI. A BIBLIOGRAPHY OF KERALA-BASED JYOTIṢA LITERATURE</b>	<b>185-96</b>
Source material and method of presentation (185-86)—Bibliography of authors and works with documentation of manuscripts etc. (187-96)	
<b>INDEX</b>	<b>197</b>

## P R E F A C E

The present work on the Kerala School of Hindu Astronomy grew out of my conviction about the sustained development of the twin disciplines of astronomy and mathematics, in that part of India, during mediaeval times, even after the period of Bhāskara II (b. A. D. 1114), from when on, it is uniformly presumed that Hindu mathematics had come to a standstill (see below, pp. 11-12). For a proper assessment of the said development, the premier requirement was an analytical and documented account of the extensive source materials on the subject, in Sanskrit and in Malayalam, as recorded, mostly, in palmleaf manuscripts. Critical and comparative studies on individual topics, authors and works could follow, on the basis of the said account. And, the cumulation of such studies could be expected to set out the contribution of Kerala to Hindu astronomy, which would form a substantial chapter in the history of that discipline.

This volume is intended as a history 'in perspective', a necessary fore-runner to 'descriptive' and 'comparative' histories of the subject. The aim is to set out in broad 'perspective' the characteristics of Hindu astronomy as it developed in Kerala (pp. 1-10), its major achievements and highlights (pp. 11-28), its main trends (pp. 29-40), a chronological account of the astronomers and mathematicians of Kerala (pp. 41-81), a fully referenced and documented survey of the literature on the subject produced in the land, with extracts from manuscripts and mention of earlier writings on them (pp. 81-184) and a similar survey of the literature inspired by Keralite ideas, but produced beyond the borders of Kerala (pp. 185-96).

The sections on 'Modern anticipations' (pp. 11-28) and on 'Major trends' (pp. 29-40) are bound to be highly instructive. So also are the sections on the 'Bibliography of Kerala Jyotiṣa' and the 'Bibliography of Kerala-based Jyotiṣa', in 115 pages, which form the burden of this book. In the former as many as 752 works and 111 authors have been identified and marked off with documentary evidence, and in the latter 118 works and 32 authors have been similarly treated.

Of the said 752 Kerala works, 402 pertain to astronomy and mathematics and 350 to astrology. Among the astronomical works, the *karāṇa* texts number 211 and works on general astronomy, 80. There are 34 works on eclipses, which either enunciate new methodologies, indicate revised calculations or describe eclipse computation. A very important type of texts, numbering 9, pertain to the exposition of astronomical rationale (*nyāya* and *yukti*). Works connected with the *Siddhāntas* number 6, with *Tantra* 34 and with mathematics 28. The above résumé would amply substantiate the claim for sustained astronomical investigation and literary activity in that subject in Kerala during the late mediaeval period.<sup>1</sup>

The survey, conducted as above, has resulted, as might be seen from the inventory of Kerala authors and works (pp. 85-184), in the identification of several hitherto unknown astronomers and the discovery of a large number of interesting texts, especially on *chayā*, *grahaṇa* and *sphutakriyā*; these can be distinguished in the said inventory by the absence of any reference to modern writings recorded below the respective entries. Among the identifications are included also the different versions and recensions of works like the *Kriyākramakarī*, *Goladīpikā* and *Nyāyaratna*. Several works bearing the same title, and authors having a common name have been identified. (See for example, *Uparāgakriyākrama* I-III, *Grahaṇagaṇita* I-X, *Grahaṇaṣṭaka* I-IV, *Pañcabodha* I-XI, *Muhūrtapadavī* I-VII; Dāmodara I-III, Nārāyaṇa I-VIII, Puruṣottama I-III, Śaṅkara I-IX etc.). A number of additions, correlations, and corrections to existing views could also be made which would be apparent on a reference to entries such as Acyuta II (see also p. 184), Āzhvāñceri Tamprākkaḷ, Ghaṭigopa, Citrabhānu-Śiṣya (see also p. 184), Jyeṣṭhadeva, Nārāyaṇa I, Nilakaṇṭha I, Parameśvara I, Putumana Somayāji, Mādhava I, Śaṅkara Vāriyar of Tṛkkuṭaveli, Śaṅkaran Nampūtiri of Mahiṣamaṅgalam, *Muhūrtapadavī*, *Horā* etc. Of special significance in the matter of ingenuity is the *Veṅvāroha* of Mādhava and the genre of texts based on its method. Among the numerous new works discovered, two deserve special mention, viz., the *Grahaparikṣākrama* of Nilakaṇṭha Somayāji and the *Sūryasiddhānta-vyakhyā* of Acyuta Piṣāraṭi. As a matter of fact, it is quite possible that further examination of the manuscript

---

1. It might be mentioned here that S.N. Sen's *Bibliography of Sanskrit works on astronomy and mathematics*, (National Institute of Sciences of India, New Delhi, 1966), records only about 660 works, in all, for the whole of India.

repositories in Kerala is likely to result in more discoveries and identifications.

This volume is primarily the outcome of the researches which I carried out as a University Research Scholar under the supervision of Prof. V. A. Ramaswami Sastri, concurrently with my duties as the Supervising Pandit of the Cataloguing Section of the University Oriental Manuscripts Library, Trivandrum: My intimate association, later, with the compilation of the *New Catalogus Catalogorum of Sanskrit Works and Authors* at the Madras University also proved to be of great help in my work. The thrill at discovering the thitherto unknown basic of text of the *Parahita System* of Kerala astronomy, viz., the *Grahacāranibandhana* of Haridatta (c. A. D. 650-700) and, subsequently, of the basic text of the *Dr̥k System*, viz., *Parameśvara's Dṛggaṇita*, which had been proclaimed by all earlier scholars as irrevocably lost, sustained me through the heavy strain involved in examining several hundreds of palmleaf manuscripts, identifying, studying and correlating works on Jyotiṣa. Another factor which kept up the tempo of the investigations, during later years, was the flow of queries from the late savant, Vaṭakkumkūr Rajaraja Varma, who was then writing his 6-volume *History of Kerala Sanskrit literature* and 2-volume Supplement to Ulloor's *History of Kerala literature*. I cherish the privilege I had in supplying him with substantial literary information in that connection, which he has generously acknowledged at several places in his said books, particularly in the Preface to vol. I of the latter work and in the general reference he has made on pp. 508-9 of vol. VI of the former.

The magnificent Manuscripts Library of the Kerala University, which is the largest repository of Kerala manuscripts, has, naturally, been the prime source of my basic materials. I am indebted to the successive Directors of that Library, to wit, Prof. V.A. Ramaswami Sastri, Dr. P.K. Narayana Pillai and Dr. K. Raghavan Pillai, and to Dr. L.A. Ravi Varma, who was in charge of the Maharaja's Palace Library, Trivandrum, for the facilities they afforded towards my studying the materials available at these centres. Thanks are due, for similar facilities, also to the authorities of certain other manuscript repositories, especially the Govt. Oriental Mss. Library, and the Adyar Library, Madras, the Sanskrit College Library, Trippunithura, the S.V. Oriental Institute, Tirupati, and our own Vishveshvaranand Institute, Hoshiarpur. Among the private collections

which I could make use of, a mention might be made of those at the Āzhvāñceri Tamprākkaḷ Mana, Kāñippayyūr Mana, Elamprakkottu Mana and Vayaskara Illam, to the custodians of all of which I am thankful. I am obliged to Shri Rama Varma Maru Thampuran of Cochin, Chalakkudi, for providing me with the details about several astronomical tracts and to Shri P. Ramanathan, Ulloor Publishers, Trivandrum, for placing at my disposal, the rich library of his father Ulloor S. Parameswara Aiyar, the veteran historian of Kerala literature. Among modern scholars on mathematics, I am particularly grateful to Prof. T.S. Kuppanna Sastri, Sanskrit College, Madras, and Prof. C.T. Rajagopal, lately of the Ramanujan Institute of Mathematics, University of Madras, for the inspiration they gave me in my investigations. I also wish to put on record the help that I received from Shri Raj Kumar and Shri K. Sundareswaran of our Institute in the matter of reading the proofs and allied work relating to the present publication. The credit for the neat and expeditious execution of the printing of this volume goes to the V.V.R.I. Press, Hoshiarpur.

K.V. SARMA

Vishveshvaranand Institute,  
Hoshiarpur,  
August 15, 1972.



## B I B L I O G R A P H Y

- Ad. Adyar Library, Madras. Ref. to the Library's *Alphabetical Index of Mss.*, Madras, 1944.
- Bala. ~~K. Palagangacharan~~  
~~K. Balachandran~~ A consolidated list of Hindu mathematical works', *Mathematics Student*, 15 (1947) 55-70.
- Baroda Oriental Institute, Baroda. Ref. to its *Alphabetical list of Mss.*, 2 vols., Baroda, 1942, 1950.
- C| Curator's office Collection of Skt. Mss., deposited in the Kerala Univ. Mss. Library, Trivandrum.
- CC *Catalogus Catalogorum, An alphabetical register of Skt. works and authors*, by T. Aufrecht, Leipzig, 3 vols., 1891, 1896, 1903 ; Rep. Wiesbaden, 1962.
- CM Curator's Office [Collection of Malayalam Mss., deposited in the Kerala Univ. Mss. Library, Trivandrum.
- Gaṇaka. *Gaṇakatarāṅgiṇī or Lives of Hindu astronomers* (in Skt.), by Sudhakara Dvivedi, rev. by Padmakara Dvivedi, Banaras, 1933.
- IO India Office, London: Ref. to its *Cata. of Skt. and Pkt. Mss.*, by J. Eggeling, (2 Pts., London, 1887, 1896) ; and A. B. Keith, (2 Pts., London, 1935),
- Kaye G. R. Kaye, 'A brief bibliography of Hindu mathematics', *Jl. and Proc. of the Asiatic Soc. of Bengal*, (NS), 7 (1911) 679-86.
- Ker. Kerala University Mss. Library. Ref. to its *Alphabetical Index of Skt. Mss.*, 2 vols., Trivandrum, 1957, 1965.
- Ker. Astron. K.V. Sarma, *A history of the Kerala school of Hindu astronomy (In perspective)*, Vishveshvaranand Institute, Hoshiarpur, 1972.

- Ker. Mal.** Kerala Univ. Mss. Library, *Index of Malayalam Mss.*, Trivandrum, 1951.
- Kolatheri** Kolatheri Sankara Menon, *Indian astronomy with special reference to the works of Kerala authors*, Doc. diss., Madras University, 1927.
- L** Loan Collection of Mss., deposited in the Kerala Univ. Mss. Library, Trivandrum.
- Lucknow, Skt. Parishad.** See below, p. 186.
- Mad.** Madras, Govt. Or. Mss. Library. Nos. preceded by 'D' denote mss. described in its *Des. Cata. of Skt. Mss.* and those preceded by 'T' denote mss. described in its *Triennial Cata. of Mss. (Skt.)*
- Mysore** See p. 186;
- NCC** *New Catalogus Catalogorum : An alphabetical register of Skt. and allied works and authors*, by V. Raghavan, K.K. Raja, University of Madras, 1949 ff.
- Nepal Vir.** See below, p. 186.
- P** Palace Library Collection of Skt. Mss., Trivandrum, deposited in the Kerala Univ. Mss. Library.
- PG** P. Govinda Pillai, *Malayala Bhasha Charitram* (in Mal.), rep. National Book Stall, Kottayam, 1955.
- PM** Palace Library Collection of Malayalam Mss., Trivandrum, deposited in the Kerala Univ. Mss. Library.
- Raj. Jaina** See below, p. 186.
- Raj. Jodh.** See below, p. 186;
- Raja** K.K. Raja, 'Astronomy and mathematics in Kerala (An account of its literature)', *Adyar Library Bulletin*, 27 (1963) 118-67;
- RNP** R. Narayana Panikkar, *Kerala Bhasha Sahitya Charitram* (in Mal.), V. V. Book Depot, Trivandrum, 7 vols., nd.-1951.

- Sen S.N. Sen, *Bibliography of Sanskrit works on astronomy and mathematics*, Pt. I : Manuscripts, Texts, Translations and Studies, National Inst. of Sciences of India, New Delhi-1, 1966.
- Sundaram Iyer K. Sundaram Iyer, 'Kerala's contribution to astronomy and astrology', *Proc. of the 9th All-India Or. Conf.*, Trivandrum, 1937, pp. 1109-19.
- T Transcripts Section (Skt.) of the Kerala Univ. Mss. Library, Trivandrum.
- Tanjore Tanjore, Sarasvati Mahal Library. Nos. preceded by 'D' denote mss. in its *Des. Cata. of Skt. Mss.*
- Tir. Triupati, S.V. Or. Institute : *Alphabetical Index of Skt., Telugu and Tamil Mss.*, Tirupati, 1956.
- TM Transcripts Section (Malayalam) of the Kerala Univ. Mss. Library, Trivandrum.
- Ul. Ulloor S. Parameswara Aiyar, *Kerala Sahitya Charitram* (History of Kerala literature), (in Mal.), Univ. of Kerala, Trivandrum, 5 vols., 1953-57.
- Ul. Sup. Sup. to Do. : *Kerala Sahitya Charitram—Charcchayam Puraṇavum*, (in Mal.), by Vaṭakkumkūr Rājarāja Varma, Mangalodayam, Trichur, 1967, 1969.
- Va. Vaṭakkumkūr Rājarāja Varma, *Keraliya Samskrita Sahitya Charitram* (History of Kerala Skt. literature), (in Mal.), vol. I, Kamalalaya Bk. Depot, Trivandrum, M.E. 1113 (A.D. 1938) ; vols. II-VI, Mangalodayam, Trichur, M.E. 1122-40 (A.D. 1947-65).
- Varanasi See below, p. 186.
- V.V.R.I. See below, p. 186.
- Whish Whish Collection of mss., described in *A Cata. of Indian Skt. Mss. (especially those of the Whish collection) in the Royal Asiatic Soc., London*, by M. Winternitz, London, 1902.

## GENERAL ABBREVIATIONS

arith.	Arithmetic
astrol.	Astrology (general)
astron.	Astronomy (general)
C	Commentary
ecl.	Eclipse
jā.	Jātaka
kar.	Karaṇa
Ker. (?)	Kerala authenticity doubtful
Mal.	Malayalam
Ms(s).	Manuscript(s)
muh.	Muhūrta
nat. astrol.	Natural astrology
pra.	Praśna
Skt.	Sanskrit
TSS	<i>Trivandrum Skt. Series</i>

## CHAPTER I

### SOME SALIENT FEATURES OF KERALA ASTRONOMY

#### 1. Introduction

Mathematics and astronomy are two of the scientific disciplines to which significant contributions have been made, down the centuries, by Kerala scholars. The land of Kerala, a narrow strip of territory tucked away between the Western Ghats and the Arabian sea, produced superb mathematicians from very early times. The fervour with which the sister science of astrology, in its different branches, was cultivated, had had the beneficial effect of promoting the study of mathematics and astronomy, for the latter provided the basic framework for the practice of the former. The social structure which confined mainly, to certain sections of the community, the study of these disciplines and the freedom from political or religious upheavals which Kerala enjoyed helped the uninterrupted development, here, of these sciences. As a result of all this, significant strides were made and a very large number of treatises came to be written, down to the 19th century, in these disciplines. However, only a fraction of these works have come down to us, the bulk having been lost on account of the ravages of time and the inclement climate of the land which had a highly detrimental effect on the palmleaf manuscripts on which these works had been inscribed. The highly conservative outlook of the custodians of extant manuscripts of these technical texts, the local Malayalam language in which many of these works have been composed or commented upon and the rather obscure Malayalam script used for writing the manuscripts have all stood in the way of a proper study and interpretation of these works in terms of modern mathematics and thereby institute a proper evaluation thereof. In fact, modern scientific studies on Kerala astronomy have been based mainly on just a handful of texts as have, so far, been made available in print, out of the few hundreds of texts still available in the form of manuscripts.

#### 2. Spirit of enquiry

At the outset, a reference might be made to the mental outlook and spirit of enquiry that characterised Kerala astronomers and

mathematicians in their investigations. Parameśvara of Vaṭaśreṇi (c. 1360-1455), who revised the then prevailing *Parahita* system of computation and evolved new methods in his work entitled *Dr̥ggaṇita*,<sup>1</sup> makes a revealing statement in this regard, in the beginning of that work. He says :

*dr̥syante vihaḡa dr̥ṣṭyā bhinnāḡ parahitoditāḡ |*  
*pratyakṣadr̥ṣṭāḡ spaṣṭāḡ syur grahāḡ śāstreṣv it̥iritam ||I.1.2 ||*

*satkarmoditakālasya grahā hi jñānusādhanam |*  
*aspaṣṭavihagaiḡ siddhaḡ kālah śuddho na karmaṇi || 3 ||*

*ye tu śāstravidas tadvad golayuktividaś ca taiḡ |*  
*sphuṭakhecaravijñāne yatnaḡ kāryo dvijair atah || 4 ||*

*sañcintyete samalocya pūrvatantrāṇi yatnataḡ |*  
*sphuṭayuktim khecarāṇām goladr̥ṣṭyā samikṣya ca || 5 ||*

*sphuṭakhecaravijñānam śiṣyair yaiḡ prarthitam dvijaiḡ |*  
*tebhyo Dr̥ggaṇitam nāma gaṇitam kriyate mayā || 6 ||*

‘(The positions of) the planets derived according to the *Parahita* (system of computation) are found to be different (from their actual positions) as seen by the eye. And, in authoritative texts (*śāstra*) it is said that (only) positions as observed (should be taken) as the true ones. (I. i. 2).

‘( The positions of ) the planets are the means of knowing the times specified for ( the performance of ) meritorious acts. (Here), times calculated from incorrect (positions of ) planets will not be auspicious for those) acts. (3)

---

1. K. V. Sarma, *The Dr̥ggaṇita of Parameśvara*, Cr. ed. with Introduction, Hoshiarpur, 1963. Parameśvara is reputed to have made continuous astronomical observations for 55 years with the help of instruments : Cf. what Nilakaṇṭha Somayājīn, who received instruction from Parameśvara, says in his *Āryabhaṭīya-bhāṣya* (Gola, 48) : *Parameśvarācāryeṇa punaḡ grahaṇa-grahayogādikam yantraḡ pañcapañcāśad-varṣakālam samyak parīkṣitam. Aha caivam...“grahendraḡ pañcapañcāśad-varṣakalapaḡantare”* etc. (Trivandrum Skt. Ser., No. 185, p. 154).

'Hence, efforts should be made for knowing the true (positions of) planets by those who are learned in the sciences and by those who are experts in spherics. (4)

'Cogitating thus, and painstakingly studying the ancient texts and observing well the true positions of the planets according to the spherics, I am composing a manual on astronomy for the twice-born disciples who requested for a knowledge of the true (positions of the) planets'. (6).

### 3. Stress on observation and experimentation

An insight into the mediaeval astronomer's methodology, which consisted of prolonged and repeated observation, experimentation, recording of readings, checking of the values obtained from observation with those obtained by computation and the postulation of corrections (*samskāra*), in order to make computation correspond with observation, might be illustrated by certain statements which Parameśvara makes elsewhere. In his sub-commentary *Siddhāntadīpikā* on the *Mahābhāskarīya-bhāṣya* of Govindasvāmin,<sup>1</sup> he has a long excursus on a number of eclipses which he had observed carefully and about which he had recorded the details, with a view to effecting necessary corrections to prevailing rules of computation or for formulating new rules therefor (*op. cit.*, pp. 321-32). He commences the said excursus with the statement that he had been observing eclipses from Śaka 1315 (A.D. 1393), that he had found the observed times to have always preceded the computed times and, so, the computations needed corrections :

'*tithiviśva*'-(1315)-same śake prārabhya grahaṇam mayā |  
*anekam ikṣitam, teṣu bhinnah kālo dṛśā sadā* || 2 ||  
*pratyakṣakālas teṣu prāg gaṇitānītakālataḥ |*  
*ataḥ kāryo 'tra samskāro yaḥ kaścid gaṇakottamaiḥ* || 3 || (p. 321)

He then enunciates the True positions of the Sun, Moon, Moon's higher apsis and node at sunrise for a particular contemporary date as calculated by the application of the corrections proposed by him,

1. T. S. Kuppanna Sastri, Cr. ed. of *Mahābhāskarīya of Bhāskarācārya with the Bhāṣya of Govindasvāmin and the super-commentary Siddhāntadīpikā of Parameśvara*, Madras, 1957.



so as to form the zero-readings for calculations beginning from that date. He also suggests that verifications should be made in course of time and further corrections postulated and applied as and when needed :

*asmin kāle tu ravīnduccapātānam sthītir īdr̥ṣī |*  
*etatsiddhyartham asmābhiḥ saṃskārāntaram ādṛtam || 91 ||*

... ..

*kālāntare tu saṃskāroś cintyatām gaṇakottamāḥ ||93|| (p.332)<sup>1</sup>*

#### 4. Concern for accuracy

The concern of these astronomers for accuracy in the results of computations is reflected in a statement, again by the same author, in another work of his. Towards the close of an extensive work on the computation of eclipses, entitled *Grahaṇamaṇḍana*,<sup>2</sup> Parameśvara observes, in all humility, that the times of contact etc. as obtained through the calculations enunciated in that work *may, at times, differ slightly from observed positions*.<sup>3</sup> He hastens to add that these small differences must be due to factors which he could not take into account or which had not been identified thus far. But, as a practical scientist, he is confident that it would be possible to postulate, as a result of further observations and experimentations, the necessary corrections by the application of which even these small differences could be eliminated :

*śāstrād alabdha ekāḥ saṃskāro grahaṇakarmaṇi ravīndvoḥ |*  
*asty eveti ca kalpyaḥ gaṇakavarair yuktividbhir atāḥ || 98 ||*  
*dṛṣṭvā bahūparāgān sañcintya ca golayuktim iha gaṇakāḥ |*  
*kalpyaḥ sa tu saṃskāras tasmād, athavā gurūpadeśena || 99 ||*

#### 5. Researcher's outlook

The endeavour among Kerala astronomers for continuous

1. On Parameśvara's astronomical observations, see K. V. Sarma, 'An-pattiyāñcu kollatte tapassu' ('Fifty-five years' penance'), *Mathrubhumi* (Malayalam Weekly, Kozhikode), 7.10.1956, pp. 29-30.

2. K. V. Sarma, *Grahaṇamaṇḍana of Parameśvara*, Cr. ed. with Introduction, Translation and Appendix, Hoshiarpur, 1965.

3. Cf., *Ibid.* : *kālo 'nena ca siddhaḥ kadācid api bhidyate svalpam ||66||*

efforts at improving their results is reflected in the enunciation by Parameśvara in a later work of his, viz. *Dr̥ggaṇita*, a correction to one of his earlier works, the *Grahaṇamaṇḍana*. This correction which is to be applied to the Mean positions of the Sun, Moon, Higher apsis and Node as calculated according to the *Grahaṇamaṇḍana* is given at the close of his *Dr̥ggaṇita*, II. 47-50, with the introductory statement :

*kārya graheṣu Grahaṇamaṇḍanokteṣv atah param |*

*saṁskāras tam ca vakṣyāmi tatra noktam yato mayā || II. 47 ||*

## 6. Continuity of tradition

Still another significant characteristic of Kerala astronomy and mathematics relates to the regular continuity of traditional knowledge that was handed down from father to son or from teacher to disciple, in succession. Some of the known lines of tradition extend through several centuries. An old palmleaf document discovered and published by the present writer<sup>1</sup> records a line of tradition which extends from the 13th to the 17th centuries : Govinda Bhaṭṭatiri of Talakkūḷam (1237-95) → pupil : grandfather of Parameśvara (13th-14th cent.) → grandson-pupil : Parameśvara (c. 1360-1455) → son : Dāmodara (15th cent.) → pupil : Nilakaṇṭha Somayāji (1444-1545) → pupil : Jyeṣṭhadeva (c. 1500-1600) → pupil : Acyuta Piṣāraṭi (1550-1621). Another similar astronomical chronology recorded in the *Āranmula-vllāsam Haṁsappāṭṭu* by Kṛṣṇan Āśān, author of *Bhāṣā-Jātakapaddhati*, carries the above-noted tradition to the beginning of the 19th century ;<sup>2</sup> Acyuta Piṣāraṭi (1550-1621) → pupil : Tr̥ppāṇikkara Potuvāḷ → pupil : Nāvāyikkuḷattu Āzhāti → pupil : Pulimukhattu Poṭṭi (1686-1758) → pupil : Rāman Āśān (18th cent.) → son : Kṛṣṇan Āśān (1756-1812). This line continues as follows : Kṛṣṇadāsa (1756-1812) → pupil : Dakṣiṇāmūrti Mūssatu of Maṅgalaśśeri, in Āranmula (18th-19th cent.) → pupil : Bālarāman Piḷḷa of Nālēkāṭṭil family of Mānnār (19th cent.) → pupil : Prince Rājarāja Varma (Vidvān Karindran Ceruṇṇi

1. K.V. Sarma, 'Direct lines of astronomical tradition in Kerala', *Pt. Charudeva Shastri Felicitation Volume*, Delhi, 1972 ; 'Oru Jyotiṣa-granthavari' (An astronomical document), (in Malayalam), *Mathrubhumi* (Kozhikode, Kerala), 19.5.1957.

2. See Ulloor S. Parāmeswara Aiyar, *Kerala Sāhitya Charitram*, (*History of Kerala literature*), Vol. II, (Trivandrum, 1954), pp. 321-22.

Koyittampurān of Kilimānūr) (1812-46).<sup>1</sup> The importance of the continuity of tradition in a practical, demonstrative discipline like astronomy, at a time when there was not a proliferation of printed books and public schools, is self-evident. And, the part played by these traditions in keeping alive the torch of astronomical enquiry in Kerala cannot be underestimated.

## 7. Basic features of Kerala astronomy

(a) *Adherence to the Āryabhaṭan system.* From at least the 7th century, if not earlier, Kerala had been the bastion of the Āryabhaṭan school of astronomy. While the view expressed in certain quarters that Āryabhaṭa hailed from Kerala<sup>2</sup> has yet to be substantiated, there is no doubt about the extensive popularity of this system in the land. The later Kerala schools are all based on the Āryabhaṭan system. Most of the known commentaries on the *Āryabhaṭīya* have been written by Kerala mathematicians. Well-nigh, every one of the scores of astronomical works produced in Kerala follow the *Āryabhaṭīya* basically. And, the efforts of Kerala mathematicians have generally been directed towards the revision, supplementation and correction of Āryabhaṭan astronomy and mathematics with a view to deriving more accurate results.

(b) *Kaṭapayādi notation.* An extremely convenient method of expressing numbers through letters, known as the *Ka-ṭa-pa-yādi* notation, has been extensively used in Kerala from very early times. A legendary author named Vararuci is credited with this innovation and the authorship of the popular collection of *Candra-vākyas* or *Vararuci-vākyas* ('Moon computation sentences'), composed in this notation. The *Grahaṅgārahāṅgā* of Haridatta (A.D. 683) also uses this notation extensively. In this notation, each of the four series of consonants beginning with *k*, *ṭ*, *p*, and *y* in the Sanskrit alphabet stands for the digits 1 to 9. In conjunct letters, the value only of the final consonants is to be taken into account. Vowels following the consonants have no value. *n* and *ñ* and the pure vowels stand for zero.

---

1. *Ibid.*

2. For the latest essay in this direction, see K Damodaran Nambiar, 'Āryabhaṭan', *Mathrubhumi* (Malayalam Weekly, Kozhikode, Kerala). Oct. 18, 1970, pp. 15-16, 41.

The letter *l*, which is peculiar to Dravidian denotes 9.<sup>1</sup> The versatility of the notation rests in the fact that even long and intricate numbers can be expressed through apparently meaningful expressions and verse-bits, facilitating their easy verification and memorisation.<sup>2</sup> The numerous sine and other mnemonic tables which form a characteristic feature of the Kerala School of astronomy are couched in this notation.

(c) *Basic principles.* In their mathematical work, Kerala authors and, for that matter, Indian authors in general, based themselves on the fundamentals of arithmetic, algebra, geometry and trigonometry. They were aware also of properties of numbers, to some extent. Calculus and higher mathematics, as developed in the West during the last three hundred years, were not known, but strict application of geometry, trigonometry and algebra, coupled with clear analytical thought and intuition, have enabled Kerala astronomers to arrive at important results and enunciate theorems which were later rediscovered in the West, some after several centuries.<sup>3</sup>

## 8. Parahita system of astronomy

A significant event in the annals of Kerala astronomy was the promulgation, in A. D. 683, of the *Parahita* system by Haridatta (c. 650-700) through his *Grahacāranibandhana*<sup>4</sup> and *Mahāmārga-*

- 
1. The simple rule for this notation is given by the verse :

*na-ñāv acas ca śūnyāni, saṅkhyāḥ ka-ṭa-pa-yādayaḥ |*  
*miśre tūpāntahasaṅkhyā, na ca cintyo halaḥ svaraḥ ||*

*Sadratnamālā* of Śaṅkara Varman

2. See e.g., the chronogram 'ācāryavāg abhedya' which is kali day 1434160, on which Śaṅkarācārya introduced certain reforms; and the Moon-sentence, 'gīr naḥ śreyāḥ' denoting 0°—12'—3".

3. For a resume of the more important of these anticipations, see below, Ch. II.

4. Cr. ed with Intro. by K.V Sarma, K.S. Research Inst., Madras, 1954. On the discovery and identification of this thitherto unknown basic text of the *Parahita* system see K. V. Sarma, 'Parahita-gaṇitattinte mūlagrantham', *Mathrubhumi* (Mal. Weekly, Kozhikode), Oct. 10. 1954.

*nibandhana*.<sup>1</sup> The event is recorded in several later works. For instance, the *Sadratnamālā* of Śaṅkaravarman says :

*acāryāryabhaṭapraṇītagaṇitam prāyaḥ sphuṭam tat kalau*  
*'gotrottūṅga'-(3623)-mitābdake vyabhicaran brahmādisiddhāntake |*

... ..

*ḍṛgvaiṣamyavaśāt 'mahāsthala'-(3785)-mite kalyābdake niścitaḥ*  
*saṁskāro vibudhair yataḥ parahitatvam teṣu vīneṣv ayam || (6.1, 3)*

'The astronomical treatise composed in Kali 3623 (A.D. 522) by Āryabhaṭa gave well-nigh accurate results, whereas the *siddhāntas* ascribed to Brahmā etc. had (by that time) tended to be inaccurate. (When its results too tended to be inaccurate, as exemplified by their) not tallying with observation, the correction called *Parahita* was adopted by the wise in Kali 3785 (A.D. 683) for the planets other than the Sun'.<sup>2</sup>

Tradition says that the inauguration of the system took place on the occasion of the twelve-yearly *Māmāṅkam* (*Mahā-magha*) festival held at Tirunāvāy on the Malabar coast.<sup>3</sup>

Haridatta based his system on the *Āryabhaṭīya*, but improved upon it in several ways. He made computation easier by specifying simple multipliers and divisors for the various calculations, including the derivation of the positions of the planets. His use of the *Kaṭapayādi* notation made his composition elegant. He introduced the unique system of enunciating graded tables of the Sines of the arcs of Anomaly and of Commutation of the different planets (*Manda-jyā* and *Siḥra-jyā*) at intervals of 3° 45', to facilitate the computation of the true positions of the planets. His *Grahacāranibandhana* being only the computation manual of the system, deals,

---

1. This seems to be the full-fledged theoretical treatise of the *Parahita* system while the *Grahacāranibandhana* is only its working manual. Manuscripts of this work have not yet come to light; the work is known through its reference by Haridatta himself in the *Grahacāranibandhana*, 3. 44.

2. For other references to this event and the identity of Haridatta and his works, see K.V. Sarma, *Grahacāranibandhana*, *op. cit.*, Intro., pp. v-ix.

3. See *ibid.*, pp. vi-vii; Ulloor S. Parameswara Aiyar, *Kerala Sahitya Charitram*, vol. I, (Trivandrum, 1953), p. 165.

mainly, with the calculation of the Kali days elapsed, *tithi* and *nakṣatra* of any day, the mean and retrograde motion of the planets and their Mean and True positions. One of the corrections introduced by Haridatta to make Āryabhaṭan results more accurate, is called *Bhaṭa-saṃskāra* or *Śakābda-saṃskāra* (on account of its being calculated for the years beginning from the 'śakābda' of Āryabhaṭa, viz., 444), and is particularly significant. This correction specifies that for every completed year after Śaka 444, a correction in minutes (*kalā*) of  $-9/85$ ,  $-65/134$ ,  $-13/32$ ,  $+45/235$ ,  $+420/235$ ,  $-47/235$ ,  $-153/235$  and  $+20/235$  should be made to the Mean positions of the Moon, Moon's apsis, Moon's node, Mars, Mercury, Jupiter, Venus and Saturn, respectively, no correction being necessary in the case of the Sun.<sup>1</sup>

A large number of astronomical manuals based on the *Parahita* system, including a *Grahacāranibandhana-saṅgraha*,<sup>2</sup> have come to be composed during later times, both in Sanskrit and in Malayalam, each taking off from a convenient contemporary epoch (*khaṇḍa-dina*) for which the True positions of the planets would have been fixed after elaborate calculations, these positions being used as zero-corrections for computation according to these manuals. Some of these incorporate also further corrections.

### 9. Dṛk system of astronomy

The *Dṛk* system promulgated by Parameśvara of Vaṭaśreṇi (c. 1360-1455), through his *Dṛggaṇita*,<sup>3</sup> is, as pointed out above (§2), a revision of the *Parahita* system and was composed with a view to make the results of computation accord with observation. While no new methodology is enunciated here, new multipliers and divisors are given for the derivation of the Kali days and for the calculation of the Mean positions of planets. Minute corrections are given

1. The verse giving this correction reads as follows :

'vāgbhavo' (444) nāc chakābdat dhana-śata-laya-hān manda-vailakṣya-rāgair  
 aptābhir liptikābhir virahitatanavaś candra-tattuṅga-pātāh |  
 śobhā-nīrūḍha-saṃvid-gaṇaka-nara-hatān māgar-aptāh kujādyāh  
 saṃyuktā jñāra-saurā virahitatanukau jīvaśukrau, na bhānoḥ //

2. Ed. K. V. Sarma, as Appendix to the edn of *Grahacāranibandhana*, Madras, 1954.

3. Cr. ed. by K. V. Sarma, with Intro. V.V.R. Inst., Hoshiarpur. 1963.

for these positions after long periods of time. Revised values are given for the positions of planets at zero Kali. Also, the values of the sines of arc of Anomaly (*Manda-jyā*) and of Commutation (*Śīghra-jyā*) are revised and given for intervals of 6 degrees.<sup>1</sup>

As in the case of the *Parahita* system, a large number of manuals have come to be composed following the *Dṛk* system, both in Sanskrit and in Malayalam. The results obtained through this system being more accurate, this system was used for horoscopy (*jātaka*), astrological query (*praśna*) and the computation of eclipses (*grahaṇa*), while the *Parahita* continued to be used for fixing auspicious times for rituals and ceremonies (*muhūrta*). In order to cater to both the purposes, some of the later manuals have dealt with both the *Dṛk* and *Parahita* systems.

---

1. On Parameśvara and the *Dṛk* system in general, see Intro. to *Dṛggaṇita*, *op. cit.*, pp. x-xiii. See also, K.V. Sarma. 'Parameśvara's *Dṛggaṇita*', *Mathrubhumi* (Kozhikode), Aug. 28, 1960, pp. 19-21.



## CHAPTER II

# ANTICIPATION OF MODERN MATHEMATICAL DISCOVERIES BY KERALA ASTRONOMERS

### 1. The background

In the light of the trends that developed in the study and practice in Kerala of the twin sciences of astronomy and mathematics, as indicated in the last chapter, it need not be surprising that some of the significant findings of modern mathematics are found anticipated in the astronomical works produced during the mediaeval times in that region. In their endeavour to make the results obtained by computation accord with observation, the Āryabhaṭan school of astronomers of this corner of India made substantial advancement in their computational skill. Working on the basic principles of algebra, geometry and limiting values, they produced, by dint of shrewd thinking and logical reasoning, coupled with a fund of intuition, significant results on such matters as the reduction to the ecliptic, summations and associated integrations leading up to the value of  $\pi$  etc. Especially, the achievements connected with  $\pi$  were brought to the notice of scholars by Charles M. Whish who presented a paper on the subject before the Royal Asiatic Society in 1832.<sup>1</sup> Among other things, Whish set out in this paper the several formulae enunciated in four Keralite works on astronomy and mathematics, viz., *Tantrasaṅgraha*, *Yuktibhāṣā*, *Karaṇapaddhati* and *Sadratnamālā*, for the circumference of a circle in terms of its diameter and transformations of the infinite series for  $\pi$  associated with the name of Leibnitz.

The significance of the findings of Whish was hardly taken note of by historians of mathematics or of Indian literature, for more than a century. Instead, the view continued to prevail that Indian astronomy and mathematics were mostly borrowed from the West and that, at least since Bhāskara II, little original contribution was made by India to

---

1. C.M. Whish, 'On the Hindu quadrature of the circle, and the infinite series of the proportion of the circumference to the diameter exhibited in the four Śāstras, the *Tantrasamgraham*, *Yukti-bhāṣā*, *Carana Padhati* and *Sadratnamālā*', *Trans. Royal Asiatic Soc. of Gr. Britain and Ireland*, 3 (1835) 509-23.

these disciplines.<sup>1</sup> The credit for launching, in the 1940-s, a detailed study of the discoveries of Whish in terms of modern mathematics goes to Prof. C.T. Rajagopal and his students and colleagues, including K. Mukunda Marar, A. Venkataraman, T.V. Vedamurthi Aiyar and K. Balagangadharan. The valuable notes added by Rama Varma Maru Thampuran and A.R. Akhileswara Aiyar to their excellent edition of the First Part of *Yuktibhāṣā*, (Trichur, Kerala, 1948), an expository work in Malayalam, new light on whose date and authorship has recently been thrown,<sup>2</sup> is another significant contribution in this direction. More recently, some other scholars like T. S. Kuppanna Sastri, T. A. Saraswathi and R.C. Gupta have been making valuable contributions to connected topics. The attempt made herein below to present, in a succinct form, the results of the investigations of the said scholars and those of the present writer which lie scattered in different books and periodicals, will, it is to be hoped, give a bird's-eye view of the significant contributions of Kerala savants to mathematics and astronomy.

## 2. Tycho Brahe's Reduction to the ecliptic

In astronomical computations, the longitude of a planet is measured along the ecliptic, while, in fact, its motion takes place along its own orbit which, generally, deviates slightly from the ecliptic. For an accurate computation of the planet's position this deviation has to be taken into consideration. In the West, it was

---

1. *Vide*, for instance, G.R. Kaye: "After the time of Bhāskara (born A.D. 1114), no Indian mathematical work of historical value or interest is known." (*Indian mathematics*, Calcutta, 1915, p. 24); A. B. Keith: "After Bhāskara, no progress can be recorded in Indian astronomy." (*A history of Indian literature*, Oxford, 1929, p. 523); A. A. Macdonell: "The last eminent Indian astronomer was Bhāskarācārya, born in A.D. 1114." (*A history of Sanskrit literature*, Indian rep., Delhi, 1962, p. 370); D. Arka Somayaji, "Bhāskara is the last name in the field. Barring a number of commentators, no name worthy of mention is there in India subsequent to Bhāskara." (*A critical study of the ancient Hindu astronomy*, Dharwar, 1971, p. 3). Standard historians of mathematics like Cantor, Cajori and D.E. Smith, too, hold the same view. The first Western historian of mathematics to take note of Whish's findings would appear to be A. P. Juschkewitsche in his *Geschichte der Mathematic Mittelalter*, (Leipzig, 1964), as pointed out to C. T. Rajagopal by D. T. Whiteside, the eminent Cambridge authority on Isacc Newton.

2. K. V. Sarma, 'Jyesthadeva and his identification as the author of *Yuktibhāṣā*', *Adyar Library Bulletin*, 22 (1958) 35-40.

the Danish astronomer Tycho Brahe (1546-1601) who enunciated a formula for this 'Reduction to the ecliptic'.<sup>1</sup>

In India, a formula for this Reduction was enunciated, for the first time, by a contemporary Kerala astronomer Acyuta Piṣāraṭi (1550-1621), author of *Rāṣigola-sphuṭānīti* ('Computation of True longitude on the celestial sphere')<sup>2</sup> and several other works on astronomy. Acyuta gives his formula for this reduction in the case of the moon in his work entitled *Sphuṭanirṇaya* ('Computation of true longitudes of planets') in the following verse :

*pātonasya vidhos tu koṭibhujayor jīve mithas tāḍayet  
antyakṣepaśarāhatam vadham amum vikṣepakotyā haret |  
labdham vyāsadaloddhṛtam himakare svarṇam, vipāte vidhau  
yugmāyugmapadopage ; vidhur ayam spaṣṭo bhagole bhavet ||*

'Multiply the tabular cosine (*koṭijyā*) and sine (*bhujajyā*) of the moon-minus-node and the product by the tabular versine (*śara*) of the maximum latitude (*antya-kṣepa*) of the moon. Divide this by the tabular cosine of the latitude at the particular moment and the quotient is to be divided again by the tabular radius (*vyāsadala*). The result (will give the correction for longitude which) is to be added to or subtracted from the moon's longitude, as the moon-minus-node is in an even or an odd quadrant, respectively. The True Moon measured on the ecliptic is thus got'.<sup>3</sup>

Acyuta's formula may be expressed in terms of modern mathematics thus : 'If  $F$  is the longitudinal difference between the node and the planet,  $w$  the maximum latitude and  $y$  the actual latitude, then, the correction  $k = \sin F \cdot \cos F (1 - \cos w) / \cos y$ .<sup>4</sup>

1. Vide his *Astronomiae instauratae Progymnasmata*, Vol. I, Prague, 1602.

2. K. V. Sarma, *The Rāṣigolasphuṭānīti*, (On the calculation of true longitude on the celestial sphere and Reduction to the ecliptic in Indian astronomy), Critical ed. and Tr. with Introduction, Adyar Library and Res. Centre, Madras, 1955.

3. This verse has been extracted by the author in his *Rāṣigola-sphuṭānīti*, verse 47, *op. cit.*, p. 29.

4. For a demonstration of the correctness of this formula in terms of modern mathematics, see K. V. Sarma, *op. cit.*, Introduction, pp. 10-13.

In another of his works, viz. *Uparāgakriyākrama* ('Procedures in the computation eclipses'), Acyuta gives also a simplified version of the said formula.<sup>1</sup>

The actual date of composition of the *Sphuṭanirṇaya*, which is the earliest work to enunciate the reduction formula, is not known, but it is definitely before 1583 which is the date of composition of the *Uparāgakriyākrama* which contains the simplified formula.<sup>2</sup>

### 3. Newton-Gauss Interpolation formula

It has been demonstrated in detail that Indian mathematics employed, in its search for better results, improved rules of interpolation, by using the second differences and that a particular case, upto the second order, of the more general Newton-Stirling interpolation formula was known to Brahmagupta (c. A.D. 625).<sup>3</sup> Following this line of thought, the Kerala astronomer Govindasvāmin (c. 800-850) has enunciated a set of rules for the computation of intermediary functional values, different formulae being laid down for different augmental intervals :

*gacchad-yāta-guṇāntaravapur yātaiṣya-diṣvāsanac-  
chedābhyāsa-samūha-kārmukakṛti-prāptāt tribhis tāḍitāt |  
vedaiḥ ṣaḍbhir avāptam antyaguṇāje rāśyoḥ kramād antyabhe  
gantavyāhata-vartamāna-guṇajāc cāpāptam ekādibhiḥ ||  
antyaḍ utkramataḥ krameṇa viśamaiḥ saṅkhyāviśeṣaiḥ kṣiped  
bhaṅktvāptam, yadi maurvikāvidhir ayam makhyāḥ kramād vartate  
sodhyam vyutkramatas tathākṛtaphalam...*

(*Bhāṣya* on *Mahābhāskarīya*, 4.22)<sup>4</sup>

'Multiply the difference of the last and the current sine differences by the two parts of the elemental arc (made by any intermediary point on it) and divide by the square of the elemental arc and further multiply by three. Now divide the result so obtained by four in

1. For a demonstration of this formula, see *ibid.*, pp. 13-14.

2. On the chronology of these works, see *ibid.*, pp. 14-15.

3. R. C. Gupta, 'Second order interpolation in Indian mathematics upto the fifteenth century,' *Indian Jl. of Hist. of Sc.*, 4 (1969) 86-98.

4. *Mahābhāskarīya* of Bhāskarācārya, with the *Bhāṣya* of Govindasvāmin and the super-commentary *Siddhāntadīpikā* of Parameśvara, ed. by T.S. Kuppanna Sastri, Madras, 1957, pp. 201-2.

the first *rāśi*, or by six in the second *rāśi*. The final result thus obtained should be added to the portion of the current sine difference (got by linear proportion).

‘In the last (third) *rāśi*, multiply the linearly proportional part of the current sine difference by the remaining part of the elemental arc and divide by the elemental arc. Now, divide the result (so obtained) by the odd numbers (1, 3, 5 etc.) according as the current sine difference (is first, second, third etc.), when counted from the end in the reverse order. Add the final result thus obtained to the portion of the current sine difference (got by ordinary proportion). These are the rules for computing true sine differences for (direct) sines. In the case of versed sines, apply the rules in the reverse order and the above corrections are to be subtracted from the respective differences (got by linear interpolation).<sup>1</sup>

Using the general functional notation and finite difference operator, the rule for the second *rāśi* may be put as :

$$f(x+nh) = f(x) + n \Delta f(x) + \frac{n(n-1)}{2} \{ \Delta f(x) - \Delta f(x-h) \}$$

which is a particular case (up to the second order) of the general Newton-Gauss interpolation formula.<sup>2</sup>

#### 4. Taylor series for Sine and Cosine functions

The approximations for sine and cosine functions up to the second power of small quantities, following from a well-known series expansion due to the British mathematician Brook Taylor (1685-1731)<sup>3</sup> may be expressed as :

$$f(x+\theta) = f(x) + \theta f'(x) + \frac{\theta^2}{2!} f''(x) \dots$$

(approximately, when  $\theta$  is small)

- 
1. For the rationale of this formula, see R.C. Gupta, *ib.*, pp. 91-92.
  2. E. Whittaker and G. Robinson, *Calculus of observations*, London, 1965, p. 37.
  3. W.W.R. Ball, *A short account of the history of mathematics*, Dover reprint, New York, 1960, pp. 380-81. But see C. B. Boyer, *History of mathematics*, Wiley, 1968, p. 422.

This approximation has been anticipated, in its particular cases,  $f(x)=\sin x$  and  $f(x)=\cos x$ , by more than three hundred years, by Mādhava of Saṅgamagrāma (c. 1340-1425)<sup>1</sup> in the following verses :

*iṣṭa-dohkoṭidhanuṣoḥ svasamīpasamīrite |*  
*jye dve sāyave nyasya kuryād unādhikam dhanuḥ ||*  
*dvighna-talīptikāptaikaśaraśailasikhīndavaḥ |*  
*nyasyācchedāya ca mithas tatsamśkāravidhitisayā ||*  
*chitvaikām prakṣipej jahyāt taddhanuṣyadhikonāke |*  
*anyasyām atha tām dvighnām tathā 'syām iti samśkṛtiḥ |*  
*iti te kṛtasamśkāre svaguṇau dhanuṣas tayoh ||<sup>2</sup>*

'Placing the (sine and cosine) chords nearest to the arc whose sine and cosine chords are required, get the arc difference to be subtracted or added. For making the correction, 13,751 should be divided by twice the arc difference in minutes and the quotient is to be placed as the divisor. Divide the one, (say sine), by this (divisor) and add to or subtract from the other (*i.e.*, cosine), according as the arc difference is to be added or subtracted. Double this (result) and do as before (*i.e.*, divide by the divisor). Add or subtract the result (so obtained) to or from the first sine or cosine to get the desired sine or cosine chords'.<sup>3</sup>

## 5. Newton's Power series for the Sine and Cosine

In Western mathematics, Newton (1642-1727) is credited with

1. On Mādhava, his date and works, see K. V. Sarma, Introduction to his edition of the *Devyāroha of Saṅgamagrāma Mādhava*, (Sanskrit College Trippunithura, Kerala, 1965), and his paper on 'The date of Mādhava, a little-known Indian astronomer *Quarterly Jl. of the Mythic Soc.*, 49 (1958) 183-86.

2. Quoted by Nilakaṇṭha Somayājīn in his commentary on the *Āryabhaṭīya Gaṇita.*, 12, (edn. Trivandrum, 1930, pp. 54-55), with the prefatory statement : *tatrāha Mādhavaḥ.*

3. For this translation and its rationale in terms of modern mathematics, see R.C. Gupta, 'Second order of interpolation in Indian mathematics up to the fifteenth century', *Indian Jl. of Hist. of Sc.*, 4 (1969) 92-94. For a traditional elucidation, see commentary by Śaṅkara Vāriyar on Nilakaṇṭha's *Tantra-saṅgraha*, II, 10-13 (edn. Trivandrum, 1953, pp. 19-20) and *Yuktibhāṣā*, *op. cit.*, pp. 168-71.

the enunciation, in about 1670,<sup>1</sup> of the sine and cosine power series, which might be stated as :

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots$$

These formulae are implied in the following verses of Mādhava, depicting the derivation of the series of sine and tabular versine (*śara*) values of the arc correct to 1/3600 of a degree :

*nihatya cāpavargeṇa cāpam tattatphalāni ca |*  
*haret samūlayugvargais trijyāvargahataiḥ kramāt ||*  
*cāpam phalāni cādhodho nyasyoparyupari tyajet |*  
*jīvāptyai, saṅgraho 'syaiva vidvān-ityādina kṛtaḥ ||*  
*nihatya cāpavargeṇa rūpam tattatphalāni ca |*  
*hared vimūlayugvargais trijyāvargahataiḥ kramāt ||*  
*kintu vyāsadalenaiva dvighnenādyam vibhājyatām |*  
*phalāny adhodhaḥ kramaśo nyasyoparyupari tyajet ||*  
*śarāptyai, saṅgraho 'syaiva stenasirī-tyādina kṛtaḥ |*

'Multiply repeatedly the arc by its square and divide by the square of the even numbers (2, 4 etc.) increased by that number and then multiplied by the square of the radius. Place the arc and the results (of the above operation) one below the other and subtract each from what is above it. (This is the method) to derive the arcs, which are collected (and stated, in order, in the mnemonic verse) beginning with the expression *vidvān* (i.e., 0° 0' 0" 44" stated in the *kaṭapayādi* notation).

'Multiply repeatedly the unit measurement, (which is the radius), by the square of the arc and divide by the square of the even numbers

1. Moritz Cantor, *Vorlesungen über Geschichte der Mathematik*, 2nd edn., Vol. III, cited by C.T. Rajagopal and A. Venkataraman in their paper on 'The sine and cosine power series in Hindu mathematics', *Jl. of the Royal As. Soc. of Bengal*, (Science), 15 (1949) 1-13, fn. on p. 1.



(2, 4 etc.) decreased by that number and then multiplied by the square of the radius ; the first is, however, to be divided by twice the radius. Place the results one below the other and subtract each from the one above it. (This is the method) to derive the *śara-s* (tabular versines of the arc) which are collected (and stated, in order, in the mnemonic verse) beginning with the expression *stena* (i.e.,  $0^{\circ} 0' 0'' 6'''$ ).<sup>1</sup>

These verses, taken with certain statements occurring in the *Yuktibhāṣā* (pp. 183-90) and in the *Karaṇapaddhati* (IV. 12-13) lead one directly to Newton's sine and cosine formulae. Though positive proofs are still wanting about the authorship of the above verses which explain the derivation of the sine and *śara* values enumerated in the mnemonical verses beginning with *vidvān* and *stena* which are definitely known to be composed by Mādhava, it is very likely that he himself is the author of these verses also.<sup>2</sup> But whatever that be, since he has derived the values *vidvān* etc., it is but logical to presume that he knew also the method therefor.

## 6. Infinite G.P. Convergent series

The credit for enunciating in India, for the first time, a formula for the sum of an infinite convergent geometrical progression, goes

---

1. For an exposition of these verses and a demonstration of the procedure described, see *Yuktibhāṣā*, *op. cit.*, Notes on pp. 183-93. See also *Karaṇapaddhati*, ed. with com. in Malayalam by P. K. Koru. (Cherp, Kerala, 1953), pp. 199-207. For a detailed exposition of the rationale of the method, see C. T. Rajagopal and A. Venkataraman, *ibid.*; T. A. Saraswathi, 'Development of mathematical ideas in India', *Indian Jl. of Hist. of Sc.*, 4 (1969) 75-76.

2. While quoting these verses in their Notes, the editors of *Yuktibhāṣā* give the source as *Tantrasaṅgraha*, but without any further reference (see *op. cit.*, p. 190), and other scholars have followed this lead (see, e.g., C. T. Rajagopal, *ibid.*, p. 2). But these verses, as also several others similarly quoted by the editors of the *Yuktibhāṣā*, do not occur in the *Tantrasaṅgraha* (vide edn. of the work, Trivandrum, 1958). T. A. Saraswathi says that "the *Tantrasaṅgraha* published from the Trivandrum University (*sic*) seems to contain one part only of the text. The editors of the *Yuktibhāṣā* had access to the complete MS. in the Trippunithura Skt. College Library, I am informed." (Fn. 9 on p. 234 of the *Bul. of the National Inst. of Sc.*, No. 21 (1962)). This information is not likely to be correct. The Trivandrum edition of *Tantrasaṅgraha* is, in fact, complete in itself. The second part of the Trippunithura MS. is likely to be another astronomical work written in continuation of *Tantrasaṅgraha*.

to Nilakanṭha Somayāji (born 1444). This he gives in his *Āryabhaṭīya-Bhāṣya*, while explaining the process of deriving the arc of a circle in terms of the chord by means of a computation which involves the summing up of an infinite convergent G.P. series: *evam yas tulyaccheda-paramabhāga-paramparāyā anantāyā api saṁyogaḥ, tasya anantānām api kalpyamānasya yogasya ādyāvayavinaḥ paraspar-amsacchedāi ekanacchedānīśasādhyam sarvatrāpi samānam eva.* (*Bhāṣya* on *Āryabhaṭīya*, Gaṇita. 17, edn., Trivandrum, 1930, p. 106). 'Thus the sum of an infinite series, whose later terms (after the first) are got by diminishing the preceding one by the same divisor, is always equal to the first term divided by one less than the common mutual divisor.'

In continuation of this enunciation, Nilakanṭha elaborately demonstrates it for a finite G.P. and also for an infinite decreasing G.P.<sup>1</sup>

### 7. Lhuiler's formula for the Circum-radius of a Cyclic quadrilateral

In Western mathematics, the eighteenth century mathematician Lhuiler is credited with the discovery, in 1782, of an expression for the circum-radius of a cyclic quadrilateral.<sup>2</sup> In India, however, we find the same formula enunciated by the Kerala astronomer Parameśvara (c. 1360-1455) in his commentary on the *Lilāvati*, in the following lines :

*doṣṇām dvayor dvayor ghātayutānām tisṛṇām vadhāt |*  
*ekaikonetarattraikyam catuṣkavdhabhājitam ||*

*labdhamūlena yadvṛttam viṣkambhārdhena nirmitam |*  
*sarvam caturbhujakṣetram tasminn evāvatiṣṭhate ||*

'The three sums of the products of the sides, taken two at a time, are to be multiplied together and divided by the product of the sums of the sides taken three at a time and diminished by the fourth. If a circle is drawn with the square root of this quantity as radius, the whole quadrilateral will be situated inside it.'

1. On this, see T.C. Saraswathi, 'The development of mathematical series in India', *Bul. National Inst of Sc. of India*, No. 21 (1962) 320 ff.; see esp. pp. 325-26.

2. *Vide* D.E. Smith, *History of mathematics*, Boston, 1925, vol. II, p. 286.

Thus, if  $a, b, c, d$  are the sides and  $r$  the circum-radius,

$$r = \sqrt{\frac{(ab+cd)(ac+bd)(ad+bc)}{(a+b+c-d)(b+c+d-a)(c+d+a-b)(d+a+b-c)}}$$

The rationale of this formula has been given in the 16th cent. Kerala commentary *Kriyākramakarī* on the *Līlāvati*.<sup>1</sup>

### 8. Gregory and Leibnitz's Series for the Inverse tangent

The power series for arc tan  $x$ , which was enunciated for the first time in the United Kingdom in 1671 by the Scottish mathematician James Gregory (1638-75) and in Europe in 1673 by the German mathematician and philosopher Gottfried Wilhelm Leibnitz (1646-1716), in the case of  $x=1$ , may be stated as follows: In the case of infinite series of powers of  $x$  representing an arc of a circle of unit radius which subtends at the centre of the circle an angle whose tangent ( $x$ ) does not exceed unity,

$$\text{arc tan } x = x - \frac{x^3}{3} + \frac{x^5}{5} - \dots (|x| \leq 1)$$

In India, this series was enunciated by Mādhava of Saṅgamagrāma (1350-1410), nearly three centuries before it was discovered in the West. Mādhava's enunciation of the formula is contained in the following lines:

*iṣṭajyā-triṣṭayor ghātāt kotyāptam prathamam phalam |*  
*jyāvargam guṇakam kṛtvā koṭivargam ca hārakam ||*  
*prathamādiphalebhyo 'tha neyā phalakṛtir muhuḥ |*  
*eka-triyādy-ojasaṅkhyābhir bhakteṣv eteṣv anukramāt ||*  
*ojānām saṁyutes tyaktvā yugmayogam dhanur bhavet |*  
*doḥ-koṭyor alpam eveha kalpanīyam iha smṛtam |*  
*labdhīnām avasānam syān na tathāpi muhuḥ kṛte ||<sup>2</sup>*

'Obtain first the result of multiplying the *jyā* (of a given *dhanus*) by the *triṣṭayā* and dividing the product by the *koṭi* (of the *dhanus*). Multiply

1. On this, see T.A. Saraswathi, 'Development of mathematical ideas in India', *Indian Jl. of. His. of Sc.*, 4 (1969) 69.

2. Quoted in the Keralite commentary *Kriyākramakarī* on Bhāskara II's *Līlāvati*, kāṇḍa 2, vṛtta. 40. These lines have been quoted also in the *Yuktibhāṣā* where a geometrical proof for it is given (see *op. cit.*, pp. 113-16).

this result by the square of the *jyā* and divide the square by the *koti*. Thus we obtain a second result, (as also) a sequence of the further results by repeatedly multiplying by the square of the *jyā* and dividing by the square of the *koti*. Divide the terms of the sequence in order by the odd numbers 1, 3, 5, etc.; after this, add all the odd terms and subtract from them all the even terms (without disturbing the order of the terms). Thus is obtained the *dhanus* whose two elements are the given *jyā* and *koti*. Here, the smaller of the two elements should be taken as the *jyā*, since, otherwise, the series obtained will be non-finite (in value).'

According to the above formula, if  $R$  is the radius and  $s$  and  $c$  are the sine and cosine chords of the arc,

$$\text{the arc} = \frac{sR}{c} - \frac{sR}{3c} \frac{s^2}{c^2} + \frac{sR}{5c} \frac{s^4}{c^4} - \dots$$

which is Gregory's general series for arc tan  $x$ .

Mādhava's verses quoted above have been extracted and explained in the *Yuktibhāṣā* (*op. cit.*, pp. 113-16) in the traditional manner and its rationale demonstrated in terms of modern mathematics by C.T. Rajagopal and others.<sup>1</sup> Rajagopal's demonstration throws up, *inter alia*, certain interesting anticipations of Kerala mathematicians. Thus, after giving the general derivation of Gregory's series according to the *Yuktibhāṣā* and offering the proof therefor, Rajagopal observes: "There are two points which emerge from a consideration of the mathematical text presented here. In the first place, it employs relations which would appear not to have been noticed in Europe before modern forerunners and followers of the calculus started investigations.....Our second point is not unconnected with the first. The Hindu mathematicians achieved, without the aid of calculus, results which, for us, are treated best by means of the calculus."<sup>2</sup>

1. C. T. Rajagopal and T V. Vedamurthi Aiyar, 'On the Hindu proof of Gregory's series', *Scripta Math.*, 17 (1951) 65-74; K. Mukunda Marar and C.T. Rajagopal, 'On the quadrature of the circle', *Jl. of the Bombay Br. of the RAS* (NS) 20 (1944) 65-82; T.A. Saraswathi, 'Development of mathematical series', *ibid.*, 'Development of mathematical ideas', *ibid.*

2. "This is not to gainsay the fact that (i) the Hindus' proof of Gregory's series shows their awareness of the principle of integration as we ordinarily use it nowadays; (ii) their intuitive perception of small quantities like  $O(1/n^p)$ ,  $n \rightarrow \infty$ , in a certain role, is, as good as a practical knowledge of differentiation."

But the Europeans who first explored the possibilities of expressing a circular arc as an infinite series, deliberately employed the calculus to guide them."<sup>1</sup>

### 9. Leibnitz's Power series for $\pi$

In modern mathematics, the irrationality of  $\pi$  was demonstrated, for the first time, by Lambert in a paper read before the Berlin Academy in 1671. It is interesting to note that nearly two centuries prior to this, Nilakaṇṭha Somayāji (1444-1545) stressed the same point when he expressed himself in his *Bhāṣya* on the *Āryabhaṭīya* (Gaṇita. 10) to the effect that it is impossible to measure the circumference of a circle in exact terms of its diameter; it could be stated only approximately (*āsanna*).<sup>2</sup> What is more significant, is that, after elaborating the point further, he quotes anonymously an earlier authority to the same effect, which means that the fact had long been recognised in Indian mathematics.<sup>3</sup>

The enunciation of the value of  $\pi$  as a particular case of the power series for arc  $\tan x$ , due to Leibnitz (1673), is explicitly :  
 $\pi/4 = 1 - 1/3 + 1/5 - \dots$

This formula has been anticipated by Mādhava of Saṅgamagrāma (1350-1410) while enunciating a method for the circumference of a circle, in the following verse :

*vyāse vāridhi-nihate rūpahṛte vyāsaśāgarābhigate |*  
*tri-śarādi-viśamasāṅkhyā-bhaktam ṛṇam svam pṛthak kramāt kuryāt ||<sup>4</sup>*

'Multiply the diameter by 4. Subtract from it and add to it alternately the quotients obtained by dividing four times the diameter to the odd integers 3, 5 etc.'

1. Mukunda Marar and Rajagopal, 'On the Hindu quadrature of the circle', *ibid.*, p. 68.

2. Cf.: *āsannaḥ... kutaḥ punaḥ vāstaviṃ saṅkhyāṃ utsṛjya āsannā eva ihoktā ? ucyate. tasya vaktum āśakyatvāt. kutaḥ ? yena mānena mīyamāno vyāso niravayavaḥ syāt, tenaiva mānena mīyamānaḥ paridhiḥ punaḥ sāvayava eva syāt ... niravayavatvam tu na labhyam iti bhāvyaḥ.* (edn. Trivandrum 1930, Pt. I, pp. 41-42).

3. Cf.: *ata evāhuḥ—"kṛtakānityavad vyāsa-paridhī niyatau mithaḥ"*, *ibid.*, p. 42.

4. Quoted in the *Kriyākramakarī* (op. cit.), with the prefatory statement : *atrāha Mādhavaḥ ... ito'pi laghutaraparidhyānayanopāyaḥ amunaivoktam, yathā, com. on Līlāvati, kāṇḍa 2, vṛtta., 40).*

For a circumference  $C$  of a circle of diameter  $D$ , this gives the formula :  $C$ , (i.e.,  $\pi D$ ) =  $4D - 4D/3 + 4D/5 - \dots$  or  $\pi/4 = 1 + 1/3 - 1/5 - \dots$ <sup>1</sup>

### 10. Approximations to the value of $\pi$

Continuing his enunciation of the circumference of a circle, as given above, Mādhava goes on to give a rational approximation to its value and, through it, the value of  $\pi$  :

*yatsaṅkhyayā 'tra haraṇe kṛte nivṛttā hṛtis tu jāmitayā |*  
*tasyā ūrdhvatāyās samasaṅkhyā taddalam guṇo 'nte syāt ||*  
*tadvargai rūpahato hāro vyāsābdhighātaḥ prāgvat |*  
*tasyām aptam svamṛṇe kṛte dhane śodhanañ ca karaṇīyam |*  
*sukṣmaḥ paridhiḥ sā syāt bahukṛtvo haraṇato 'tisukṣmaś ca ||*

'Let the process stop at a certain stage, giving rise to a 'finite sum'. Multiply four times the diameter by half the even integer subsequent to the last odd integer used as divisor and then divide by the square of the integer increased by unity. The result is the correction to be added to or subtracted from our 'finite sum', the choice of addition or subtraction depending on the sign of the last term in the sum. The final result is the circumference determined more accurately than (that obtained) by taking a large number of terms, i.e., terms going beyond the stage at which we stopped.'

The formula enunciated here, which gives the value of  $\pi$  to an advanced degree of accuracy, may be expressed thus :

$$C \doteq 4D \left\{ 1 - \frac{1}{3} + \frac{1}{5} - \dots \pm \frac{1}{n} \mp \frac{(n+1)/2}{(n+1)^2 + 1} \right\} \text{ where } n \text{ is large.}^2$$

$$\therefore \frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \dots \pm \frac{1}{n} \mp \frac{(n+1)/2}{(n+1)^2 + 1}$$

1. For a detailed demonstration, see : *Yuktibhāṣā*, *op. cit.*, pp. 99, 112-13 : C.T. Rajagopal, T.V. Vedamurthi Aiyar, K. Mukunda Marar. *ibid.*, P.K. Koru, *Kīraṇapaddhati*, *op. cit.*, pp. 166-67.

2. For a demonstration of this formula; see Rajagopal, Vedamurthi Aiyar, Mukunda Marar, *ibid.*, P.K. Koru, *ibid.*, pp. 176-79 ; *Yuktibhāṣā*, *op. cit.*, pp. 120-23.

A still better correction is suggested by Mādhava in the following lines :

*asmāt sukṣmataro 'nyo vilikhyate kaścanāpi saṁskāroḥ |*  
*ante samasaṅkhyādalavargas saiko guṇaḥ, sa eva punaḥ ||*  
*yugaguṇito rūpayutaḥ samasaṅkhyādalahaḥto bhaved hāraḥ |*  
*triśarādiviśamasāṅkhyāharaṇāt param etad eva vā kāryam ||<sup>1</sup>*

'A correction still more precise is being stated here. The multiplier is the square of half the even integer (next greater than the last odd-interger divisor) increased by unity. This multiplier multiplied by 4, then increased by unity, and then multiplied by half the even-integer (already defined), is the divisor. This correction may be applied after the division by the odd integers 3, 5 etc. (indicated in the previous method and the same method of calculation followed).'

This formula which gives a still more accurate value of  $\pi$  may be expressed thus :

$$C \doteq 4D \left\{ 1 - \frac{1}{3} + \frac{1}{5} - \dots \pm \frac{1}{n} \mp \frac{\left(\frac{n+1}{2}\right)^2 + 1}{\left[\left(\frac{n+1}{2}\right)^2 \cdot 4 + 1\right] \left(\frac{n+1}{2}\right)} \right\}$$

$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \dots \pm \frac{1}{n} \mp \frac{\left(\frac{n+1}{2}\right)^2 + 1}{\left[\left(\frac{n+1}{2}\right)^2 \cdot 4 + 1\right] \left(\frac{n+1}{2}\right)}$$

where  $n$  is odd and large.<sup>2</sup>

Elsewhere, Mādhava gives a series for  $\pi$ , different from that of Leibnitz. Thus, in continuation of the formula for the inverse tangent given in the lines *iṣṭajyātrijyayor ghātāt* etc. (see above, p. 20), he mentions the measure of the circumference when the arc calculated is half of circumference, thus :

*vyāsavargād ravihatāt padam syāt prathamam phalam |*  
*tadāditas trisaṅkhyāptam phalam syād uttarottaram ||*

1. Quoted in the *Kriyākramakarī* on *Līlavatī*, kṛṇḍa 2, vṛtta., 40.

2. For its demonstration, see *Yuktibhāṣā*, *op. cit.*, pp. 136-39.

*rupādyayugmasaṅkhyābhir hṛteṣv eṣu yathākramam |  
viṣamāṇām yutes tyaktvā samam hi pāridhir bhavet ||*

‘Multiply the square of the diameter by 12 and extract the square root of the product. That is the first term. Divide the first term by 3 to obtain the second, the second by 3 to obtain the third and so on and thus get further terms. Divide the terms, in order, by the odd numbers 1, (3, 5) etc. Add the odd-order terms to and subtract the even-order terms from the preceding. The result will give the circumference’.<sup>1</sup>

The above enunciation gives the following formula for the circumference :

$$C \text{ (i.e., } \pi D) = \sqrt{12D^2} - \frac{\sqrt{12D^2}}{3 \cdot 3} + \frac{\sqrt{12D^2}}{5 \cdot 3^2} - \frac{\sqrt{12D^2}}{7 \cdot 3^3} \dots$$

$$= \sqrt{12D} \left\{ 1 - \frac{1}{3 \cdot 3} + \frac{1}{5 \cdot 3^2} - \frac{1}{7 \cdot 3^3} \dots \right.$$

$$\pi = \sqrt{12} \left\{ 1 - \frac{1}{3 \cdot 3} + \frac{1}{5 \cdot 3^2} - \frac{1}{7 \cdot 3^3} \dots \right.$$

It would be interesting to derive from Mādhava’s above-noted value of  $\pi$ , the following relation between circumference and diameter given by him :

*vibudha-netra-gaj-āhi-hutāśana-  
tri-guṇa-veda-bha-vāraṇa-bāhavāḥ |  
nava-nikharva-mite vṛttivistare  
paridhi-mānam idaṁ jagadur budhāḥ ||<sup>2</sup>*

1. For an exposition and demonstration of these verses, see *Yuktibhāṣā*, *op. cit.*, pp 114-19 ; Marar and Rajagopal, ‘On the Hindu quadrature of the circle’, *ibid.*, p. 78 ; P.K. Koru, *op. cit.*, pp. 263-6.

2. Quoted in the *Kriyākramakarī*, oh *Līlāvāṭī*, kāṇḍa 2, vṛtta. 40, with the prefatory statement : *Mādhavācāryaḥ punaḥ ato ’pyāsannatamam paridhimānam uktavān.*



That is, for a diameter of  $9^{11}$ , the circumference is 28,27,43,33,88,233. The value of  $\pi$  from this, correct to eleven decimal places, would be 3.14159265359, which accords closely with the modern value of  $\pi$ , which is 3.14159265.

Using the above relationship of the diameter and the circumference, Mādhava has derived the 24 mahajyās (accurate sign-chords) which he has depicted in the mnemonic beginning with *śreṣṭham nāma variṣṭhānām* ( $0^\circ-224'-50''-22''$ ).<sup>1</sup> It has also been verified that the value of the radian assumed by Mādhava in this evaluation corresponds to  $3437'-44''-48''-22''$ , which is remarkably close to its modern approximation, viz.,  $3437'.74577078 = 3437'-44''-48''-22''$ , 49.<sup>2</sup>

Rajagopal and his colleagues have drawn attention to and demonstrated, in terms of modern mathematics, a large number of further rational approximations of  $\pi$  which are found enunciated in later works like *Yuktibhāṣā*, *Karaṇapaddhātī* and *Sadratnamālā*,<sup>3</sup> for most of which there are no exact parallels in Western mathematics. These approximations had been obtained by the application of various corrections, presumably in the form of continued fractions, on partial sums of the infinite series for  $\pi/4$ . Indeed, the enunciation of these corrections speaks volumes about the fervour with which mediaeval mathematicians of Kerala attacked this fascinating problem and the success they achieved therein, some of their enunciations anticipating

---

1. For the full enunciation of these *maha-jyās* of Mādhava and their rationale, see *Yuktibhāṣā*, *op. cit.*, pp 195-98; P.K. Koru, *op. cit.*, pp. 203-6.

2. See Rajagopal and Venkataraman, 'The sine and cosine power series in Hindu mathematics', *JRASB* (Sc.), 15 (1949) 3.

3. For these enunciations and their traditional expositions, see: Nilakaṇṭha Somayāji's *Bhāṣya* on the *Āryabhaṭīya*, *Gaṇita*, 9-12 (edn., Trivandrum, 1930), Pt. I, pp 40 ff.; *Yuktibhāṣā op. cit.*, pp. 72-142; *Kriyākramakarī* on the *Līlāvati* 2, vṛtta. 40, and *Karaṇapaddhātī*, *op. cit.*, pp. 173-88. And, for their demonstration in modern terms see, Marar and Rajagopal and Vedamurthi Aiyar, 'On the Hindu proof of Gregory's series', *Scr. Math.* 17 (1951) 65-74; Rajagopal and Vedamurthi Aiyar, 'A Hindu approximation to Pi', *Scr. Math.* 18 (1952) 25-31; T.A. Saraswathi, 'The development of mathematical series in India', *Bul. of the National Inst. of Sc. of India*, 21 (1962) 320-43.

Western discoveries by nearly three hundred years. The same may be said with justification in the case of certain of their other mathematical contributions also. A competent and critical analysis, in terms of modern mathematics, of the writings of Kerala astronomers and mathematicians, the bulk of which still remains locked up in old palmleaf manuscripts, written in Malayalam script, may be expected to throw welcome light on the advances, down the centuries, made in these disciplines, in one remote corner of India.

### 11. Some other highlights

In the context of the continuity of astronomical tradition and the diligence with which its traditional exponents cultivated its study, a reference might be made here to certain other significant methodologies evolved and discoveries made by Kerala astronomers and mathematicians. The introduction of the *Kaṭapayādi* notation and the expression of astronomical data through mnemonic tables and verses composed with the help of this facile notation has already been noticed. In his table of sine-differences enumerated in the verse *makhi-bhakhi* etc. (*Gītikā* 10), Āryabhaṭa gives only their rough values, correct to the minute. It is interesting that Govindasvāmin (c. 800-50) developed their evaluation still more accurately, correct up to the second order of sexagesimal fractions, viz., seconds and thirds, which he gives in his *Bhāṣya* on *Mahābhāskarīya*. He also gives a formula for the derivation of the value of the last sine-difference when the tabular interval is halved. Developing the topic further, he enunciates also a rule for computing, from a given last sine-difference, the other sine-differences lying between  $60^\circ$  and  $90^\circ$ .<sup>1</sup>

The *Kuṭṭakāra-gaṇita*, which is a complex type of calculation involving the Rule of three, Indeterminate equations and Continued fractions, has been developed by Kerala mathematicians to a high degree. It enabled them to solve various problems which require the application of higher algebra according to modern working. Śāṅkaranārāyaṇa (c. 825-900) quotes in his commentary on the *Lahgubhāskarīya* (*op. cit.*, pp. 95-97) a short disquisition on the subject from *Govindakṛti*,

1. See *Mahābhāskarīya* with Govindasvāmin's *Bhāṣya*, *op. cit.*, ch 4, verse 22, pp. 201-2. For an exposition of these rules and their rationale, see R.C. Gupta, 'Fractional parts of Āryabhaṭa's sines and certain rules found in Govindasvāmin's *Bhāṣya* on the *Mahābhāskarīya*', *Indian JI. Hist. of Sc.* 6 (1971) 51-59.

a lost work of Govindasvāmin, while the later works like *Yuktibhāṣā* (16th cent.) give full accounts of the processes involved.<sup>1</sup> Nilakanṭha Somayāji (1444-1545) has made significant contributions including logical proofs and demonstrations to geometrical theorems, a formula for the sum of an infinite, geometrically progressing convergent series, and the rationale for the formula for the sum of a geometrical progression. He has also offered geometrical demonstrations for the sum of an arithmetic progression, the sum of triangular numbers and the sums of squares and cubes of natural numbers.<sup>2</sup>

---

1. See *Yuktibhāṣā*, ch. 5, *op. cit.*, pp. 54-71. For the rationale of *Kuṭṭakāra* according to modern mathematical terms, see *ibid.*, Appendix, pp. xli-lxi.

2. See for details, T.C. Saraswathi, 'The development of mathematical series in India', *Bul. of the National Sciences of India*, No. 21 (1962) 320-43.

## CHAPTER III

### MAJOR TRENDS IN KERALA LITERATURE ON JYOTIṢA

#### 1. Introductory

The extensive Jyotiṣa literature produced in Kerala, in Sanskrit and in Malayalam which latter is the regional language of that part of India, comprise of original treatises, expositions of individual topics, commentaries on standard texts, computation manuals, minor tracts, single verses and manifold mnemonic tables. A good part of the shorter tracts and other secondary literature which do not form full-fledged works have been lost and what survives of this type of literature has to be looked for in flyleaves and end folios of codices where such matter is generally found written. The definitive literature, too, has been affected considerably. The full extent of the literary activity in this line is not adequately known, much less recognised, for reasons of subject, script and language, as already mentioned above. However, an idea of this literary production can be judged from an examination of the surviving literature, a documented Inventory of which is given in Ch. V, below. While the said Inventory is expected to include references to all the works and authors that could be identified, special notice might be taken here of the broad trends and nature of the literature produced in this discipline. In order that the picture of Kerala Jyotiṣa might be presented in full, the accounts given below and in the Inventory are not restricted to astronomy and mathematics but made to include also the allied discipline of astrology which constitutes the applied aspect of astronomy.

#### 2. The Classical texts

Some scholars have claimed that the foremost Indian astronomer, Āryabhaṭa hailed from Kerala. Though this claim yet remains to be fully authenticated, the popularity of the *Āryabhaṭīya* among Kerala astronomers is apparent from the profusion of manuscripts of that work recorded from that region<sup>1</sup> and from as many as eleven commentaries on it,

---

1. Out of about 120 manuscripts of *Āryabhaṭīya* recorded in the *New Catalogus Catalogorum of Sanskrit and allied works and authors*, Vol. II, (Madras, 1966), p. 171, as many as 85 are from Kerala.

In Sanskrit and Malayalam, written by Kerala astronomers, the more important among them being those composed by Sūryadeva Yajvan, Parameśvara of Vaṭaśreṇi, Nilakaṇṭha Somayāji and Ghaṭigopa.<sup>1</sup> Two other texts of the Āryabhaṭan school, viz., the *Laghubhāskarīya* and the *Mahābhāskarīya* of Bhāskara I,—of which, too, most of the recorded manuscripts are from Kerala,—have been equally popular in the land. There are seven Keralite commentaries on the former by Śaṅkaraṅkāyaṇa, Sūryadeva Yajvan, Parameśvara, Udayadivākara and Śaṅkaraṅ Nampūṭiri, the other two being anonymous. The latter work has five Keralite commentaries, including those by Govindasvāmin, Sūryadeva Yajvan and Parameśvara. The other classical astronomical texts which were popular in Kerala are the *Sūryasiddhānta* which claims three Kerala commentaries and the *Laghumānasa* of Muñjāla, which has at least four Kerala commentaries. The most popular textbook on mathematics has been the *Līlāvati* of Bhāskara II, for which at least a dozen commentaries, besides several other works based on it, have been recorded. On the side of horary astrology, the *Horā* or *Brhājātaka* of Varāhamihira enjoyed the greatest popularity; about twenty commentaries on this work by Kerala authors have been identified; besides these, there are also several abridgements and adaptations of that work. On the same subject, the *Jātakakarmapaddhati* of Śrīpati, which has three Kerala commentaries, had also been quite popular and in *Praśna* (Astrological query), the pride of place goes to *Praśnaṣatpañcāśikā* of Pṛthuyāśas with two Kerala commentaries.

### 3. Major works on Astronomy

A number of original texts on astronomy, dealing with all the main topics of the subject, have been identified. Some of them, like the *Tantrasaṅgraha* of Nilakaṇṭha Somayāji, the *Tantrasāra* of Nārāyaṇa of Peruvanam and the *Sadratnamālā* of Śaṅkara-Varman, belong to the *tantra* type of treatises which take the beginning of the Kali era as the starting point for astronomical calculations. The bulk of the original texts are, however, of the *karāṇa* type, which use some convenient contemporary date as the epoch for starting the calculations enunciated by them, a device made use of by modern astronomers as well. This date is so chosen that at the ending moment of that day, i.e., at the beginning (sunrise) of the next day, the Mean Moon (*Candra*) and

1. For details of the manuscripts, editions, extent, dates, and available studies on these works, as also of other works that might be referred to here-in-below, see Ch. V, 'Inventory of Kerala Jyotiṣa'.

Mean Higher Apsis (*Candra-tuṅga*) are in the same position or very close to each other, so that the days accumulated up to the epoch (called *Khaṇḍa-dina* or *śodhya-dina*) could be subtracted in 'full' from the current *Kali-dina*. The Mean positions of the Sun, Moon and other planets etc. are determined very accurately for the epoch and the readings so obtained are used as zero corrections for all computations for any date after the epoch. The *Graha-cāranibandhana* of Haridatta, the basic *karāṇa* text of the *Parahita* system of astronomy, however, uses the date of Āryabhaṭa as the epoch, and the *Dṛggaṇita* of Parameśvara, the basic text of the *Dṛk* system, uses the beginning of Kali as its epoch. Some of the *karāṇa* texts are mere manuals giving rules for specific astronomical computations while some others like the *Karāṇapaddhati* of Putumana Somayāji, are fullfledged textbooks on the subject. Among the more important *karāṇa* texts may be mentioned the *Karāṇāmṛta* of Citrabhānu, which has three commentaries, the *Karāṇasāra* with commentary, possibly, by Śaṅkara Vāriyar pupil of Nilakaṇṭha Somayāji, the anonymous *Karāṇadarpaṇa* with three commentaries, *Karāṇottama* of Acyuta Piṣāraṭi with two commentaries, of which one is by the author himself, the anonymous *Laghukālarpaṇa* and the anonymous *Kriyāsaṅgraha*, with two commentaries. Several *karāṇa* texts have the generic title *Pañcabodha*. A dozen of them have been identified in the Inventory in Ch. V. Most of these are anonymous and only three of the authors could be identified, they being Putumana Somayāji, Puruṣottama and Kṛṣṇadāsa. These *Pañcabodha-s* have been very popular with the almanac-makers of the land and some of these claim commentaries, as well. The *Pañcabodha-s* generally contain five sections dealing with five astronomical topics. The topics treated are not, however, always the same. Thus *Pañcabodha* IV deals with *Vyatīpāta*, *Chāyā*, *Mauḍhya*, *Śṛṅgonnati* and *Grahaṇa*, while *Pañcabodha* II deals with *Tithi*, *Vāra*, *Nakṣatra*, *Yoga* and *Karāṇa*. Again, to deal with only five topics is not always the rule in these works; the number of topics dealt with could be less or more than five. For instance, *Pañcabodha* V or *Pañcabodhasataka* of Puruṣottama, in 100 verses, contains only two sections and *Pañcabodha* I is in ten sections, dealing with *Tithinakṣatra*, *Vākya-dhruva*, *Madhyama Sphuṭakriyā*, *Lāṭavaidhṛta*, *Mauḍhya*, *Sūryacchāyā*, *Somacchāyā*, *Śṛṅgonnati* and *Grahaṇa*. The *Bhadrādīpagaṇita* of Itakramañceri Nampūtiri and the *Gaṇitasāra* or *Pañcabodha-gaṇitasāra* of Śaṅkaran Nāmpūtiri of Maṇiṣamaṅgalam, both in Malayalam, are also comprehensive treatises.

Several of the *karāṇa* texts are smaller tracts devoted only to one or two topics like *Vyatīpāta*, *Vaidhṛta*, *Chāyā*, *Sphuṭakriyā* etc.

Three amongst these topics, viz., Computation of the Moon, Eclipses and Shadow, seem to have attracted the special attention of Kerala astronomers and, as a result, a large number of manuals have come to be composed on these subjects. Some of these works attempt also at evolving new processes, offer new corrections and give the rationale to the procedures adopted. Most of these texts are anonymous.

#### 4. Computation of the Moon

The fact that the calculation of the exact *tithi* (lunar day) and *nakṣatra* (asterism) at any moment depends upon the accurate knowledge of the Moon at that moment and that all the three, viz., *tithi*, *nakṣatra* and Moon, are always required for the fixation of social and religious functions, in horoscopy and in the computation of eclipses etc. is enough to explain the importance given to the computation of the Moon. But the fast motion of the Moon, amounting to about 13 degrees a day, and the consequent quick change of its position during the same day, required special consideration in its correct computation. A good number of *karaṇa* texts, devoted specifically for the computation of the Moon, have, therefore, been composed. Among the more important manuals of this type may be mentioned the *Candra-sphuṭagaṇita* with a commentary and a super-commentary, *Candra-sūryasphuṭa-gaṇita*, *Candra-sphuṭadi-gaṇita*, *Śuddha-candra-kriyā-gaṇita*, *Śrāddha-candrādi-gaṇita* and *Sūkṣmu-candra-sphuṭadi-gaṇita*, all anonymous.

#### 5. Veṅvāroha method for the Moon

Of all heavenly bodies, the Moon has not only the fastest motion, but also the maximum changes in its velocity during the same day. Therefore, the computation of the Moon at some intermediate time during the day, if calculated on the basis of its true position and motion at sunrise or at sunset, as advocated in some *Pañcabodha* texts, would not give accurate results. An ingenious but facile method for the determination of the Moon at any time of the day with high accuracy has been evolved by the 14th century Kerala astronomer Mādhava of Saṅgamagrāma in his work called *Veṅvāroha*. He has also enunciated accurate moon-mnemonics, correct to the seconds, for being used in the *Veṅvāroha* method. His method seems to have caught the fancy also of later astronomers who have extended the method further to yield still more accurate results. At least four later works of this genre have been identified, they being *Candra-*

*sphuṭāpti*, *Veṅvārohakriyā* and *Dṛg-Veṅvārohakriyā*, all anonymous, and *Veṅvārohāṣṭaka* of Putumana Somayāji.

## 6. Computation of Eclipses

A branch of astronomy in which intense investigations have been made by Kerala astronomers refers to the computation of eclipses. The phenomenon of eclipses seems to have been exploited fully towards verifying calculations, instituting corrections and devising new methodologies. A reference has already been made to Parameśvara of *Dṛgganīta* fame who has recorded the details about a large number of eclipses which he had computed, observed and also suggested corrections to correlate the two. Apart from minor tracts, a number of texts on the computation of eclipses have come down. These include three works having the common title *Uparāgakriyākrama*, the first by Nārāyaṇa with commentary, the second by Acyuta Piṣāraṭi, with two commentaries, and a third, which is anonymous; an *Uparāgaviṃśati* with commentary; *Grahaṇamaṇḍana* by Parameśvara; six anonymous works with the common title *Grahaṇa-gaṇita*; four works under the title *Grahaṇāṣṭaka*, one of which is by Parameśvara and the others anonymous; and the three works, *Candra-graha-gaṇita*, *Candra-suryoparāga-gaṇita* and *Sūrya-grahaṇa-gaṇita*, all anonymous. Two works on eclipses which deserve special mention are the *Grahaṇa-nyāya-dīpikā* of Parameśvara, which discusses the rationale of eclipse-computation, and the *Grahaṇa-granthādī* by Nilakaṇṭha Somayāji, which is an elaborate disquisition on the tradition and rationale of computing eclipses etc.

## 7. Computation of the Shadow

Computation of the positions of the Sun and the Moon from the Shadow (*Chaya*) caused by them and vice versa had practical utility in the social and religious life of the people of mediaeval times. Besides calculations made on the basis of the *Śaṅku* (gnomon), intrinsic calculations involving the *Mahācchāyā* (Great Shadow or Sine Zenith distance) and the *Mahāśaṅku* (Great gnomon or Sine Altitude) had been developed in this behalf. Some of the *Pañcabodhas* and other *karāṇa* texts mentioned above have sections devoted to Shadow computation. Besides these, several independent works devoted solely to this subject have also been produced. Among the works of this category may be mentioned five different works, all entitled *Candracchāyā-gaṇita*, one of these being by Parameśvara, another by



Nilakaṅṭha Somayāji and the others anonymous ; two of these works have also commentaries. Other works on the subject include the *Chāyāgaṇita*, *Chāyāgraha-gaṇita*, *Chāyādigaṇita* and two different works having the common title *Sūryacchāyādi-gaṇita*. Acyuta Piṣāraṭi, too, has written a succinct work on the subject, entitled *Chāyāṣṭakam*.

### 8. Long-range almanacs

In the matter of preparing annual almanacs, while the general trend in Kerala, as elsewhere, has been to prepare them for one year at a time, efforts had been made to prepare long-range almanacs covering long periods. It has been recorded that Mādhava of Saṅgamagrāma compiled an *Agāṇita-pañcāṅga*<sup>1</sup> which is, probably, the same as referred to in the *Karaṇapaddhati* (IV. 14, 16, 18) and preserved in the Kerala University Oriental Research Institute under the title *Agāṇitagrahacāra*. Śāṅkaran Nampūtiri of Mahiṣamaṅgalam is credited with a 'Register of Muhūrtas'<sup>2</sup> for 1000 years. The *Agāṇita* of Nalleppaḷli Subrahmaṇya Śāstri enunciates methods for the facile computation of the planets for a 1000 years.<sup>3</sup>

### 9. Astronomical rationale

An extremely significant class of astronomical treatises from Kerala refers to disquisitions on the rationale of astronomical formulae and procedures. Short expositions of this nature occur in commentarial literature, especially in the commentaries of Parameśvara, Nilakaṅṭha Somayāji and Nārāyaṇa, author of *Kriyākramakarī* on the *Līlavatī*. Single or groups of verses and short tracts pertaining to the exposition of specific points or procedures are often found inscribed on end-leaves of astronomical codices, without indication of source or author. These go mostly unnoticed or ignored by cataloguers of manuscripts. It would, indeed, be highly worthwhile to record, study and analyse these passages with a view to see if some of them contain anything important. In this connection, the discovery of some full-fledged treatises devoted to the exposition of astronomical

---

1. This reference occurs in an astronomical document preserved in the Oriental Institute, Baroda, Cf. K. V. Sarma, 'Direct lines of astronomical tradition in Kerala', *Pt. Charudeva Shastri Felicitation Volume*, Delhi, 1972.

2. See Ulloor, *Kerala Sāhitya Charitram*, Vol. II, (Trivandrum, 1954), p. 272.

3. Ref. to by Ulloor, *op.cit.*, Vol. IV, (Trivandrum, 1957), p. 291.

theories and processes ought to be highly interesting to scholars and historians of mathematics. These texts, which, generally, have the words *yukti* or *nyāya* 'rationale' attached to their titles, explain, interpret and discuss the formulae used and procedures followed in the topics which the texts deal with. Among works of this nature may be mentioned the *Grahaṇa-nyāya-dīpikā* on the computation of eclipses and *Vakyakarṇa* on the formulation of astronomical mnemonics, both by Parameśvara of Vaṭaśreṇi, the *Yukti-bhāṣā* and *Gaṇita-yukti-bhāṣā*, the former and, possibly the latter too, by Jyeṣṭhadeva, the *Nyāya-ratna* by Putumana Somayāji, the *Gaṇita-yuktayah* by an anonymous 'Bhāradvāja brāhman' and the *Rāṣigola-sphuṭānīti* on 'Reduction to the ecliptic' by Acyuta Piṣāraṭi. The *Sundararāja-praśnottara* by Nilakaṇṭha Somayāji, in which he has explained certain astronomical theories and practices in answer to queries raised by a contemporary astronomer Sundararāja of the Tamil country, also belongs to this category of works. It may also be noted that works solely devoted to the demonstration of procedures call themselves *-kriyā* or *-kriyākrama*, e. g., *Saṅgrahasādhana-'kriyā'* and *Uparāga-'kriyākrama'*.

#### 10. Practical astronomy

Astronomy being a practical science, progress in that discipline is incumbent no less on practical observation than on computational skill. Several works including the *Goladīpikā* I of Parameśvara and the *Bhadra-dīpa* of Iṭakramaṅceri Nampūtiri contain sections on the construction and use of the armillary sphere. The commentaries of Parameśvara and Nilakaṇṭha Somayāji carry references to their lifelong astronomical observations. By far the most interesting treatise in this line is the *Graha-parīkṣākrama* of Nilakaṇṭha Somayāji, in about two hundred verses. There is also a detailed Malayalam commentary on this work. An equally interesting, though possibly, very late, work is *Nazhika-manīyūṭe yukti*, in Malayalam, which is a detailed exposition of the working of the pendulum clock.

#### 11. Revision of astronomical constants

As indicated earlier, the composers of *karṇa* texts generally started their works with contemporary epochs. Sometimes they also started with corrections to the astronomical constants, and to the sine tables which they incorporated in their works. A work mainly devoted to the enunciation of corrected constants is the *Siddhāntadarpaṇa* of Nilakaṇṭha Somayāji, wherein he has set out the number of revolutions of the planets, and their higher apsides, ascending nodes, maximum

latitudes, velocities etc., as investigated and verified by him. He has also written an elaborate commentary on this work. Some short tracts call themselves *Khaṇḍavum dhruvavum* and merely give the epoch and the corresponding zero-corrections as determined by their respective astronomer-authors. Then again, there exist a large number of manuscripts which form collections of sine tables and mnemonics and are catalogued in libraries under generic titles like *Jyāḥ*, *Jyotiṣa-vākyāni* etc. on account of their not being full-fledged and independent works. These collections are potential sources of additions and novelties to the well-known mnemonics and, so, deserve to be examined from this point of view.

## 12. Mathematics

The *Līlāvati* of Bhāskara II, with more than a dozen Kerala commentaries, has remained, as indicated earlier, the most popular textbook on general mathematics. Among indigenous works, some of the astronomical treatises like *Yuktibhāṣā*, *Bhadradīpa* etc. deal with general mathematics in some of their sections. An interesting summary of the general mathematical processes is contained in an anonymous work entitled *Ēkaviṁśatipraśnakrama*. Other works solely devoted to the treatment of mathematics are *Kaṇakkatikāram*, with commentary, two works having the same title *Kaṇakkusāram*, one in prose and the other in verse, both with commentaries, *Kaṇakkunūl*, *Kaṇakkucodyam* and *Kaṇakkuśāstram*, all anonymous.

## 13. Horary astrology

While the classical texts on *Jātakā* used in Kerala were the *Bṛhajjātaka* of Varāhamihira and the *Jātakakarmapaddhati* of Śrīpati, the most popular indigenous text on the subject was the *Jātakapaddhati* of Parameśvara of Vaṭaśreṇi, which has as many as eight commentaries and the *Jātakādeśamārga* of Putumana Somayāji. From among other works, which enjoyed varied popularity, may be mentioned the *Jātakakrama* and *Jātakasāra* of Śaṅkaran Nampūtiri of Mahiṣamaṅgalam, the *Jātakānītimārga* and *Jātakasārasaṅgraha* by Āzhvāñceri Tamprākkal and the anonymous *Jātakodaya*.

## 14. Auspicious times (Muhūrta)

Practically all the texts popular in Kerala, enunciating the fixation of auspicious times (*muhūrtas*) for the numerous religious and social ceremonies, are of indigenous origin. The *Muhūrtadarśana* of Vidyāmādhava of Nilamana near Gokarṇa, with six commentaries, and the *Muhūrtaratna* of Govinda Bhaṭṭatiri of Talakkulam, with its

commentary by Parameśvara of Vaṭaśreṇi, are the early texts of this category. But, by far the most popular works on the subject are two *Muhūrtapadavī-s* written by two brothers of the Māttūr family in Cochin, whose names have, hitherto, remained unknown, but can, now, be identified as Puruṣottama and Subrahmaṇya. The popularity of these two *Muhūrtapadavī-s* can be judged from the profusion of manuscripts of these works available and the seven commentaries composed on them.<sup>1</sup>

### 15. Astrological query (Praśna)

The branch of astrology called *Praśna* has been very popular in Kerala where many a new technique and practice has been evolved. The classical work on the subject which was popular in the land was the *Praśnaśatpañcaśikā* of Pṛthuvaśas, son of Varāhamihira, which claims two good Kerala commentaries. There has, however, been substantial literary production, in consonance with the high popularity of its practice. Here too, several treatises comprehending all aspects of *Praśna* and many others which dealt with special items therein have come to be composed. The most important work of the former category is the *Praśnamārga* by a Nampūtiri of the Panakkāṭṭu family, possibly named Parameśvara. Numerous manuscripts of this work and of the four commentaries on it have been recorded. A good number of later works have been based on it or take it as their chief authority. Other full-fledged works on *Praśna* include three treatises with the identical title *Praśnasāra*, one by Śaṅkara, the second by a Somayāji of Bhūtanāthapura and the third by Mādhava of Īncakkāzhvā family, two works of the name *Praśnānuṣṭhānapaddhati*, both anonymous, *Praśnamṛta* of Śrīkumāra, *Praśnāyana* of Puruṣottama with auto-commentary, *Praśnamālā*, possibly by Śaṅkaran Nampūtiri of Maṅgalaśseri, with commentary, two works entitled *Praśnarīti*, one by Dāmodaran Nampūtiri of Maṅgalaśseri and the other by Iṭakkāṭṭu Kūkkaniyāl and three different works of the name *Praśnalakṣaṇa*, all anonymous. Among works dealing with individual subjects, there are a large number devoted to topics like *Akṣara*, *Aṣṭamaṅgala*, *Āyus*, *Āyudha*, *Pakiṭa*, *Tāmbūla*, *Roga* etc.

### 16. Natural astrology

Of classical texts on natural astrology, the *Bṛhatsamhitā* of

1. To cite but one instance, the Kerala Oriental Res. Institute and Mss. Library holds in its collections not less than 103 of these manuscripts, as recorded in their catalogues.

Varāhamihira was generally known, besides *Lampaka* by Padmanābha, a later work well known in the whole of South India. Among works on natural astrology produced in Kerala, a mention might be made of *Sānudrikasāra* of Śaṅkara, with two commentaries, two anonymous *Sānudrikalakṣaṇa-s* and the *Raṇadīpikā* by Kumāra Gaṇaka. The last-mentioned work which, in eight chapters, deals in detail with the preparation for and conduct of war, is particularly significant. Some works deal with individual topics like *Bhūparīkṣā*, *Rekhāśāstra* etc. and some others like *Naraceṣṭā*, *Pakṣīśāstra* etc. with special types of prognostication.

### 17. Malayalam versions of Sanskrit texts

It is interesting to note that almost all *Jyotiṣa* works in Sanskrit have one or more commentaries or renderings in Malayalam, produced, obviously, with a view to introduce their study among the non-Sanskrit knowing public. This is a feature found in many other regions of India as well. The Malayalam versions are generally called the *Bhāṣā* of the works concerned. Often the author of the original work himself prepared the *Bhāṣā* and at other times, others. There have also been adaptations and abridgements of Sanskrit works. A very instructive instance of this trend is found in the works of an Āzhvāñceri Tamprākkal who, in a series of works, adapted a number of important Sanskrit texts and also provided the Malayalam renderings of these adaptations. Thus, his *Phalasārasamuccaya*, in three parts, forms, in its Part I called *Jātakabhāga*, an adaptation of the *Horā* of Varāhamihira and the *Sārāvalī* of *Kalyāṇavarman*, in Part II called *Praśnabhāga*, an adaptation of the *Praśnamārga* of Panakkāṭṭu Nampūtiri, and in part III entitled *Muhūrtabhāga*, of the *Muhūrtadarśana* of Vidyāmādhva. In fact, of the ten works credited to this author, five, viz., *Jyotiśśāstrasāṅgraha*, *Sāṅgrahasāadhanakriyā*, *Jātakasārasāṅgraha*, *Jātakānītimārga* and *Phalasārasamuccaya*, are adaptations of standard Sanskrit works and the other five, form the *Bhāṣā-s* of these five works.

### 18. Kerala-Jyotiṣa outside Kerala

That some of the characteristic innovations, extensions and practices evolved in Kerala in the discipline of *Jyotiṣa*, especially in its astrological aspect, have travelled beyond its borders and become current in certain other parts of India is but natural. It is again natural that, as these theories and practices grew popular in those regions, local treatises came to be composed incorporating the new ideas. Most of these treatises are distinguished by the term 'Kerala' tacked

on to their titles.<sup>1</sup> However, what seems highly significant in this matter is the variety and profusion of the works that have been composed in this manner. About 80 works of this nature have been identified in the different Manuscripts Libraries.<sup>2</sup> Their non-Kerala origin has been determined from one or more of the following indications : (1) Clear mention of alien authorship, (2) the addition of the term 'Kerala' to the title, (3) the popularity of the works in other parts of India, while they are virtually unknown in Kerala, (4) the availability of manuscripts of these works only in non-Kerala scripts and (5) the general absence of manuscripts of the works in Kerala. While the bulk of these works are anonymous, some are apocryphal texts attributed to ancient sages or said to be parts of larger *Tantras* and *Samhitās*. Only a few of these are known under the names of their real authors. The disciplines of *Jātaka* and *Praśna* claim the largest number of these works, the former about 20 and the latter about 35.

In horoscopy, some of the works are comprehensive treatises, like for example, *Kerala-rahasya* or *Kerala-jātakānanda* ascribed to Śukrācārya, *Kerala-sūtra* ascribed to Marīci, *Kerala-śāstra-sūtra* or *Jātakalāṅkāra* ascribed to Nikaṣā, and the two anonymous works *Keralīya-jātaka* and *Keralīya-jātaka-saṅgraha*, while the others are devoted to specific aspects of astrology like *bhāva-s*, *daśa-s* and *yoga-s*. An interesting work is *Kerala-horāvyākhyā* by Sarvartupaṇḍita who composed that work at Vijayanagar at the instance of his patron Gopāla.

Most of the texts on *Praśna* are anonymous. Among those whose authors, real or apocryphal, have been indicated are : *Kerala-praśna-grantha* and *Kerala-granthodāharaṇa* both by Mūladeva, *Kerala-śāstra*, *Kerala-praśna* and *Pāśaka-keralī*, all by Garga, *Keralī* by Rāvaṇa, and *Keralīya-praśnaratna* by Nandarāma Paṇḍita. Of peculiar subjects dealt with are prognostication (1) on the basis of letters in the *Akṣaracintāmaṇi* section of *Keralamata* ascribed to Śiva, *Keralapraśna* or *Keralīya-jñāna* and *Akṣarakevalīpraśna*, both anonymous ; (2) on the basis of the throw of the dice in *Kerala-pāśāvalī* of Garga and the two anonymous works *Keralī-praśnavicāra* and *Keralīya-śakunāvalī* ; and

1. This phenomenon is found, in varying degrees, also in the case of certain other disciplines like Tantra, Śrauta, Dharma and Mantraśāstra.

2. For a classified and documented list of the manuscripts of these non-Kerala works, see Appendix, below.

(3) on the basis of arecanuts in *Keralapraśna* (anonymous, Mithila III. 180). Of works on natural astrology, a mention might be made of *Keralayātrā* on setting out on a journey, and *Keralī* on the throbbing of the limbs and on dreams, both anonymous, and *Keralī-śakuna*, on omens, the last being attributed to Vyāsa.

*The desideratum.* The non-Kerala works on Kerala Jyotisa, mentioned above, demonstrate how the specialities of a discipline as evolved in one region of India have been transmitted to the other regions of the country and how they have been accepted, preserved and propagated in those parts under the label of their original place of origin. It is well to remember here that it is but natural that during their transmission and propagation through the centuries, some of the original ideas might have undergone some modifications. It is also possible that some new or local ideas have come to be incorporated in these works and paraded as Keralite views. It would be extremely instructive to investigate this subject fully. Comparative studies between the non-Keralite works and allied Keralite works could show how far the former represent the original views. The textual or other sources from Kerala, if any, of the individual non-Keralite works have to be identified. It would also be interesting to examine why these works are almost always unknown in Kerala, the land to which the ideas expressed therein are supposed to belong.

## CHAPTER IV

### KERALA ASTRONOMERS

#### 1. Introductory

The approach of the Kerala astronomers to the study of that discipline and the broad trends of their writings, as set out in the previous chapters, should form the natural background for an appraisal of the literature produced in the land on astronomy and, for the sake of fullness, also on the allied discipline of astrology. Such an appraisal is attempted in the two chapters that follow. In the present chapter, the major writers are taken note of and in the next chapter is presented a fully documented Inventory of the available literature on these disciplines. It may be noted that the said Inventory carries references to the manuscripts, editions and studies relating to as many as about 600 works on astronomy, astrology and mathematics and details of about 100 authors and authorities.

#### 2. Earlier documentation

Several efforts have been made before to take stock of Hindu astronomical and allied literature, including that of Kerala, though these attempts have hardly succeeded in giving any adequate idea of the extent of the literature produced in Kerala. 'A brief bibliography of Hindu mathematics' by G.R. Kaye<sup>1</sup> records but a single work from Kerala, being the commentary of Paramādiśvara (sic.) on the *Āryabhaṭīya*. The *Gaṇakatarāṅgiṇī or Lives of Hindu astronomers* by Sudhakara Dvivedi mentions just four Kerala authors and two works.<sup>2</sup> 'A consolidated list of Hindu mathematical works' by K. Balagangadharan<sup>3</sup> includes just 18 Kerala authors and 42 works. K.K. Raja's well-documented paper on 'Astronomy and mathematics in Kerala : An account of the literature',<sup>4</sup>

---

1. *Jl. and Proc. of the Asiatic Soc. of Bengal*, (NS) 7 (1911) 679-86.

2. Rev. edn. by Padmakara Dvivedi, Banares, 1933. The Keralite authorities referred to herein are Parameśvara, Kṛṣṇācārya, Govinda and Vidyāmādhava, among authors, and *Bhaṭadīpikā* and *Daśādhyāyī*, among works.

3. *Mathematics Student*, 15 (1947) 55-70.

4. *Adyar Library Bulletin*, 27 (1963) 118-67.



takes into its purview only some of the more prominent authors in these two disciplines, numbering about 20, and their works, numbering about 80. S.N. Sen's *Bibliography of Sanskrit works on astronomy and mathematics*,<sup>1</sup> carries the documentation of just 13 Kerala authors and 47 works. The major histories of Kerala literature, viz., *Kerala Sahitya Charitram* (in 5 vols.) by Ulloor S. Parameswara Aiyar,<sup>2</sup> *Keraliya Samskrita Sahitya Charitram*, (in 6 vols.)<sup>3</sup> and *Kerala Sahitya Charitram : Charcchayum Pūraṇavum*, (in 2 vols.),<sup>4</sup> both by Vāṭakkumkūr Rājarāja Varma, *Malayala Bhasha Charitram* by P. Govinda Pillai,<sup>5</sup> and *Kerala Bhasha Sahitya Charitram* (in 7 vols.), by R. Narayana Panikkar,<sup>6</sup> especially the first three, notice a much larger quantum of the literature, though they, too, fail to do adequate justice to the subject. In fact, more than half of the literature on Jyotiṣa produced in Kerala does not find a mention in these volumes. Moreover, the accounts given in these histories are not documented and are, mostly, distributed in their different volumes. Neither do these histories, except that of Ulloor, carry any index to help the reader in locating a work or an author dealt with therein. Under the circumstances as stated above, the wealth of material presented, in a chronological manner, in the following pages may be expected to provide a far more comprehensive account of the literary output of Kerala in the discipline of Jyotiṣa. It has been thought not necessary to repeat here the details which are available in the earlier accounts, but it was felt essential to set out all new information not noticed in therein. Therefore, in the following pages, the stress will be on new information, identifications and correlations, although, for the sake of completeness and continuity, a brief mention will be made also about currently known authors and works, for further details about which the earlier writings referred to in the footnotes might be consulted with advantage. For the documentation of the manuscripts of the works and for extracts therefrom, the annotated Inventory in the next chapter might be referred to.

---

1: Part I: *Manuscripts, Texts, Translations and Studies*, National Institute of Sciences of India, New Delhi-1, 1966.

2. Pub., University of Kerala, Trivandrum, 1953-57.

3. Pub., Vol. I, Kamalalaya Book Depot, Trivandrum, M. E. 1113 (A. D. 1938), Vols. II-VI, Mangalodayam, Trichur, M. E. 1122-40 (A.D. 1947-65).

4. Pub., Mangalodayam, Trichur, 1967-69.

5. Reprint, National Book Stall, Kottayam, 1955.

6. Pub., Vidyavilasini Book Depot, Trivandrum, n.d.-1951.

### 3. Vararuci I (4th cent. A.D.)

Vararuci is the father figure in the astronomical tradition of Kerala. He is supposed to have lived in the first half of the 4th century, this date having been arrived at on the basis of the dates of birth and death of his eldest son Meḷattoḷ Agnihotri, which are given, according to tradition, in the Kali chronograms *yajñasthānam surakṣyam* (12,70,701) and *purudhiḥ samāśryaḥ* (12,57,921) which fall, respectively, in A.D. 343 and 378. The manuscript tradition of the land ascribes to Vararuci the authorship of the 248 *Candra-vākyas* ('moon-sentences'), popularly called *Vararuci-vākyas*, beginning with *gīr naḥ śreyāḥ*, and also the promulgation of the *kaṭapayādi* notation of depicting numbers which has been used in the composition of the said *Vākyas*.<sup>1</sup>

### 4. Vararuci II

In horary astrology, the work *Kerala-dvādaśabhāvavākyāni*, in 12 chapters, is ascribed to Vararuci; the manuscripts of the work carry expressive colophons such as *iti Keralīya-Vararuci-vākye* and *Kerala Vararuci-prokta*. Two anonymous works, both entitled *Kerala-dvādaśabhāva-phalam*, one in verse and the other in prose, are allied to Kerala-Vararuci's work mentioned above. Another work of Vararuci is the *Vārarucika*, an extensive treatise on general astrology in 12 chapters. Still another work called *Vararuci-kerala* called also *Jātakarahasya* and *Kerala-rahasya* on horoscopy is, also, attributed to him. The Vararuci, who is the author of the above works on astrology might be identical, but it is not possible to assert that he is the same as the author of the *Candra-vākyas*.

### 5. Haridatta (c. 650-700)

Haridatta, as noted earlier, has the distinction of promulgating,

1. On Vararuci, see Raja, pp. 120-22; Ul. vol. I, pp. 77-81, 165; Va. vol. I, pp. 90-95. There is another astronomer named Vararuci, the author of the well-known *Vākyakarana* (ed. T. S. K. Sastri and K. V. Sarma, Madras, 1962), which is the source-book of the *Vākyapañcāṅga*, popular in South India, especially the Tamil region. But this Vararuci, whether the name is real or apocryphal, belonged to the Tamil region, as is clear from the introductory verses of that work. It has also been shown that this is a 13th century work, having been composed between 1282 and 1306, as can be inferred from the *śodhya-dina* ('deductive day') made use of in that work as a 'zero-day' for computations (*vide op. cit.*, Intro., p. ix). For some Keralite legends on Vararuci, see Kottāraṭhil Śaṅkuṇṇi, 'Parayiperttu pantiru kulam' (Mal.), ('The twelve families born of a woman of the Paraya caste'), *Āitiḥyamalā*, (6th edn., Trichur, 1961), pp. 60-90.

In 683, at Tirunāvāy in Kerala, a new system of astronomical computation called *Parahita*, which presented distinct advantages over the prevailing Āryabhaṭan system.<sup>1</sup> One of the important corrections which he introduced was called the *Śakābda-saṃskāra* or *Bhaṭa-saṃskāra*.<sup>2</sup> His *Grahacāranibandhana*, of which and of whose summary critical editions are available,<sup>3</sup> is the working manual of the system. His comprehensive treatise on astronomy entitled *Mahāmārganibandhana*, referred to in the *Grahacāranibandhana* (III. 44), is yet to be recovered. The well-known verse *vāgbhāvonāt* etc., enunciating his *Śakābda-saṃskāra*, which does not occur in the shorter manual, must be from this treatise ;<sup>4</sup> so also Nilakaṇṭha Somayāji's quotation in his *Grahaṇādi-grantha* (ms., p. 59) which reads : *atra Haridattas cāpy āha—'caturdaśabhāgāntas calanty eva grahas tatah'*. The *Parahita* system of computation, which grew highly popular, has played a leading role in the propagation and practice of astronomy in Kerala.<sup>5</sup>

#### 6. Govindasvāmin (c. 800-850)

In Govindasvāmin, teacher of Śāṅkaranārāyaṇa (see below) who was the court astronomer of King Ravi Varma Kerala, we have one of the ablest exponents of Bhāskara I and of the Āryabhaṭan system. His elaborate *Bhāṣya* on the *Mahābhāskarīya*<sup>6</sup> contains new ideas and mathematical elaborations which remain to be fully recognised and expounded in terms of modern mathematics.<sup>7</sup> An original work of his on astronomy and mathematics, which is quoted under the title *Govindakṛti* by later writers like Śāṅkaranārāyaṇa, Nilakaṇṭha

1. See above, pp. 7-8.

2. On this see above, p. 9.

3. Cr. ed. with Intro., K.V. Sarma, K.S.R. Institute, Madras, 1954.

4. For this verse and its exposition, see above, p. 9.

5. On Haridatta, see : K.V. Sarma, Intro. to his edn. of *Grahacāranibandhana*, *op. cit.*, and 'The original 'text of Parahita-gaṇita'', (Mal), *Mathrubhumi Weekly* (Kozhikode), 10.10.1954 ; Raja, 123-26.

6. Cr., ed., T. S. Kuppanna Sastri, Madras, 1957.

7. For an exposition of some of these, see R. C. Gupta, 'Second order of interpolation in Indian mathematics', *Indian Jl. of Hist. of Sc.*, 4 (1969) 86-98 ; 'Fractional parts of Āryabhaṭa's sines and certain rules found in Govindasvāmin's *Bhāṣya* on the *Mahābhāskarīya*', *ibid.*, 6 (1971) 51-59.

Somayāji and Nārāyaṇa,<sup>1</sup> is yet to be recovered. So also is his work on astrology which is referred to by Nilakaṇṭha as *Govindapaddhati*.<sup>2</sup> However, manuscripts of his short commentary called *Prakāṭārtha* or *Sampradāyapradīpikā* on *Parāśarāhora* are known but it is yet to be issued in print.<sup>3</sup>

### 7. Śaṅkaranārāyaṇa (c. 825-900)

Ravi Varma, the 9th century ruler of the Cera dynasty of Kerala had as his chief court astronomer Śaṅkaranārāyaṇa disciple of Govindasvāmin. Śaṅkaranārāyaṇa was a native of Kollapuri on the Arabian coast. The only known work of his is a commentary on the *Laghubhāskarīya* which he wrote in A. D. 869.<sup>4</sup> Besides being highly elucidatory with regard to the subject treated therein, the work throws light on the keen interest evinced by the royalty in the promotion of the study of astronomy, the presence of an astronomical observatory at the capital city Mahodayapuram (modern Koṭungalloor near Cochin), the construction of buildings with due reference to mathematical principles, arrangements made in the city for announcing the times of the day—which all point to the conditions that greatly favoured the flowering of astronomical studies in that part of India.<sup>5</sup>

### 8. Udayadivākara (11th cent.)

Udayadivākara, surnamed Jyotiṣikabhaṭṭa, author of the elaborate commentary called *Sundarī* on the *Laghubhāskarīya*, which takes as its epoch 1073,<sup>6</sup> probably hailed from Kerala. In the *Sundarī* he quotes as many as twenty verses from an unnamed work of a

1. For instance, see *Śaṅkaranārāyaṇa* in his com. on *Laghubhāskarīya*, TSS, No. 162, pp. 19, 55, 95; Nilakaṇṭha, *Grahaṇādigrantha*, ms., pp. 35, 42, 44.

2. See his *Grahaṇādigrantha*, ms., p. 44.

3. On Govindasvāmin, see: T.S.K. Sastri, Intro, to his edn. of *Mahābhāskarīya*, *op. cit.*, pp. xlvi-1; Raja, 127-28; UI. II.96-97. The identification of our author with the 13th cent. Govinda Bhaṭṭatiri, au. of *Muhūrtaratna*, made by Ulloor (I.169, II. 96, 97) is not correct. Again, Ulloor (I.169) refers to a com. on the *Āryabhaṭṭīya* by our author, but no such com. is known.

4. Ed. *Trivandrum Skt. Ser.*, (TSS), No. 162, (Trivandrum, 1949).

5. On Śaṅkaranārāyaṇa, see, Intro. to the above edn., pp. x-xv; Raja, 128-29; UI. I. 165-67; Va. IV, 221-23. Va.'s statement (IV. 222) that *Bṛhatkarmanibandhana* is a work of this author is not correct. *Bṛhatkarmanibandhana* is another name for the *Mahābhāskarīya* of Bhāskara I.

6. Ulloor 1955, as given in his com. on *Laghu.*, II. 29.

mathematician Jayadeva and comments on them.<sup>1</sup> His comments on Jayadeva are quoted also in the *Līlavatīvyākhyā* (*Kriyākramakarī*) by Nārāyaṇa (Madras Ms. R. 2754, pp. 182, 183-84, 185). Possibly Udayadivākara has commented on Jayadeva's work in full.

### 9. Acyuta I

An extensive work on analytic astrology, called severally as *Devakerala*,<sup>2</sup> *Keralajyotiṣa*, *Candranāḍī* and *Candrakalānāḍī*, introduces itself as to have been compiled from the teachings of Acyuta, a brahman from Kerala. Acyuta propitiated, by penance, Bṛhaspati, who taught him the *Jātakaskandha*. In a similar manner, Acyuta propitiated Śukra and Parameśvara also and got from them their teachings as well, which he propagated.<sup>3</sup> Neither the date of this Acyuta nor any personal details about him is known. The *Devakerala* which represents his teachings is, obviously, a compilation by his disciples, among whom Veṅkaṭeśa of the Kāśyapagotra is specifically mentioned as the redactor of the *Uttarabhāga* of the work.<sup>4</sup>

### 10. Keralācārya (? 12th cent.)

According to current tradition, Keralācārya hailed from Trichur in Central Kerala and belonged to the Kāśyapagotra. It is also said that he was a minister of King Rāma Varmā who ruled in Kerala from 1108-32. He wrote on Jyotiṣa, Āyurveda and Tantra. His works on

1. For a study on these verses, see K. S. Shukla, 'Ācārya Jayadeva, the mathematician', *Gaṇita*, (Bharat Ganita Parishad, Lucknow), 5 (1954) 1-20.

2. Ed. by T. S. Ranganatha Josyar, in 3 parts, *Madras Gov. Or. Ser.*, Madras, 1952-56.

3. Cf.: *Kerale viṣaye kaścid Acyuto nāma bhūsurah |*  
*Bṛhaspatim samuddiśya sa cakre tapa uttamam ||*  
*prasādasumukhas tasmai prāha devapurohitah |*  
*tapasā tava tuṣṭo 'smi vatsa kim te karomy aham || ...*  
*yan mayānukṛtam pūrvam Jātakaskandham uttamam |*  
*dviśahasreṇa saṅkṣipyā tvatkr̥te procyate 'dhunā || ...*  
*Acyuto 'pi punaḥ prītas tapasārādhyā Bhārgavam |*  
*tasmāt sahasrasaṅkhyākam prāptavān Bhārgavam matam || ...*  
*śiṣyān adhyāpayāmāsa śāstram tad Devakeralam | ...*

4. Cf.: *abhivandya mataṅgākhyam śrīmad-veṅkaṭanāyakam |*  
*Kāśyapo Veṅkaṭeśo 'ham phalam vakṣyāmi bhūbhujam ||*

Jyotiṣa included *Kerala-saṁhitā*, *Kerala-nāḍigrantha*, *Keralīyapraśna-mārga* and *Keralapraśnasāra*. However, as observed earlier, these works must, obviously, be non-Keralite treatises based on Keralite teachings attributed to Keralācārya.<sup>1</sup>

### 11. Vyāghrapāda

*Aṅkaṇāśāstra*,<sup>2</sup> called also *Grahasamaya* and *Navagrahasamaya*, has, obviously, been composed by a devotee of god Śiva enshrined at Vaikkom (Skt. Puṇḍarikapura) in Central Kerala and attributed to sage Vyāghrapāda, the establisher of that place. It is an interesting treatise in analytical astrology, intended as a supplement and corrector to general horoscopic astrology and contains 389 verses, divided into four chapters. Herein, each of the twelve *lagna-rāśis* (ascending zodiacal segments) are divided into nine *aṅkaṇa-s* ('court-yards'), each *aṅkaṇa* being presided over by a planet having individual characteristics. Minute prognostications are made on the basis of the effects of these planets.<sup>3</sup>

### 12. Kṛṣṇa (c. 1200)

Kṛṣṇa, called also Kṛṣṇācārya, is the author of *Cintajñāna*, a comprehensive work on astrology in thirtytwo chapters. No personal details about him are known but his being quoted frequently as an authority by later writers, the earliest of them being Govinda Bhaṭṭatiri of Talakkulam (1237-95), is a pointer to his popularity and his date, which might be taken to be about 1200 or before. He may be identical with Kṛṣṇa, the author of a commentary on the *Horā* of Varahamihira, of which a manuscript has come to light. Kṛṣṇa's *Cintajñāna* has a popular commentary called *Caturasundarī* by Viṣṇu.<sup>4</sup>

### 13. Kṛṣṇa-śiṣya (c. 1200)

Kṛṣṇa had in one of his disciples, who does not disclose his name or give any other personal details, an ardent admirer and propagator of his teachings. This disciple has composed two works, one a metrical commentary on the *Horā* and the other a short treatise in verse on astrological query, entitled *Praśnaphalaprāptikalanirṇaya*. In both these works, he mentions his teacher in high terms

1. See above, pp. 38-40.

2. Ed. by K. Raghavan Pillai, TSS, No. 222, Trivandrum, 1968.

3. On this work, see Intro. to the edn. cited above and Ul. Sup. I. 221-22.

4. On Kṛṣṇa, see Ul. I. 169-70.

and, in the latter, goes to the extent of saying that the minds of those who have imbibed the teachings of Kṛṣṇācārya would remain unassailed so far as prognostication is concerned.<sup>1</sup>

#### 14. Sūryadeva Yajvan (1191-c. 1250)

Sūryadeva Yajvan of the Nidhruva gotra and nephew of another Sūryadeva was a versatile commentator and recognised authority. He gives his date of birth as 'viśveśa' (1113) śāka in the colophon to his commentary on the *Tripraśnādhyāya* of the *Laghumānasa* of Muñjāla. His elaborate commentaries on the *Laghumānasa* and the *Āryabhaṭīya* are available, but that on the *Mahābhāskariya-bhāṣya* of Govindasvāmin is known only from his reference to it. On astrology, he commented on the *Mahāyātra* of Varāhamihira, and the *Jatakakarmapaddhati* of Śrīpati, both of which are popular.<sup>2</sup>

#### 15. Vidyāmādhava

Vidyāmādhava, whose commentary on the *Kirātārjunīya*, is perhaps, the best exposition of that *mahākāvya*, was equally at home in Jyotiṣa. His *Muhūrtadarśana*, called also *Muhūrtamādhaviya* and *Vidyāmādhaviya*,<sup>3</sup> is an extensive work in 15 chapters, discussing and prescribing auspicious times for all types of social and religious functions. He was a member of the Tuḷu brahman family of Nilamana, his village being Guṇavati (Guṇavanta), near Gokarṇa, on the Arabian coast. He was the son of Nārāyaṇa, an eminent scholar attached to the court of King Mallappa. The *Muhūrtadarśana* has been extremely popular in Kerala and has six Keralite commentaries on it, two in Sanskrit and the others in Malayalam.<sup>4</sup>

#### 16. Viṣṇu of Nilamana

Viṣṇu was the son of Vidyāmādhava and had the distinction of commenting upon his father's *Muhūrtadarśana*. This commentary,

---

1. See the verses extracted in the Inventory, below, under the respective works.

2. On Sūryadeva, see Raja, 131-32, Sen, p. 124 ; Ul. II. 97-98 ; Ul. Sup. I. 219 ; Va. I. 390-92.

3. Ed. by Shama Sastry, *Vidyāmādhaviyam* with Viṣṇuśarma's *Muhūrtadīpaka*, *Bibl. Sanskrita*, Nos. 63, 67, 70, Or. Res. Inst., Mysore, 1923, 1925, 1926.

4. On Vidyāmādhava, see, Ul. II. 95 ; Ul. Sup. I.540 ; Va. I. 441-44.

called *Dīpikā*,<sup>1</sup> is highly elucidatory and informative and has been as much popular in the land as its text.<sup>2</sup>

### 17. Govinda Bhaṭṭatiri of Talakkūḷam (1237-95)

Govinda Bhaṭṭatiri of Talakkūḷattūr family belonged to the village of Ālattūr in S. Malabar and is renowned as the progenitor of the famous Pāzhūr Kaṇiyār family of astrologers. A line of astronomical tradition which he started continued for more than 700 years.<sup>3</sup> The dates of his birth and death are given by tradition by the Kali chronograms *rakṣed govindam arkaḥ* (15,84,362) and *kāḷindīpriyatustaḥ* (16,12,891), which fall, respectively, in A. D. 1237 and 1295. His elaborate commentary *Daśādhyāyī* on the *Horā*, called so on account of its commenting only chs. I to X of the work, deals, in substance, with the entire *Horā*.<sup>4</sup> His *Muhūrtaratna* has been very popular. He is said to have written also a *Muhūrtapadavī*, which formed the basis for several later works of that name (Ul. II. 110).<sup>5</sup>

### 18. Tāmaranallūr (14th cent.)

A member of the Tāmaranallūr family has produced an authoritative work entitled *Muhūrtavidhi*, called also *Muhūrtam Bhāṣā*. The work is popularly known as *Tāmaranallūr Bhāṣā*, after its author. It deals with the fixation of auspicious times for functions and is composed

1. Ed. with text, *op. cit.*

2. The colophon to the commentary on ch. XI reads :

*Muhūrtādarśanādarśavyākhyāne Viṣṇunā kṛte |  
vyācāṣṭaikādaśādhyāyam Vidyāmādhavanadanah ||*

On the basis of this Ulloor (II. 95) distinguishes between Viṣṇu and Vidyāmādhava's son and states that while the disciple Viṣṇu is the main commentator, ch. XI was commented by Vidyāmādhava's son. But, for the identity of the two, see colophon to the com. on ch. V :

*ittham Vidyāmādhavīye Muhūrtādarśe 'Vidyāmādhavasyātmajena' |  
vyākhyāto 'bhūd gumphite 'Viṣṇunāmnā' vīryāvīryam darśanam pañcamo 'yam ||*

3. See above, pp. 5-6.

4. Pub. under the title *Daśādhyāyī*, Venkatesvara Press, Bombay, Sarā. 1969 (A.D. 1912) ; Vidyakalpataru Press, Palghat, (1905), (in grantha script).

5. On Govinda Bhaṭṭatiri, see : Raja, 132-33 ; Ul. I. 167-69, II. 110 ; Va. I. 353-59, II. 499-500. For the legends about him see, Koṭṭārathil Śaṅkunṇi, 'Talakkūḷattūr Bhaṭṭatiriyum Pāzhūr paṭippurayum' (Mal.), *Aicīhyamālā*, I, (6th edn., Trichur, 1961), 99-108.



in early *bhāṣā-miśra* (Skt.-Mal.) verses. The author, who does not reveal his personal name, makes mention of his patron Ceyyūr (?Cellūr) Nārāyaṇan Nampūtiri and might have hailed from Peričcellūr in Malabar.<sup>1</sup>

#### 19. Nityaparakāśa Yati (14th-15th cent.)

Nityaparakāśa Yati or °Bhaṭṭāraka, about whom the only personal information known is the name of his preceptor, viz., Ānandaparakāśa, has commented on the *Horā*, both in Sanskrit and in Malayalam. Both the commentaries are elaborate and are called *Prakāśikā*: The Sanskrit commentary is called also *Viṣamākṣaravivṛti*. The language of the Malayalam commentary, which is characterised by mediaeval traits,<sup>2</sup> would suggest for it a date in the 14th-15th century.

#### 20. Kumāra Gaṇaka (c. 14th-15th cent.)

Kumāra Gaṇaka is the author of *Raṇadīpikā*,<sup>3</sup> which he composed at the instance of Deva Śarmā, younger brother of Govinda, a Kerala prince, probably of the principality of Cempakaśseri (modern Ampalappuzha). The work deals with politics, royal conduct and war, on the background of natural and horary astrology. It is divided into eight chapters, called *viveka-s*, devoted, respectively, to *Naya*, *Yātrā*, *Jayājaya*, *Kāla*, *Sūlacakrādi*, *Pañcasvara*, *Mṛgavīrya* and *Bhūbala*. The author writes very readable poetry and reveals a liberal and progressive bent of mind.<sup>4</sup>

#### 21. Rudra I (c. 1325-1400)

Parameśvara Vaṭaśreṇi (1360-1455), of *Dṛggaṇita* fame, has mentioned in several of his works, Rudra, the eminent astronomical authority at whose feet he learnt the discipline. This Rudra's has, however, not been identified as the author of any work.<sup>5</sup>

1. On Tāmaranallūr, see Ul. I. 430-1; Ul. Sup. I 146; Va. III 396. Two manuscripts of the work, Ker. 4147-A and PM 4113-B, call themselves *Muhūrtapadavī Bhāṣā*. It remains to be seen whether it is related to the *Muhūrtapadavī* of Govinda Bhaṭṭatiri of Talakkuḷam.

2. E. g., see the lines: *yāvad gataḥ śītakaro* etc. (*Horā* 24.6): *enpatu praśnam peṇṇina pozhutu praśnarāśikku ettanayām rāśiyile candran ninṇān enṇu inta candran ninṇa rāśi piṭittu akkaṇṇakkeṇṇi avviraśiyile candran nilkaṇṇirantān enṇu colluka* / (*Des. Cata. of Skt. Mss. in H. H. the Maharaja's Palace Library, Trivandrum, Ms. No. 995, (vol. IV, p. 1315).*

3. Ed. TSS, No. 95, Trivandrum, 1923.

4. On Kumāra Gaṇaka, see Ul. II. 112-13; Va. II. 705-29

5. On Rudra, see Raja, 138.

## 22. Mādhava of Saṅgamagrāma (c. 1340-1425) : Mādhava I

Mādhava, referred to by later astronomers as *Golavid* ('Master of spherics'), was an astute mathematician who belonged to Saṅgamagrāma, identified with Irinjālakkuḍa, near Cochin. According to an old astronomical document, he belonged to the sub-caste of Kerala brāhmins called Emprān-s and the name of his house was Ilaññippaḷli.<sup>1</sup> In his *Veṅvāroha*,<sup>2</sup> he evolved a facile procedure to read out the true positions of the Moon every 36 minutes.<sup>3</sup> He uses, in this work, a date in A. D. 1400 as the epoch, which gives a clue to his date. Among his known works are *Lagnaprakaraṇa* and a table of moon-mnemonics correct to the seconds. His *Mahājyānayanaprakāra* and *Madhyamānayanaprakāra*, for which short commentaries are available, contain novel theorems and computational methods evolved by him and used by later writers.

An important work of Mādhava, which may be identified here, is his *Aganīta*. The astronomical document mentioned above states that Mādhava is the author also of an *Aganītapāñcāṅga*. An anonymous *Aganītagraha-cāra* which has been quoted by *Karaṇapaddhati* (IV. 14, 16, 18) and is available in manuscript form mentions the *śodhyābdas* ('deductive years') for the computation of Mars, Mercury, Jupiter, Venus, Saturn and Moon's Higher Apsis as Śaka 1320, 1318, 1340, 1158, 1301 and 1276, corresponding to A.D. 1398, 1396, 1418, 1236, 1379 and 1354.<sup>4</sup> Since the principle underlying the *śodhyābdas* is to fix them in such a way that the largest possible number of

1. Cf. the words: *Mādhavan Veṅvārohādīnām karttā. ... Mādhavan Ilaññippaḷli Emprān*, in a Kerala manuscript, No. 9886, preserved in the Oriental Institute, Baroda, and ed. by K. V. Sarma in the paper 'Some direct lines of astronomical tradition in Kerala', Pt. Charudeva Shastri Felicitation Vol., Delhi, 1972.

2. Cr. ed. by K. V. Sarma, with the commentary of Acyuta Piṣaraṭi, Sanskrit College, Trippunithura, 1956.

3. For a note on other works of this genre, see above, pp. 32-33.

4. Cf. Ms. T. 280, *Cata. of the Skt. Mss. in the Curator's Office, Trivandrum*, Vol. IV, p. 1305 :

*śakābdāt 'naraloko'nād rāghavair dhītsunā kujah |*  
*'divyaloko'-nanīlāgrais tattvajñair bhājite budhah ||*  
*'navaloko'-nasāraṅgair gajair āpte gurur bhavet |*  
*'hemarūpyo'-naśakābdāt sāravair govarair bhṛguḥ ||*  
*'yajñaloko'-nanītamśair dharmair āpte śanir bhavet |*  
*'tīrthapriyo'-naśakābdād gandhajñair bhājite tamah ||*

years will be cut off from the number of the current year, thereby providing maximum ease in calculation, the *śodhyābdas* selected would be as near as possible to the date of the composition of a work, which date would, naturally, be just ahead of the largest *śodhya*. In the case of the *Aganītagraha-cāra* in question, the *śodhyābdas*, with A. D. 1418 as the latest among them, agrees, surprisingly, with the date of Mādhava. This goes to confirm that in the present *Aganītagraha-cāra* we have a hitherto unidentified work of Mādhava, viz. his *Aganītapancānga* which is mentioned in the said astronomical document. Again, it seems quite possible that Mādhava had composed a comprehensive treatise on astronomy and mathematics, which yet remains to be identified and which may be supposed to contain the numerous single and groups of verses enunciating computational procedures, theorems and formulae which are quoted as Mādhava's by later writers. Possibly, Mādhava wrote also a work named *Golavāda*<sup>1</sup> which gained for him the appellation *Golavid* by later scholars.<sup>2</sup>

### 23. Parameśvara of Vaṭaśreṇi (c. 1360-1455) : Parameśvara I

Parameśvara, one of the foremost astronomers of Kerala who revised the *Parahīta* system of computation through his *Dṛggaṇita* in 1430, has made significant contributions to Hindu mathematics and astronomy. He was a Ṛgvedin of the Āśvalāyana-sūtra and the Bṛghu-gotra. He hailed from the village of Aśvatthagrāma (Mal. Ālattūr) and his house Vaṭaśreṇi (Mal. Vaṭaśseri) was situated on the confluence of river Niḷā (Mal. Bhāratappuzha) with the Arabian Sea, where, on the sandy expanse, he carried on investigations for fiftyfive years. He also observed a large number of eclipses, of which he has recorded the details in his *Siddhāntadīpikā*.<sup>3</sup> His grandfather was a disciple of

1. A matter of melencholy interest might de mentioned here, at least for record. The presence of a work entitled *Golavāda* written in continuation of Mādhava's *Veṅvāroha* in a manuscript preserved in the Eḷankunnappuzha Naṭakkal Kovilakam, near Ernakulam, raised in the present writer the hope that that could, possibly, be a thitherto unknown work of Mādhava. When, however, he proceeded to the said Kovilakam and, with a good deal of persuasion, caused the wooden box containing the family collection of manuscripts to be opened, he found that all the manuscripts in that box, including that of *Golavāda*, had been completely eaten away by white ants. For further details, see his note on the subject in the *Mathrubhumi W.*, (Kozhikode), 17.6.1956, p. 4.

2. On Mādhava, see : K. V. Sarma, Intro. to the edn. of *Veṅvāroha*, op. cit.; 'Saṅgamagrāma Mādhava', (Mal.), *Mathrubhumi W.*, 4. 11. 1956, pp. 17-18, 59 ; Raja. 133-36 ; Ul. II. 91-100 ; Va. I, 387-88, III. 388-90.

3. On Parameśvara's extensive astronomical observations, see above, pp. 2-4.

Govinda Bhaṭṭatiri of Talakkulam and he himself was a pupil of Rudra I, Nārāyaṇa son of Parameśvara and Mādhava of Saṅgamagrama.

Parameśvara was a prolific writer, author of about 30 works, including original treatises and commentaries, both on astronomy and astrology. Among his original writings on astronomy might be mentioned the *Dṛggaṇita* (1430),<sup>1</sup> three works on spherics, being the *Goladīpikās* I-III (1443),<sup>2</sup> three works on improved computation and rationale of eclipses, viz., *Grahaṇaṣṭaka*,<sup>3</sup> *Grahaṇamaṇḍana*<sup>4</sup> and *Grahaṇanyāyadīpikā*,<sup>5</sup> a text on the computation of the Moon-shadow, entitled *Candracchāyāgaṇita* and a rationale on the computation of mnemonic tables, *Vākyakarāṇa*.<sup>6</sup> He has commented on the *Āryabhaṭīya*,<sup>7</sup> *Mahābhāskariya*,<sup>8</sup> *Mahābhāskariya-bhāṣya*,<sup>9</sup> *Laghubhāskariya*,<sup>10</sup> *Sūryasiddhānta*, *Laghumānasa*<sup>11</sup> *Līlāvati*, *Goladīpikā* I<sup>12</sup> and *Vyatīpātāṣṭaka*. Some of his commentaries, like, for instance, those on the *Āryabhaṭīya* and *Mahābhāskariya-bhāṣya*, are extremely valuable for the historian of Hindu astronomy, since they contain the enunciation of some of his new findings, theories and interpretations. Two of his works on astronomy, viz., *Vākyadīpikā* and *Bhādīpikā*, are yet to be recovered. His writings on astrology include *Ācārasaṅgraha* in two versions, one of them ending with *Vivāhānukūlyam*, *Jātakapaddhati*, and *Ṣaḍyargaphalam* and commentaries on the *Jātakakarmapaddhati* of

1. Cr. ed., K.V. Sarma, V.V.R.I., Hoshiarpur, 1963.

2. I: Cr. ed., K.V. Sarma, Adyar Library, Madras, 1957; II; Ed. T. Ganapati Sastri, TSS, No. 49, Trivandrum, 1916. The traditional date of composition of one the *Goladīpikās* (which one it is not possible to say) is given by the chronogram *dīyatām* (M.E. 618) equivalent to A.D. 1443, is given by Achyutattu Vasudevan Moossatu in his collection of chronograms entitled *Marakkatta nalukal* ('Unforgettable days'), Kunnamkulam, M.E. 1130 (A.D. 1955).

3. Cr. ed., K.V. Sarma, K S R. Inst., Madras, 1959.

4. Cr. ed., K.V. Sarma, V.V.R.I., Hoshiarpur, 1965.

5. Cr. ed., K.V. Sarma, V.V.R.I., Hoshiarpur, 1966.

6. This *Vākyakarāṇa*, in about 75 verses, is different from the *Vākyakarāṇa* attributed to Vararuci III.

7. Ed., H. Kern, Leiden, 1874; Udaya Narain Singh, Etawah, 1906.

8. Pub., *Anandasrama Skt. Ser.*, No. 126, Poona, 1945.

9. Cr. ed., T.S. Kuppanna Sastri, Gov. Or. Mss. Lib. Madras, 1957.

10. Pub., *Anandasrama Skt. Ser.*, No. 128, Poona, 1946.

11. Pub., *Anandasrama Skt. Ser.*, No. 123, Poona, 1944.

12. Cr. ed., K.V. Sarma, Adyar Library, Madras, 1957.

Śrīpati, *Praśnaṣatpāñcāśikā* of Pṛthuyāśas, an anonymous *Muhūrtāṣṭaka* and the *Muhūrtaratna* of Govinda Bhaṭṭatiri.<sup>1</sup>

#### 24. Dāmodara of Vaṭaśreṇi (c. 1410-1510) : Dāmodara I

Of Dāmodara, son of Parameśvara of Vaṭaśreṇi, no fullfledged work is known, but his pupil Nīlakaṇṭha Somayāji refers to him as an erudite astronomer and quotes from his writings. Thus, in his *Bhāṣya* on *Āryabhaṭīya* (*Kālakriyā* 17-21), Nīlakaṇṭha says : *tac cōktam asmad Ācāryaiḥ : sarvatra viṣkambhadalam śrutau vā vyāsārdhake syāt viparītakarṇaḥ* | (Edn., TSS, No. 110, p. 47). Further down, in the same context, Nīlakaṇṭha quotes a longer piece with the introductory statement : *nibaddham ca tat tadaiva asmadgurubhiḥ pañcabhir upajātibhiḥ* :

*arkasphuṭenānayanam prakuryāt  
svamadhyamasyātra vituṅgabhānoḥ |  
bhujāguṇam koṭiguṇam ca kṛtvā  
mṛgādikendre 'ntyaphylākhyakoṭyoḥ ||*

*bhedāḥ kulīradigāte tu yogas  
tadvargayuktād bhujavargato yat |  
padam viparyāsakṛtaḥ sa karṇas  
trijyākṛtes tadvihṛtas tu karṇaḥ ||*

*tenāhatām uccavihīnābhānor  
jīvām bhajed vyāsadalena labdham |  
svocce kṣīpec cāpi tam ādyapāde  
cakrārdhataḥ suddham api dvitīye ||*

*cakrārdhayuktam tu trītiyapāde  
samśodhitam maṇḍalātās caturthe |  
evamkṛtaḥ sūkṣmataras tu madhyaḥ  
pūrvam padam yāvad ihādhikam syāt |*

1. On Parameśvara, see : K.V. Sarma, Intro. to his edns. of Parameśvara's works, *op. cit.* ; 'Dṛggaṇita of Parameśvara', (Mal.), *Mathrubhumi W*, 7.10.1956, pp. 29-30; 'Fiftyone years' penance' (Mal.), *Mathrubhumi W*, 7.10.1956, pp. 29-30 ; Raja, 136-43 ; Sen, pp. 166-70 ; Ul. II. 100-5 ; Ul Sup., I. 215-19 ; Va. I. 378-83.

*antyāt phalāt koṭiguṇas caturthe  
tv arabhyate yady adhikātra koṭiḥ |  
sarvatra viṣkambhādalam śrutau vā  
vyāsārdhake syād viparītakarṇaḥ ||*

(*Ibid.*, p. 48)

Elsewhere, too, Nilakaṇṭha quotes Dāmodara : *E.g., prakārantareṇa 'candrabāhuphala' ityādina śrīmad-Dāmodarāhvayāsmadgurumukhod-gatena slokenoktā | (Grahaṇādigrantha, ms., p. 61)*. Later writers also mention Dāmodara. Dāmodara might have composed certain works which are yet to be identified, and from which the above-mentioned passages should have been quoted.<sup>1</sup>

## 25. Ravi Nampūtiri (c. 1425-1500)

Nilakaṇṭha Somayāji (1444-1545) mentions in the colophon to his *Aryabhaṭīya-bhāṣya, Gaṇitapāda*, Ravi as his teacher on Vedānta. He pays his respects to Ravi also in the beginning of his *Siddhāntadarpaṇa*. Ravi was also an erudite scholar in Jyotiṣa and has been identified as the author of *Ācāradīpikā*, an elaborate metrical commentary on the *Muhūrtadīpikā*.<sup>2</sup>

## 26. Nilakaṇṭha Somayāji (1444-1545) : Nilakaṇṭha I

Nilakaṇṭha Somayāji, the centenarian astronomer of Kuṇḍapura (Mal. Tṛkkaṇṭiyūr) in South Malabar, was, perhaps, as eminent as his grand-teacher, Parameśvara of Vaṭaṣreṇi. In a detailed colophon to his *Bhāṣya* on the *Aryabhaṭīya, Gaṇitapāda*, he gives full details about himself. Elsewhere also, in his works, he records particulars about his person. He was a Numpūtiri of the Garga-gotra and hailed from the family of Keḷallūr (Mal. Kerala-nal-ūr, Skt. Kerala-sadgrāma). He was the son of Jātavedas and had a younger brother named Śaṅkara. His date of birth is given in the chronogram given in his *Siddhāntadarpaṇa-vyākhyā, viz., tyajāmyajñatām tarkaiḥ (16,60,181)* which falls in Dec. 1444. He is referred to as a 'living' authority by Mādhava of Īñcakkāzhvā in his *Praśnasāra*, composed in 1542-43. Both he and his brother Śaṅkara were patronised by Kauṣītaki Aḍhya

1. On Dāmodara, see Ul. Sup. I. 210-11 ; Va. I. 388. Va. identifies (I. 388) the present author with Dāmodara, au. of *Muhūrtābharāṇa*, but this is not possible, for the former belonged to the Bhārgava-gotra while the latter was of the Bhāradvāja-gotra ; cf. the Intro. verse to *Muhūrtābharāṇa* (Ms. Kerala T. 71) : *teṣāṃ viduṣāṃ madhye Bhāradvājagotrājātā ye |*

2. On Ravi, see K.V. Sarma, Intro. to the edn. of *Golasāra*, p. xv ; Ul. II. 113-14.

Netranārāyaṇa (Āzhvāñceri Tamprākkal), the hereditary religious head of the Nampūtiris. Nilakaṇṭha spent his student days at the house of Parameśvara of Vaṭaśreṇi and received occasional instruction from him, his regular teacher being Parameśvara's son, Dāmodara. Nilakaṇṭha had also another teacher by name Ravi, who is identified as the author of *Ācāradarśana*.

Nilakaṇṭha was a versatile scholar, though his writings, which are prolific and erudite, are all on astronomy. His *Tantrasaṅgraha* (A.D. 1500)<sup>1</sup> is a comprehensive treatise on astronomy. His *Grahaṇanirṇaya* and *Candracchāyāgaṇita*, the latter with his own commentary, deal with revised procedures on the respective topics. In his *Golasāra*<sup>2</sup> he gives a résumé of some of his views on certain astronomical topics and in his *Siddhāntadarpaṇa*,<sup>3</sup> he sets out the astronomical constants, as determined by him, the rationale of which he expounds in his commentary on that work. In some elaborate tracts on eclipses and certain other topics (*Grahaṇādigrantha*) he expounds the tradition and rationale of eclipse computation, methods for determining corrections (*saṃskāra-s*) etc. His *Sundararājapraśnottara* forms his answers to certain astronomical problems posed by a contemporary astronomer from the adjoining Tamil region who has commented on the *Vākyakaraṇa* ascribed to Vararuci.<sup>4</sup> Nilakaṇṭha sets out much original contribution through his extensive *Bhāṣya* on the *Āryabhaṭīya*<sup>5</sup> which is considered to be his masterpiece. But, by far the most instructive work of Nilakaṇṭha is the *Grahaṇaparīkṣākrama*,<sup>6</sup> where, in about 200 verses, he sets out the procedures for the observation of the planets, sometimes with instruments, and for their computation using the data

---

1. Ed. with the commentary of Śaṅkara Vāriyar, TSS, No. 185 (Trivandrum, 1958).

2. Cr. ed., K.V. Sarma, V.V.R.I., (Hoshiarpur, 1970).

3. Cr. ed., K.V. Sarma, Adyar Library, (Adyar Library, Madras, 1955).

4. Cr. ed., T.S.K. Sastri and K.V. Sarma, K.S.R. Inst., Madras, 1962.

5. Ed. TSS, Nos. 101, 110, 185, (Trivandrum, 1930, 1931, 1957).

6. This work has been quoted in full in his *Āryabhaṭīya-bhāṣya*, Gola. 48, (TSS, No. 185, pp. 132-49). An adapted edition of this has been issued by Puliur Purushottaman Nampūtiri, (Bombay, 1950). A perfect ms. of the work is available with K.V. Sarma.

obtained from the observations. A commentary in Malayalam expounding the said procedures is also known.<sup>1</sup>

27. Śaṅkara of Keṇallūr (c. 1475-1575) : Śaṅkara I

Nilakaṅṭha Somayāji's younger brother Śaṅkara, an astronomer in his own right, was, like his brother, patronised by the Azhvāñceri Tamprākkaḷ, at whose house he was teaching astronomy as mentioned in Nilakaṅṭha's *Āryabhaṭīya-bhāṣya, Gaṇita*. 26, (edn., p. 156). The said *Bhāṣya* had been composed for the sake of Śaṅkara, who was also entrusted with its propagation.<sup>2</sup>

28. Citrabhānu (c. 1475-1550)

Citrabhānu Nampūtiri, author of *Karaṇāmṛta*, an advanced manual on astronomical computation in four chapters, was a pupil of Nilakaṅṭha Somayāji, whom he mentions as 'Gārgya' in the beginning of his work. He belonged to the Gautama-gotra and hailed from the village of Covvaram (Skt. Śivapuram) near Trichur. The date of composition of *Karaṇāmṛta* which is indicated in that work by the Kali chronogram *buddhyonmathyoddhṛtam yatnāt* (16,91,513) (A.D. 1530) gives the clue to its author's date.<sup>3</sup>

29. Citrabhānu-Śiṣya (c. 1500-75)

*Bhāvacintāvali*, in three chapters, is a work on astrology by an anonymous pupil of Citrabhānu. That the pupil has written on astrology would suggest that the teacher Citrabhānu, besides being an astronomer, was also an authority on astrology.<sup>4</sup>

30. Nārāyaṇa I (c. 1500-75)

Nārāyaṇa, disciple of another Nārāyaṇa and Citrabhānu, ardent admirer of Nilakaṅṭha Somayāji and highly devoted to Subrahmaṇya,

1. On Nilakaṅṭha, see : K.V. Sarma, 'Gārgya Kerala Nilakaṅṭha Somayājin', *Jl. of Or. Res.*, 26 (1956-57) 24-39; Intro. to the edns. of *Siddhantadarpaṇa* and *Golasāra*, *op. cit.*,; Raja, 143-52; Sen, 155-57; Ul. II. 117-20; Ul. Sup. I. 235-37; Va. I. 3:3-87.

2. On Śaṅkara, see K V. Sarma, Intro. to *Golasāra*, *op. cit.*, p. xiii.

3. On Citrabhānu, see Raja, 153-55; Ul. II. 273-75; Ul. Sup. I. 365-6.

4. On Citrabhānu-Śiṣya, see Raja, 154 (where the work is wrongly called *Bhāvacintāmaṇi*); Ul. II.275.



an esteemed associate of Nilakaṇṭha, was an original thinker and highly informed commentator. He wrote, in A.D. 1529, an instructive commentary called *Laghuvivṛti* on *Pañcabodha IV*.<sup>1</sup> His *Uparāgākriyākrama* in five chapters is a detailed exposition of eclipse computation. He also wrote two commentaries on the *Līlāvati*, one short and the other nearly five times as long, both called *Kriyākramakarī* and *Karmadīpikā* (called also *Karmapradīpa* and *Karmapradīpikā* according to the exigencies of the metre of the verses containing these names).<sup>2</sup> The longer *Kriyākramakarī* is especially valuable to the historian of Kerala astronomy and mathematics for the profuse references it contains to earlier authors and authorities, some of which are now lost, and for the theories and procedures enunciated in that commentary.<sup>3</sup>

### 31. Śaṅkara Vāriyar (c. 1500-60) : Śaṅkara II

The author of *Laghuvivṛti* (A. D. 1556), which is an erudite commentary on the *Tantrasaṅgraha*, was a disciple of Nilakaṇṭha Somayāji and protege of (Netra) Nārāyaṇa (Āzhvāñceri Tamprākka!), both of whom are mentioned in the beginning of that commentary, is identified with Śaṅkara Vāriyar of Tṛkkuṭaveli family. Though the name of the author is not mentioned in the commentary itself, some manuscripts of that commentary (Kerala Univ. 8351, 8906, C. 524) carry the following post-colophonic statement, in Malayalam, by the scribe :  
*ī vyākhyānam Tṛkkuṭaveli-c-Śaṅkaravāriyar oṭukkattu camaccatu /*  
*Āzhvāñcerikku veṅṭittu sukhamē śikṣiccu camacu ennu Paraññoṭṭu*  
*paraññu keṭṭu |* : 'This commentary was composed last by Tṛkkuṭaveli Śaṅkara Vāriyar. It is stated to have been said by Paraññoṭṭu that it was composed with great care for the sake of Āzhvāñceri'. The person referred to here as Paraññoṭṭu is very likely to be Paraññoṭṭu

1. Cf. the chronogram *prajñālokoddhṛtam yas* (Kali day 16,91,302) in the verse at the end of this work :

*prajñālokoddhṛtam yasmāt gūḍham artham vivṛṇvatī |*  
*vyākhyāyam Pañcabodhasya ciram tiṣṭhatu bhūtale ||*

2. Some scholars distinguish between the authors of the two commentaries on the *Līlāvati* and suggest that Śaṅkara Vāriyar of Tṛkkuṭaveli might have written the longer *Kriyākramakarī* (cf. Raja, 155) ; again, some miss to recognize 'two' *Kriyākramakarī*-s (Ulloor II, 121). The matter has been examined in detail and the authorship of Nārāyaṇa of both the commentaries is being set out by the present writer, elsewhere.

3. O<sup>2</sup> Nārāyaṇa, see Ul. II. 121 ; Ul. Sup. I. 222, 227-28.

Jyeṣṭhadeva, an younger contemporary of Nilakaṇṭha, and, therefore, the statement is quite likely to be authentic.

Hitherto, Śaṅkara Vāriyar has been credited with the authorship only of the above-said commentary. However, three more of his works can now be identified. Thus, in the beginning of the present commentary, he makes mention of a larger commentary of his on *Tantrasaṅgraha*:

*Nārāyaṇam jagadanugrahajāgarūkam  
Śrī-Nilakaṇṭham api sarvavidam praṇamya |  
yat Tantrasaṅgraha-gatam grahatantra-jātam  
tasyā'parām' ca Vivṛtim vilikhāmi Laghvīm ||*

Again, in the final colophon at the end of the work, he states that the present commentary is an adaptation of a larger commentary of his named *Kriyākalāpa* ('Detailed demonstration') on the *Tantrasaṅgraha*. Cf. :

*iti Tantrasaṅgrahasya Kriyākalāpam'krameṇa saṅgṛhya |  
racite tadvyākhyāne pūrṇo 'bhūd aṣṭamo 'dhyāyah ||*

A unique manuscript of this longer commentary has been recorded in the Inventory below. It can also be shown that the anonymous work entitled *Karaṇasāra*, in four chapters, whose authorship has been left open (cf., Ul. II. 121-22) and a Malayalam commentary on it which is, at present, attributed to Śaṅkaran Nampūtiri of Mahiṣa-maṅgalam (Ul. II. 272, 474), are really the works of Śaṅkara Vāriyar.<sup>1</sup>

### 32. Jyeṣṭhadeva (c. 1500-1610)

Jyeṣṭhadeva, this name being, most probably, the Sanskritised form of his personal name in the local language, has the distinction of

1. Evidences for these identifications are being set out by the present writer elsewhere. Some scholars (cf. Raja, 155) ascribe to Śaṅkara Vāriyar the elaborate commentary *Kriyākramakarī* on the *Līlāvati* on the basis of the similarity of some expressions in one of the introductory verses of that work with those in his commentary on the *Tantrasaṅgraha*. However, there are clear evidences, which, as indicated above are being set out elsewhere, to show that the *Kriyākramakarī* is a work of Nārāyaṇa and not of Śaṅkara Vāriyar.

being the author of the popular *Yuktibhāṣā*<sup>1</sup> or *Gaṇitanyāyasaṅgraha*,<sup>2</sup> which forms an elaborate and systematic exposition of the rationale of mathematics in its Pt. I and of astronomy in its Pt. II. The Sanskrit version of this work, known as *Gaṇitayuktibhāṣā*, is also, in all probability, his work. An old astronomical document informs that he was the pupil of Dāmodara of Vaṭaśreṇi and was a member of the Paraññoṭṭu family<sup>3</sup> of the Ālattūr village in South Malabar.<sup>4</sup> Nilakaṇṭha Somayāji, whose *Tantrasaṅgraha* he mentions towards the beginning of his work, was his respected elder. He himself was the teacher of Acyuta Piṣāraṭi who mentions him in reverential terms at the close of his *Uparāgakriyākrama* (A.D. 1592). M. Whish records a tradition that the author of the *Yuktibhāṣā* was the author also of a *Dṛkkaraṇa*.<sup>5</sup> The *Dṛkkaraṇa* in question, which is now available in a single manuscript, is a comprehensive metrical treatise in Malayalam on astronomy. It does not give anywhere the name of its author, but gives in its last verse, its date of composition in the words *kolambe barhisūnau* (M.E. 783=A.D. 1603). In view of this date and the mention of the tradition recorded by Whish, it is quite possible that this is a work of Jyeṣṭhadeva.<sup>6</sup>

### 33. Jyeṣṭhadeva-Śiṣya (c. 1550-1625)

A disciple of Jyeṣṭhadeva, who studied *Tantrasaṅgraha* under him, has composed a metrical commentary on that work ; this

---

1. Pt. I. ed with elaborate notes by Ramavarma Maru Thampuran and A. R. Akhilesvara Aiyar, (Mangalodayam, Trichur, 1948). See also, A. Venkataraman, 'Some interesting proofs from Yukti-bhāṣā,' *Mathematics Student*, 16 (1968) 1-7.

2. An extremely unreliable edition of the whole work has been issued under this title by the Govt. Or. Mss. Library, Madras, 1954.

3. An old Malayalam Ms. No. 9386, preserved in the Or. Inst., Baroda, reproduced by K.V. Sarma, in his paper 'Direct lines of astronomical tradition in Kerala', Pt; Charudeva Shastri Felicitation Volume, Delhi, 1972.

4. See Paṛayil Rāman Nampūtiri, (ed.) *Nampūtirimār*, Trichur, M.E. 1093, (A.D. 1918), p. 65.

5. M whish, 'On the Hindu quadrature of the circle' etc., *Trans. Royal As. Soc.*, 3 (1835) 523.

6. On Jyeṣṭhadeva, see K.V. Sarma, 'Jyeṣṭhadeva and his identification as the author of *Yuktibhāṣā*', *Adyar Lib. Bul.*, 22 (1958) 35-40. On *Yuktibhāṣā*, see Raja, 156-58 ; Ul. III. 439-40 ; Ul. Sup. I. 612-16.

commentary extends, unfortunately, only to the first four of the eight chapters of that work.<sup>1</sup>

34. Māttūr Nampūtiri-s : Puruṣottama I and Subrahmaṇya I (c.1475-1550)

Two *Muhūrtapadavī*-s, out of the seven texts that go under that name, have been widely known as the works of two brothers belonging to the Māttūr (Skt. Mahāvastu) family in the village of Pāññāḷ (Skt. Pāñcālagrāma), near Chelakkara in Cochin. These two works, comprising, respectively, of 36 and 43 verses, condense in themselves, independently, the prescription of auspicious times for all the major social and religious functions and indication of the baneful times which are to be avoided. Their popularity, as attested by their numerous manuscripts as available and the several commentaries on them is matched only by the obscurity that surrounded the names of their authors. It has now been possible to identify both these writers. A unique manuscript of the first of these two works, preserved in the India Office, London, (Catal. No. 8070), carries a colophon giving the name of its author as Puruṣottama :

*V(B)ṛhadāvṛtigehasambhavenḥ dvijarājñā Puruṣottamena |  
gurunāthakṛpābalāt kṛtam yat tad idam sadviduṣām mude 'stu nityam ||*

With regard to the second of the two works, a hitherto unnoticed commentary thereon available in the Āzhvāñceri Mana (List No. 81) etc., mentions in its introductory verse the name of the author of the text as Subrahmaṇya. Cf. :

*'vṛddhimdheyad hitāyā'sau savitā vas trayīmayah  
yadras̄misambhramād bhānti jyotīṃsy etāni santatam |  
śrisvarṇabhūmir vidvadbhir sevyā, padyair iyam kṛtā  
Muhūrtapadavī yena Subrahmaṇyam praṇaumi tam ||*

It is also of interest to note that the first words of the said verse, viz., *Vṛddhimdheyaddhitāya* (16,91,994), gives the date of composition

1. Cf. the concluding verse :

*ity eṣa Parakroḍavasadvijavara-samīrito yo 'rthah |  
sa tu Tantrasaṅgrahasya prokto 'dhyāye caturthe 'bhūt ||*

The view expressed by some scholars (cf. Ul. II. 120, Va. II. 498 and Intro., to the edn. of *Tantrasaṅgraha*, TSS 188) that the author of the commentary was a 'Brāhman of the Parakroḍa village' is not warranted by this verse.

of the work as A D. 1531, enabling the date of the author to be fixed correctly.<sup>1</sup>

35. Nārāyaṇa of Kāṇvavastu (c. 15th cent.) : Nārāyaṇa II

Nārāyaṇan Nampūtiri hailing from the village of Kāṇvavastu, which is differently identified with Trīkkaṇṇapuram and Kaṇṇanparampu in Malabar, was the son of Keśava.<sup>2</sup> Nārāyaṇa's *Muhūrtadīpaka* is a comprehensive treatise in about 400 verses on the selection of auspicious times for social and religious functions and has been cited as an authority by Śāṅkara of Maḥiṣamaṅgalam (see below).<sup>3</sup>

36. Rudra Vāriyar (c. 1475-1550) : Rudra II

Rudra (Mal. Uzhattira) Vāriyar belonged to the Deśamaṅgalam Vāriyam, in South Malabar, which, during the middle ages, was a renowned centre of Sanskrit studies and a rich repository of manuscripts.<sup>4</sup> Rudra wrote in A.D. 1527 his elaborate commentary called *Naukā* or *Vivarāṇa* on Varāhamihira's *Horā*.<sup>5</sup> His other known work is the *Aṣṭamaṅgalapraśna* on a type of astrological query which is very popular in Kerala.<sup>6</sup>

37. Śāṅkara of Maḥiṣamaṅgalam (1494-1570) : Śāṅkara III

In the matter of the popularisation of studies on Jyotiṣa among the masses in Kerala, Śāṅkaran Nampūtiri of Mazhamaṅgalam

1. On Māttūr Nampūtiri-s, see K. Sankara Menon, Intro. to his edn. of *Muhūrtapadavī II* with *Bālaśāṅkaram*, *Sri Vanchi Setu Lakshmi Series*, No. 5, (Trivandrum, 1926); Ul. II.110-11; Va. II. 601-12.

2. Ulloor (II. 107) suggests that Nārāyaṇa might have been one of the teachers of Parameśvara of Vaṭaśreṇi. But this is not possible, for the name of the father of the present Nārāyaṇa is Keśava (cf. : *kaścid dvijo guṇakhyāta-Keśavakhyadvij-ātmajaḥ* / *Kāṇvavastu-āhvayagrāmajanmā Nārāyaṇāhvayaḥ* //). while the name of the father of Parameśvara's teacher Nārāyaṇa was Parameśvara (cf. Nilakaṇṭha Somayāji's statement on the subject : *Parameśvaras tu Rudra-Parameśvarātmaja-Nārāyaṇa-Mādhavādibhyo golavidbhyo gaṇitagolayuktīr api bālya eva samyag grhītvā* etc. (*Āryabhaṭīya-bhāṣya*, Gola. 48; edn., Pt. III, p. 154).

3. On Nārāyaṇa, see Ul. II. 107; Va. II. 612-13.

4. For an account of this repository of Mss., see K.V. Sarma, 'Deśamaṅgalam Mss. collection' (in Mal.), *Mathrubhumi Weekly*, (Kozhikode), 8.2.1957.

5. Ed. TSS, No 91, Trivandrum, 1926; 2nd edn., Trivandrum, 1958.

6. On Rudra, see Ul. II. 114-17; Ul. Sup. I. 531-34.

(Skt. Mahiṣamaṅgalam) family had an important part to play. Śaṅkara hailed from the Perumanam village near Trichur but spent most of his active life at Chengannoor with his teacher Parameśvaran Potti of Vāzha-māveli house. In his work, *Rūpānayanapaddhati*, on grammar, Śaṅkara gives the date of his birth in the chronogram *jātoyam haṁsatulye('hani)* (Kali day 16,78,168), which falls in A.D. 1494.

Śaṅkara wrote a large number of works both on astronomy and on astrology, mostly in simple Malayalam poetry and easy prose. These works include *Gaṇitasāra*, *Candragāṇitakrama* and *Ayanacalanādi-gāṇita* in astronomy, *Jātakakrama* in horoscopy and *Praśnamālā* with *Bhāṣā* in astrological query. A work which he composed in two versions is the *Kāladīpaka*, called in general parlance *Cerīya Kāladīpakam* (Short *Kāladīpaka*) and *Valīya Kāladīpakam* ('Long *Kāladīpaka*'). He has a *Jātakasāra* in Sanskrit and another with the same title in Malayalam. He has commented on *Pañcabodha* (II) and *Pañcabodha* (IV).<sup>1</sup> His commentaries on *Laghubhāskariya*, *Muhūrtapadavī*, *Pañcabodha* IV and his own *Kāladīpaka* II, all called *Bālaśaṅkaram*, have greatly helped the popularisation of these works among the people. On *Pañcabodha* IV, besides the *Bālaśaṅkaram*, he wrote another shorter (?metrical) elucidation entitled *Pañcabo-*

---

1. A good amount of confusion has occurred in earlier writings in the identification of Śaṅkara's works. Thus, the *Jātakasāra*, noticed by Ulloor (II. 474) is, really, by a namesake of our author. Our Śaṅkara has actually composed two works under the title *Jātakasāra*, one in Sanskrit and the other in Malayalam; Ulloor does not mention the former and describes the latter as an anonymous work (Ul. III. 241-42), failing to take note of the apparent Mahiṣamaṅgalm characteristics in it. Similarly, Ulloor does not take note of Śaṅkara's *Praśnamālā* and describes Śaṅkara's own *Bhāṣā* on it as an anonymous work (Ul. III. 242). Again, Ulloor describes Śaṅkara's *Bālaśaṅkaram*, called also *Pañcabodhakriyākrama* on *Pañcabodha* IV as the *Pañcabodha* of Śaṅkara, while Śaṅkara's commentary on *Pañcabodha* (II) is not noticed. Certain other works, viz., *Bhāṣāsaṅgraha*, *Praśnasāra* and *Karaṇasāra* have also been ascribed to our author but they do not appear to be his works. Of these, *Bhāṣāsaṅgraha* is a commentary by Vāsudeva on *Muhūrtapadavī* V and the *Praśnasāra* and *Karaṇasāra* are the works of different authors named Śaṅkara. A detailed study on the identification of Śaṅkara's works is being presented by the present writer elsewhere.

*dhārthadarpaṇa*. Śaṅkara is also reputed to have composed a 'Register of muhūrtas' for a 1000 years.<sup>1</sup>

### 38. Mādhava of Īñcakkāzhvā (c. 1500-75) : Mādhava II

Mādhava was a member of the Nampūtriri family of Īñcakkāzhvā in Rāmamaṅgalam in the Mūvāttupuzha Taluk (Dt. Kottayam). He composed his *Prāśnasāra* in A.D. 1543, in 16 chapters, based on earlier works like the *Horā*, but incorporating in it numerous local practices. The work is historically significant for it provides the names of several contemporary astronomical and astrological authorities like Nilakaṅṭha Somayāji of Keḷallūr, Parameśvaran Potti of Vāzha-māveli, Attimattam, Vākkaṭ, Paḷḷimattam, Mecceri, Koyikkara and Araṇappuram.<sup>2</sup>

### 39. Acyuta Piṣāraṭi (c. 1550-1621) : Acyuta II

Acyuta Piṣāraṭi of Tṛkkaṅṭiyūr (Skt. Kuṇḍapura) in South Malabar, was a versatile scholar and original thinker on astronomy. It was he who enunciated, for the first time, in Indian astronomy, the correction called 'Reduction to the the ecliptic', in his work *Sputanirṇaya* (before A.D. 1593) and set out its rationale, elaborately, in his work *Rāśigolasphuṭānīti*.<sup>3</sup> As pointed out earlier, (see above pp. 12-14), this correction was first introduced in Western astronomy by Tycho Brahe, at about the same time. Acyuta was a protege of King Ravi Varma of Veṭṭattunāḍ (Skt. Prakāśaviṣaya) and was the teacher of the renowned poet and grammarian Melputtūr Nārāyaṇa Bhaṭṭa, who, in the *carama-śloka* which he composed at the death of Acyuta, expressed the date of the latter's demise in the chronogram, *vidyātama svar asarpāt* (17,24,514), which falls in A.D.1621. Acyuta has composed about a dozen works on Jyotiṣa, including *Karaṇottama*,<sup>4</sup>

1. On Śaṅkara, see Koṭṭārattil Śaṅkunṇi, 'Muzhamaṅgalattu Nampūri', *Aitihiyamala* IV, (4th edn., Trichur, 1958), pp. 89-93; Raja, 155-56; Ul. II. 269-72, 469-75; Va. II, 613-22; Ulloor, *Vijñānadīpikā*, (Trivandrum), IV, pp. 187-95.

2. On Mādhava see Ul. II. 475-77. R. Narayana Panikkar (II. 234-35) wrongly describes Mādhava's *Prāśnasāra* as a commentary on the well-known *Prāśnamārga*. It may be noted that the *Prāśnamārga* was composed in 1650, more than hundred years after the composition of *Prāśnasāra* (1543).

3. Ed. by K.V. Sarma, Adyar Library, Madras, 1955.

4. Ed. by K. Ragahvan Pillai, *TSS*, No. 213, Trivandrum, 1964.

on astronomical computation, in five chapters, *Uparāgakriyākrama*,<sup>1</sup> and *Uparāgaviṃśati*<sup>2</sup> on eclipse computation, *Chāyāṣṭaka* on shadow computation and *Jātakābharāṇa* (?) and *Horāsāroccaya* on horoscopy. He has commented on the *Veṅvāroha* of Saṅgamagrāma Mādhava,<sup>3</sup> *Suryasiddhānta* and on his own *Sphuṭanirṇaya* and *Karaṇottama*.<sup>4</sup>

#### 40. Nilakanṭha (16th-17th cent.) : Nilakanṭha II

Nilakanṭha II, about whom nothing more is known, is the author of a comprehensive treatise on arithmetic, entitled *Kaṇakku-sāram*, couched in *maṇipravālam* verses in Malayalam and a commentary thereon. The author claims to have based his work on Sanskrit texts like the *Līlāvāṇī* and old Malayalam texts like *Kaṇakkatikāram*. It is noteworthy that, besides the general mathematical procedures, this work deals also with practices relating to local grain transactions, housebuilding, weighing of gold and silver, land tenure, masonry, ground measurement etc.<sup>5</sup>

#### 41. Nārāyaṇa III

*Laghudarśinī*, a short work on astrology, is the work of a Nārāyaṇa, about whom nothing more than his name is known at present.

#### 42. Dāmodara II of Maṅgalaśreṇi (c. 1575-1675)

In Dāmodaran Nampūtiri of the Maṅgalaśreṇi house in Kaṇṇātipparampu in the Chirakkal taluk in N. Malabar, we have a reputed authority in astrology, of the times. His disciples included Itākramaṅceri Nampūtiri, author of *Bhadradīpa* and the anonymous author of *Jyotiṣasaṅgraha* (II), noticed below. Vaṭakkumkūr mentions

1. This work, in four chapters, contains 130 verses, and not 20 as stated by Raja, 161.

2. Ed. by Rama Varma Maru Thampuram, *Ravivarma Granthāvali*, (Quarterly of the Skt. College, Trippunithura), 2 (1954) i-iii, 16 pp.

3. Ed. by K.V. Sarma, with text, Skt. College, Trippunithura, 1956.

4. On Acyuta, see, S. Venkitasubramonia Iyer, 'Acyuta Piṣṭraṭi and his works', *Jl. Or. Res.* 22 (1952-53) 40-46; K.V. Sarma, Intro. to his edns. of *Rāṣigolāspṭhānānti* and *Veṅvāroha*, *op. cit.*; Raja, 158-62; Ul. II. 319-26; Ul. Sup. I. 315; Va. II. 748-57.

5. On Nilakanṭha, see Ul. II. 478-79; Ul. Sup. I. 226-27; Va. IV. 276.



two of his works, viz., *Praśnarīti* (1) and *Lilāvati-vyākyaṇa*, which, he adds, have been popular. Manuscripts of these works have, however, yet to be identified.<sup>1</sup>

#### 43. Itākramañceri Nampūtiri (c. 1625-1700)

He is author of *Bhadrādīpa-gaṇita* (A.D. 1665) but prefers to remain anonymous and refers to himself only by the name of his family, viz., Itākramañceri (or Eṭākramañceri). He mentions his native place as Perumānūr in Malabar and his teacher as Dāmodaran Nampūtiri<sup>2</sup> of the Maṅgalaśseri family. In eleven chapters, couched in easy Sanskrit-Malayalam verses, he provides the layman with the elements of astronomical computation. A shorter work entitled *Bhūgolañāyam*, composed in the same style and devoted to a description of the earth as suspended in the atmosphere, its main landmarks, the construction of the armillary sphere etc., has much in common with Ch. V of the *Bhadrādīpa* and is likely to be another composition of our author.<sup>3</sup>

#### 44. Maṅgalaśreṇivipra-Śiṣya (17th cent.)

An author, who does not give out his name and describes himself as a pupil of a Nampūtiri of the Maṅgalaśseri family, has composed, in Malayalam, a *Jyotiṣasaṅgraha* (II). The Maṅgalaśseri Nampūtiri in question is very likely to be the same as the Dāmodaran Nampūtiri, author of *Praśnarīti* I and teacher of Itākramañceri Nampūtiri, noticed above.

#### 45. Panakkāṭṭu or Itakkāṭṭu Nampūtiri (c. 1625-1725)

The *Praśnamārga*, the most popular and authoritative work on *praśna* in Kerala, was composed in about A.D. 1650 (cf. *kolambe 'muraha'-saṅkhye*, M.E. 825) by a Nampūtiri of the Panakkāṭṭu family. Since his family was situated in a place called Itakkāṭṭ (or Eṭakkāṭṭ) (Skt. Madhyāṭavi or Madhyāraṇya), in North Malabar, he was known by that name as well. K. Mahadeva Sastri gives the name of the

1. On Dāmodara, see Va. III. 373-79.

2. Va. III. 379 takes the word 'Dāmodara' occurring in the Intro., verse 2 of the *Bhadrādīpagaṇita* as the author's name on the basis of the wrong reading 'Dāmodaro', instead of that of his teacher, as per the correct reading 'Dāmodaram'.

3. On this author, see Ul. III. 232-34.

author as Paramesvara, on what grounds it is not known.<sup>1</sup> The author gives the name of his parents as Mahādeva and Śri. In 32 chapters, the work presents a detailed exposition of the different topics and types of *praśna*. The author has also supplied a lucid exposition called *Durgamārthapradarsinī* on the work. It has several commentaries in Malayalam also, including some produced during modern times. Panakkāṭṭu Nampūtiri is said to have composed in 1676 a work on astronomy, which is not available now.<sup>2</sup>

46. Itakkāṭṭu (or Eṭakkāṭṭu) Kukkaṇiyāḷ (c. 1675-1750)

The personal name of this author seems to be Śāṅkaran Kaṇiyār. He belonged to the house of Kaṇiyāṅkaṇṭi in Eṭakkāṭ in North Malabar and studied astrology under Panakkāṭṭu Nampūtiri. In later life, he came under the influence of a Yogi and spent his life in meditation. His *Praśnarīti*<sup>3</sup> in 20 chapters is very popular among astrologers of the Kaṇiyār caste. In its first twelve chapters, it is a free metrical rendering in Malayalam of his teacher's *Praśnamārga* and deals, in the remaining eight chapters, with other allied and miscellaneous matters.<sup>4</sup>

47. Rāma-śiṣya (17th cent.)

Manuscripts of a free explanatory rendering, in Malayalam verses, of the *Laghujātaka* or *Laghuhorā* of Varāhamihira, called *Laghuhorāvivarāṇam* have been identified. The author does not reveal his name but mentions his teacher Rāma and the date of composition of the work, viz., A.D. 1640. The author says in the beginning of the work that he had already composed a *Horāsāra* in Malayalam, possibly a free explanatory rendering, like the present work, of the *Horā*.

48. Puruṣottama II (c. 1650-1725)

A unique manuscript of the *Uparāgapariccheda* of a *Pañcabodhaśataka* (*Pañcabodha* V) is known. In 47 verses, this section of the work sets out the computation of solar and lunar eclipses, using its own

1. See his *Des. Cata. of Skt. Mss. in the Curator's Office Library, Trivandrum*, vol. IV, (Trivandrum, 1939), p. 1539.

2. On Panakkāṭṭu Nampūtiri, see Ul. III, 87-89; Va. III, 400-5.

3. Ed. serially in the *Kavanodayam* (Mal. monthly, Kozhikode).

4. On this author see Ul. III, 236-37; Ul. Sup. I, 536; Va. III, 405-6.

revised multipliers, divisors and other constants. For the calculation of the precession of the equinox, it mentions the epoch *prauḍhaśrī-guṇasevya* (17,53,242). This date works out to A.D. 1699 and gives a clue to the date of the author.<sup>1</sup>

#### 49. Putumana Somayāji (c. 1660-1740)

The *Karaṇapaddhati*,<sup>2</sup> in ten chapters, is a comprehensive treatise on astronomy by an anonymous Somayāji of the Putumana or Putuvana (Skt. Nūtanagrha or Nūtanavipina) family of Śivapuram (Trichur). The availability of manuscripts of the work in Tamil and Telugu scripts indicate its popularity in those regions as well. The work has been commented in Malayalam,<sup>3</sup> Sanskrit and Tamil. Its date of composition is said to be given in the concluding verse of the work by the chronogram *gaṇitam etad samyak* (17,65,653) which falls in A.D. 1732.<sup>4</sup> While *Karaṇapaddhati* is the best known work of the author in Jyotiṣa, it has been shown that he has written certain other works also in that discipline.<sup>5</sup> In *Nyāyaratna*, he deals, in eight chapters, with certain aspects of *Sphuṭa*, *Vikṣepa*, *Chāyā*, *Viparītacchāyā*, *Grahaṇa*, *Śrngonnati*, *Mauḍhya* and *Vyatīpāta*. The object of writing the work is expressed in its concluding verse thus :

*nyāyapradarśanāyaivam gaṇiteṣvalpacetasām |*  
*gaṇitābdhau nimajjyaitat Nyāyaratnam mayoditam || ...*

‘This *Nyāyaratna* has been composed by me by delving into the depths of astronomy for demonstrating astronomical rationale to the dullwitted.’

1. On Puruṣottama, see Ul. Sup. I. 224-25.

2. Ed. TSS, No. 126, (Trivandrum, 1937); with two old Malayalam commentaries, *Madras Govt. Or. Ser.*, No 98, (Madras, 1956); with a modern commentary by P.K. Koru, (Astro Press, Cherp, Kerala, 1953).

3. See fn. above.

4. Some scholars like Ulloor (II. 107-8) and Vaṭakkumkūr (I. 529-30) have held that this work was written in A.D. 1430. For a refutation of this view and for conclusive evidences for a much later date, see K. V. Sarma, ‘The date of Putumana Somayāji’, (Mal.), *Mathrubhūmi W.*, (Kozhikode), 5. 2. 1956. It has also been argued that the said chronogram, which according to the tradition recorded by Whish is the date of composition of the work, may not be so. However, in view of date indicated by the evidences set out in the said paper, there is no incongruity in believing the tradition.

5. On these, see K. V. Sarma, ‘The hitherto unknown works of Putumana Somayāji’ (Mal.), *Mathrubhūmi W.*, ib. 29.1.1956.

The *Nyāyaratna* occurs in two versions, which differ slightly by the presence or absence of certain verses and in the arrangement thereof. The *Veṅvārohāṣṭaka* of Putumana Somayāji is a manual for the accurate determination of the moon at short intervals. His *Pañcabodha* III<sup>1</sup> is a practical manual for the computation of *Vyatīpāta*, *Grahaṇa*, *Chāya*, *Śṛṅgonnati* and *Maudhya*. *Grahaṇagaṇita* IV commences with the characteristic introductory verse of Putumana Somayāji, viz., *mādiya-hṛdayākāse* etc. and so is likely to be his work. So also *Grahaṇāṣṭaka* II, which, though a self-contained work, forms a part of the said *Grahaṇagaṇita*. K. Rama Varma Raja makes mention of a tradition which attributes to our author a work called *Mānasagaṇitam*.<sup>2</sup> This is likely to be the Malayalam commentary on (*Laghu*)*mānasa* which has now been identified and whose introductory verse contains words reminiscent of Putumana Somayāji's expressions. In horoscopy, he wrote the highly popular *Jātakādeśa(marga)*<sup>3</sup> which is known in two recensions, both of which might have been written by him.<sup>4</sup>

#### 50. Vāsudevasvāmi : Vāsudeva I

Vāsudevasvāmi, who describes himself as a devotee of Viṣṇu, is the author of a treatise entitled *Kāladīpa*, dealing, mainly, with natural astrology. It is preserved in a unique manuscript procured from the Punnattūrkoṭṭa Mana, Koṭṭappaṭi, in Malabar. It is a comprehensive treatise dealing with a wide range of topics, which the author enumerates towards the beginning of his work.<sup>5</sup>

#### 51. Śyāmalavāraṇarāja

The *Kāladīpa* of Vāsudevasvāmi has an elaborate commentary which gives the name of its author as Śyāmalavāraṇarāja. The

1. Included in the *Jyotiśśāstrasubodhinī*. Pt. II, by Punnaśśeri Nilakaṇṭha Śarmā, (Triśśivaperur, M. E. 1104) and in *Pañcabodham Bhāṣā*, ed. by Kanippayoor Sankaran Namputirippad, Kunnamkulam, M.E. 1107.

2. 'The brahmins of Kerala', *Jl. of the Royal As. Soc.*, 1910, p. 635.

3. Pub., Panchangam Press, Kunnamkulam, 5th edn., M. E. 1125; A.R.P. Press, Kunnamkulam, M.E. 1105.

4. On Putumana Somayāji. see K. V. Sarma, 'Putumana Somayāji', Proc. All-India Or. Conf., 18th Session, Annamalainagar, 1956, pp. 562-64; Intro. to *Karaṇapaddhati*, op. cit., (Madras). pp. xxi-xxxi; Raja, 162-65; Ul. II. 107-9; Ul. Sup. I. 212-15; Va. I. 529-31; A. K. Bag; 'Trigonometrical series in the *Karaṇapaddhati*, etc.', *Indian Jl. of Hist. of Sc.*, 1 (1966) 98-106.

5. On *Kāladīpa*, see Va. III. 392-94.

name is obviously the Sanskritisation of the author's Malayalam name. Since he describes himself as a 'rājā' and a manuscript of the work has been found only in the palace of Punattūrkoṭṭa, it is likely that the author is a member of that household.<sup>1</sup>

#### 52. Dāmodara of Bhāradvāja-gotra : Dāmodara III

He was a Nampūtiri who hailed from a village east of Trpparañnoṭ in Malabar and was the brother of Keśava, who was also his teacher. Two earlier scholars of his family were Yajña and Yajña's son Dāmodara. The *Muhūrtābharāṇa* of our author is an exhaustive text in nine chapters, devoted, respectively to : definitions, merits of neutral times, demerits of baneful times, merits of auspicious occasions, comparative potencies, auspicious times for : (a) religious functions beginning with *niṣeka* to marriage, (b) agriculture, consecration etc., (c) royal installations and (d) miscellaneous functions. A special distinction of the *Muhūrtābharāṇa* is that it provides very readable poetry from a deft-handed poet.<sup>2</sup>

#### 53. Kṛṣṇa II

The *Āryabhaṭīya* has a commentary in Malayalam by an author whom its only known manuscript (India Office 6273) labels as Kṛṣṇa. He is different from Kṛṣṇadāsa, another commentator (see below), as shown by the difference in the beginning of the two commentaries.

#### 54. Keraliya-dvija

An author who calls himself merely as Keraliya-dvija and does not give out his real name has written a good Malayalam commentary on the *Karaṇottama* of Acyuta Piṣaraṭi. No personal detail is known about this author.

#### 55. Govinda-śiṣya

There is an anonymous author who describes himself as a devotee of Lord Śiva at Vaikkam (Skt. Vyāghra-grāma) in Central Kerala and as a pupil of Govinda. He has composed an elucidatory and highly popular commentary called *Balabodhinī* or *Balaprabodhinī* on the

1. On *Kāladīpavyākhyā*, see Va. III 393.

2. On Dāmodara, see Ul. II. 105-6 ; Ul. Sup. I. 210-11 ; Va. I. 383. Va's equating our Dāmodara of the 'Bhāradvāja gotra' with Dāmodara of Vaṭasāreni, who belongs to the 'Bhārgava gotra' is, obviously, not correct. So also his suggestion that Keśava was the father and not the brother of Dāmodara as found in the original manuscript of the work,

*Jatakapaddhati* of Parameśvara of Vataśreṇi. His teacher Govinda is identified, generally, as Govinda Piśāraṭi of the Kailāsapuram house near Vaikkom.<sup>1</sup>

#### 56. Veṇād-brāhmaṇa

The *Jātakodaya* is a succinct work on astrology in 103 verses, whose author does not give out his name, but styles himself as a brāhmaṇ of Veṇād.<sup>2</sup> Veṇād, as is well known, is the name of the southern part of the erstwhile State of Travancore in Kerala.

#### 57. Azhvāñceri Tamprākkaḷ (c. 1725-1800)

The painstaking enterprise and zeal for propagating, among the Nampūtiris, studies on Jyotiṣa, evinced by a member of the Āzhvāñceri Tamprākkaḷ's family is apparent from his series of adapted texts and extensive commentaries thereon, covering the entire field of astronomy and astrology in eleven books. In the penultimate volume of the said works, viz., *Phalasārasamuccaya-Bhāṣā*, while setting out his objectives, he makes a mention of his earlier works : "In the Malayalam area, those who are not eligible to learn Jyotiṣa study it. And, brāhmaṇas ask them about *muhūrta*, *praśna* etc. Since neither of these is proper, I, with a view to change this state of affairs through making the brāhmaṇas learn Jyotiṣśāstra, summarised the most essential matters thereof in the *Jyotiṣśāstrasāṅgraha* and, also prepared a commentary in Sanskrit-Malayalam on this *Sāṅgraha*. Later, in order to enable the understanding of the working of the matters set out in the *Sāṅgraha*, a *Sāṅgrahasādhanakriyā* was written and also a Malayalam commentary thereon. Then I compiled the *Jātakasārasāṅgraha* and its Malayalam commentary. Then, in order to be of help in the drawing of horoscopes, I wrote the *Jātakāṇitimārga* and a Malayalam commentary on it. Later, with a view to enable an understanding of the results of astrological aspects, I compiled the work entitled *Phalasārasamuccaya*. Now, I am writing the present work, being its Malayalam commentary." The *Jyotiṣśāstrasāṅgraha* is a résumé on the essentials of practical astronomy and astrology (text, 650 granthas ; *Bhāṣā* 1700 gr.) is in two parts : I. *Siddhāntaskandha* or *Gaṇitaskandha*, on astronomy and II. *Horāskandha*, comprising of Muhūrta, Jātaka and Praśna. The *Sāṅgrahasādhanakriyā* (text, 150 gr. ; *Bhāṣā*, 600 gr.) is intended to indicate the working of the matters set out in the *Jyotiṣśāstrasāṅgraha*.

1. On this work see, Ul.III. 89-90 ; Ul. Sup. I. 464 ; Va. III. 382-83.

2. The actual expression is : *dvijena...dvi (?) Veṇāṭikadeśajanmanā*.

The *Jātakasārasaṅgraha* (text, 230 gr.) in six sections and the *Jatakānītimārga* (text, 200 gr. ; *Bhāṣā*, 1300 gr.) in fourteen sections are complementary texts on horoscopy. The *Phalasārasamuccaya*, the author's *magnum opus*, (text, 1300 gr.; *Bhāṣā*, 21,000 gr.), is an extensive work in three sections, devoted, respectively, to Jātaka, Praśna and Muhūrta. The Tamprākkaḷ wrote also a detailed commentary called *Tamprākkaḷ Bhāṣā* in Malayalam on *Muhūrtapadavī* II.<sup>1</sup>

The author does not give out his personal name anywhere in his works, but gives his family name, viz., Āzhvāñceri Tamprākkaḷ.<sup>2</sup> Some of the manuscripts of his works are dated. The earliest of these dates, viz., A.D. 1756, which is possibly, the date of composition of the work, occurs in a manuscript of *Gaṇitasārasaṅgraha* Section of *Jyotiśśāstra-saṅgraha*, Kerala C. 2183-I. This provides a clue to the author's date, which might be put as c. 1725-1800.

#### 58. Vāsudeva of Vaḷḷimāna : Vāsudeva II

Vāsudeva hailed from Kaṅṅamaṅgalam and wrote a metrical commentary on a hitherto unrecognised *Muhūrtapadavī* (V) beginning with the words *cakrārḍham mṛtivaidhṛtam ca gulikaḥ*. Two versions of this commentary, which is called *Bhāṣāsaṅgraha*, are known, one in 178 verses and the other in 185 verses ;<sup>3</sup> to all appearances, Vāsudeva himself has effected this revision.<sup>4</sup>

#### 59. Tuppan Nampūtiri of Iṭavaṭṭikkāṭ (c. 1725-1800)

Tuppan Nampūtiri was a member of the Iṭavaṭṭikkāṭ family of

1. Pub. Keralakalpadruman Press, Trichur.

2. One of the ms. *Jyotiśśāstrasaṅgraha-Bhāṣā* (Kerala C. 2197-A) has the name of Kaypañceri Tamprākkaḷ mentioned in the post-colophonic statement, though, without being 'specifically' stated as the author.

3. Cf. the concluding verses of the two versions :

i. 'dāsakṛt' (178) *ślokasaṅkhyā ca Vāsudevena nirmitā* /  
*Vaḷḷimanṛu gṛham, deśam collinṛu Kaṅṅamaṅgalam* // and

ii. 'mandāyuh' (185) *ślokasaṅkhyā ca Vāsudevena nirmitā* /  
*Vaḷḷimanṛu gṛham, deśam collinṛu Kaṅṅamaṅgalam* //

4. Ulloor, inconsiderate of the content of this work and the colophon (as above) at the end, wrongly takes (Ul. II. 272, 473) this work as an independent treatise and ascribes it to Śaṅkara of Mahiṣamangalam on the basis of a superficial similarity of its introductory verses with those in the works of Śaṅkara.

Pāṅkode in Kunnathunad taluk, Dt. Kottayam, and was patronised by Maharaja Rāma Varmā, surnamed *Dharmarājā*, of Travancore. He was also a poet of some merit. His work on Jyotiṣa is *Muhūrtapadavī* VI, in 40½ verses.<sup>1</sup>

60. Nārāyaṇa of Itavattikkāṭ (c. 1728-1800) : Nārāyaṇa IV

Nārāyaṇan Nampūtiri of Itavattikkāṭ family was the younger brother of Tuppan Nampūtiri and was, like his brother, patronised by *Dharmarājā* of Travancore. He too was a poet of merit, both in Sanskrit and Malayalam and has left some exquisite writings. He wrote in Jyotiṣa *Muhūrtapadavī* VII, in 36 verses.<sup>2</sup>

61. Parameśvara II

The *Prasnaṣatpañcāsikā* of Pṛthuyāśas and the *Horā* of Varāhamihira have concise commentaries called *Pārameśvarī* by a Parameśvara who has to be distinguished from his namesakes. In the commentary on the *Horā*, which is also called *Horābhiprāyanirṇaya*,<sup>3</sup> Parameśvara often adds his own explanatory verses in elucidation of the text.

62. Parameśvara, pupil of Śaṅkara : Parameśvara III

The *Horā* of Varāhamihira has a commentary called *Jātakacandrikā* or *Vīśvārīhadīpinī* by a Parameśvara who describes himself as a disciple of a Śaṅkara, but about whom nothing more is known.<sup>4</sup>

63. Bhāradvāja-dvija (c. 1750-1800)

An astronomer who calls himself merely as *Bhāradvāja* has composed two important works, viz., (1) *Gaṇitayuktayah* which sets out the rationale of several mathematical and astronomical procedures and (2) *Karaṇadarpaṇa*, an advanced manual for astronomical computation. The former work cites frequently a 'Bhāṣyakāra' who is, obviously, Nilakaṇṭha Somayāji, Jyeṣṭhadeva, the author of *Yuktibhāṣā*,

1. On Tuppan Nampūtiri, see Ul. III. 470-76.

2. On Nārāyaṇa, see Ul. III. 470-76.

3. Ed. by K. Raghavan Pillai, TSS, Trivandrum, 1963.

4. On this author, see Va. III. 394.



and *Nyāyaratna*, most probably, the work of that name by Putumana Somayāji. The *Karaṇadarpaṇa* has been commented in Malayalam.

#### 64. Nārāyaṇa of Perumanam: Nārāyaṇa V

Nārāyaṇan Nampūtiri of Perumanam village, near Trichur, is the author of an astronomical treatise entitled *Tantrasāra*. There is also a Malayalam commentary available on the work.<sup>1</sup>

#### 65. Kṛṣṇadāsa (Koccukṛṣṇan Āśān) (1756-1812)

Koccu-kṛṣṇan Āśān was born in the family of Neṭumpayil in the Tiruvalla taluk of Kerala, as the son of an erudite astrologer named Rāman Āśān. He studied Jyotiṣa under his father as also under Śūlapāṇi Vāriyar of Kozhikode. He came of a long line of astronomers and astrologers and had several disciples who continued that tradition.<sup>2</sup> He was a great devotee of God Kṛṣṇa and was a poet with several works to his credit. His works on Jyotiṣa, all intended for the novice, include *Pañcabodha VIII*, in Malayalam verse, *Bhāṣājātakapaddhati*, being a free rendering-cum-commentary of the popular *Jātakapaddhati* of Parameśvara of Vaṭaśreṇi, incorporating several matters not dealt with in the original.<sup>3</sup> *Kaṇakkusūstram* presenting mathematical procedures in Malayalam verse and a *Bhāṣā-Golayukti* which he mentions in his *Bhāṣājātakapaddhati* as a work which he intended to write but which yet remains to be traced.

A hitherto unknown work of Kṛṣṇadāsa is a commentary in Malayalam prose on the *Āryabhaṭīya*. The commentary is elucidative and quotes several authorities including Bhāskara I, *Laghubhāskarīya*, Saṅgamagrāma Mādhava, Parameśvara of Vaṭaśreṇi, *Karaṇapaddhati* and a *Prakāśika* which remains to be identified.<sup>4</sup> A Malayalam

1. On this, see Raja, 153.

2. *Vide* above, pp. 5-6.

3. Ed. by K. Sankara Menon. *Bhāṣājātakapaddhati*, Sri Vanchi Setu Lakshmi Series, No. 3, Trivandrum, 1926.

4. The relevant quotation occurs in the com. on *Gītikā* 5 and gives the number of Kalpa days up to the beginning of Kali: *Prakāśika enna granhattil varttamānakaliyugattil ninnu munpu atītanāla'āya kalpadivasaññal 'śarāśviṣaṭkhā-driśārādrivedakṛteṣuyugmasvara-sammitāḥ syat' (7,25,44,75,70,625) ennu paṭhikkappettīṭṭumunṭu.*

quotation from Parameśvara<sup>1</sup> poses a problem, for all known works of Parameśvara are in Sanskrit. Possibly, Parameśvara has written also in Malayalam or the passage in question is only a view of Parameśvara expressed in Malayalam.<sup>2</sup>

#### 66. Śaṅkara of Muktisthala (17th cent.) : Śaṅkara IV

This author was a Nampūtiri who hailed from Mūkkola (Skt. Muktisthala) in North Malabar. He refers, in his works, to Nārāyaṇa, his teacher on Jyotiṣa, and to his patron, the Zamorin of Kozhikode. In his *Mantrasāra*, he says that the name of his house was 'Rājakula' (Mal. ?) and that he imbibed his knowledge in *mantraśāstra* from Dāmodara, son of Nilakaṅṭha of the Bhāradvāja-gotra, who belonged to Kuṇḍapura (Mal. Tṛkkaṅṭiyūr).<sup>3</sup> He wrote, on natural astrology, the *Sā mudrasāra*, called also *Ārūḍhapraśna* and *Lāñchanaśāstra*, a comprehensive work which dealt with omens, palmistry, astrological query etc. He is the author also of another work, in Malayalam *maṇipravāla* verses, tentatively entitled *Āyuhpraśna*, but dealing, besides *Āyus*, with *Aṣṭamaṅgala*, *trisphuṭa*, *viṣṭi* etc.<sup>4</sup>

#### 67. Śaṅkara V

A Śaṅkara, about whom little personal details are available, is the author of two works, entitled *Jātakasāra* (III) and *Praśnasāra* (I).<sup>5</sup> Both are in Malayalam prose interspersed with Sanskrit verse and have four chapters each. The former deals with the main topics of practical astrology starting from the drawing of a horoscope, and the latter with astrological queries relating to age, marriage, children and profit and loss. He is, probably, the author also of *Praśnanuṣṭhana-paddhati*, which occurs in two versions, I and II.

1. Cf. : 'iviṣṭe yojanakarṇam candrante madhya-yojanakarṇam akunnu' enniññane Parameśvarācāryar paraññiṭṭumunṭu.

2. On Kṛṣṇadāsa, see Ul. III. 519-27 ; Ul. Sup. I. 647-48 ; Va. III. 384-85.

3. For extracts, see Va. II. 719.

4. On Śaṅkara, see Ul. III. 86-87 ; Va. II. 718-23.

5. Ulloor does not notice this *Jātakasāra*, which is different from its namesake by Śaṅkara of 'Mahiṣamaṅgalam'. Of *Praśnasāra* II, Ulloor (II. 473) takes Mahiṣamaṅgalam Śaṅkara as the author. This is unlikely, for this work does not bear any of the characteristic *mudrās* of the Mahiṣamaṅgalam author.

## 68. Bhūtanāthapura-Somayāji

An anonymous Somayāji of Bhūtanāthapura, who was a disciple of Vaidyanātha has composed a comprehensive work on astrological query, entitled *Praśnasāra* (III).

## 69. Śaṅkara VI

Śaṅkara, about whom nothing more is known than his name, has composed a commentary in Malayalam to the *Praśnasāra* III of Bhūtanāthapura-Somayāji.

## 70. Śrikumāra, son of Nilakanṭha

Śrikumāra Nampūtiri, son of Nilakanṭha and pupil of Nārāyaṇa, is the author of *Praśnāmṛta*, a succinct work on astrological query. The author is good at versification and writes in a pleasing language. He mentions his village as 'Dvipakānana' (? Mal. Ānakkāṭ).

## 71. Nārāyaṇan Ilayatu of Maccāṭ (1765-1843) : Nārāyaṇa VI

Nārāyaṇan Ilayatu was a member of the Chāntampiḷli family in Maccāṭ near Cochin. He was a gifted poet, author of several poems in Sanskrit and Malayalam and a resourceful astrologer whose predictions have developed into legends.<sup>1</sup> He was patronised by the royal house of Cochin, especially by Śaktan Thampurāṇ. In Jyotiṣa, he wrote the *Jyotiṣabhāṣavalī*, called also *Maccāṭtu-Bhāṣa*, being an introduction to astrology, and the *Jātakādeśaratna*,<sup>2</sup> based on the *Jātakādeśamārga* of Putumana Somayāji.<sup>3</sup>

## 72. Parameśvara of Puradahanapura (c. 1775-1839) : Parameśvara IV

Parameśvara, disciple of Agnidatta, was a member of the Nampūtiri family of Purayannūr (Skt. Puradahanapura), in the Vaḷḷuvanāṭ taluk of South Malabar. He was a poet of merit and is the author of two long poems in Malayalam. His significant contribution

1. Several of these feats are described by Puthezhathu Rama Menon in his book *Śaktan Thampurāṇ*, (Mangalodayam, Trichur).

2. Manuscripts of this work are yet to be recovered, but the work is referred to by Puruṣottama III, the grandpupil of our author, in his *Praśnāyana*, III.19, VIII 88, XV. 41.

3. On Nārāyaṇa, see Kuṭṭamaśseri Nārāyaṇa Pishāroṭi, 'The works of Maccāṭtu Ilayatu' (Mal.), *Sahitya Parishat Traimāsikam* (Ernakulam) 9 (M.E. 1119) 130-31, Ul. III 527-29; Ul. Sup. I. 648-49; Va. IV. 216-21.

to Jyotiṣa is his commentary *Varadīpikā*, composed, in A.D. 1815 (cf. 'naladhī'-saṅkhyā-kolambe, M.E. 990), on the *Muhūrtapadavī* II of Māttūr Puruṣottaman Nampūtiri. This commentary is highly elucidative, profusely documented and extremely elaborate, in 2000 granthas for a text of 35 verses. One of the important works quoted by Parameśvara is the *Prācīna-Muhūrtapadavī* (*Muhūrtapadavī* I), supposed to have been written by Govinda Bhaṭṭatiri of Talakkuḷam.<sup>1</sup>

### 73. Śrikanṭha Vāriyar of Veḷḷārakkāḍ

The popular *Jātakapaddhati* of Parameśvara of Vaṭaśreṇi has a lucid commentary in Malayalam which has been made available in print in a slightly adapted form by Kanippayyoor Sankaran Namputirippad.<sup>2</sup> The edition contains a verse, carried over from the original manuscript, to the effect that it was written (*likhitavān*) by Śrikanṭha, a 'devadāsa' of Śvetagrāmatavi (Mal. Veḷḷārakkāḍ). It is not definite, however, whether Śrikanṭha was only the scribe or the real author.

### 74. Ghaṭigopa (c. 1800-60)

Ghaṭigopa, which is, presumably, not his real name but only the Sanskritisation of his personal or popular name,<sup>3</sup> calls himself a disciple of Parameśvara and a devotee of God Padmanābha, the presiding deity of Trivandrum. His contribution to astronomy is in the form of two commentaries, one in Sanskrit and the other in Malayalam, on the *Āryabhaṭīya*. The commentary in Malayalam occurs in two

1. On Parameśvara, see Ul. III. 476-77 ; Ul. Sup. I. 627 ; Va. II. 695-12.

2. Pub. under the title *Balapiṇḍavum āyurdāyavum*, Kunnankulam, M.E. 1102 (A.D. 1927).

3. The South Indian village accountant is called *Maṇiyakkāran* ; this term, which can be rendered, literally, as 'clock-man' could give rise to the Sanskritisation 'Ghaṭigopa'. To hazard another specific suggestion : Prince Goda Varma Koyittampurān (1810-60) a member of the scholarly family of Kilimanoor and a resident of Trivandrum, had the distinction of constructing, all by himself, a clock, and, thereby, getting as present a golden bracelet from the reigning ruler of Travancore (Ul. IV. 57 ; RNP V. 21). Following this achievement, he gained the popular appellation 'Maṇikkāran Thampurān' ('Prince of the clock'). This prince was also a good astronomer. Can it be that he composed the commentaries on the *Āryabhaṭīya* under the Sanskritised version of his name 'Ghaṭigopa' ? In that case, the date arrived at on the basis of internal evidence (see below) and the author's being a devotee of God Padmanābha, would fit in well.

distinct versions, the longer one being nearly one and a half times in extent as the shorter. In the shorter version, under *Kālakriyā* 4, Ghaṭigopa gives the rationale for the 248 *candra-vākyas*. An indication of his date is given by his mention of Putumana Somayāji's (1675-1750) *Pañcabodha*, *Chāyākhaṇḍa* 20, in the said shorter version of his commentary. Ghaṭigopa might, for this reason, be placed after 1800.<sup>1</sup>

#### 75. Goda Varmā, Vidvān Iṣaya Tampurān (1800-51)

Among the renowned scholars and patrons of literature produced by the scholarly royal house of Koṭungallūr, near Cochin, Goda Varmā, better known as Vidvān Iṣaya Tampurān, occupies a place in the front rank. He was a versatile scholar and has written profusely, both in Sanskrit and in Malayalam. In astronomy he has produced erudite commentaries in Sanskrit on the *Gaṇitādhyāya* (*Bhāskariyaganita*) and the *Golādhyāya* of the *Siddhāntaśiromaṇi* of Bhāskara II.<sup>2</sup>

#### 76. Śaṅkara Varmā of Kaṭattanāṭ (1800-38)

Prince Śaṅkara Varmā, known also as Appu Tampuran, belonged to the royal house of Kaṭattanāṭ in North Malabar. He was an astute astronomer and his *Sadratnamālā*,<sup>3</sup> in six chapters, is a compendium of the Kerala school of mathematics and astronomy. The date of composition of the work is indicated in the concluding verse of the work by the chronogram *lokāmbē siddhisevye* (17,97,313), which falls in A. D. 1823. The author himself has written an elaborate commentary on the work, which, however, extends only up to verse 32 of the last chapter.<sup>4</sup>

#### 77. Subrahmanya Śāstri (1829-88)

Subrahmanya Śāstri was a versatile scholar who hailed from the village of Nalleppalli in Chittur taluk (Cochin). His erudition extended to different disciplines, including Jyotiṣa, Mantraśāstra, Viśavaidya,

1. On Ghaṭigopa, see Ul. III. 234-35 ; Ul. Sup. II. 535.

2. On Goda Varmā, see Ul. IV.31-44 ; Ul. Sup. II. 19-23 ; Va. IV. 315-44.

3. Ed. with auto-commentary, in *Kavanodayam*, (Mal. monthly, Kozhikode), vol. 16 (1898),

4. On Śaṅkara Varmā, see Raja, 165-66 ; Sen, 191 ; Ul. III. 499-501 ; Ul. Sup. I. 635-37 ; Va. IV. 384-93.

Music and Dramaturgy, and has, to his credit, several works in Sanskrit, Malayalam and Tamil. His contribution to Jyotiṣa is his *Aganīta* (A.D. 1851) which enunciates procedures to compute the planets for a thousand years.<sup>1</sup>

78. Subrahmaṇya of Kunnattu Mana (1835-1903) : Subrahmaṇya II

Subrahmaṇyan Tirumunpu was a member of Kunnattu Mana of Bhūtanāthapura (Payyanur) in North Malabar. He wrote a commentary called *Bhāvaprakāśaka* on the *Muhūrtadarśana Vidyāmādhava*. This commentary is very extensive, though it has not grown popular.<sup>2</sup>

79. Puruṣottaman Mūssatu (c. 1850-1900) : Puruṣottama III

Puruṣottaman Mūssatu of Kūttaleṭattu Mana is the author of *Praśnāyana*,<sup>3</sup> a comprehensive work in 1018 verses, distributed in fifteen sections called *ayana*'s, composed in A.D. 1881.<sup>4</sup> The author mentions, at the beginning of his work, his teachers as Bhāskara, Śaṅkara, Vahni and Nārāyaṇa and, at the close, he indicates the inspiration behind its composition :

*Madhyāraṇyadvijāsyād vikalita iha yaḥ Praśnamārgo 'marādau'  
kolambe, chātraśiṣyo 'sya ca viracitavān Jātakādeśaratnam |  
tacchiṣyasyānumatyā Sthalipurānilayasy 'Āyanam' 'Praśna'to 'sau  
Sṛprā-deśādhivāsī vyaracayam aham apy 'Uttamaḥ Pūruṣāṇām' ||*

According to this statement, Madhyāraṇyadvija (Iṭakkāṭ or Panakkāṭ Nampūtiri) composed his *Praśnamārga* in the Kollam year *marādi* (825=A.D. 1650)<sup>5</sup> and a grand-pupil of his (identified with Nārāyaṇan Ilayatu of Maccāṭ, 1765-1842) composed the *Jātakādeśaratna*. At the instance of a pupil of his from Sthalipura (Mal. Taḷipparampu), his

1. On Subrahmaṇya Sastri, see Ul. IV. 292 ; Ul. Sup. II. 122-23 ; Va. IV 607; RNP IV. 481-82.

2. On this author, see Ul. Sup. I. 540 ; Va. I. 444.

3. Ed. by K. Raghavan Pillai, TSS, No. 223, Trivandrum, 1968.

4. Cf., *Praśnāyana* X. 14, *yātā 'rājadhavāḥ' samāḥ* and com. thereon *idānim, 'rājadhavā' (4982) ity akṣarasankhyā, samāḥ kalybdā, atitāḥ |* (Edn., op. cit., p. 176). Kali 4982=A.D. 1881.

5. On this, see above, p. 66 § 45.

grand-pupil<sup>1</sup> Puruṣottama, who hailed from Sr̥prādeśa (Mal. Tr̥prayāer ?) composed the *Parśnāyana*. The work has a succinct commentary included in the edition of the work, which, too, to all appearances, has been composed by the author himself.<sup>2</sup>

#### 80. Rāma Varma Koyittampurān (1853-1910)

Rāma Varmā of the royal house of Grāmam was a scion of the principality of Parappanāṭ which took refuge in Travancore when Tipu Sultan of Mysore invaded Malabar in 1807. He was a versatile scholar and author of several literary works. He studied Jyotiṣa under Prince Ampurājā at the Chirakkal Palace in North Malabar and composed, in that discipline, the *Jyotiṣapradīpa*, an instructive introduction to astronomy.<sup>3</sup>

#### 81. The later phase

Among later scholars who continued the tradition of Jyotiṣa and who, by their expositions and interpretations, helped to sustain and promote astronomical and astrological studies in the land, a mention might be made of four important names : (1) Rāma Vāriyar of Kaikkulangara (1833-97), author of *Samudrikaśāstra* and *Gauliśāstra* and commentator of *Horā* and *Praśnamārga* ;<sup>4</sup> (2) A. R. Rajaraja Varma Koyittampurān (1853-1918) who wrote two studies entitled, respectively, *Karaṇa-pariṣkaraṇa* and *Pañcāṅgaśuddhipaddhati*<sup>5</sup> and *Jyotiṣaparakāśana*,<sup>6</sup> being

---

1. Elsewhere also in this work, Puruṣottama refers to his teacher's teacher as the author of *Jātakādeśaratna*. Cf., *madguror-śrīguror vaktrāḥ Jātakādeśam utthitam* (III. 19) and *Śrīman-madgurunāthasadgurumukhāḥ jātaḥ sphuṭam Jātakādeśas tena* (VIII. 88). The contraction of *Jātakādeśaratna* to *Jātakādeśa* in the above references is, obviously, due to metrical exigencies.

2. On Puruṣottama, see Ul. Sup. I. 225.

3. On Rāma Varma, see Ul. IV. 544-50.

4. On Rāma Vāriyar, see the biography included in P. V. Krishna Variyar, *Maṅmarañña saḥityakāranmār* (Mal.) ; Ul. IV. 267-76 ; Ul. Sup. II. 107-16 ; Va. IV. 587-607.

5. Pub. Trivandrum.

6. Ms. No. 719, *Des. cata. of Skt. Mss. in the Curator's Office Library*, vol. V, Trivandrum, 1939, pp. 1489-91.

an exposition of the *Golādhyāya* of Bhāskara II;<sup>1</sup> (3) Vāsuṅṅi Mūssatu of Vellānaśseri (1855-1914), author of an erudite commentary in Malayalam on *Pañcabodha*;<sup>2</sup> and (4) Punnaśseri Nampi Nilakaṅṅha Śarmā (1858-1935) who compiled a very instructive manual on astronomy under the title *Jyotiśśāstrasubodhinī* with an extensive elucidation<sup>3</sup> and wrote a *Pañcabodhakriyā-Bhāṣā*, besides commenting, elaborately, on the *Camatkāracintāmaṅi* and the *Prāśnamārga*, both published through the Bharata Vilasam Press, Trichur.<sup>4</sup>

## 82. Modern times

It is significant that, even during modern times, compendiums on astronomy and manuals of computation in Sanskrit continue to be composed by traditional exponents of the discipline.<sup>5</sup> And, what is more interesting is that some of the Western advances, corrections and methods have been duly taken note of and appropriately incorporated in the Sanskrit texts and elucidated in the Malayalam expositions, in these works.<sup>6</sup>

---

1. On Rājarāja Varma, see Ul. V.791-827; Ul. Sup. II. 436-49; Va. VI. 27-65.

2. On Vāsuṅṅi Mūssatu, see Ul. IV. 698-703; Ul. Sup. II. 373-76.

3. Pub. in 2 parts, Trissivaperur, M.E. 1097, 1104 (A.D. 1922, 1929).

4. On Nilakaṅṅha Śarmā, see Ul. V. 964-70; Ul. Sup. II. 500; Va. V. 192-204.

5. See, for instance, *Gaṅitanirṅaya* by P. S. Purushottaman Namputiri, (2nd edn., Quilon, M.E. 1127—A.D. 1952); *Gaṅitaprakāśikā* by K.V.A. Rama Potuval, (Kannocr. 1950) and *Śuddha-Drggaṅitam* by V. P. Kunhikkanna Poduval, (Pāyannur, 1956). All these works are in Sanskrit and are provided with Malayalam expositions by their authors themselves.

6. See, for instance, the innovations adopted in the *Gaṅitanirṅaya* of Purushottaman Namputiri, (*op. cit.*), such as fourteen of the Western corrections for the moon, a revision of the traditional astronomical constants in the light of the modern value for the mean motion of the Sun, sine-tables prepared on the basis of the ellipse instead of the circle and revised mnemonics for computations.



## CHAPTER V

### A BIBLIOGRAPHY OF KERALA JYOTIṢA LITERATURE

The Bibliography of Kerala Jyotiṣa Literature which is presented here is intended to document information on the manuscripts, studies and other references to Kerala authors and works in the allied disciplines of astronomy and astrology. The authors and works, with their dates and other essential identificatory or descriptive details, wherever necessary, have been arranged in one alphabetical sequence, the former being printed in thick roman type and the latter in bold italics. Since the works whose authors are known are automatically identified by those authors, the identification of anonymous works has been sought to be achieved through the supply of extracts of the initial lines of the respective works. Wherever some amplification seemed necessary, that has been supplied by extracting end-passages and colophons ; this has been done also to set out hitherto unknown information.

The nature of the contents of the works has been indicated by adding, after the titles, their subjects such as : Astronomy (astron.), Saṁhitā, Tantra, Karaṇa (kar.), Eclipse computation (ecl.), Astrology (astrol.), Jātaka (jā.), Praśna (pra ), Muhūrta (muh.), Prognostication, Natural astrology (nat. astrol.), arithmetic (arith.) etc. Sanskrit works are given no special indication to that effect but Malayalam works are distinguished by the addition of '(Mal.)' after their titles.

Often, different works bear a common name, (*e.g. Pañcabodha*), and all their manuscripts are bunched together in catalogues. In such cases, an attempt has been made to examine the manuscripts and identify them for this Bibliography and give against each distinct work the manuscripts relevant to it. Authors or works having a common name have been distinguished by the addition of I, II etc., to their names. So also the different commentaries on the same work. When a work does not give its title and therefore a title had to be assigned to it on the basis of its contents, the fact is generally indicated by the addition of '(?)' after the title. The symbol '(?)' is used also when a doubt is entertained about any matter. When the Kerala origin of a work is suspect that is indicated by adding '(Ker. ?)' to it.

Whenever it was felt that some purpose would be served by indicating the extent of a work, that has been done by noting the numbers of its sections or the number of *granthas* (32 syllables) it is comprised of.

The documentation of the manuscripts of works is intended more as indicative than as exhaustive. When only a single manuscript or just a few manuscripts are known, the numbers of all the manuscripts have been noted. When, however, a large number of manuscripts of a work are known, the references to the relevant manuscripts catalogues alone are given or a few manuscripts noticed. Incomplete manuscripts are indicated by the addition of '(inc.)' to their numbers.

All the major repositories of Kerala manuscripts have been examined, either directly or through their catalogues of manuscripts, for the work on this Bibliography. The Kerala University Oriental Research Institute and Mss. Library, which, now, houses all the Trivandrum collections, is by far the largest of these repositories and had been most useful in the present work. In this Bibliography, references to the manuscripts germane to the University Collection<sup>1</sup> are given merely by their Ms. numbers, with no other indication. The numbers of the manuscripts belonging to the erstwhile Curator's Office Collection<sup>2</sup> are prefixed with 'C', those of the Curator's Office (Malayalam) Collection,<sup>3</sup> with 'CM', the Loan Collection with 'L', the Maharaja's Palace Collection,<sup>4</sup> with 'P', the Palace Malayalam Collection,<sup>5</sup> with 'PM', Transcripts Section with 'T' and Transcripts (Malayalam) Section, with 'TM'. Of the other collections, that of the Adyar Library and Research Centre<sup>6</sup> is indicated by 'Ad', the Oriental Institute, Baroda,<sup>7</sup> by 'Baroda',

---

1. *Alphabetical Index of Skt. Mss. in the Univ. Mss. Library, (Ker.)*, Trivandrum, 2 vols., 1957, 1965; *Index of Malayalam Manuscripts, (Ker. Mal.)*, Trivandrum, 1951.

2. *A Des. Cata. of Skt. Mss. in the Curator's Office Library*, Trivandrum, 10 vols., 1937-41.

3. *Do. of Mal. Mss.*, Trivandrum, 3 vols., 1941.

4. *A Des. Cata. of Skt. Mss. in H. H. the Maharaja's Palace Library*, Trivandrum, 8 vols., 1937-38.

5. *Do. of Mal. Mss.*, Trivandrum, 2 vols., 1939.

6. *Alphabetical Index of Skt. Mss. in the Adyar Library*, Madras, 1944.

7. *An alphabetical list of Mss. of the Or. Institute*, Baroda, 2 vols., 1942, 1950.

the Government Or. Mss. Library, Madras,<sup>1</sup> by 'Mad.', S.V. Oriental Institute, Tirupati,<sup>2</sup> by 'Tir.', the India Office Library, London,<sup>3</sup> by 'IO' and the Whish Collection of the Royal Asiatic Society, London,<sup>4</sup> by 'Whish'. Other public and private collections have been indicated by their full names. The *Catalogus Catalogorum of Sanskrit works and authors (CC)* by T. Aufrecht (Leipzig, 3 vols., 1891, 1895, 1903; Rep., Wiesbaden, 1962) and the *New Catalogus Catalogorum (NCC)*, (Madras University, 1949 ff.) are also referred to when necessary.

For facilitating general information and further study of individual works and authors, such details as the editions of the works, if available, and references to special articles on them are supplied towards the end of each entry. Besides these, their treatment in such important sources as : Ulloor, *Kerala Sahitya Charitram* (Ul.), (5 Vols., Trivandrum, 1953-57), Vatakkumkur, *Keraliya Samskrita Sahitya Charitram*, (Va.), (6 vols., Trivandrum-Trichur, 1938-65), and *Kerala Sahitya Charitram—Chacchayun Puranavum*, (Ul. Sup.), (2 vols., Trichur, 1967-69), R. Narayana Panikkar, *Kerala Bhasha Sahitya Charitram*, (RNP), (7 vols., Trivandrum, nd.-1951), S.N. Sen, *Bibliography of Sanskrit works on Astronomy and Mathematics*, (Sen), (New Delhi, 1966) and K.K. Raja, 'Astronomy and Mathematics in Kerala : An account of the literature', (Raja), (*Adyar Library Bulletin*, 27 (1963) 113-67), has also been duly indicated. Other relevant pieces of information also find their due place here.

---

1. *An alphabetical index of Skt. Mss. in the Govt. Or. Mss. Library, Madras*, 3 vols., 1938, 1940, 1942.

2. *An alphabetical index of Sanskrit, Telugu and Tamil Mss. in the S.V.Or. Res. Inst. Library, Tirupati*, 1956.

3. *A Cata. of Skt. and Pkt. Mss. in the India Office Library*, by J. Eggeling, 2 pts., London, 1887, 1896; and A.B. Keith, 2 pts., London, 1935.

4. *A Catal. of South Indian Skt. Mss., (especially those of the Whish Collection), in the Royal As. Soc., London*, by M. Winternitz, London, 1902.

## BIBLIOGRAPHY OF AUTHORS AND WORKS

*Aṃśakadaśanyanam* (jā.), (Mal. prose), Anon. 30 gr.

Ms. L. 765-B.

*Aṃśakaphalavicāra* (jā.), Anon. (Skt.-Mal.), 125 gr.

Beg. guror api ca saṃvāda iṣṭadaivatandanam /  
kalivākyāni lagnam ca sūryādyeṣu grahasphuṭam //

Ms. TM. 119.

*Akarādipraśna* (pra.), (Mal.), Anon.

Beg. Vālmikiṛṣiproktam Rāmabhadrasvāmi-kathā. Śrī. Praśnam.  
Akārādi akṣaram, i pustaka-lakṣaṇam kāṇum prakāram.  
grantham keṭṭikkoṇṭu kāryam vicāriccu etc.

Ms. CM. 2262.

*Akṣarapraśna* (pra.), (Mal.), Anon.

Ms. See *Ker. Mal.*, p. 1 ; Ad.

Do.—C (Mal.)

Ms. See *Ker. Mal.*, p. 1.

*Aganīta* (kar.), (A.D. 1861) by Nalleppaḷli Subrahmaṇya Śāstri  
(A D. 1829-88), enunciating facile methods to read out positions of  
the planets for 1000 years.

Ref. : Ul. IV. 290, 292 ; Ul. Sup. II. 122-23 ; Va. IV. 607 ;  
RNP IV. 481-82.

*Aganītagrahaçara* or *Aganītapañcāṅga* (kar.), by Mādhava of  
Saṅgamagrāma, 2000 gr.

Beg. ādityapramukhān khetān vande lokaparakāśakān /  
Aganītagrahaçāre drśyate rāsinirṇayaḥ //1//  
śakābdāt naralokonād rāghavair dhītsunā kujāḥ /  
divylokonanilāgrais tattvajñair bhājito budhaḥ //2//

Mss. 5955-A, C. 628, T. 280.

*Aṅkaṇaśāstra*, called also *Grahasamaya* or *Navagrahasamaya* (ja.), Anon., by a native of Vaikkam, couched in the form of a dialogue between Vyāghrapāda and some sages, in 4 chs., in 425 gr.

Beg. Vyāghrapādam aham vande śeśāmśena samudbhavam /  
 puṇḍarikapureśasya padapaṅkajasamśrayam //  
 śṛṇvantu munayaḥ sarve durūbam sarvadaivataiḥ /  
 grahāṇām samayam hyagre vakṣyāmi matimātrataḥ //

Ms. T. 206. Ed. TSS, No. 222, (Trivandrum, 1968). Ref. Ul. Sup. I. 221-22.

### Acyuta I

—*Devakerala*, called also *Keralajyotiṣa*, *Candrakalanāḍī* and *Candranāḍī*.

Mss. Mad. D. 13776-79, R. 853 (a), 3322. Ed. Gov. Or. Mss. Lib., Madras, 3 vols., 1952-56. Ref. See above, p. 46, § 9.

**Acyuta II** : Acyuta Piṣāraṭi, (1550-1621), of Trkkāṇṭiyūr, pupil of Jyeṣṭhadeva and teacher of Nārāyaṇa Bhaṭṭatiri; patronised by king Ravi Varmā of Veṭṭattunāḍ; had a long line of teachers and pupils.

- Uparāgakriyākrama*
- Uparāgaviṃśati* (?)
- Karaṇottama*
- C on *Karaṇottama*
- Chāyāṣṭaka*
- Jatakābharāṇa*
- Rāsigolasphuṭānīti*
- C on *Veṅvāroha* of Mādharma
- Sphuṭanirṇaya*
- C on *Sphuṭanirṇaya*
- Horāsāroccaya*

Ref. See above, pp. 12; 64-65, § 39; K. V. Sarma, Introductions to his edns. of *Rāsigola*° and *Veṅvāroha*; S. V. Iyer, 'Acyuta Piṣāraṭi: His time and works', *JOR* 22 (1952-53) 40-46; Raja, 158-62; Ul. II. 319-26; Ul. Sup. I. 315; Va. II. 748-57.

*Adhimāsanirṇaya*, (astron.), Anon.

Beg. : meṣādyaiikaikarāśisphuṭagatidinakṛtsaṅkramaikaikagarbhāḥ.

Ms. L. 1229-D (with C, 65 gr.).

*Adhimāsanirṇaya* (contd.)

Do—C (interspersed with Mal.), Anon.

Beg. : dvādaśamāsātmakatvena lokavedaprasiddhasya Cāndrasam-  
vatsarasyāṅgabhūtānām lakṣaṇam āha—meṣādāvekaikasmin  
rāśau sphuṭagatyā.

Ms. : L. 1229-D.

*Ayanacalanādigaṇita* (astron.), (Mal.), by Śaṅkara of Mahiṣa maṅgalam.

Beg. tumpa tiṅkaḷoṭu gaṅga tanneyum etc.  
candradhṛlagnasamyuktam kollasaṅkhyayutam kramāt etc.

Ms. PM. 4026-A. Men. Ul. II. 272.

*Aṣṭamaṅgalapraśna* I (pra.), by Rudra II (?)

Beg. jayati bhagavān gajāsyo etc. // 1 //  
satyajñānapradāyeṣṭa etc.

Ref. Ul. II. 117.

*Aṣṭamaṅgalapraśna* II (pra.), Anon., prose.

Beg. svasthacitto'pi vittasthaḥ samabhyarcya gaṇādhipam /  
nijān gurūn devatās ca sūryādimś ca navagrahān //  
...anantaram viḷakkum gaṇapatiyum vaccu aṣṭamaṅgalavum  
vaccāl rāśicakram varappū /

Ms. 3556-C, 13494-K, CM. 565-A. Ref. Ul. III. 245.

*Aṣṭamaṅgalapraśna* III (pra.) Anon., (Mal. pr. and verse), 160 gr.

Beg. dūtasvabhāvam vacanam pravṛttim  
sthalam ca taṅte svaravum svavṛttim /

Ms. PM. 4029.

*Aṣṭamijayantīnirṇaya* (astron.), by Puṭayaṅṅūr Parameśvaran Nampūtiri (or Puradahanapura-dvija), A.D. 1810. 300 gr.

Ms. CM. 6-E. Ref. Ul. III. 476-82 ; Ul. Sup. I. 220-21.

*Aṣṭakavarga* (jā )

Ms. See *Ker.*, I. p. 43.

Do—C. (Mal.).

Ms. 6065-B,

*Aṣṭakavargaprayoga* (jā.), (Mal. prose), Anon.  
Ms. 6065-B.

*Aṣṭakavargaphalavicāra* (jā.), (Mal.), prose, Anon., 225 gr.  
Beg. ādityante aṣṭakavargattil paral pizhaiyāte etc.  
Ms. C. 2338-C.

*Aṣṭakavargopadeśam* (jā.), (Mal. prose), Anon., 150 gr.  
Ms. C. 565-C.

*Aṣṭavargaparakāra* (jā.), (Mal. prose), Anon.  
Ms. 13294-Q.

*Aṣṭavargaparakriyā* (jā.), Anon., (Skt.-Mal.).  
Beg. ... ..kanyāmakarau  
śarais ca seṣāḥ svamānagaṇitāḥ syuḥ /  
Ms. C. 962-B.

*Aṣṭavargaprayoga* (jā), Anon.  
Beg. athāṣṭavargaprayoga ucyate. putro vāso dadhāṇaḥ syāt.  
Ms. P. 894-B.

*Ahargaṇadigaṇitam* (?) I (kar.), (Mal.), Anon.  
Beg. vākyasaṅkhyakāḥ vacchiṭṭu cenna tiyati kūṭṭiyāḥ /  
Ms. 10967-F (inc., 25 gr.).

*Ahargaṇadigaṇitam* (?) II, (kar.), (Mal.), Anon., in verse.  
Ms. 13295-I (inc., 170 gr.).

*Ahargaṇadigaṇitam* (?) III, (kar.), (Mal.), in prose and verse.  
Ms. 142 8-E (inc., 24 gr.).

*Aharmanādigaṇitam* (?) I, (kar.), Anon. Epoch : Kali 17,21,162  
A.D. 1611.

Beg. 'prītāsyaḍdyarasāyano'nadivasān modāḍḍhya-putram tyajet.  
Ms. 1005-C.

Do—C (Mal.), Anon.  
Ms. 1005-C.

*Aharmanādigaṇitam* (?) II, (kar.), (Mal.), prose.  
Beg. talkālacandran oṇṭākkuvān vākyam vaccu.  
Ms. L. 765-H (inc., 140 gr.).

*Aharmānadigaṇitam* III (kar.), (Mal.), Anon.

Beg. purabhaktiḥ, sudhaneḍhyā, nṛpapaṭukapi, nityanindādhisūta-  
mūlādhyo meṣanaya ṛṇam yuṭaniyataprātāḥ (?) itu ubhe  
aharmānam.

Ms. PM. 4328-B.

*Ācāradarśana* (astrol.), Anon., by a pupil of Śaṅkara and Śrī-  
vallabha.

Beg. ... vande Śaṅkaram Aṣṭamūrtijanakam Śrīvallabham vā  
gurum.

Ms. 1055-G.

*Ācāradīpikā* : Name of C on *Muhūrtāṣṭaka*.

*Ācārasaṅgraha* I (muh.), by Parameśvara of Vaṭaśreṇi.

Ms. : See *Ker.*, I. p. 54. Ref. Va. II. 686-87 ; III. 394-95 (where  
the work is said to be different).

Do.—C (Mal.), Anon.

Beg. Ācārasaṅgramākunna muhūrta-granthatte camappān tuṭaṅ-  
ṇunna ācāryan.

Ms. 773-B.

*Ācārasaṅgraha* II (muh.), (Mal. prose), Anon., 2200 gr.

Mss. 5886-A, L. 1286.

*Ānandaprakaśa*, teacher of Nityaparakāśa Yati (au. of C on *Horā*)

*Āyuhpraśna* (pra.), (Mal.), by Śaṅkara of Muktisthala.

Mss. 5109-A, 10582-C-2, C. 565-B.

*Āyuhpraśnadīcintanam* (pra.), (Mal. prose).

Ms. 13494-E.

[*Āyudhapraśna* (pra.), Anon.]

Do.—C (Mal.), Dūtalakṣaṇabhāṣāvyākhyā, 175 gr.

Beg. Āyudhapraśnasya dūtālakṣaṇa-bhāṣā likhyate / dūtan kizha-  
kkoṭṭu ninnu iṭakkaikoṭṭāyudham piṭiccu.

Ms. C. 173-D.



*Āyudhalakṣaṇam* I (pra.), (Mal.), in verse, Anon., in 4 chs., 110 gr.

Beg. gurupādatte vandiccu kuaṛyekkōṇṭu bhāṣayāy /  
arivāniha collunnen aham Āyudhalakṣaṇam //

Ms. See *Ker Mal.*, p. 16 ; P. 970-B ; PM. 4026-D.

*Āyudhalakṣaṇam* II (pra.), (Mal.), in verse, Anon., 62 gr.

Beg. ampilikkala cūṭunna tampurān mūttaputrane /  
mumpil tozhutu kumpiṭṭen vanpōlum vāṇimāteyum //  
arālum keṭṭinikkunnor āyudhathinnu lakṣaṇam /  
arivān jñānadrṣṭikku guruvinn varam ekuka //

Ms. CM. 127-C.

*Āyurdāyagaṇitam* (?) (astrol.), (Mal.), Anon. in prose.

Beg. āyurdāyam varuttān jātakam varuttū.

Ms. L. 144-P, L. 1217-B.

*Ārūdhapraśna*. by Śaṅkara : See *Sāmudrikasāra*.

[*Āryabhaṭīya* (tantra), by *Āryabhaṭa*]

Do.—C I, *Bhaṭapraśna* or °*prakāśikā* by Sūryadeva-yajvan, 2500 gr.

Mss. : See *Ker.*, I. p. 74 ; Ad., Mad.

Do.—C II, *Bhaṭadīpikā* by Parameśvara of Vaṭaśreṇi.

Mss. 10617, C. 1363-B ; Mad. Edn. H. Kern, Leiden, 1874 ;  
Udaya Narain Singh, Etawah, 1906.

Do.—C III, *Bhāṣya*, (for Gaṇita, Kālakriyā and Gola Sns. only, but  
not for Gītikā Sū), by Nilakaṇṭha Somayāji, 4000 gr.

Mss. : See *Ker.*, I. pp. 73-74, *NCC* II. 172. Edn. *TSS* 101, 111, 185.

Ref. : Ul. II. 119-20.

Do.—C IV, by Ghaṭigopa, (Skt. com.).

Mss. 13305-A, T. 736.

Do C V, (Mal.) by Ghaṭigopa, version I, 1200 gr.

Beg. of Gaṇitapāda : gaṇitapādattiṅkaḷ muppattimūnnārya-  
kaḷekkoṇṭu yuktisiddhamāyirikkunna gaṇitatte colluvān  
tuṭaṇṇunna Āryabhaṭācāryan naṭette sūtram koṇṭu iṣṭa-  
devatānamaskāravum cikirṣita-pratijñayum ceyyunnū—  
Brahma-śāsi etc.



**Azhvāñceri Tamprākkaḷ** (contd.)

—*Jātakasārasaṅgraha*

—C (Mal.) on Do.

—*Jātanītimārga*.

—C (Mal.) on Do.

—*Jyotiśśāstrasāṅgraha*

—C (Mal.) on Do.

—*Phalasārasamuccaya*

—C (Mal.) on Do.

—C (Mal.) on *Muhūrtapadavī* II

—*Sāṅgrahasādhanakriyā*

—C (Mal.) on Do.

Ref. See above, pp. 71-72, § 57 ; Va. II. 123-27.

**Īṭakkāṭṭu or Eṭakkāṭṭu Kukkaṇiyāl** (17th cent.), pupil of Panakkāṭṭu Nampūtiri (au. of *Praśnamārga*).

—*Praśnarīti* II (Mal.):

Ref. See above, p. 67, § 43 ; Ul. III. 235-37 ; Ul. Sup. I. 536 ; Va. III. 405.

**Īṭakkāṭṭu Nampūtiri** : See under Panakkāṭṭu Nampūtiri.

**Īṭakramañceri Nampūtiri** (17th cent.) ; of Peruñcellūr village ; pupil of Dāmodaran Nampūtiri of Maṅgalaśśeri house.

—*Bhadradīpagaṇita* (Mal.)

—*Bhūgolañāyam* (Mal.)

Ref. See above, p. 66, § 43 ; Ul. III. 232-34 : Ul. Sup. I. 534.

**Īñcakkāzhvā Mādhava** : See under Mādhava II.

*Uccanīcādigaṇita* (kar.), (Mal. prose).

Ms. 13194-B.

*Uccādibalānayanam* (kar.), (Mal. prose).

Ms. C. 2197-E.

*Uḍugaṇaphalam* (astrol.), Anon.

Ms. 3671-F.

Do.—C (Mal.), Anon.

Ms. 3671-F.

*Uḍujatakodaya* (jā.), Anon., (Ker. ?).

Beg. gaṇeśavāgdaivataviṣṇuśaṅkarān  
inendubhaumajñagurūśanaśśanin /

**Uḍujātakodaya (contd.)**

praṇamya pātoccagr̥hām̐sca sadgaṇān  
udāhariṣyāmy Uḍujātakodayam //

Mss. 1004-A, 10627-B, 13478-G, C. 1912-D, CM. 118-E, L. 690-D, L. 864-B, P. 876-I, P. 900-B.

Do.—C (Mal.), Anon.

Ms. 1004-A, 10627-B, CM. 118-E, P. 876-I, P. 900-B.

**Udayadivākara (Ker. ?), (before, A.D. 1073, his epoch).**

—C on an unidentified work of Jayadeva.

—C *Sundarī* on *Laghubhāskariya* of Bhāskara I.

Ref. See above, pp. 45-46, § 8; K. S. Shukla, 'Jayadeva, the mathematician', *Gaṇita*, (Lucknow), 5 (1954) 1-20.

*Uparāga* : See also under *Grahaṇa*-.

***Uparāgakriyākrama* I (ecl.), by Acyuta Piṣāraṭi, A.D. 1592, in 4 chs., 175 gr.**

Mss. See *Ker.*, I. p. 100. Ref. Ul. II. 323.

Do.—(Mal.), Anon., 425 gr.

Beg. gurūṇām caraṇambhoja etc. ; tithiye pratykṣamākkintā pramāṇam.

Mss. 404-B, 13389-D, C. 173-E, C. 531-B, C. 628-B, C. 541-C ; Mad. Mal. D. 216. Ref. Va. II. 682-83 (where it is wrongly described as the com. Nārāyaṇa's *Uparāga*°).

Do.—C (Mal.), *yukti* of certain sections, Anon.

Ms. With K.V. Sarma.

***Uparāgakriyākrama* II (ecl.), by Nārāyaṇa, in 5 chs., 300 gr. ; epoch A.D. 1561.**

Mss. See *Ker.*, I. p. 100 ; Mad. Ref. Sen., p. 150 ; Ul. II. 121 ; Ul. Sup. I. 222 ; Va. II. 683.

Do.—C (Mal.), Anon. (300 gr.).

Ms. 770-B ; C. 531-B. Ref. Va. II. 683-84.

***Uparāgakriyākrama* III (ecl.), Anon., acc. to Nīlakaṇṭha Somayāji.**

Beg. puṣpavantau namaskṛtya 'Nīlakaṇṭhokta-vartmanā' / anyo vilikhyate kaścid Uparāgakriyākramah //

Ms. 5862-C. Ref. Ul. Sup. I. 222-23.

*Uparāgavimśati* (ecl.), Anon., 60 gr., by Acyuta Piṣāraṭi (?)

Beg. puṇyaghnāt khaṇḍaśeṣād vitatha-br̥talavādy ūnitaḥ khaṇḍa-  
śeṣo.

Ms. Trippunithura Skt. Col. 1075. Edn. Rama Varma Maru  
Tampurān, *Śrī Ravi Varma Skt. Granthāvali*, (Trippuni-  
thura), 2 (1954) i-iii, 16 pp. Ref. Ascription of  
authorship, on the authority of Puliyoor Purushottaman  
Nampūtiri, Intro., to the *Sūryasiddhānta*, (Trivandrum,  
1125 M.E.), p. x.

Do.—C (Mal.), Anon.

Beg. sūryagrahaṇam tān somagrahaṇam tān raṇṭālonnu.

Ms. Trippunithura Skt. Col. 1075. Edn. Rama Varma Maru  
Tampurān, with text, above.

*Uparagāṣṭaka* (ecl.), Anon., 20 gr. Epoch : Kali 1703,790, A.D.  
1563 :

Beg. 'nālosau gānasampad'-virahitadivasād.

Mss. 5817-A, C. 173-K.

Do.—C (Mal.), Anon.

Beg. anantaram Uparāgāṣṭakattinte bhāṣa camakkunna ācāryaṇ  
sūryendukkaḷuṭe grahaṇatte ... nālosau:

Ms. C. 173-K.

Do.—C (Mal.), Anon., 175 gr.

Beg. anantaram sūryacandranmāruṭe grahaṇatte gaṇikkum pra-  
kāram collunnū—nālosau.

Ms. 5817-A.

*Ṛtūtpattiphalam* (astrol.), Anon., 30 gr.

Beg. sūrye vyādhisamṛ...somavāre patipriyam /  
(bhaume) duḥkham avāpnoti budhe putrasamāgamam //

Ms. PM. 4077-E.

*Ekavimśatipraśnakrama* (arith.), Anon., (Mal.).

Beg. yaḥ sūryācandranetraḥ saridadhipasutātūṅgavakṣojalagnaiḥ

Ms. C. 541-D. Ref. Ul. III. 239-40.

*Eñcuvāṭi* (arith.) (Mal.), Anon.

Mss. See *Ker. Mal.*, pp. 23-24.

*Eṭakkattu Kukkaṇiyāl* : See under *Iṭakkāṭṭu Kukkaṇiyāl*.

*Kakṣyādi-sphuṭa-gaṇitam* (?) (kar.), (Mal.), Anon.

Ms. 151-D (inc., 70 gr.).

*Kakṣyāpratimaṇḍalādi-śloka-yukti* (on *Āryabhaṭīya*, Kāla., 17-21),  
(astron.) Anon., 135 gr.

Beg. atha sūryendvor madhyamāt sphuṭasya mandaphala-sams-  
kārād bhedo bhavati / kujādīnām etc. / tatra pratimaṇḍala-  
kalpanām sārḍhābhyām āryābhyām kathayati—kakṣyāprati-  
maṇḍalagā etc. /

Mss. 8358-F ; IO. 6301 (*Golasāra* etc.), ff. 4b-11b.

*Kaṭapayadi-saṅkhyāḥ* (astron.).

Ms. Ad.

Do.—C, Anon.

Ms. Ad.

*Kaṇakkatikāram* (arith.), (Old Mal.), Anon.

Beg. paṇakkarinākamīṭum paṭarcaṭaiccivanu polum  
piṇakkaruṭāta celvam peruma cernnoḷiviḷaṅkum /  
Kaṇakkatikāram ennum kavita kaṭṭiyampuvānāy  
tuṇaikka nalkarimukatton tuyarkeṭṭatteḷintu vante //

Mss. See *Ker. Mal.*, p. 25. Ref. Ul. II.478. See also *Gaṇitanul*  
to which this work seems to be related textually.

Do.—C (Mal.), Anon.

Mss. See *Ker. Mal.*, p. 25.

*Kaṇakkucodyam* (arith.), (Mal.), Anon., 15-16th cent.

Ref. Ul. II. 480.

*Kaṇakkuśāstram* I (arith.), (Mal.), by Kṛṣṇadāsa (Koccu-kṛṣṇan  
Āśān).

Ref. See above, pp. 74-75, § 65 ; Ul. III. 524.

*Kaṇakkuśāstram* II (arith.), (Mal.), Anon.

Ref. Ul. II. 479-80.

*Kaṇakkusāram* I (arith.), (Mal.), by Nilakaṇṭha, 16-17th cent. (?)  
1250 gr.

**Kaṇakkusāram I (contd.)**

**Beg.** eṇāṅkaśekharasutam gaṇanāthamettam  
vandiccu vaṇiye vaṇaṅṅi harim gurum ca /  
nānāmuniṅ tozhutukoṅṅu Kaṇakkusāram  
nere cameppatinu sāmpratam ārabhe ṅān //

**Mss.** C. 2085-C ; CM. 630. **Ref.** Ul. II.478-79 ; Ul. Sup. I. 226-27 ; Va. IV. 276.

**Do.**—C (Mal.), by the au. himself.

**Ref.** Ul. II. 478-79.

**Kaṇakkusāram II (arith.), (Mal, verse), Anon.**

**Ms.** T. 874.

**Do.**—C (Mal.).

**Ms.** T. 874.

**Kaṇaśappanikkar**

—C (Mal.), *Horaphalaratnāvali* on *Horā*, (apocryphal).

**Karaṇam (?) (kar.), Anon., epoch A.D. 1734, 75 gr.**

**Beg.** 'calanastutisaṅkhy'onam divasagaṇam dhidaśodhanaiḥ kulī-  
nāṅgaiḥ.

**Ms.** C. 2470-C.

**Karaṇadarpaṇam (kar.), by a Bhāradvāja brāhman.**

**Beg.** haripādāmbujam natvā Bhāradvājo dvijottamaḥ /  
laghupūrvasphuṭopāyam vakṣye Karaṇadarpaṇam //

**Mss.** 597-D, 12367-D, E.

**Do.**—C (Mal.), Anon.

**Mss.** 597-D, 12367-D.

**Do.**—C (Mal.), Anon.

**Beg.** taveghnādi-khaṇḍaśeṣatte tāpam koṅṅu guṇiccu sudevanek-  
koṅṅu hariccāl varunna phalam rāśi.

**Ms.** 12367-E.

**Karaṇapaddhati (kar.), by Putumana Somayāji of Śivapura (Trichur), 10 chs., 300 gr.**

**Mss.** See *Ker.*, I. p. 120 ; *Ad., Mad., NCC* I. 174. **Edn.** *TSS*, No. 126 ; *Gov. Or. Ser., Madras*, No. 98, with two Mal. C-s.

**Ref.** *Raja*, 164 ; *Sen*, pp. 104-5 ; *Ul.* II.107-8 ; *Va.* I, 529-31.

**Karaṇapaddhati** (contd.)**Do—C I** (Mal.), Anon.**Beg.** Nūtanagr̥ha-Somasutā..... / aviṭe ācāryaṇ prabandhatte camappān tuṭaṇṇunneṭattu...**Mss.** See Intro. to Madras edn. ; Edn. See above.**Do—C II** (Mal.), Anon.**Beg.** Nūtanagr̥ha-Somasutā ... / Karaṇapaddhatiyākunna granthatte camappān tuṭaṇṇunna ācāryaṇ...**Mss.** See Intro. to Madras edn. Edn. See above. Ref. Ul. III. 238-39.**Do—C III** (Mal.), *Śakābdasamskarakriyā*, on verses I. 12-13, Anon., 100 gr.**Ms.** 5820-C. Edn. App. pp., 307-11, to the Madras edn., above.**Karaṇasāra** (kar.), by (? Śaṅkara Vāriyar), pupil of Nīlakaṇṭha Somayāji and Dāmodara ; 4 chs., 135 gr. Epoch : *anūnajñānasādhyā*, Kali day 17,00,000, A.D. 1553.**Beg.** ābhātyadvayadantādhyam... (1); jayanti mānsāmbhoja... (2); Śri-Nīlakaṇṭham ācāryam Śrīmad Dāmodaram gurum / praṇamya likhyate kiñcid gaṇitam sulaghukriyam //**Do—C** (Mal.), *Kriyākrama* by Śaṅkara Vāriyar.**Mss.** C. 8-B, C. 173-J. Ref. Ul. II. 474.**Karaṇāmṛta** (kar.), by Citrabhānu, A.D. 1550, 4 chs., 120 gr.**Mss.** C. 1380 A, B ; T. 734 ; NCC I. 176.**Do.—C I** Anon., 900 gr.**Beg.** śivam dadyācchivo mahyam etc. // tatrādaṇ tāvad Ācāryaḥ Karaṇāmṛtam nāma prakaraṇam cikirṣuḥ...**Mss.** C. 1380-B, T. 734.**Do.—C II**, Anon., 1000 gr.**Beg.** śivam dadyāc chivo mahyam etc. / vāgīśvarim praṇamyāham gurumścārkādikāṇ grahāṇ / prārabhe Citrabhānūktam vyākhyātūm Karaṇāmṛtam //**Ms.** C. 1380-B.



*Karaṇottama* (kar.), by Acyuta Piṣāraṭi, 5 chs., 150 gr.

Mss. See *Ker.*, I, p. 120 ; *Mad.* ; *NCC* I, 176. Ed. *TSS*, No. 213.

Ref. *Ul.* II. 323-24.

Do.—C I by the au. himself, 400 gr.

Beg. atha iṣṭadevatānamaskārapūrvakam cikirṣitam pratijānāti—  
praṇipatyā etc.

Mss. See *Ker.*, I, p. 120 ; *Mad.* ; *NCC* I, 176. Edn. *TSS*, No. 213.

Do—C II (Mal.), Anon., by a Kerala brāhman.

Beg. anantaram Karaṇottamattinte bhāṣayunṭākkuvān tuṭaṅ-  
nunnū.

End : Acyutan tān camaccuḷḷa Karaṇottamakasya tu /  
bhāṣāvyākhyānam unṭakki Keraliyo dvijottamah //

Ms. with K.V. Sarma.

*Karmadīpikā* I : Name of C by Parameśvara I on the the *Mahā-  
bhāskariya* of Bhāskara I.

*Karmadīpikā* II : Name of C by Nārāyaṇa I on *Līlavatī* of  
Bhāskara II.

*Kalidinādigāṇitam* (?) (kar.), (Mal.), Anon., 140 gr.

Beg. dhījagnnūpuram koṇṭu kalyabdatteperukkiyāl /  
tatsamena hariccuḷḷa phalaṅṅal divasaṅṅaḷām //

Ms. 11064-A.

*Kālacakradaśānayanam* (jā), Mal. prose, Anon., 20 gr.

Ms. 3631-D.

*Kālacakradaśānirṇaya* (astrol.). Ms. L. 336-F (inc.)

Do.—C (Mal.). Ms. L. 336-F (inc.).

*Kāladīpa* (astrol.), by Vāsudevasvāmi.

Beg. vande'mbujaprabhākṣam mābhūbhyām cārutaram yutam /  
lasannāge'sucan saktam amlānam kṣaravarjitam //

Mss. L. 1379-C, D ; *Mad.* R. 5158 (b). Ref. *Va.* III. 392-94.

Do.—C. by Śyāmalavāraṇarāja, a prince.

Mss. L. 1379-C ; *Mad.* R. 5158 (b). Ref. *Va.* III. 392-93,

**Kaladīpaka I** (muh.), by Śaṅkaran of Nampūtiri of Mahiṣamaṅgalam.

I : shorter version (Mal. title : *Ceṛiya Kālādīpakam*).

Mss. See *Ker. Mal.*, pp. 29-31.

Do.—C I (Mal.), Anon. Mss. 151-C, 935-D, 19842-B.

Do.—C II (Mal.), Anon., 850 gr. Ms. 3630-C.

**Kaladīpaka II** (muh.), by Śaṅkaran of Nampūtiri of Mahiṣamaṅgalam : II. Longer version (Mal. title : *Valiya Kālādīpakam*).

Mss. See *Ker. Mal.*, pp. 31-32. Edn. With auto-com, See below.

Do.—C *Bālasaṅkaram* (Mal.), by the author himself.

Mss. See *Ker. Mal.*, p. 32. Edn. *Sri Vanchi Setu Lakshmi Series*, Nos. 6, 13, 15, Trivandrum.

**Kaladīpikā** (astrol.), Anon.

Ms. Vaṭavarkkoṭṭu Mana, Venkitangu, List I, 14.

Do.—C (Mal.), Anon. Ms. Vaṭavarkkoṭṭu Mana, Venkitangu, List I, 14.

**Kalaprakāśikā** (astrol.), (Mal.), Anon., pupil of Pūrṇaprabodha ;  
2 pts., 340 gr.

Beg. arkabimbamakame vasiccukoṭṭ ittrilokamatil ātmatejasā /  
satkriyādyakhilakālabodhadam cakrapāṇiye vaṇaṇṇiṭunnu ṅān //  
Pūrṇaprabodha-mukhasadguṇa-madgurūṇām  
pūrṇaprasāda-paramāśrayavaibhavena / ... ... /  
bālaprabodhamatiṇāy adhunā Muhūrta-  
Kālaprakāśika curukkiyatāy camappān //

Mss. 12686-E ; Pāliyam List, 621.

**Kalārpaṇam** : See *Laghukālārpaṇam*.

**Kujādīpaṅcagraha-mahāvākya** or **Samudravākya** (kar.), (Ker. ?)  
2075 mnemonic sentences of the cyclic tables of planets,  
Anon. 750 gr.

Mss. See Intro., pp. v-vi of *Vākya-karaṇa*, ed. T. S. Kuppanna Sastri and K.V. Sarma, K. S. R. Inst., Madras, 1962 ; L. 893-A, T. 510 ; Edn. *Ibid.*, App. III, pp. 135-249. Ref. For their application in the computation of true planets, see *ibid.*, Intro., pp. xvii-xx ; 258-60.

*Kujadisphutaṅṅitam* (kar.), (Mal.). Ms. 151-D.

*Kujadisphutasamskārah* (kar.), Anon. Ms. 14039-A.

Do.—C (Mal.), Anon. Ms. 14039-A.

*Kuṭṭākārādigaṅṅita* (math.), Anon., 350 gr.

Beg. atha kuṭṭākārādikriyām āha.

Ms. 14076-D, L. 1337-B.

**Kumāra-gaṅṅaka**, (14th-15th cent.), a protege of Devasarmā, br. of Govinda, possibly of the royal brāhman family of Ampalappuzha.

—*Raṅṅadīpikā*.

Ref. See above, p. 50, § 20 ; Ul. II. 112-13 ; Va. II. 725-29.

*Kṛṣṅicakraṅṅal* (nat. astrol.), (Mal.), Anon.

Ms. 10856-G (with diagrams).

**Kṛṣṅa I** or **Kṛṣṅācārya**, (c. 1200), an early and highly popular author q. by Govinda Bhaṭṭa (1237-95).

—*Cintajñāna* or *Kṛṣṅīya*

—C *Kṛṣṅīya* on *Horā*

Ref. See above, p. 47, § 12 ; Ul. I. 169-70.

**Kṛṣṅa II**, (diff. from Kṛṣṅadāsa, below).

—C (Mal.) on *Āryabhaṭṭīya*

Ref. See above, p. 70, § 53.

**Kṛṣṅadāsa** (Kṛṣṅan Āsān or Koccu-Kṛṣṅan Āsān), (1756-1812), of Neṭumpayil house near Tiruvalla.

—*Kaṅṅakkuśāstra* (Mal.)

—*Pañcabodha VIII* (Mal.)

C (Mal.), *Daśagītisūtram-bhāṣā* on *Āryabhaṭṭīya*, *Gītikā-pāda*.

—C (Mal.), *Bhaṣājātakapaddhati* on the *Jātakapaddhati* of Parameśvara

Ref. See above, p. 74-75, § 65 ; Ul. III. 519-27 ; Ul. Sup. 647-48 ;

Intro. to the edn. of *Bhāṣā-jātakapaddhati*.

**Kṛṣṅan Āsān** : See Kṛṣṅadāsa.

**Kṛṣṇa-śiṣya**, (c. 1200).

—*Praśnaphalaprāptikālanṛṇaya*

—C on *Hora*

Ref. See above, pp. 47-48, § 13.

**Kṛṣṇīya** or *Cintājñāna* (astrol.) : See *Cintājñāna*.

**Keralajyotiṣa** (astrol.), by Acyuta I : See under *Devakerala*.

**Kerala-dvādaśabhāvaphalam** I (astrol.), Anon., (Ker. ?), in verse.

Beg. lagnādhipo vā jīvo vā śukro vā yadi kendragah /  
tasya putrasya dirghāyur dhanavān rājavallabhaḥ //

Ms. 4853-B (inc., only 10 of the 11 sns.).

**Kerala-dvādaśabhāvaphalam** II (astrol.), (Ker.?), Anon., in prose,  
apparently a prose redaction of the above work. Ms. 4854.

**Kerala-dvādaśabhāvavākyaṇi** (astrol.), (Ker. ?) by Vararuci, 12 chs.,  
in prose, 150 gr.

Beg. Kerala-dvādaśabhāvavākyaṇi likhyante. dehasthānādhipaḥ  
ṣaṣṭāṣṭama-vyaya-sthānādhipaś cet dehasaukhyam bhavati.

Col. Iti Keraliya-Vararucivākyaḥ ... .. dvādaśodhyāyaḥ. Kerala-  
Vararuci-prokta-Bhāvaphalam.

Ms. 4853-A. Ref. Ul. Sup. I. 228.

**Kerala-Nāḍigrantha** (astrol.), by Keralācārya. Men. Va. IV. 255.

**Keralanirṇaya** or *Jātakarahasya* : See under *Vararuci-kerala*.

**Kerala-Praśnasāra** (pra.) by Keralācārya.

Men. Va. IV. 255.

**Kerala-rahasya** by Acyuta I : See *Devakerala*.

**Kerala-saṃhitā** (nat. astrol.), by Keralācārya.

Men. Va. IV. 255.

**Keralācārya**, (12 cent. ?), of the Kāśyapa gotra, native of Trichur ;  
said to be an authority on Jyotiṣa and Āyurveda and minister of  
the Kerala king Rāma Varmā (?). Or, is he only an apocryphal  
author ?

**Keralācārya (cont.)**

- Kerala-nāḍīgrantha*
- Kerala-Praśnsāra*
- Keralīya-Praśnamārga*
- Keralasamhitā*

Ref. See above, pp. 46-47, § 10 ; Ul. I.164 ; Va. IV. 255-56.

**Keralīya-dvija, real name not known.**

—C (Mal.) on *Karaṇottama* of Acyuta Piṣāraṭi.

Ref. See above, p. 70, § 54.

***Keralīya-Praśnamārga* (pra.), by Keralācārya.**

Men. Va. IV. 255.

**Koccu-Kṛṣṇan Āśān :** See Kṛṣṇadāsa.

***Kriyākramakarī*, names of two commentaries, both by Nārāyaṇa, on the *Līlāvātī* of Bhāskara II.**

***Kriyāsaṅgraha* I (kar.), Anon., in six sns., on the computation of *śraddha*, *sthālipāka*, *kalyabdādi*, *cakrārtha*, *chāyā* and *grahaṇa*, 300 gr.**

Beg. śraddhāpurassaram natvā grahān api gaṇeśvaram /  
śraddhacandrādigaṇana-Kriyāsaṅgraha ucyate //

Mss. C. 621-D, C. 2470-D. Ref. Va. II. 685-86.

**Do.—C I, *Kriyāsaṅgrahakriyāmārga*, Anon., 1650 gr.**

Beg. gurudhyānena sambandhabṛdayāmburuham mayā /  
Kriyāsaṅgraha-samproktam kriyāmārgam vilikhyate //

Mss. 1093, 12804-B, T. 139, T. 140-A.

**Do.—C II (Mal.), Anon. Ms. 844-D.**

***Kriyāsaṅgraha* (?) II (kar.), (Mal.), Anon.**

Beg. candrārkayoge nālañcu patinonniha pattapi /  
rāśi vannāl annu cintyam lāṭavaidhṛtadoṣakau //

Ms. T. 140-B (inc., 500 gr.).

**[*Kṣudrapraśna* (pra. )]**

—C (Mal.), Anon., 70 gr. Ms. 10512-C-3.

***Khaṇḍajyādi* (kar.), miscellaneous sine tables etc., Anon.**

Ms. L. 1242-B (120 gr.).

*Khaṇḍadhruvādyānayanam* (kar.).

Ms. C. 2197-K, L. 1221-C (70 gr.),

*Khaṇḍadhruvānayanam* I (?) (kar.), (Mal.), Anon.

Beg. ini dṛkkile khaṇḍavam dhruvavum uṇṭakkum prakāratte collunnṁ.

Ms. L. 1221-C-1 (18 gr.)

*Khaṇḍadhruvānayanam* II (?) (kar.), (Mal.), Anon., 45 gr.

Beg. iṣṭadivasatte kali vaccu amitayavotsuka ennu vāññi ...

Ms. C. 2197.

*Gānakriyādi* (?) (kar.), (Mal. verse), Anon. Ms. CM 530-D.

*Gaṇita* : See also under *Grahagaṇita*, *Grahaṇagaṇita*, *Candracchāyāgaṇita*, *Chāyāgaṇita*, *Vyatīpātādiḡaṇita* etc.

*Gaṇita* I (?) (kar.), Anon., Misc. calculations and tables.

Ms. 333-B (200 gr.).

*Gaṇita* II (?) (kar.), misc. calculations and tables. Ms. 1170-B (200 gr.)

*Gaṇitakrama*, (kar.), Anon. Mss. Cranganore Palace, 65, 177.

*Gaṇitakriyā* (?) (kar.), Anon., misc. computations; epoch A.D. 1527.

Beg. 'dhīpatirnaḷatuly'onam śivadūtāhatam dinam.

Ms. C. 531-C (inc., with C, 500 gr.). C. 1954-I (inc., 210 gr.).

Rem. Some of the procedures have been adapted from the *Veṅvāroha* of Mādhava.

Do.—C (Mal.), Anon. Ms. C. 531-C (inc., 500 gr. with text).

*Gaṇitagrantha* I (kar.), by Panakkāṭ or Iṭakkāṭ Nampūtiri, A.D.

1671. Mss. Not identified. Ref. Ul. III. 88 ; Va. III. 401:

*Gaṇitagrantha* II (kar.), by Putumana Somayāji (?)

Beg. madiyahṛdayākāśe cidānandamayo guruḥ /  
udetu satatam samyag ajñānatimirāruṇaḥ //

pātonāt svamṛdusphuṭād bhujagaṇaḥ kṣiptāntyayā taḷḷitaḥ

Ms. Mad. R. 5151 (c).

*Gaṇitagrantha* II—C. Anon.

**End :** asyārthaḥ—kujasya dve kale madhyama-bimba-kalāmānam /  
 budhasya tisraḥ kalāḥ / guros sārdbās tisraḥ / śukrasya  
 catasraḥ kalāḥ / śaneḥ dve kale, daśa vikalās ca hi (?) /  
 tā vyāsārdhahatāḥ svacaturdha-karṇahṛtād bhaumādinām  
 sphuṭabimba-kalāmānāni syuḥ //

Ms. Mad. R. 5151 (c).

*Gaṇitadarpaṇa*, (*?* *Siddhāntadarpaṇa*) (siddhānta), by Nīlakaṇṭha  
 Somayāji, 45 gr.

Ms. *List of mss. collected by the Curator for the Pub. of Skt.  
 mss., Trivandrum, App. to the Annual Adm. Rep of the  
 Travancore State, M.E. 1104, no. 75.*

*Gaṇitanūl* (arith.), (Old Mal.), Anon.

**Beg.** Maṇi nī keḷ pūmitoyavāyuvākāśam ennum  
 maṇitikeḷanattamāti arimporuḷakinnu /  
 tuṇayillātoruvan tanne tozhutu nīn  
 talanīrkkonṭa Gaṇitanūl atineconnān //

Ms. CM. 566-A. Rem. This work is related to *Kaṇakatikāram*,  
 textually.

*Gaṇitanyāyasaṅgraha* : See *Yūktibhāṣā*.

*Gaṇitam Bhāṣā* I (astron.), (Mal.), Anon., 500 gr.

**Beg.** Gīrnaḥ śreyah ... ..

**End** divasāgararatnāni deśāntaravilīptikāḥ /  
 ādityacandrātuṅgānam vikalādi puroktavat //  
 Gaṇitabhāṣā samāptā.

Ms. 935-C.

*Gaṇitam Bhāṣā* II (astrol.), (Mal.), Anon.

**Beg.** sāyanārkaneyenṇunna prakāram atha collinen /  
 antikkekku gaṇikkenam śrāddham samśayamākilo //

Ms. 12367-C.

Do. III : Mss. 1416-E (verse, inc., 450 gr.)

Do. IV : ,, 5076-B (mixed, inc., 4800 gr.)

Do. V : ,, 5109-B (prose, inc., 80 gr.)

Do. VI : ,, 5815 (mixed, inc., 400 gr.)

Do. VII : ,, 5820-B (mixed, inc., 240 gr.)

*Gaṇitam Bhaṣā* (contd )

- Do. VIII : ,, 12367-C (mixed, inc., 225 gr.)  
 Do. IX : ,, T. 149 (mixed, inc., 1000 gr.)  
 Do. X : ,, T. 251-A (mixed, inc., 230 gr.)  
 Do. XI : ,, T. 897 (mixed, inc., 700 gr.)  
 Do. XII : ,, PM. 4345-B (mixed, inc., 19 gr.)

On the above See *Ker. Mal.*, pp. 47-48.

Do. XII (kar.), Anon. ; epoch : Kali 16,89,131, A.D. 1523.

Beg. 'paulastyādhirhitāy'onita-kalidivase prastragorājyabhakte  
 etc. ; dhanyā ramā sā etc. ; koḷambam taraḷāṅgāḍhyam etc.

Ms. PM. 4043-B.

*Gaṇita-yuktayah* (astron. rationale). by a Bhāradvāja brāhman.

Beg. viditvāryabhaṭaprokta-golatattvena kenacit /  
 Bhāradvājena tanyante kaścid gaṇitayuktayah //

Mss. 755 ; Mad. Mal. D 339, pp. 83-89 ; Crangannore Palace,  
 no. 242.

*Gaṇita-yukti* (math.-astron. rationale).

Beg. vande gaṇdatatasravanmadadhuni etc.  
 gurupādāmbujam natvā dhyātvā sāmbaśivam mayā /  
 likhyate gaṇitam kṛtsnam grahagatyupayogi yat //

Ms. Mad. R. 4382. Ref. For Mal. version, see *Yuktibhaṣā* ;  
 Ul. III. 440 ; Ul. Sup. I. 616.

*Gaṇitavakyani* (kar.), Anon. Ms. L. 893-A.

*Gaṇitasāgraha* : Alt. title for Pt. I of *Jyotiṣśāstrasāgraha* of  
 Azhvāñceri Tamprākkaḷ.

*Gaṇitasāra* I (kar.), (Mal.), Anon.

End. of Ch. I : tekkum kollattu vāṇijyā agnindhram tiruvallabhe /  
 ...tatra tatra tu keṭṭiṭṭu pūrvācāryoktam ācaret //

Ms. PM. 4158-A.

*Gaṇitasāra* II or *Pañcabodha-Gaṇitasāra* ( kar. ), ( Mal. ), by  
 Śāṅkaran Nampūtiri of Mahiṣamaṅgalam, in 8 chs., 1550 gr.

Mss. See *Ker. Mal.*, p. 48. Men. Ul. II. 472.



*Gaṇitasūcikā*, by Govinda Bhaṭṭa (?), in 6 chs.

Ms. Q by Va., but said to be missing ; possibly a fictitious work.

Men. Va. I. 530, III. 390.

*Garbhalakṣaṇam* (astrol.), (Skt.-Mal.), Anon.

Beg. ini ippoḷ garbham unṭo ennarivān collunnu. lagnārūḍhañ-  
ñalil tān etc.

Ms. C. 565-E.

*Gīrnaḥ śreyādi-Candavākyāni* or *Vararuci-vākyam* (Moon mnemonic table) by Vararuci I.

Mss. See *Ker.* I. 212-14 (*Candravākyam*). Edn. *Candavākyas* of Vararuci, Adyar, 1948 ; App. II, pp. 125-34 to the edn. of *Vākyakaraṇa*, Madras, 1962.

*Guṇakārādīpramāṇa* (kar.), (Mal., prose), Anon. Ms. 4124-B.

*Gurumandadijyaḥ* (kar.), (Mal). Ms. 13445-B.

Goda Varmā. Ref. See above, p. 78, § 75.

*Goladīpikā* I (spherics), by Parameśvara of Vaṭaśreṇi, A.D. 1443, 4 chs., 300 gr.

Beg. vande kiśoram pārvatyā ankasaṁstham gajānanam /  
stanyapānaratam kalpadrumasyādho viṇāyakam //

Mss. See Intro., p. 9, to edn. ; Mad. Ed. with auto-com. and Tr., by K.V. Sarma, Adyar Library, Madras, 1957.

Do.—C *Vivṛti* by the author himself. Mss. See Intro, p. 10, to edn. ; Mad. Edn. K.V. Sarma, Adyar Library, Madras, 1957.

Ref. Va. IV. 223-24.

*Goladīpikā* II (spherics), by Parameśvara of Vaṭaśreṇi, 302 āryā verses in one sequence.

Beg. vighneśvaram vāgdevim gurūn diṇśādikān grahān /  
vaksye bhūgolam asmaī kṣoṇimānādikam ca laghumataye //

Mss. See Intro. to edn. Edn. *TSS* 49. Ref. *Ul.* II. 322-23, where it is wrongly described as the work of Acyuta Piṣāraṭi.

*Goladīpikā* III, (spherics), by Parameśvara of Vaṭasreṇi. A highly expanded version of *Goladīpikā* II. Ms. IO 6297.

*Golavṛda* (spherics) by Mēdhava of Saṅgamagrāma.

Ms. Elaṅkunnappuzha Kovilakam List, 20. Ref. On the loss of this ms., see note by K. V. Sarma, *Mathrubhumi Weekly*, (Mal., Kozhikode), 17.6.1956, p. 4.

*Golasamsthānam* (spherics), Mal. verse, Anon.

Beg. ādityāstamayodayaṅṅaṅil vidhau śṅgonnatikkarkkanum / candran pāmpoṭu kālalagnavum uṭan vacciṭṭu rāṣitrayam //

Ms. PM. 4186-B (100 gr.).

*Golasāra* (spherics), by Nīlakaṅṭha Somayāji, in 3 sns., 56 verses.

Mss. See Intro., pp. viii-xi to edn.; Mad. Edn. and Tr. by K.V. Sarma, V.V.R.Inst., Hoshiarpur, 1970.

[*Golādhyāya* (astron.), of Bhāskara II]

—C by Vidvān Iḷaya Tampurān of Koṭuṅṅallūr.

Men. Ul. IV. 34; Va. IV. 318; RNP IV. 400.

Do.—C *Jyotiṣaprakāśanam*, by Rājarāja Varmā Koyittampurān.

Ms. C. 719.

*Govindakṛti* (astron.), by Govindasvāmin.

Rem. Known through qns. in the works of Śāṅkaranārāyaṇa (C on *Laghubhāskariya*, under II.3, IV. 9, VIII. 18), Nīlakaṅṭha Somayāji (*Āryabhaṭīya-bhāṣya*, *Gaṇita*. 4, 33) and Nārāyaṇa (C *Kriyākramakarī* on *Līlavatī*, I. *Trairāśika*, 3 etc.

**Govinda Bhaṭṭa**

—*Gaṇitasūcikā*.

Men. Va. I. 530, III. 390.

**Govinda Bhaṭṭatiri** of Talakkuḷam, (1237-95).

—C *Daśādhyāyī* on *Horā*

—*Muhūrtapadavī* I

—*Muhūrtaratna*

Ref. See above, p. 49, § 17; Raja, 132-33; Ul. I. 167-69; Va. I. 353-59, II. 499-500; Koṭṭārattil Śāṅkuṅṅi, *Aitihyamala*, Pt. I, (6th edn., Trichur, 1961), pp. 99-108.

*Govindapaddhati* (astrol.), by Govindasvāmin.

Ref. by Nilakaṇṭha Somayāji in his *Grahaṇḍigrantha*, ms., p. 44 ; Raja, 127.

Govinda Piṣārati of Kailāsapuram house, in Vaikkom, teacher of the anon. com. on Parameśvara's *Jātakapaddhati*.

Ref. See above, p. 70, § 55.

Govindamaṅgalam Nampi, (15th-16th cent.), teacher of Mādhava of Īncakkāzhvā (au. of *Prāśnasāra* I).

Govinda-śiṣya, real name not known ; native of Vaikkom.

—C on the *Jātakapaddhati* of Parameśvara I.

Ref. Ul. III. 89-90 ; Ul. Sup. I. 464 ; Va. III. 382-83.

Govindasvāmin, (c. 800-850), teacher of Śāṅkaranārāyaṇa who was court-astronomer of King Ravi Varmā at Mahodayapuram, the then capital of Kerala.

—*Govindakṛti*

—*Govindapaddhati*

—C *Prakaṭārtha* or *Sampradāyapradīpikā* on *Parāsarahora*

—C *Bhāṣya* on the *Mahābhāskarīya* of Bhāskara I

Ref. See above, pp. 14-15 ; 44-45, § 6 ; T.S.K. Sastri, Intro., pp. xlvi-l of his edn. of the *Mahābhāskarīya*, (Madras, 1957) ; Raja, 127-28 ; Ul. II. 96-97.

*Gauliśāstram* (nat. astrol.), (Mal.), by Rāma Vāriyar of Kaikkulangara. Ref. See above, p. 80, § 81.

*Graha-karmasaṅgraha* (astron.), Anon., 60 gr.

Beg. golam jyotirmayam natvā graṇthair pūrvakṛtair api /  
karomi bālabodhārtham Saṅgraham Graha-karmaṇām //

Mss. 1025, 1050.

Do.—C, Anon., 300 gr. Ms. 1050.

*Grahagaṇitam* (?) I (kar.), (Mal. verse), Anon Ms. 13034 (80 gr.)

Do. II : Ms. 13057-B (verse, 200 gr.)

Do. III : „ 13073-C (with Mal. C, 75 gr.)

Do. IV : „ 13136-D (verse, 40 gr.)

Do. V : „ 13149-J (verse, 95 gr.)

Do. VI : „ 13194-C (verse, 350 gr.)

Do. VII : „ 13294-V (mixed, 100 gr.)

Do. VIII : „ C. 555-A (verse, 500 gr.)

Do. IX : „ L. 336-A (verse, 500 gr.)

*Grahacakralkhanavidhi* (astron), Anon. Ms. 12999-S.

*Grahacāra* I (kar.), Tables for the day-to-day reading of the planets.

Ms. 1100. Rem. For the years A D. 1845-55.

*Grahacāra* II (kar.), Tables for the day-to-day reading of the planets.

Ms. P. 873 (inc., 2000 gr.).

*Grahacāra* : See also *Agaṇita-grahacāra*, *Pañcāṅga*.

*Grahacāranibandhanam* (kar.), by Haridatta ; the source-book of the Parahita system of Kerala, 3 sns., 150 gr.

Mss. See Intro., pp: x-xii, to the edn. of the work. Edn. K.V. Sarma, K.S.R. Institute, Madras, 1954.

*Grahacāranibandhana-saṅgraha* (kar.), Anon. Ms. See Intro., p. xii, to the edn. above. Edn. K. V. Sarma, as App. to the edn. above.

*Grahacārāphalam* (astrol.), Anon., being a summary of the *Gocārādhyāya* of the *Bṛhatsamhita*.

Beg. Varāhamihireṇoktam Samhitāyām savistaram /  
Grahacārāphalam yat tat saṅkṣipyātha mayocyate //  
āyāso vibhavakṣayo'dhvagamanam ...

Mss. C. 2259 C, D.

Do.—C I (Mal.), Anon.

Beg. janmattil sūryan— āyāsam, vibhavakṣayam, sañcāram.  
rogapīḍā.

Ms. C. 2259-C.

Do.—C II (Mal.), Anon. Ms. C. 2259-D.

*Grahacārāphalādinirūpaṇam* (astrol.), Anon. Ms. 865-A.

Do.—C (Mal.), Anon. Ms. 865-A.

*Grahaṇa* (ecl.), (Mal.) Readings of a solar eclipse in A.D. 1687.

Beg. (8)63-ām āṅṭu tulāmāsam 24-ām tīyati sūryagrahaṇam.  
'dānto naḷo vai sevyah' ka(li).

Ms. CM. 595-I (40 gr.).

*Grahaṇagaṇita* I (ecl.), by Putumana Somayāji (?), in 16 verses.

**Beg.** madiyahṛdayākāśe cidānandamayo guruḥ /  
udetu satatam samyag ajñānatimirāruṇaḥ || 1 ||  
sūryendvor grahaṇam sphuṭam gaṇayitum ... (2); sūryendū  
sagatī tamaś ca... (3).

**Ms.** With K.V. Sarma. This work incorporates into it *Graha-  
ṇaṣṭaka* II. The two works seem to be by the same author,  
who might be Putumana Somayāji, as inferred on the basis  
of his characteristic initial verse *madiyahṛdayākāśe* etc.

**Do.—C** (Mal.), Anon.

**Beg.** madiyahṛdayākāśa iti. iprakāram guruvine prārthiṅciṭṭu  
sūryendukkaḷuṭe grahaṇatte aṛivān collunnū...

**Ms.** With K.V. Sarma.

*Grahaṇagaṇita* II (ecl.), Anon.

**Beg.** mārtāṇḍasyoparāgam... (1); kṛtvā liptāsu bhedaṃ... (2)

**Ms.** With K.V. Sarma.

*Grahaṇagaṇita* III (ecl.), Anon.; an improvement on Acyuta  
Piṣāraṭi's *Uparāgakriyākrama* in 14 verses.

**Beg.** sūryendvor auparāgam gaṇanam abhinavam procyate 'tr-  
Ācyutoktāt / parvānte'rkendutuṅgād... (1).

**Ms.** With K.V. Sarma.

**Do.—C** (Mal.), Anon.

**Beg.** sūryendvor iti. ādityaṅṭeyum candraṅṭeyum grahaṇatte sam-  
bandhiccuḷla gaṇanam apūrvam āyiṭṭu onnu collapṭeṭunnū.

**Ms.** With K.V. Sarma.

*Grahaṇagaṇita* (?) IV (ecl.), Anon., in 12 verses.

**Beg.** parvānte punar ūhite... (1); vyarkendvor bhujā... (2).

**Col.** iti Grahaṇakhaṇḍaḥ.

**Ms.** With K.V. Sarma.

*Grahaṇagaṇita* V (ecl.), Anon., in 10 verses.

**Beg.** pātārkaikya ... (1); vyarkendvor bhujā ... (2); ākṣam  
sundara ... (3).

**Ms.** With K.V. Sarma.

*Grahaṇagaṇita* VI (ecl.), Anon., 280 gr. ; epoch, Kali 1629048, A.D. 1359.

Beg. 'daivajñādhiṣṭhitārko'na-dyugaṇam sthānigokharaiḥ ...

Ms. L. 1329-B.

*Grahaṇagaṇita* VII (ecl.), Anon. Au. same as for *Grahaṇopadeśa*, below.

Beg. māyāparvantanaḍivivararahitanighnāḥ dharānāgabhaktāḥ...

Mss. 1005-E, 12367-B.

Do.—C (Mal.), Anon.

Beg. itin poruḷ grahaṇadivasattinnāḷe udayattinnu...

Mss. 1005-E, 12367-B.

*Grahaṇagaṇita* VIII (ecl.), (Mal.), Anon.

Beg. kalyabdād giriśātmabhūvininatād ā candravāroditāt.

Ms. 1187-A (cata. *Grahaṇādigaṇita*) ; Mad. D. 339 (pp. 11 ff.)

Do.—C (Mal.), Anon. Ms. 1187-A ; Mad. Mal. D. 339 (pp. 11 ff.)

*Grahaṇagaṇita* IX (ecl.), Anon.

Ms. 13294-D.

Do.—C (Mal.), Anon., 200 gr. Ms. 13294-D.

*Grahaṇagaṇita* X (ecl.), Mal. verse, Anon.

Beg. grahaṇam tanne eṇṇēṇṇil collunnuṇṇu curukki ṅān /  
rāhuketukkaḷoṭarkkan patimūnnatha tīyati //

Ms. PM. 4327-E (165 gr.)

*Grahaṇanirḥaya* (ecl.), by Nilakaṇṭha Somayāji.

Ref. Q by the author himself in his *Āryabhaṭīya-bhāṣya*, (TSS 185, p. 102) and by others.

*Grahaṇanyāyadīpikā* (rationale of eclipses), by Parameśvara of Vaṭasreni, in 85 verses.

Mss. 762-G ; M. S. Srinivasa Sastri, Palghat. Edn. and Tr. by K.V. Sarma, Hoshiarpur, 1966. Ref. Ul. Sup. I. 209-10.

*Grahaṇaphaladi* (astrol.), (Skt.-Mal.), Anon. Ms. 6914-B.

*Grahaṇamaṇḍanam* (ecl.), by Parameśvara of Vaṭaśreṇi, in two versions, of 89 and 100 verses (with two addl. verses), respectively.

Ms. 339-D, 788-B, C. 166-D, CM. 333-C, L. 1248-F; with K.V. Sarma. Edn. and Tr. by K.V. Sarma, Hoshiarpur, 1965. Ref. Ul. Sup. I. 207-8.

*Grahaṇādigaṇita* I (ecl.), Anon.

Beg. setau gām vāturāje...

Ms. 1085-C (inc., 150 gr.)

*Grahaṇādigaṇita* II (ecl.), Anon.

Beg. pātāsanne kharāṁśau yadi divasaṁśor drśā pūrṇavasāne.

Ms. 1092-F.

*Grahaṇādigaṇita* III (ecl.), Anon.

Mss. 12687-C (inc., 450 gr.), C. 472.

*Grahaṇādigrantha* (?) (ecl.), by Nilakaṇṭha Somayāji, an elaborate exposition of the tradition and rationale of eclipse computation and certain allied topics.

Ms. P. 975, latter portion; transcript with K.V. Sarma.

*Grahaṇādiphalam* (astrol.), Anon. Ms. 6914-B.

Do.—C (Mal.), Anon. Ms. 6914-B.

*Grahaṇāṣṭaka* I (ecl.), by Parameśvara of Vaṭaśreṇi.

Beg. bhāsvattuṅgau prasiddhau...

Mss. 475-K, C. 166-E, L. 1248-B-1, T. 179-B; Vayaskara Illam, Kottayam, No. 339-C; Eḷamprakkoṭṭu Mana, Eravoor, Trippunithura. Edn. and Tr. by K.V. Sarma, K.S.R. Inst., Madras, 1959.

*Grahaṇāṣṭaka* II (ecl.), by Putumana Somayāji (?), 25 gr.

Beg. sūryendvor grahaṇam sphuṭam gaṇayitum vakśymy upāyam laghum ...

Mss. 1005-B, 5113-F, L. 1248-B-1. Rem. Authorship suggested on the basis of *Grahaṇagaṇita* I, which incorporates this work and has the characteristic initial verse of the Somayāji.

Do.—C (Mal.), Anon. Ms. 1005-B (inc., 120 gr.)

*Grahaṇaṣṭaka* III (ecl.), Anon., 25 gr., epoch, A.D. 1538. Exposition of a new method of Nīlakaṇṭha Somayāji.

**Beg.** kaṭākṣamālā yasyā hi kāmādāpi madhudviṣaḥ /  
padmakiñjilkavarṇām tām namāmi kamalālayām //  
mātaṅgavadanam natvā vāgdevim ca gurūn grahān /  
'Somasut'-sūtritāpūrvapakriyām vivṛṇomy aham //

**Ms.** 8358-H.

*Grahaṇaṣṭaka* IV (ecl.), unidentified.

**Mss.** C. 555-A, T. 323 (a few pages therein).

**Do.**—C I (Mal.), Anon. **Mss.** C. 555-A, T. 323 (a few pages therein).

*Grahaṇopadeśa* (ecl.), Anon., in 8 verses.

**Beg.** kāryas sūryendu... (1); māyāparvānta... (2); grāsam  
teṣviṣṭa ... (3).

**Ms.** With K.V. Sarma. **Rem. Au.** same as for *Grahaṇagaṇita*  
VII (?)

**Do.**—C II (Mal.), Anon.

**Beg.** grahaṇopadesattinnu collunnū— kāryas sūryendu iti.  
sūryagrahaṇam gaṇippān...

**Ms.** With K. V. Sarma. **Note.** Refers to an unidentified *Kriyā-*  
*krama*.

*Grahapañcadaśāphalam* (astrol.), Anon. **Ms.** P. 875.

*Grahaṇaparīkṣākrama* (astron.), by Nīlakaṇṭha Somayāji. Practical directions for scanning the skies and computing the planets.

**Beg.** Gargādismṛtanakṣatṛakṣepayogakalāgatam...

**End :** iti saṅkṣepataḥ proktam parīkṣā jyotiṣām iha /  
kālamānacatuṣkasya śrutasya vivṛtis tv iyam //

**Edn.** Q. in full in the au.'s *Aryabhaṭīyabhāṣya*, under Gola. 48,  
(TSS 185, pp. 132-49).

**Do.**—C. (Mal.), Anon.

**Beg.** bhagaṇaparidhyādikaḷakunna avattinnu oro ācāryanmār  
ororiṭattu oro prakāram collikkiṭakkunnu.

**Ms.** With K. V. Sarma. **Edn.**, in an adapted form, by P. S.  
Purushottaman Namputiri, Astr. Res. Inst., Bombay 25,  
1950.



*Grahabalādyānanayanam* (āstrol.), (Mal. prose), Anon. Ms. L. 765-B.

*Grahabhāvaphala* (?) (āstrol.), (Mal. verse), Anon.

Beg. pittam jvaram śirasi...muṇivum cirañnum /  
pādakṣirogam udarasya ca raktadoṣam //  
rājāricoraripuśastracatuspadānām /  
kuṣṭham mahodaram apasmṛti sūryabhānau //

Ms. PM. 4077-A.

*Grahamadhyamānanayanam* (?) (kar.), (Mal. prose).

Beg. kali vaccu khaṇḍiccu raṇṇeṭṭattu vaccu onnine paṭu koṇṭu  
perukki...

Ms. L. 765.-B (inc., 35 gr.)

*Grahasamaya* : See *Aṅkaśāstra*.

*Grahasithiphala* I (āstrol.), Anon.

Beg. atha grahāṇam svabalābalavaśāt jātayontibhāga (?) kriyate.  
prathamam tatra ja...yājanam āha— iṣṭakaṣṭaphala etc.

Ms. CM. 565-G.

*Grahasithiphala* II (?) (āstrol.), Skt.-Mal., Anon.

Beg. bahiṣṭhasvarkṣasamstheṣu nicageṣūccageṣu vā /  
sarveṣūpacayastheṣu caturṣv ekarkṣabheṣu va //

Ms. PM. 4321-B.

*Grahasphuṭa* I (kar.), Mal. verse, Anon. Ms. T. 255.

*Grahasphuṭa* II (kar.), Skt.-Mal., Anon. Ms. 13041-C.

*Grahasphuṭaparilekhaḥ* (?) (astron.), Anon., in 6 verses.

Beg. draṣṭa kendrasthitaś ced ... (1); svocavyāsārdhavṛttam  
prathamam abhilihed ... (2)

Ms. With K.V. Sarma.

*Grahasphuṭavākyaṇi* I (?) (kar.), Anon. Ms. 3638-B (100 gr.)

*Grahasphuṭavākyaṇi* II (?) (kar.), Anon. Ms. 5809 (1000 gr.)

*Grahasphuṭānayanā* I (kar.), Mal. verse, Anon.

Beg. ādityasyodayattinum madhyāhnāntattinum tathā /

Ms. T. 255 (inc., 450 gr.)

*Grahasphuṭanayana* II (kar.), Mal., Anon.

Beg. guṇakāraḥ kulam bhānor bhājako gotragāyakaḥ /  
Ms. PM. 4331-A.

*Grahāriṣṭa* (astrol.), Anon. Ms. 13294-P.

*Grahāvasthādivicāra* (astrol.), Mal. verse, Anon. Ms. 5109-I.

*Ghaṭīgopa*, disciple of Parameśvara and devotee of God Padmanābha of Trivandrum, c. 1800.

—C on *Āryabhaṭīya* (Skt.)

—C on *Āryabhaṭīya* (Mal.), version I

—C on *Āryabhaṭīya* (Mal.), version II

Ref. See above, pp. 77-78. § 74. Ul. III. 233-34; Ul. Sup. I. 535.

*Caturasundarī* : Name of C on *Cintājñāna*.

*Candrakalānādī* (astrol.), by Acyuta : See *Devakerala*.

*Candrakriyā* (kar.), Skt.-Mal. prose, Anon. Ms. 5806-A.

*Candraganīta* (kar.), Mal. verse. Anon.

Beg. candrane sūkṣmamāyitṭu gaṇippān iha collinen /  
abargaṇatte vacciṭṭaṇṇiṣṭakalattinākkīyāl //  
tatparāntam madhyamaṇṇaḥ varuttū candratuṅgayoḥ /

Ms. PM. 4368-G (75 gr.)

*Candraganītakrama* (kar.), (Mal.), by Śaṅkaran Nampūtiri of Mahiṣamaṅgalam.

Mss. PM. 4078-A, T. 251-B. Ref. Ul. II. 473.

*Candragrahagaṇīta* (kar.), Mal. verse, Anon., 60 gr. Ms. L. 765-C.

*Candrachāyāgaṇīta* I (kar.), by Parameśvara of Vaṭaśreṇi.

Beg. himaraśmicchāyāgaṇītam vakṣye hitāya daivavidām /  
Āryabhaṭa-śāstrasiddham dṛkkarmadvitayapūrvakam //

Ms. 475-I (inc., 60 gr.)

*Candrachāyāgaṇīta* II (kar.), by Nīlakaṇṭha Sōmayāji.

Beg. sūryendutuṅgapātau ca tadānim ayanāṁśakān /  
taddeśākṣam ca nirṇīya gaṇyatām śāśinaḥ prabhā //

Mss. 475 (f. 65), 5862-B, 5867 (ff. 173-77); Mad. R. 5185-(b)  
Ref. Va. III. 391-92.

*Candracchāyagaṇita* II (contd.)

Do.—C, by the author himself.

Ms. 5862-B (copied in Mad. R. 5185-b). Ref. Va. III. 391-92.

*Candracchāyagaṇita* III (kar.), Anon.

Beg. nārṣā(?)lamūrtitvenūdye'tra tu... / arkendutuṅgapātau ca  
nitvā kuryād...

Ms. L. 1167-C (inc., with Mal. C., gr. 10).

Do.—C (Mal.), Anon.

Beg: ...kal pratipadam āyi oḷḷa pakkaññaḷe eraṭṭippatu...

Ms. L. 1167-C.

*Candracchāyagaṇita* (?) IV (kar.), Mal., Anon., 40 gr.

Beg. candracchāyakku collunen tatkālārkkane veccatil /  
ayanāmsāññaḷeccerttāl kūṭṭeṇam rāśiyāyatil //

Mss. 10647-G, PM. 4329-D.

*Candracchāyagaṇita* (?) V (kar.), Mal., Anon.

Beg. viparitacchāya veṇam candranennāññirikkilo /  
viṣamam punarennālum collinen oru jāti ñān //

Ms. L. 636-C (inc., 40 gr.)

*Candracchāyānayanopāyaḥ* (?) (astron.), Anon.

Beg. atha pāramārthikāpakramādibhir vinā candracchāyānayanane  
kañcin mārgam upadiśati—

kakhalagnapade lagnam natakālapade graham /  
akṣasthāne ca dṛkṣepam kṣepam krāntipade 'pi ca //

Mss. C. 2314 (towards the end), C. 2470 (ff. 91b-92a).

*Candranāḍi* (astrol.), by Acyuta : See *Devakerala*.*Candrabhaṣā* (kar.), Mal. verse, Anon., 50 gr.

Beg. śuddhamāyi gaṇikkeṇṭū candrārkanmāre enkilu /  
khaṇḍaśeṣam muzhuvane vaykkeṇam udayattinu //

Mss. 4079, 4158-B, 4327-B.

*Candralagnādiphala* (astrol.), Mal. prose, Anon. Ms. 13475-E.*Candravākyādi* (?) (kar.), Misc. mnemonic tables etc., Anon.

Ms. L. 1229-A (1000 gr.)

*Candrāvākyaṇi* I (kar.), by Vararuci : See *Gīrnaḥ śreyādi-Candra-vākyaṇi*.

Do. II : See *śīlam rājñaḥ śriyetyādi-Candrāvākyaṇi*.

*Candrasūryoparāgagaṇita* (ecl.), Mal, prose, Anon. Ms. 1005-B.

*Candrasphuṭagaṇana-vākya* (?) (kar.), Anon., 7 vākya.

Ref. Below in the CC of this work.

Do.—C, in 2 verses, Anon. Men. Below in the CC of the work.

Do.—CC, Anon.

Beg. 'vākyaḥ saptabhir' adimair gaṇayitum candrasphuṭam yat  
jyotiśśāstraviśāradena sudhiyā ślokadvayam proditam / <sup>purā</sup>  
vyākhyām tasya karomy avismṛtikṛte natvā gajāsyaṃ gurūn  
sūryā — — kalāspadācchadhiṣaṇām satkālavin maṅgalān //

Ms. MC. 173-A (inc., 55 gr.)

*Candrasphuṭagaṇita* (?) III (kar.), Mal., Anon.

Beg. candracūḍanamāpākantanmakan gaṇanāthane /  
caraticcu vaṇaṇniṭṭu kavimāṭineyum tathā //

Mss. 2243-C (under the title *Aharmānādigaṇitam*), (150 gr.),  
4145-A (inc., 60 gr.)

*Candrasphuṭādigaṇita* I (kar.), Mal., Anon.

Beg. candrane sūkṣmamāyitṭu gaṇippān kriya collinen /  
khaṇḍiccāl ara pokkeṇam antikkaṇṇu harikkilu //

Ms. 5811 (inc., 350 gr.)

*Candrasphuṭādigaṇita* II (kar.), Mal. prose and verse, Anon.

Beg. candrane sūkṣmamāyitṭu gaṇippān iha collinen /  
aharga[ṇatte va]ccittāṇṇiṣṭakālattinākkīyāl //

Ms. 14228-H.

*Candrasphuṭāptih* (?) (kar.), Anon., related to the *Veṅvāroha* of  
Mādhava.

Beg. śiraḥ śaś mām (?) śikhāṇiṣyandicandrikah /  
anakāraharam divyam sindhubhūṣam bhaje mahah //  
adodho kramaśotkirṇacandratattungasaṅgamāt /  
pratyaham vākyaṇavakāt sphuṭacandrāptir ucyate //

Ms. 1055-A (inc., 60 gr.)

**Citrabhānu**, (c. 1475-1550), Nampūtiri of the Gautama-gotra, from Śivapura (Covvaram), near Tirchur.

—*Karaṇāmṛta* (A.D. 1530)

Ref. See above, p. 57, § 28 ; Raja, 153-55 ; Ul. 273-75 ; Ul. Sup. I. 305-6.

**Citrabhānu-śiṣya**, (c. 1525-75)

—C II on *Jātakapaddhati*

—*Bhāvacintāvalī*

Ref. See above, p. 57, § 29 ; Ul. II. 275. Note : The maṅgala-ślokaś of *Bhāvacintāvalī* and the anon. *Pañcabodha* II, C IV, *Grahaṇāṣṭaka* III, *Praśnabhāṣa* I and *Muhūrtapadavī* II, C V exhibit close similarity as to suspect their common authorship.

**Cintājñāna** or *Kṛṣṇīya* (astrol.), by Kṛṣṇa, in 32 chs., 1500 gr.

Mss. See *Ker.*, I. 165, and *Mad.*, under *Kṛṣṇīya*. Edn. by P.S. Purushottaman Nampūtiri, with his own Mal. C, Quilon, 1106 M.E.

Do.—C, *Caturasundarī*, by Viṣṇu, 1500 gr.

Mss. See *Ker.*, I. p. 165 and *Mad.* under *Kṛṣṇīya*.

**Cozhipraśna** (pra.), Mal. prose, Anon., 305 gr. Ms L. 225.

**Chāyāgaṇanāṣṭaka** (?) (kar.), Anon.

Beg. abhyūhite candra ... (1); indūconita ... (2); pātonāc ca (3).

Ms. With K.V. Sarma.

**Chāyāgaṇita** I (kar.), Skt.-Mal., Anon., 45 gr. Ms. 931-D.

**Chāyāgaṇita** (?) II (kar.), Anon., Mal. verse.

Beg. sūryacchāya gaṇikkeṇṭil tatkālārkane veccuṭan /  
ayanāmsāññāḷ kūṭṭiṭṭu caravum krāntibāṇavum //

Ms. 5126-A (450 gr.)

**Chāyāgrahaṇagaṇita** (?) II. (kar.), Anon., prose and verse.

Beg. pāṭum piṭappum eṇṇēṇṭil collunnuṭu curukki ñān /  
iṣṭagrahayor arkan eṇunnāḷ udayattinu //

Ms. 13430-A (300 gr.)

**Chāyāṣṭaka** (kar.), by Acyuta Piṣāraṭi. Ms. P. 4116-A, in a misc. folio.

*Janmavāraphalādi* (jā.), Skt.-Mal., Anon. Ms. 4184-A.

[*Jātakakarmapaddhati*, *Jātakapaddhati* or *Śrīpatipaddhati* (jā.) by Śrīpati].

—C I, *Jātakalaṅkāra*, by Sūryadeva Yajvan.

Mss. See *Ker.*, I, 229 ; Baroda, Mad.

Do.—C II, by Parameśvara of Vaṭaśreṇi.

Mss. 665, C. 2337-C ; Ad. Mad. ; Āzhvāñceri Mana List, 167-D.

Do.—C III (Mal.), Anon.

Beg. aviṭe naṭe ācāryaṅ gurupraṇāmatte munpeṭuttu cikirṣitate  
pratiṅṅa ceyyunnū—natvā tām gurudevatām ...

Ms. C. 543-B. Ref. Ul. III. 237.

*Jātakakramam* (jā.), (Mal.), by Śaṅkaraṅ Nampūtiri of Mahiṣamaṅ-  
galam, 1500 gr.

Mss. 5129-H, C. 2173-A, C. 2216. Ref. Ul. II. 473.

*Jātakagaṅita* (jā.), Skt.-Mal., Anon. Ms. 13194-H.

*Jātakacandrikā* I (jā.), Skt.-Mal., Anon. Ms. 3634.

*Jātakacandrikā* II : Name of C by Parameśvara III, pupil of  
Śaṅkara, on *Hora*.

*Jātakacintā* (jā.), Mal. prose, Anon. Ms. 13029-C.

*Jātakanidhāna* (jā), Mal. prose, Anon. Ms. L. 327-C.

*Jātakapaddhati* (jā.), by Parameśvara of Vaṭaśreṇi, in 44 verses.

Mss. See *Ker.*, I, p. 229. Edn. *Śrī Vañchi Setu Lakshmi Series*,  
No. 2, Trivandrum, 1926. Ref. Ul. II. 103 ; Va. III. 379-  
81, where it is taken to be by a different Parameśvara.

Do.—C I *Balabodhinī* or *Balaprabodhinī*, Anon., by a native of  
Vaikkom.

Beg. vyāghragrāmeśa ... (1) ; vidyādāyyapy avidyādam... (2) ;

*Vaṭaśreṇi*tt loka 'smin prasiddhasya divijaṅmanah |

krter vilikhyate vyākhyā svalpā *Jātakapaddhateḥ* ||

Mss. 5097-B, C. 914-A, B, C. 1512-B, C.2478-E ; Āzhvāñceri  
List, 167-E. Ref. Ul. III. 89-90 ; Ul. Sup. I. 464 ; Va.  
III. 382-83.

*Jatakapaddhati* (contd.)

Do.—C II (Mal.), by a pupil of Citrabhānu, 400 gr.

Beg. natvā gaṇeśvaram vāṇim Citrabhānvādikaṅ gurūn /  
bhaktyā Jātakapaddhatyā kriyāmārgam vilikhyate //  
aviṭe naṭe — candrārkaḥ janyarkṣakayoś ca patyoḥ...

Ms. C. 543-B.

Do.—C III (Mal.), *Bhāṣājātakapaddhati*, an exposition in verse, with extra matter, by Kṛṣṇadāsa (Koccu-Kṛṣṇan Āśān).

Mss. CM. 543-B, CM. 2123-B. Edn. *Śrī Vanchi Lakshmi Series*, No. 3, Trivandrum, 1926. Ref. Ul. III. 520, 523 ; Va. III. 384-85.

Do.—C IV (Mal.), by Śrīkaṇṭha of Veḷḷārakkāḍu (?)

Col. Śvetagrāmāṭavi-saṁśrita ... Śrīkaṇṭhaḥ kaścid etat sapadi  
likhitavān pustakam devadāsaḥ //

Edn In an adapted form, under the title *Balapiṇḍavum āyur-dāyavum*, as app. to *Jātakadesa*, ed. Kanippayoor Sankaran Namputirippad, Kunnamkulam, 2nd edn., M.E. 1102.

Do.—C V (Mal.), Anon., 400 gr.

Beg. harihara-sarasiruhāsana ... (1) ; gaṇḍāntanirgalad ... (2) ;  
pañcāśadakṣara ... (3) ; Śrī-Vaṭaśreṇi-bhūdevaiḥ ... (4) ;  
aviṭe naṭe jananakālatte chāya koṇṭu tān ambuyantram  
koṇṭutān ...

Mss. 421-B, 1134-B, CM. 563-B ; Āzhvāñceri List, 167-B,  
Trippunithura Skt. Col. 804-B. Ref. Ul. III. 245-46.

Do.—C VI (Mal.), Anon., 240 gr.

Beg. perul— janmalagnasphuṭatte vaccu ayanacalanam kūṭṭiyatu...  
Ms. 5880-C.

Do.—C VII (Mal.), Anon., 180 gr.

Beg. 'kuryāt sāyanalagnataś ca' ādyapadyam, 'sandhigrahāntara-  
kālādi'padyam iti lagnasphuṭaṅṅaḥ sūkṣmamāyi varutti ...

Ms. L. 984.

Do.—C VIII (Mal.), Anon.

Beg. jananakālatte udayalagnam uṅṭakki ayanacalanam kūṭṭi  
caravum praṇakalāntaravum koṇṭu...

Mss. P. 878 ; Trippunithura Skt. Col. 804-A.

Do.—See also *Jātakakarmapaddhati*, *Laghujātakapaddhati*.

*Jatakaphalam* (jā.), Mal. verse, Anon., 500 gr.

Beg. gurukkanmāre vandiccittavarāl uktamāyatil /  
curukki *Jatakaphalam* kuṛaññonniha likhyate //  
mūrttiyum kirttiyum sthānam...

Mss. See *Ker. Mal.*, p. 60. Ref. Ul. III. 239; Ul. Sup.  
I. 537.

*Jatakabhāvaphalam* (?) (jā.), Anon., (Kar. ?).

Beg. astu trailokyadipāya bhaktābhimatadāyine /  
samastavidyānirmāṇakavaye ravaye namaḥ //  
vṛttākṣo janavallabho 'ticapalo ...

Ms. C. 267-A (1700 gr).

*Jatakamātrkā* (jā.), Skt.-Mal., Anon,

Mss. 6007-D, C. 155-A, T. 147-A.

*Jatakarahasya* or *Keralanirṇaya* by Vararuci : See *Varaurucikerala*.

*Jatakalekhanakrama* I (jā.), Mal., Anon., 400 gr.

Beg. ślokaṁ mun toṭṭanāḷ pinne rāśiyum nāmadheyavum /  
ādiyādiphuṭam sarvam bhāṣayil kalināḷ punaḥ //

Mss. 8268-E, PM. 4329-E, T. 147-B, T. 154-B-4.

*Jatakalekhanakrama* II (jā.), Mal. verse and prose, Anon.

Beg. jātakam ezhutuvānuḷḷa kramaññal collunnū. naṭe tanne  
gaṇapatikku kuṛiccu ...

Ref. Ul. III. 238.

*Jatakalekhanakrama* (?) III (jā.), Mal. verse, Anon.

Beg. iṣṭadevata vandiccāl iṣṭamām keṭṭanāḷiṭṭū /  
lagnam drekkāṇavum perum grahataḷkālāvākyavum //

Ms. PM. 4117.

*Jatakalekhanakrama* IV (jā.), Mal. verse, Anon.

Beg. taḷkālārkkane vacciṭṭu vēre muppatu tiyati /  
vaccāl atil kaḷaṇñiṭṭu arkante bhāgaliptakaḷ //

Ms. PM. 4158-H.



*Jātakasāra* I (jā.), (Skt.) by Śaṅkara of Mahiṣamaṅgalam, 485 gr.

**Beg.** vande 'ham iṣam giriḷāsametam ... (1) ; ajākhyam ādyam  
ca ... (2) ; siṁham ca kanyām ca ... (3).

**Mss.** PM. 4111-B, T. 268-C.

*Jātakasāra* II (jā.), Mal., by Śaṅkara of Mahiṣamaṅgalam, in 7 chs.

**Beg.** vande giḷiṣam giriḷāsametam ... (1) ; santatiyum kaḷatravum  
nirūpikkenṭumpoḷ ...

**Mss.** P. 882 ; PM. 4026-C ; T. 144-D (a). Ref. Ul. III. 241-42.

*Jātakasāra* III (jā.), Mal. prose, by (a diff.) Śaṅkara, in 4 chs.

**Beg.** jātakam ezhutuvām naṭe lagnam niścayiccu ...

**Ms.** C. 1205-A (950 gr.)

*Jātakasārasaṅgraha* (jā.), by Āzhvāñceri Tamprākkaḷ, in 6 khaṇḍas.  
184 verses.

**Mss.** C. 2431-D ; Ad. ; Mad.

**Do.**—C (Mal.), by the author himself.

**Ms.** L. 1217-A.

*Jātakādeśamārga* I (jā.), by Putumana Somayāji, 335 gr.

**Beg.** madiyahṛdayākāṣe... (1) ; gaṇeśādīn namaskṛtya... (2) ;  
kujenduketu... (3)

**End :** guror lagneśādāreśa... ; suteśaśaśiśukreṣu... ;

*Navālayavanākhyena dhīmatā Somayājina |*  
*kṛtam prakaraṇam hy etad daivajñajanatuṣṭaye //*

**Ms.** CM. 2197-F.

**Do.**—C I (Mal.), Anon., 1100 gr.

**Beg.** enṇāl gaṇapati tuṭaṇṇiyuḷḷavarre namaskaricciṭṭu...

**Mss.** CM. 2197-G, L. 1092- C.

**Do.** C. II (Mal.), Anon. Ms. L. 1097-A.

*Jātakādeśamārga* II (jā.), by Putumana Somayāji (?) in 16 chs.

**Beg.** madiyahṛdayākāṣe... (1) ; mūrdhāsya galaskandha.. (2) ;  
matsyau ghaṭi... (3) ; kriyatāvuru... (4) ; aruṇasita... (5)

**End.** tatra śubhāśubhayogā...

*Jatakādeśamārga* II (contd.)

Edn. By Kanippayoor Sankaran Namputirippad, 5th edn.,  
Kunnamkulam, M. E. 1125; By V. N. Sankunni Nair,  
A.R.P. Press, Kunnamkulam, M.E. 1105.

*Jatakādeśaratna* (jā.), by Nārāyaṇan Ilayatu of Maccāṭ, being an  
adaptation of the *Jatakādeśamārga* of Putumana Somayāji.

Men. By the author's grandpupil, Puruṣottama III, in his  
*Praśnāyana*, III. 19; VIII. 81. Ref. Ul. III. 529; Ul. Sup.  
I. 225,

*Jatakānītimārga* (jā.), by Āzhvāñceri Tamprākkaḷ, in 14 khaṇḍas,  
166 verses. Ms. C. 2331-A.

Do.—C (Mal.), by author himself, 1300 gr. Ms. C. 2431-B.

*Jatakābharaṇam* (jā.), by Acyuta Piśāraṭi.

Beg. mūrtitva parikalpitaḥ... (1); ṣaḍānām... (2); gurūṇām  
caraṇāmbhoja... (3); Varābahorām ālokya... (4)

Ms. C. 2139-A. Ref. Ul. II. 324.

*Jatakālāṅkāra*: Name of Sūryadeva Yajvan's C on *Jātakakarma-*  
*padḍhati*.

*Jātakodaya* or *Uḍujātakodaya* (jā.), Anon., by a Brahman  
of Veṇāḍ in S. Kerala, 103 verses.

Beg. gurūn upāsyā śāstrāṇi samāloḍyābhiyujya ca /  
niścityāvyabhicāritvam kriyate *Jātakodayaḥ* //

End. *Dvijena kenāpy Uḍu-Jātakodayam*  
kṛtam dvi-(?) *Veṇāṭikadeśajanmanā* /  
trayādhikślokaśatena nirmītam  
hitāya taj jātakasāravedinām //  
sarvoktam etc.

Mss. 1004-D. C. 1912-E, L. 1248-D, P. 883, T. 283.

*Jivānayanam* (?) (astron.), Anon, misc. composition.

Beg. nihatya cāpavargeṇa cāpam tattatphalāni ca /

Ms. 8358-C (inc., 100 gr.)

*Jivādyānayanam* (?) (astron.), Mal. verse, Anon.

Beg. anūnanūtnānanununnānityaiḥ...

Ms. 14152-C (inc., 75 gr.)

*Jyāḥ* I (astron.), mnemonic sine tables etc.

**Beg.** gaṇānām adhipas caṇḍo gajavaktravilocanaḥ /  
prito bhavatu me nityam varadātā vināyakaḥ //  
janena satyena...

**Ms.** C. 595-C (140 gr)

**Do.** II. Mss. See *Ker.*, I. p. 238 ; *Ker. Mal.*, p. 62.

*Jyākhaṇḍadyānāyana* (?) (astron.). Mal., Anon.

**Ms.** T. 323 (inc., 1910 gr.)

*Jyāgaṇita* (?) (astron.), Anon.

**Beg.** lakuṭena samabhyastā rāśicakrakalā haret /  
śalmaleti stutir labdhā tadartham tridamaurvikā //

**Ms.** L. 765-G.

**Do.**—(Mal.), Anon. Ms. L. 765-G (160 gr.)

**Jyeṣṭhadeva**, (1500-1610). of the Paraññoṭṭu family in the Ālattūr village ; pupil of Dāmodara and teacher of Acyuta Piṣāraṭi.

—*Gaṇitayukti*

—*Drkkaraṇam* (Mal.)

—*Yuktibhāṣā* (Mal.)

**Ref.** See above, pp. 59-60, § 32 ; K. V. Sarma, 'Jyeṣṭhadeva and his identification as the author of *Yuktibhāṣā*', *Adyar Lib. Bulletin*, 22 (1958) 35-40; Raja, 156-58.

*Jyeṣṭhadeva-śiṣya*, (c. 1550-1625).

—C in verse on *Tantrasaṅgraha*.

**Ref.** See above, p. 60, § 33; Raja, 158.

*Jyotiśśāstrasāṅgraha* (astron.-astrol.), by Azhvāñceri Tamprākkaḷ, in two parts : I. *Siddhāntaskandha* or *Gaṇitaskandha*, and II. *Horāskandha* (*Muhūrta*, *Jātaka* and *Praśna*).

**Mss.** CM. 6-A, L. 1179, L. 1221-A, T. 1156 : Vaṭavarkkoṭṭu Mana, Venkitangu, List II. 12-A. Note. For an exposition of the principles involved, see *Sāṅgrahasādhana-kriyā*.

**Do.**—C (Mal.), by the author himself.

**Mss.** See *Ker. Mal.*, p. 42 (under *Gaṇitasāṅgraha*) ; p. 62 ; Vaṭavarkkoṭṭu Mana, Venkitangu, List II. 12-B.

*Jyotiṣadīpamūla* (astron.-astrol.), Mal. verse, Anon. 5 chs., 750 gr.

**Beg.** gaṇapatiguruvāṇim arkacandrārasaumyaṇ  
suragurusitamandam rāhuketum vaṇaṇṇi /  
gaṇitam api muhūrttam jātakam praśnabhāgam  
lēghutaram iha collām mardadhidhāraṇāya //

**Mss.** See *Ker. Mal.*, pp. 62-63; C. 1864-C. Ref. UI. II. 228-29.

*Jyotiṣapaddhati* (astron.-astrol.), Mal. verses, Śītaṅkan tuḷḷal, Anon.

**Ms.** 10967-C.

*Jyotiṣapraśāsa* : Name of C by Rājarāja Varmā Koyittampurān  
on the *Golādhyāya* of Bhāskara II.

*Jyotiṣapradīpa* (astron.), Mal., by Rāma Varma Koyittampurān  
of Gramam.

**Ref.** UI. IV. 545.

*Jyotiṣabhāṣāccārttu* (astrol.), Mal., Anon. **Ms.** L. 1250.

*Jyotiṣabhāṣāvalī* or *Māccāttu Bhāṣā* (astron.-astrol.), Mal., by Nārā-  
yaṇan Iḷayatu of Maccāttu house. **Ref.** UI. III. 529; Va.  
IV. 221.

*Jyotiṣavākyaṇi* (mnemonic sine and other tables), Anon. **Mss.** See  
*Ker.*, I. p. 239.

[*Jyotiṣasaṅgraha* I (astrol.), Anon.]

—C (Mal.), Anon.

**Beg.** pañca prācīr ālikhed bāṇasaṅkhyāḥ  
tiryagrekhāvarjitāntāś catuṣkāḥ /  
prāgādiśā dvādaśavyomavāsāḥ  
jyotiścakrasvāminas tūbarādyāḥ //

**Ms.** Mad. D. 13765.

*Jyotiṣasaṅgraha* II (astrol.), Mal., by a pupil of Maṅgalaśreṇi-  
vipra.

**Beg.** Maṅgalaśreṇiviprendugurupādāmbujadvayam |  
vandiccittu camaykkunnen Bhāṣā-Jyotiṣasaṅgraham //

**Ms.** T. 142 (inc., 120 gr.)

*Tamprakkaḷ Bhāṣā* : Nama of the Mal. C-s of Azhvāñceri Tamprakkaḷ on his several works and on the *Muhūrtapadavī*, esp. the last.

*Tantrasaṅgraha I* (astron.), by Nīlakaṇṭha Somayāji, in 8 chs., 450 gr., A.D. 1500.

Mss. See *Ker.*, II, pp. 16-17; Ad.; Mad. Edn. TSS 188. Ref. Ul. II. 118.

Do.—C I, *Kriyākalapa*, by Śaṅkara Vāriyar of Tṛkkuṭaveli.

Beg: tatra tāvat kalyāder ārabhya yātān abdān dvādaśabhir nihatya.....

Ms. L. 1329-A (2000 gr.) Ref. See above, pp. 58-59, § 31.

Do.—C II, *Laghuvivṛti*, by Śaṅkara Vāriyar of Tṛkkuṭaveli.

Mss. See *Ker.*, II, pp. 16-17; Mad. Edn. TSS 188. Ref. Ul. II. 120-21; Va. II. 498-99.

Do.—C III, in verse, by an anon. pupil of Jyeṣṭhadeva, for chs. I-IV only; 2600 gr.

Mss. 586-E, C. 1375, L. 1302; Mad. R. 2505. Ref. Ul. II. 120; Va. II. 498.

Do.—C IV, *Laghuvyākhyā*, anon., possibly by a Tamil astronomer.

Mss. Panjab Univ. Lib., (Lahore), *Catal.*, II, p. 220, mss. nos. 3494, 3495, both in grantha script.

Do—C V (Mal.), Anon., 4300 gr.

Beg. aviṭe ācāryān ārambhippānāyikkonṭu icchikkappettirikkunna *Tantrasaṅgrahattinte...*

Mss. See *Ker.*, II, p. 17; *Ker Mal.*, p. 64.

*Tantrasaṅgraha II* (astron.), Mal. prose, Anon., Mss. 8380, T. 211-C.

*Tantrasaṅgrahat Sphuṭanirṇayabhagaṇah (?)* (astron.), Anon.

Beg. *Tantrasaṅgraha-samprokta-kalyādi-dhruvaparyayaiḥ / Sphuṭanirṇaya-samproktā bhagaṇāntir ucyate //*

Ms. With K.V. Sarma.

*Tantrasāra* (astron.), by Nārāyaṇa of Perumanam village.

Ms. With Rāma Varmā Maru Tampurān of Chalakkudi.

Ref. Raja, 153.

Do.—C (Mal.) Ms. With the text above.

*Tāmaranallūr*

—*Muhūrtam-Bhāṣā* or *Tāmaranallūr Bhāṣā*.

Ref. See above, p. 49, § 18.

*Tāmaranallūr-Bhāṣā* : See under *Muhūrtam Bhāṣā*.

*Tāmbūlapraśnādiphalam* (pra), Mal verse, Anon. Ms. L. 1187-C.

*Tāmbūladipraśna* (pra.), Mal. prose, Anon. Ms. 3383-H.

*Tithinakṣatrādiphalam* (astrol.), Mal. prose, Anon. Ms. L. 247.

*Tithinirṇaya* (astron.), Mal. verse, Anon. Ms. L. 336-B

**Tuppan Nampūtiri**, (c. 1725-1800), of Itavattikkattu family in Central Kerala.

—*Muhūrtapadavī* VI

Ref. See above, pp. 59-60, § 59 ; Ul. III. 470-76.

**Trppāṇikkara Putuvāl**, (17th cent.), astrological authority, pupil of Acyuta Piṣāraṭi. Ref. See above, p. 5.

*Trirāśijyāvakyāni* (?), misc. astron. mnemonics. Ms. L. 1328 (40 gr.)

**Dakṣiṇārmūrti Mūssatu** of Maṅgalaśeri, (18th-19th cent.), astrological authority, Ref. See above, p. 5.

*Daśapporuttam* (astrol.), Skt.-Mal., Anon., 10 gr. Ms. C. 2421-E.

*Daśadhyāyī* : Name of C by Govinda Bhaṭṭatiri on *Horā*.

*Daśāphalavicāra* (artrol.), Anon. Ms. Pāliyam List, 634.

*Daśavatārappaṭṭika* (astron.), Mal. prose, Anon., 150 gr. Ms. 13475-D.

*Daśaviśeṣaphala* (astrol.), Ms. Pāliyam List, 614.

**Dāmodara I**, (15th cent.), of Vaṭaśreni, son of Parameśvara and teacher of Nīlakaṇṭha Somayāji. Ref. See above, pp. 54-55, § 24

**Dāmodara II** : Dāmodaran Nampūtiri, (c. 1675-1775), of Maṅgalaśśeri in Perumanam in N. Malabar.

—*Praśnarīti I*

—C on *Līlavatī*

Ref. See above, pp. 65-66, § 42 ; Va. III. 378-79.

**Damodara III** of the Bhāradvāja gotra, brother of Keśava, hailing from Cellūr.

—*Muhūrtabharāṇa*

*Dūtalakṣaṇa-bhāṣa* : See under *Āyudhalakṣaṇa*.

*Dṛkkaraṇam* (kar.), by Jyeṣṭhadeva (?), in 10 chs., 475 gr., A.D. 1608.

Ms. C. 7-C. Ref. For the tradition that the au. is the same as the au. of *Yuktibhāṣa* (i.e., Jyeṣṭhadeva), see M. Whish, *Trans. Royal As. Soc.* 3 (1835) 523. On the work, see Ul. II. 478 ; Ul. Sup. I. 226.

*Dṛkparahitam* (kar.), Anon.

Beg. nitvā madhyam vilīptāvadrikam urudharādyāptahine dhruvāḍhye kṣiptvāsmin deśabhedam ravibhujacarayor ...

Ms. Mad. D. 13447 (cata. as *Pañcāṅgagaṇitaviṣaya*).

*Dṛggaṇita* (kar.), by Parameśvara of Vaṭaśreṇi.

Mss. 411-B, 13300-E, L. 1248-E, L. 1243-I ; with K.V. Sarma.

Edn. K.V. Sarma, V.V.R. Inst., Hoshiarpur, 1963. Ref. Ul. II. 102 ; Va. I.379-80.

*Dṛggaṇitakrama* (?) (kar.), Anon., Mal. verse.

Beg. kulina-rūksajña-vidhāna-mātrayā ...

Ms. PM. 4116 (320 gr.)

*Dṛggaṇitajyavakyani* (kar.). Ms. Baroda, p. 1198 (ms. no- 9942-d).

*Dṛggaṇitaprakāra* (?) (kar.), (Mal.), Anon.

Beg. ini Dṛggaṇitattinte prakāram paṛayinnitu—

arkano bhedamillallo dṛkkil parahitattilum /

kujannu madhyame dṛkkil bhedamilliha tuṅganum //

Ms. 189-B.

*Dr̥g-veṅvarohakriya* (kar.), Anon. Epoch : A.D. 1695. Ms. 5867 (ff. 163-65). Edn. K.V. Sarma, App. II to his edn. of *Veṅvāroha*, Trippunithura, 1956.

*Dr̥ṣṭāntapras̥na* (pra.), Old Mal., Anon., 298 gr.

**Beg.** ādiyām paramakalyāṇi uḷḷattill ninnum kuṭikolḷunna uḷḷamuṭyān rakṣa rakṣa. Śivālayam—  
(na)lam itu karumam naṅṭa ānattol viṣṇuviṇāle  
itam paṭavuratten colluvaṭināl Agastyan keḷkka  
nītiyāl pūtalattil vāḷka, oḷḷatellām arivināl.

Ms. PM. 4125-A.

*Dr̥ṣṭāntamālā* or *Śakunamuṣṭi* I (pra.), Old. Mal., Anon., in the form of questions and answers.

**Beg.** i rājāvinekkaṅṭāl śubhamo aśubhamo ennu collu.

Mss. PM : 4122, 4123, 4125-B, 4126, 4309.

*Dr̥ṣṭāntamālā* or *Śakunamuṣṭi* II (pra.), Old. Mal., Anon.

**Beg.** innirupicca kāryam śubhamo aśubhamo ennu. innurupicca kāryam ninacca vaṅṅam varum. iviṭe devālayam uṅṭakkiyāl guṅam varum. Ms. PM. 4124.

**Devakerala** (astrol.), called also *Keralajyotiṣa*, *Keralarahasya*, *Candrakalā-nāḍi* and *Candranāḍi*, by Acyuta I, a 'Kerala-brāhmaṇa'.

Mss. Mad. D. 13775-79, R : 853-a, 3322, 4056 ; Ad. Edn. Gov. Or. Mss. Lib., Madras, 3 vols., 1952-56. Ref. Ul. I. 164.

*Daivanukūlyādi* (astrol.), Anon.

**Beg.** atha daivānukūlyādikam nirūpyate.

devair vā dharmadevaiḥ phaṇipatigurubhir brāhmaṇaiḥ

Ms. C. 584-C.

pretabhūtaiḥ /

*Drekkāṇādivicāra* (astrol.), (Skt.-Mal.), Anon. Ms. 13494-H.

*Dviśatī* or *Prakāśālatikā* (astrol.), Anon., by a devotee of Śiva installed at Talipparamba (Cellūr) in N. Kerala and protege of the Nampūtiri family of Vāraṅkkoḍ.

**Beg.** yasyānuvelam udaye ... (1) ; lakṣmīpureśam ... (2) ; dvai-māturam ... *Prakāśālatikā* *Dviśatīm* likhāmi //3//

Ref. Va. III. 611-15.



*Nakṣatram nokkal* ('star gazing'), (Mal.), Anon., a single verse to derive the time for sunrise from the position of a star.

Verse : uccappettoru nakṣatram tet̄tet̄toḷm punar aññineyeññi /  
eṭṭiñkēnnatu ñāṭṭilayoḷam atrayum atrayum arkan udippān //  
sūryan udippān ini etra samayam uṇṇennaṛivan.

Ref. Q in 'Samayam niṇṇayikkān' by M.R. Vargheese, *Mathrubhumi Weekly*, (Kozhikode), 7-11-1954, p. 45.

*Nakṣatrappana* (astron.), Mal. verse, Anon., 20 gr.

Beg. oṇam mūneṇ muzhakkol pol  
uccaykku meṭṭat̄il cellum onnara nāzhika.

Ref. 5038-C, 14228-D, PM. 4328-C, PM. 4368-D.

*Naraceṣṭā* (pra.) Anon., (Ker. ?)

Beg. ādiiyādin grahān natvā śubhāśubhasusūcakān /  
yathāśāstram yathāpraśnam *Naraceṣṭām* pracakṣmahe //

Ms. C. 2137-C.

*Navagrahavākyaṇi* (?), (mnemonic tables in verse form), Anon., 30 gr.

Beg. devo vanālokanapūjanottamaḥ.

Ms. 11044-V.

*Navagrahasamaya* : See *Añkaṇaśāstra*.

*Naṣṭajatakakriyā* (astrol.), Mal. prose, Anon. Mss. 13487-D,  
L. 1217-D.

*Naṣṭajatakapraśna* (pra.), Mal. prose, Anon. Ms. 794-B.

*Naṣṭajatakādi* (astrol.), Skt.-Mal., Anon. Mss. 10999-A ; Vayas kara  
Illum, Kottayam, 92-B.

*Nārāyaṇa I*, (c. 1500-75), pupil of another *Nārāyaṇa* and admirer of  
*Nilakaṇṭha Somayāji*.

—*Uparāgakriyākrama*

—C *Karmadīpikā* or *Kriyākramakarī* on *Līlavatī*, Version I

—C Do. Do. Do., Version II

—C (I), *Laghuvivṛti* on *Pañcabodha* IV.

Ref. See above, p. 57-58, § 30 ; Ul. II. 121 ; Ul. Sup. I. 227-28.

**Nārāyaṇa II**, son of Keśava, resident of Kāṇvavastu (Tṛkkaṇṇapuram or Kaṇṇanpaṇuampu) in Malabar.

—*Muhūrtadīpaka*

Ref. See above, p. 62, § 35 ; Ul. II. 107 ; Va. II. 612-13.

**Nārāyaṇa III**

—*Laghudarśinī*

Ref. See above, p. 65, § 41.

**Nārāyaṇa IV** : Nārāyaṇan Nampūtiri (18th cent.) of Iṭavaṭṭikkāṭṭu family in Central Kerala.

—*Muhūrtapadavī VII*

Ref. See above, p. 73, § 60 ; Ul. III. 470-76.

**Nārāyaṇa V**, of Perumanam village.

—*Tantrasāra*

Ref. See above, 74, § 64 ; Raja, 153.

**Nārāyaṇa VI** : Nārāyaṇan Ilayatu of Maccāṭ (1765-1843).

—*Jātakādeśaratna*

—*Jyotiṣabhāṣāvali* or *Maccāṭṭu Bhaṣā* (Mal.)

Ref. See above, p. 76, § 71 ; Ul. III. 527-29 ; Ul. Sup. I.648-49 ; Va. IV. 216-21.

**Nārāyaṇa VII**, (c. 1325-1400), son of Parameśvara and teacher of Parameśvara (promulgator of *Dṛggaṇita*). Ref. See above, p. 53, § 23.

**Nārāyaṇa VIII**, (19th cent.), teacher of Puruṣottama (au. of *Praśnāyana*). Ref. See above, p. 79, § 79.

**Nāvāyikkūḷattu Āzhāti**, (17th cent.), astrological authority.

Ref. See above, p. 5.

*Nalūm pakkavum arivān* (kar.), (Mal.), computation of day, tithi, etc. Anon.

Beg. akāṭṭi patimūnnakṣaram sūnyam. oṭukkatte akṣaram kāryam ākunnatu.

Ms. C. 9-F.

*Nazhikamanīyute yukti* (Mal.), Anon., a detailed exposition of the pendulum clock. Ms. With K.V. Sarma.

Nityaparakāśa Yati or °Bhaṭṭāraka, pupil of Ānandaparakāśa.

—C *Prakāśika* or *Viṣamākṣaravivṛti* on *Horā*.

—C *Prakāśika* (Mal.), on *Horā*

Ref. See above, p. 50, § 19.

*Nimittaprasna* (pra.), Mal. prose, Anon. Ms. L. 28.

*Nirgaṇita* (kar.), Anon. Mem. In the *Karaṇapaddhati* of Putumana Somayāji, IV. 3.

*Nihatya cāpavargeṇetyadi-ślokaḥ* : See *Mahājyānayanaprakārah*.

Nilakaṇṭha I : Nilakaṇṭha Somayāji, (1444-1545), of the Garga-gotra. of Kerala-sad-grāma (Mal. Keḷallūr) ; pupil of Dāmodara and grand-pupil of Paramēśvara I.

—*Gaṇitadarpaṇa* (?)

—*Golasāra*

—*Grahaṇanirṇaya*

—*Grahaṇādigraṇtha*

—*Grahaṇaparikṣākrama*

—*Candracchāyāgaṇita*

—*Tantrasaṅgraha*

—*Siddhāntadarpaṇa*

—*Sundararājaprasnottara*

—C *Bhāṣya* on *Āryabhaṭīya*

—C on his own *Candracchāyāgaṇita*

—C on his own *Siddhāntadarpaṇa*

Ref. See above, pp. 19, 22-23 ; 55-57, § 26 ; K.V. Sarma, 'Gārgya Kerala Nilakaṇṭha Somayājīn', *Jl. of Or. Res.*, 26 (1956-57) 24-39 ; Raja, 143-52 ; Sen, pp. 155-57 ; Ul. II. 117-20 ; Ul. Sup. I. 235-37 ; Va. I. 383-87.

Nilakaṇṭha II, (16th-17th cent.)

—*Kaṇakkusāram* (Mal.)

—C (Mal.) on *Kaṇakkusāram*.

Ref. See above, p. 65, § 40.

**Nilakanṭha III** : Nilakanṭha Śarmā of Punnaśseri, (1858-1935).

—*Jyotiśśāstra-subodhinī* (Mal.)

—C (Mal.) on *Camatkāracintāmaṇi*

—C (Mal.) *Pañcabodhakriyā-Bhāṣā* on *Pañcabodha*

—C (Mal.) *Uparatnaśikhā* on *Prasnamārga*

Ref. See above, p. 81, § 81 ; Ul. V. 964-70 ; Ul. Sup. II. 500 ;  
Va. V. 192-204.

**Nyāyaratna**, version I (astronomical rationale), by Putumana  
Somayāji, in 8 chs., 120 gr.

Beg. madiyahṛdayākāśe cidānandamayo guruḥ /  
udetu satatam samyag ajñānatimirāruṇaḥ //  
namaskṛtya gurūn bhaktyā... (2) ; anuktāviha sarvatra... (3) ;  
tulājādigatam svarṇam ... (4).

End : apakrāntyanāntastha ... ; koṭikrānteḥ ... ; nyāyapradar-  
śanāyaivam ...

Mss. 414-C, 597-B, 11013-B ; C: 964-A ; T. 464-A ; Mad. R. 5344.

**Nyāyaratna**, version II (astronomical rationale), by Putumana  
Somayāji, in 8 chs., 120 gr.

Beg. madiyahṛdayākāśe ... (1) ; namaskṛtya gurūn bhaktyā... (2) ;  
iha grabhāḥ sphuṭikāryāḥ ... (3) ; kujāder antyakendrot-  
tha ... (4) ; antyakendrabhujābhāve ... (5).

End : yugmaujapadajam... ; svadoḥkrāntyukta... ; alpakrāntyāya-  
nāntastha ... : nyāyapradarśanāyaivam ...

Ms. With K. V. Sarma.

**Pakṭaprasna** (pra.), Mal. prose, Anon., 550 gr. Mss. 4133, 10964.

**Pakṣiśāstram** or **Pañcapakṣiśāstram** (astrol.), (Skt.-Mal.) Anon.,  
based on Agastya's *Pañcapakṣiśāstra* (For mss. of which see  
Tanjore D. 11489-92), 100 gr.

Beg. abhivandya gaṇeśānam ... (1)

natvā vighneśvaram vāṇim Pañcapakṣinidarśanam /

pur-Āgastyena devebhyaḥ proktam saṅkṣipyate mayā //

Mss. C. 350-A, P. 589. Ref. Ul. III. 243 ; Ul. Sup. I. 539 ;  
Va. II. 503.

*Pañcapakṣilakṣaṇam* (astrol.), Old Mal., verse, Anon.

Beg. covvā ñāyiru vallira ciṟanta tiṅkaḷ budhan ānta /

Ms. PM. 4154.

*Pañcapakṣisāstram* or *Pakṣisāstram* : See under *Pakṣisāstram*.

*Pañcabodha I* or *Prakīrṇasaṅgraha* (kar.), in 10 *khaṇḍas*.

Beg. yātās ca māsā divasās ca nāḍyaḥ svābhiṣṭakālāvadhikāḥ  
kramaṇa /

(Some mss. prefix a benedictory verse : yair aṁśakaiḥ sarva-  
guhāśayasya ... The col. in several mss. read : *iti Prakīrṇa-  
saṅgrahaḥ*.)

Mss. 597, 831-B, 5376-B, 5864-B, 8985, 12455, C. 77, C. 364,  
C. 588, L. 1360-A. Edn. Kanippayoor Sankaran Nam-  
putirippad, with modern com. in Mal., Panchangam Press,  
Kunnamkulam, M.E. 1102 ; M.E. 1107.

Do.—C (Mal.), Anon.

Beg. yogyādikānam tu yathopadeśam ... Mss. 5376-B, 11061-L.

*Pañcabodha II* (kar.), Anon.

Beg. viṣuvaddyugaṇam nyasya māsavākyam dināni ca /  
yuktvā śukrādivāram ca jñātvā khaṇḍam viśodhayet //  
śeṣam guṇena saṁhṛtya ...

Ms. P. 890-A.

Do.—C (Mal.), *Pañcabodhakriyākrama* by Śāṅkaran Nampūtiri of  
Mahiṣamaṅgalam.

Beg. tumpa tiṅkaḷoṭu gaṅga tanneyum ...

Ms. P. 890-A.

*Pañcabodha III* (kar.), by Putumana Somayāji in five *khaṇḍas* on  
*Vyatipāta*, *Grahaṇa*, *Chāya*, *Śṛṅgonnati* and *Mauḍhya* ; 85 gr.

Beg. devarṣigaṇais sevyam ... (1) ; madiyahṛdayākāśe ... (2) ;  
golānte dviguṇāyanārkarahite prāyo vyatipātabham ...

Mss. 414-A, T. 150-A, B ; Mad. Mal. D. 339, (pp. 1-7). Rem.  
Authorship based on the characteristic intro. verse, *madiya-  
hṛdayākāśe* etc. and the authority of Punnaśseri  
Nilakaṇṭha Śarmā, vide his *Jyotiśśāstra-subodhinī*.

*Pañcabodha* III (contd.)

Do.—C (Mal.), Anon., 800 gr.

Beg. Pañcabodhakriyāślokaḥkhyānam iha bhāṣayāy /  
gurūktarītyā collunen bālānām arivān aham //

Mss. L. 893, T. 150-A, B.

*Pañcabodha* IV (kar.), Anon., in 5 *paricchedas* on *Vyatīpāta*, *Mauḍhya*, *Chayā*, *Śṛṅgonnati* and *Grahaṇa*, in 105 verses.

Beg. sarveśām jyotiṣām ādyam namaskṛtya divākaram /  
laghūkṛtya vidhāsyāmi vyatīpātādibodhanam //  
yāvanmūlāntam ādityāḥ jalarkṣādeś ca tāvati /

Mss. 475-G, 11103, C. 173-H, C. 595-B, L. 843-A, P. 923-B ;  
PM. 4147-B ; Mad. R. 2754 (b) (under the title  
*Lāṭadipañcakam*).

Do.—C I, *Laghuvivṛti*, by Nārāyaṇa ; A.D. 1529 ; 600 gr.

Beg. bhāsvantam andhatamasam ... (1) ; samastāny api karmāṇi  
... (2) ; yatprasādād kavīndratvam ... (3) : śaktyā śaśvan  
nikhila ... (4) ; Nārāyaṇam jagadanugrahajāgarūkam /  
vidvattamam guṇanidhim sudṛḍham praṇamya /  
lāṭādipañcaka-vibodhakarasya *Pañca-*  
*bodhasya cāru-vivṛtim* vilikhāmi *Laghvim* // 5 //  
granthakāraś śiṣṭācāram anusaran ...

Mss. 411-A, T. 1184 ; Mad. R. 2754 (b) ; with K.V. Sarma.

Do.—C II (Mal.), *Pañcabodhārthadarpaṇam*, by Śaṅkaran Nampūtiri  
of Mahiṣamaṅgalam.

Beg. śrīśūryādīn namaskṛtya gurum ca Parameśvaram /  
balāyāsmāi vidhāsyāmi *Pañcabodhārthadarpaṇam* //

Mss. 10647-B. Ref. Ul. II. 472.

Do.—C III (Mal.), *Pañcabodhakriyākramam* or *Bālasaṅkaram*, by  
Śaṅkaran Nampūtiri of Mahiṣamaṅgalam.

Beg. dhātri yatkarasamparkād ... (1) ; tumpa tinakḷoṭu gaṅga  
tanneyum ... (2) ; bālānām Pañcabodhārtham ... (3) ;  
bhāskarādīn vaṇaṇṇiṭṭu gurum ca Parameśvaram /  
ceruṭoṭṭezhuttunnuṭṭu *Pañcabodhakriyākramam* //

gaṇitattinnu Pañcabodhamākunna karaṇatte camappān  
tuṭaṇṇunna ācāryan ...

*Pañcabodha* IV (contd).

Mss. 3761-D, 10625, 10987-B, C. 173-L, C. 563-D, C. 2146-B,  
L. 1167-B. Ref. Ul. II. 472.

Do.—C IV, *Pañcabodhakriyākrama*, (Mal. verse), Anon.

Beg. gaṇeśānam gurum vāṇim vaṇaṅṅikkonṭu bhāṣyāy /  
ceruotṭezhuttunnuṭu *Pañcabodhakriyākramam* //  
annannu bhāskaran ninna nāḷ toṭṭāmūlam eṇṇuka /  
pūrāṭād atra cennuḷla nāḷil annuḷla lāṭamām //

Mss. PM. 4366 (cata. *Vyatīpātagaṇitam*), PM. 4368-I. Rem.  
Apparently related to C III above.

*Pañcabodha* V or *Pañcabodhaśataka* (kar.), by Puruṣottama II

Beg. (*Grahaṇa* sn.) :

namaskṛtya guroḥ pādamaṁ mandajñānabhido varam /  
sūryendvor uparāgoktavidhānam pravadaṁmy aham //

Col. *Puruṣottamakṛte Pañcabodhaśatake* Uparāgaparicchedaḥ  
sampūrṇam.

Ms. With K.V. Sarma. Ref. Ul. Sup. I. 224-25.

*Pañcabodha* VI (kar.), Anon.

Beg. arkendvor apamāntare 'pi padayos tadbimbayogārdhataḥ.

Ms. 8112.

Do.—C (Mal. prose), *Pañcabodham Bhāṣā*, Anon.

Beg. gurupādāmbujam natvā sarvadāśāsītārthadam /  
*Pañcabodhoktapaddhatyā Bhāṣām* iha likhāmy aham //

aviṭe naṭe ācāryaṁ vyatīpātalaḥṣaṇatteyum ...

Ms. 8112.

*Pañcabodha* VII (kar.), Anon., on the computation of *Chāyā*,  
*Grahaṇa*, *Vyatīpāta*, *Mauḍhya* and *Śṛṅgonnati*.

Beg. iṣṭaś sāyanabhāskara ... (1) ; kṛtāyaneṣṭārka ... (2) ; chā-  
yeṣṭaśāṅkukṛti ... (3).

Ms. With K.V. Sarma.

Do.—C (Mal.), Anon.

Beg. iṣṭadeśa-kālaṅṅaḷil sāyanārkaṣphuṭatte veccu ...

Ms. With K.V. Sarma.

*Pañcabodha* VIII (kar.) Anon., interspersed with Mal.

**Beg.** sindūrāruṇam indukāntivadanam keyūrahārādibhiḥ ... (1);  
sūryaḥ somo budhaḥ śukraḥ ... (2); guṇakāraḥ kulam  
bhānoḥ ... (3).

**Ms.** 4124-B.

*Pañcabodha* IX (Kar.), Anon.

**Beg.** madiyahṛdayākāśe ... (1)  
lāṭavaidhṛtam eṇṇunna prakāram atha collinea /  
ayanāmsam iratṭicciṭṭarkanil saṃskariccatu //

**Ms.** 1005-D (inc., 160 gr.)

*Pañcabodha* X, *Pañcabodhagaṇitam Bhāṣā* (kar.), (Mal.), by Kṛṣṇadāsa  
(Koccu-Kṛṣṇan Āśān). Mss. PM. 4111-A, PM. 4155-B. Ref.  
Ul. III. 524.

*Pañcabodha* XI (kar.), unidentified.

**Do.**—C (Mal.), by Vāsunṇi Mūssatu of Veḷḷānaśśeri. Men. Ul. IV. 700.

*Pañcabodhakriyākrama* by Śaṅkaran Nampūtiri : See C on  
*Pañcabodha* II.

**Do.**—Anon. : See C IV on *Pañcabodha* IV.

*Pañcabodha-Gaṇitasāra* (kar.), (Mal.), by Śaṅkaran Nampūtiri of  
Mahiṣamaṅgalam : See *Gaṇitasāra* II.

*Pañcabodhaśataka* by Puruṣottama : See *Pañcabodha* V.

*Pañcabodhārtha-darpaṇam* : See C III on *Pañcabodha* IV.

*Pañcamahāyoga* (astrol.), (Skt.-Astrol.), Anon. Ms. L. 740-C.

*Pañcāṅga* (almanac), (Mal.), Anon. Mss. 5779 (for M.E. 1011-60),  
5841 (for M.E. 1061-80), 6010-A (for M.E. 1000-25).

*Pañcāṅga* (muhūrta), for 1000 years, attributed to Śaṅkaran Nam-  
pūtiri of Mahiṣamaṅgalam. Ref. Ul. II. 272.

*Pañcāṅga* : See also *Agāṇita*.

*Pañcāṅgagaṇanaviṣaya* (kar.), (Mal.), Anon. Ms. in Mad, D.  
13454.

*Pañcāṅgagaṇita* (kar.), (Mal. verse), Anon. Ms. 8268-C (220 gr.).



*Pañcāṅgaphalam* (astrol.), (Mal. verse), Anon. Mss. 6478-D, 12564-B, 13215-H, L. 144-G.

*Pañcāṅgaphalam* : See also *Vārādiphalanirṇaya*.

[*Pañcāṅgavakya* (kar.),] -C (Mal.), Anon. Ms. Mad. D. 13454.

*Paddhatigaṇitakriyā* (kar.), (Mal. prose), Anon. 400 gr. Ms. 5074-B. Rem. Of which *Paddhatti* this is a *gaṇitakriyā* remains to be ascertained.

**Panakkāṭṭu or Itakkāṭṭu Nampūtiri**, (c. 1615-95), son of Mahādeva and Śrī, pupil of Dāmodaran Nampūtiri of Maṅgalaśśeri family.

—*Gaṇitagrantha*

—*Praśnamārga*

—C *Durgamārthapradarśinī* on his own *Praśnamārga*

Ref. See above, pp. 66-67, § 45 ; Ul. III. 87-89 ; Va. III. 400-5.

**Parameśvara I** : Parameśvaran Nampūtiri, (c. 1360-1455), of Vaṭaśreṇi (Mal. Vaṭaśśeri) house in the Aśvattha-grāma (Mal. Ālattūr), pupil of Mādhava, Nārāyaṇa and Rudra.

—*Ācārasaṅgraha I*

—*Goladīpikā I*

— Do. II

— Do. III

—*Grahaṇanyāyadīpikā*

—*Grahaṇamaṇḍana*

—*Grahaṇaṣṭaka*

—*Candracchāyāgaṇita*

—*Jātakapaddhati*

—*Dṛggaṇita*

—*Vākya karaṇa*

—*Vivāhanukūlyam*

—*Ṣaḍvargaphalam*

—C *Bhatadīpikā* on the *Āryabhaṭīya*

—C *Vivṛti* on his own *Goladīpikā I*

—C on the *Jātakakarmapaddhati* of Śrīpati

—C *Parameśvarī I* on the *Praśnaṣṭapañcāśika* of Pṛthuyāśa

**Parameśvara I (contd.)**

- C *Karmadīpikā* on the *Mahābhāskariya* of Bhāskara I
- C *Siddhāntadīpikā* on the *Mahābhāskariya-bhāṣya* of Govindasvāmin
- C on the *Muhūrtaratna* of Govinda Bhaṭṭatiri
- C *Pārameśvara* on the *Laghubhāskariya* of Bhāskara I
- C *Pārameśvara* on the *Laghumānasa* of Muñjāla
- C *Vivarāṇa* on the *Lilāvati* of Bhāskara II
- C on the anon. *Vyatīpātāṣṭaka*
- C *Vivarāṇa* on the *Sūryasiddhānta*
- C *Dīpikā* on the anon. *Muhūrtāṣṭaka*
- C *Bhādīpikā* on an unidentified work
- C *Vākyadīpikā* on an unidentified work

Ref. See above, pp. 2ff., 19-20; 52-54, § 23; K.V. Sarma, Intro. to his edns. of P's works; Raja, 136-43; Sen, pp. 166-70; UI. II. 100-5; UI. Sup. I. 212-19; Va I. 378-83.

**Parameśvara II**

- C *Pārameśvarī* † (II) on the *Praśnaṣaṭpañcāśikā* of Pṛthuyāśas.
- C *Pārameśvarī* or *Horābhīprāyanirṇayā* on the *Horā*.

Ref. See above, p. 73, § 61.

**Parameśvara III, disciple of Śāṅkara:**

- C *Jātakacandrikā* or *Viśvāvṛthadīpinī* on the *Horā*

Ref. See above, p. 73, § 62.

**Parameśvara IV : Parameśvaran Nampūtiri of Puradahanapura (Mal. Purayannūr) family, c. 1775-1839; pupil of Agnidattan Nampūtiri.**

- Aṣṭamijayantīnirṇaya*.
- C *Varadīpikā* on *Muhūrtapadavi* II.

Ref. See above, pp. 76-77, § 72; UI. III. 476-77; Va. II. 605-12.

**Parameśvara V : Parameśvaran Pottī of Vazhamaveli house in Chennanoor; renowned astronomer-astrologer and teacher of the prolific writer Śāṅkaran Nampūtiri of Mahiṣamaṅgalam.**

Ref. See above, pp. 62-63, § 37; p. 64, § 38.

**Parameśvara VI, (c. 1775-1825), astronomer; teacher of Ghaṭigopa.**

Ref. See above, p. 77, § 74.

*Paralperu* (arith.), Skt.-Mal., Anon. Ms. C. 13-B (65 gr.)

*Parahitam* or *Grahacāranibandhanam* : See *Grahacāranibandhanam*.

*Parahitakaraṇam* (kar.), Anon. Ms. 5820 C.

Do.—C (Mal.), Anon. Ms. 5820-C.

*Parahitakhaṇḍaḥ* (kar.), Anon. Ms. 11044-S (6 gr.; M.E. 948).

*Parahitagāṇitam* (kar.), Anon. Ms. 411-B-1, 13300-F, L. 1248-I.

*Parahitavyākhyāganita* (kar.), Anon. Mss. Ad.; Sarasvati Mahal Library, Tanjore.

*Parahitadijyaḥ* (kar.), Anon. Ms. L. 1076-B.

[*Parāśarahora* (astrol.)]

—C *Prakāṭārtha* or *Sampradāyapradīpikā* by Govinda-svāmin.

Mss. Sarasvati Mahal Library, Tanjore, D. 11498, D. 11499; Or. Res. Inst., Mysore, 3166.

*Palisa-ślokaṇṇal* (calculation of interest), by Putumana Somayāji.

Mss. C. 2314 (folio 74), C. 2470 (folio 98).

*Paṭu gaṇippan Bhaṣā* : See C (Mal.) on *Vyatipātavaidhṛta*.

*Paṭum pirappum* (kar.), Mal. verse, Anon., 20 gr. Ms. L. 251-B.

*Paṭhya* : Name of anon. C on *Horā*.

*Putumana Somayāji* (c. 1660-1740), native Śivapura (Trichur).

—*Karaṇapaddhati*

—*Gaṇitagrantha*

—*Grahaṇaganita I*

—*Grahaṇāṣṭaka II*

—*Jātakādeśamārga I*

— Do II

—*Nyāyaratna I*

— Do. II

—*Pañcabodha III*

**Putumana Somayaji (contd.)**—*Paliśa-slokaññal* (Mal.)—*Venṅārohāṣṭaka*—C (Mal.) on the *Laghumānasa* of Muñjāla

Ref. See above, pp. 68-69, § 49; K.V. Sarma, 'P, an astronomer of Kerala and his hitherto unknown works', *Proc. of the 18th All-India Or. Conf., Annamalainagar, 1955*, pp. 562-64. Intro. to *Karaṇapaddhati*, (Madras, 1956), pp. xxi-xxxi; Raja, 162-65; Ul. II. 107-9; Ul. Sup. I. 212-15; Va. I. 529-31.

**Purayannūr Nampūtiri** : See Parmeśvara IV.**Puruṣottama I, Māttūr Nampūiri**, c. 1475-1535.—*Muhūrtapadavī* II

Ref. See above, pp. 61-62, § 34.

**Puruṣottama II**, c. 1675-1750.—*Pañcabodha* IV or *Pañcabodhaśataka*

Ref. See above, pp. 67-68, § 48.

**Puruṣottama III** : Puruṣottaman Mūssatu, (c. 1850-1900), of Kūttaleṭṭattu family, pupil of Bhāskara, Śāṅkara, Vahni and Nārāyaṇa, and grand-disciple of the au. of *Prasnamārga*.

—*Prasṅāyana*—C on his own *Prasṅāyana*

Ref. See above, pp. 79-80, § 79.

**Pulimukhattu Pottī** (1686-1758), astrological authority.

Ref. See above, p. 5.

**Purṅaprajña-** or **Pūrṅaprabodha-** Śiṣya,—*Kālaprakāśikā*—C (X) (Mal.) on *Horā***Poruttam I** (astrol.), Anon.

Beg. yadyatphalam narabhava kṣamam aṅganānām  
tattad vadet patiṣu vā sakalam vidheyam /  
teṣām tu bhartṛmaraṇam nidhane vapuś ca  
lagnendugam subhagatāstamaye patiś ca //

Ms. CM. 6-B.

Do.—C (Mal.). Beg. itinnupadeśamāvatu— yadyat yātorikkal.

Ms. CM. 6-B.

*Poruttam II* (astrol.), Mal.-Skt., 100 gr.

Beg. jāto janmatrayāt striṇām vipat pratyaranaidhane (?) /  
varjyo'trāpi viśeṣeṇa kuvedāgnyamśajaḥ kramāt //

Ms. CM. 173-B.

*Poruttam carttum prakāram* (?) (astrol.), (Mal.), Anon.

Beg. naṭe iāṣipporuttatte nirūpikka—  
strijanmato raṇṭatha mūnnum aṅcum /  
ārum vivarjjikka śubho'nyarāśau //

Ms. CM. 4147-D.

*Prakāṭārtha* : Name of C by Govindasvāmin on *Parāśarahorā*.

*Prakāśalatikā* or *Dviśatī* : See *Dviśatī*.

*Prakāśikā* : Name of C by Nityaparakāśa Yati on *Horā*.

*Prakīrṇasaṅgraha* (kar.) : Same as *Pañcabodha I*, with certain differences. Mss. See *Ker.*, II. p. 156. Ref. Va. III. 390-96.

*Prathamārtavādiphalam* (astrol.), Mal. prose, Anon. Ms. 5820-D.

*Praśnacintā* (pra.), Anon., Skt.-Mal.

Beg. ravyuccāṣṭkramomandacandrajñaguravaḥ kramāt /  
prāgādyāṣṭamadiksthānāt prārabdhārkodayāditaḥ //  
.....santatipraśnam nirūpippān...

Ms. T. 144-D (b)

*Praśnajñānam* or *Praścalāñchanam* : See *Praśnalāñchanam*.

*Praśnapaddhati* (pra.), Anon. Ms. Vayaskara Illam, Kottayam,  
92-A.

*Praśnaprakāśikā I* (pra.), Mal. prose-verse, Anon., in 7 chs., 1150 gr.

Beg. vande'hām girijāsūnum jñānamūrtim gurūn grahān /  
*Praśnaprakāśikām* vaksye bālakānam hitāya vai //

Mss. C. 554, T. 326. Ref. Ul. III. 242.

*Praśnaprakāśikā II* (pra.), Mal. prose, Anon. Ms. 3383-F.

*Praśnaphalam I* (pra.), Mal. prose, Anon. Ms. T. 144-B.

*Praśnaphalam II* (pra.), Mal. verse, Anon. Ms. 3383-B.

*Praśnaphalaprāptikalanirṇaya* (pra.), by a disciple of Kṛṣṇa.

**Beg.** Kṛṣṇācāryamatam samyak paryālocya punaḥ punāḥ /  
praṣṭuḥ praśnānusāreṇa phalam vācyam vipāścītā //  
atha *Praśnaphalaprāpteḥ* kathyate *Kālanirṇayaḥ* |

**End :** Kṛṣṇācāryasya śiṣyeṇa Horāṇām upapāditā /  
Kṛṣṇacāryaprasādena prasādāc ca vivasvataḥ //  
Kṛṣṇācāryopadiṣṭārthaḥ yeṣāṃ manasi vartate /  
avyāhatamatis teṣāṃ phalabhāge pravartate //

**Ms.** Ms. D. 13950.

*Praśna-Bhaṣā* I (pra.), Mal. verse, Anon.

**Beg.** mattebhāsyam praṇamyādau bhāskarādīn grahān gurūn /  
*Praśnabhāṣām* pravakṣyāmi balānam arivān aham //

**Mss** See *Ker. Mal.*, pp. 89-90 ; CM. 563-F, PM. 4026-E. Edn.  
*Śrī Vanchi Setu Lakshmi Series*, No. 4, Trivandrum, 1926.  
**Ref.** Va. III. 383.

*Praśna-Bhaṣā* II (pra.), Skt.-Mal., Anon. Mss. 3671-E, 5095 B,  
5780-A.

*Praśnamārga* I (pra.), by a member of the Panakkattu or Iṭakkattu  
Nampūtiri family, (c. A.D. 1650), in 32 chs., 400 gr.

**Mss.** See *Ker.*, II. pp. 177-78. Edn. Punnaśēri Nilakaṇṭha Śarmā,  
Trichur, M.E. 1104. **Ref.** Ul. III. 87-89 ; Va. III. 400-5.

**Do.—C. I,** *Durgamārthaprakāśinī*, by the author himself. Mss. *Ker.*  
II. p. 178. **Ref.** Ul. III. 89 ; Va. III. 400-5.

**Do.—C II** (Mal.), Anon.

**Beg.** ...vedattinte cakṣussallo i śāstramākunnatu. atukoṇṭu  
aṅgaṇṇajil i śāstram pradhānam ennu vannū.

**Ref.** Va. III. 405.

**Do.—C III** (Mal.), by Āzhvāñceri Tamprākkaḷ, included in his  
*Phalasārasamuccaya (Prašnabhāga.)*.

**Do.—C IV** (Mal. rendering), being chs. I-XII of the *Praśnarīti* of  
Iṭakkattu Kukkaṇiyāl.

*Praśnamārga* II (pra.), Mal. prose, Anon. Ms. L. 1100-B.

*Praśnamārga* III (pra.), Mal. verse, Anon., 1000 gr. Ms. T. 155.

*Praśnamārga* : See also *Laghu-Praśnamārga*.

*Praśnamālā* (pra.), Anon., by Śaṅkara of Mahiṣamaṅgalam.

Beg. vande giriśam girijāsametam... (1) ;

praṣṭuḥ svabhāvekṣaṇaveṣabhāṣā... (2)

Ms. TM. 213.

Do.—C (Mal.), Anon., possibly by the author himself.

Beg. jātakasāraṅṅaḥilum praśnasāraṅṅaḥilum bhūtalakṣaṇam  
nimittam...

Ms. TM. 213. Ref. Ul. III. 242. Rem. The Skt. text and the  
Mal. C have only a common *maṅgala-śloka*.

*Praśnaratna* (pra.), Anon., 350 gr., (Ker. ?)

Beg. yatsvātantryakalākālaścillavo jyotiṣām gaṇaḥ /  
candrapūṣamadaḥ pūrṇacidānandam aham śraye //

Mss. Ker., II. p. 179.

*Praśnarīti* I (pra.), by Dāmodaran Nampūtiri of the Maṅgalaśśeri house.

Ref. Va. III. 379.

*Praśnarīti* II (pra.), (Mal. verse), by Iṭakkāṭṭu Kukkaṇiyāl, 17th  
cent., in 20 chs. Mss. See *Ker. Mal.*, p. 90. Edn. in the Mal.  
monthly *Kavanodayam*, (Kozhikode). Ref. Ul. III. 236-37 ;  
Ul. Sup. I. 536 ; Va. III. 405-6.

*Praśnalakṣaṇam* I (pra.), Skt.-Mal., Anon. Ms. 13494-F.

*Praśnalakṣaṇam* II (pra.), Mal. prose. Anon. Ms. 13042-D

*Praśnalakṣaṇam* III (pra.), Mal. prose, Anon. Ms. L. 331.

*Praśnalāñchanam* or *Praśnajñānam* (pra.), Skt.-Mal., Anon., 294 vv.

Beg. ravicandrabaumasomajasuraguruśukrārkaḥjādikān natvā /  
vakṣye Lāñchanarūpam Praśnajñānam hitāya daivavidām //

Mss. 6007-G, 14294-N, L. 327-D. Ref. Va. III. 387-88.

[*Praśnaṣatpāñcāśika* (pra.), by Pṛthuyāśas].

Do.—C I, *Parameśvarī*, by Parameśvara I, 300 gr.

Beg. namaskṛtya gaṇeśānam... (1) ; tatra prathamam kendra-  
catuṣkasya saṅkṣepād viṣayabhedān āha.

Mss. 5963. 12235, C. 2132-B, T. 612.

*Praśnaṣatpañcāśika* (contd.)

**Do.**—C II, *Pārameśvarī*, by Parameśvara II, 330 gr.

**Beg.** keśajārkanīśakarān kṣitijavijjivāpnujitsūryajān ...  
lokānam hitakāmyayā dvijavaraṣ ṭikām karoty ujjvalām //

**Mss.** C. 652-A, T. 962.

*Praśnasāṅgraha, Praśnasārasāṅgraha* or *Sārasāṅgraha* (pra.),

Anon.

**Beg.** sūryendvagnivilocanam ... Cellūranātham śivam (1) ;  
Madhyāṭavayadhipam praṇāmya kamalam ... (2) ;  
skandheṣu triṣu saśramaḥ kṛtamanāḥ ... (3)

**Ms.** Whish, 144 (1).

*Praśnasāra* I (pra.), by Mādhava of Īñcakkāzhvā family, in 16 chs.,  
960 gr., A.D. 1543. **Mss.** C. 2139-B, C. 2478-A. **Edn.** *Sri Vanchi  
Setu Lakshmi Series*, No. 11, Trivandrum. **Ref.** Ul. II, 475-77.

*Praśnasāra* II (pra.), by Śaṅkara, in 4 chs. (Skt.-Mal.)

**Beg.** daivajñōpahito'tha deśasamayau ...

**Mss.** 10582-A, CM. 565-F, PM. 4168.

**Do.**—C (Mal.), Anon., possibly by the author himself. **Mss.** 10582-A,  
CM. 565-F, PM. 4168.

*Praśnasāra* III (pra.), by a Somayāji of Bhūtanāthapura, pupil of  
Vaidyanātha. **Mss.** 2745, 12810-A, C. 2007-D, T. 876.

*Praśnasārasāṅgraha* : See *Praśnasāṅgraha*.

*Praśnasārasamuccaya* (pra.), Anon.

**Beg.** praṇipatya gaṇeśānam jñānamūrtim divākaram |  
*Praśnaśāstram samālokyā vakṣye Sārasamuccayam* //

**Mss.** P. 896, P. 897, P. 898.

**Do.**—C (Mal.), Anon.

**Beg.** praṇipatya ... ennatin poruḷ—aham gaṇeśānam praṇipatya  
Sārasamuccayam vakṣye.

**Ms.** P. 898.

*Praśnadārśa* or *Jñanapradīpikā* : See *Jñanapradīpikā*.



*Praśnānuṣṭhānam* (pra.), Anon.

Beg. padabhāvaguṇā senā ramyagnā hinabhā dalā /  
Ms. CM. 543-A.

Do.—C (Mal.), Anon. Ms. CM. 543-A.

*Praśnānuṣṭhānapaddhati* I (pra.), Anon., probably by Śaṅkara of the next entry, 720 gr.

Beg. astu trailokyadīpāya bhaktābhimatadāyine /  
samastavidyānirmāṇakavaye ravaye namaḥ //  
svasthacitto viviktasthaḥ samabhyarcya gaṇādhipam /  
nijān gurūn devatās ca sūryādīmś ca navagrahān //

Mss. 722-A, 10582-B, C. 632-C, C. 733-B, TM. 36. Ref. Ul. Sup. I. 223-24.

*Praśnānuṣṭhānapaddhati* II (pra.) by Śaṅkara, in 24 chs., Possibly, an enlarged version of the previous work, *Praśn°* I. 1550 gr.

Beg. astu trailokyadīpāya (as above) (i);  
prātarvidhim vidhivad eva vidhāya pūrvam  
kṛtvā punar japavidhim gaṇanam grahāṇām /

Mss. 4162-A, 6121-B, 6126, C. 962-C, C. 2066-A, L. 839, P. 899, P. 900. T. 36. Ref. Ul. Sup. I. 223; Va. III. 386-87.

*Praśnāmṛta* (pra.), by Śrīkumāra, son of Nilakaṇṭha and pupil of Nārāyaṇa, of the village of Dvipakānana (? Mal. Ānakkād), in 6 chs., 400 gr. Mss. 1154-C, 3671-C; Whish 118 (2).

*Praśnāyana* (pra.), by Puruṣottaman Mūssatu, in 15 sns., A.D. 1881. Mss. 15084, T. 955. Edn. TSS 233 (with C), Trivandrum, 1968. Ref. Ul. Sup. I. 225.

Do.—C, by the author himself. Mss. C. 721, T. 955. Edn. TSS 223, above. Ref. Ul. Sup. I. 225.

*Praśnārūḍhādinirūpaṇam* (pra.), Mal. prose, Anon. Ms. 13294-B.

*Praśnopadeśa* I (pra.), Old Mal. prose, Anon.

Beg. rogapraśnamāvitu—guḷikane vaccu...  
Ms. PM. 4169 (412 gr.)

*Praśnopadeśa* II (pra.), Mal. prose, Anon. Ms. 14218-B.

*Prasavādiprasnaphalam* (pra.), Mal. prose, Anon., Ms. L. 336. E.

[*Phaladīpikā* (astrol.) by Mantreśvara :] C (Mal.), Anon. Ms. C. 2226-B.

*Phalanirṇaya* (astrol.) : See *Vārādīphalanirṇayaḥ*.

*Phalasārasamuccaya* (astrol.), by Āzhvañceri Tamprākkaḷ.

Ms. L. 1249-A (inc., 150 gr.), in three sections devoted to *Jātaka*, *Praśna* and *Muhūrta*.

Do.—C (Mal.), *Bhāṣā*, by the author himself. Mss. *Jātaka* sn. : L. 1215, T. 132-A, (9000 gr.); *Praśna* sn. : C: 198, L. 1216, L.1350-A, (5000 gr.); *Muhūrta* sn. : T. 132 B, C, (7000 gr.)

*Bālabodhinī* or *Bālaprabodhinī* : Name of anon. C on the *Jātakapaddhati* of Parameśvara.

**Bālarāman Piḷḷa** (19th cent.), of Nālekāṭṭil family, astrological authority. Ref. See above, p. 5.

[*Bṛhajjātaka* (j.) by Varāhamihira : See *Horā*].

*Bhagaṇahāarakādivākya* (kar.), Mal. prose, Anon. Ms. 13230-A.

*Bhadradīpagaṇita* (kar.), (Mal.), by Iṭakramañceri Nampūtiri, in 11 chs., c. A.D. 1665. Mss. See *Ker. Mal.*, p. 98. Ref. Ul. III. 232-34 ; Ul. Sup. I. 534-35.

*Bhādīpikā* (astron.), C (?) on an unidentified work by Parameśvara of Vaṭaśreṇi. Men. by him at the close of his C on the *Mahābhāskariya*.

**Bhāradvāja-dviija**, (c. 1750-1850).

—*Karaṇadarpaṇa*

—*Gaṇitayuktayaḥ*

Ref. See above, pp. 73-74, § 63.

*Bhāvacintāvalī* (astrol.), by a pupil of Citrabhānu

Beg. natvā gaṇeśvaram vāṇim Citrabhānum gurum grahān /  
bhaktyā vilikhyate kiñcit *Bhāvacintāvalī* mayā //

Ref. Raja, 154 (°*cintāmaṇi*, wrongly) ; Ul. II. 275.

*Bhāvavicāra* (astrol.), Anon., Skt.-Mal. Ms. Vayaskara Illam, Kottayam, List, 107.

[*Bhavadhyaya* (astrol.) : Beg. mūrtyādayaḥ padārthāḥ...]

—C (Mal.) : Beg. yātoru śāstrattinkal ninṭu yātoru grahattekkonṭu  
mūrtyādikaḷāyirikkinta padārthāṅṅal...

Ms. PM. 4241. Ref. Ul. II. 263.

*Bhaṣaṅaṅitam* (astron.), Mal. verse, Anon.

Beg. ādityan ādiyāyulla grahaṅṅaḷeyateṅṅuvān /  
bhāṣyāyitṭu collunnen atinulla kramaṅṅaḷe //

Ms. PM. 4368-E.

*Bhaṣājyotiṣasaṅgraha* : See *Jyotiṣasaṅgraha*.

*Bhaṣasaṅgraha* : C by Vāsudeva on *Muhūrtapadavi V*.

*Bhaskariyagaṅita* : Name of C XI on *Lilāvati*.

*Bhinnāṣṭavargopadeśa* (astrol.), (Skt.-Mal.), Anon.

Beg. bhinnāṣṭavargopadeśam varutumāṅṅu collunnen ... nyūnam  
yatra phalam tena ...

Ms. GM. 565-1.

*Bhūgolaṅāyam* (astron.), (Mal.), by Iṭakramaṅceri Nampūtiri (?),  
85 gr.

Beg. khamadhyato nilpitu bhūmi taṅṅe  
kaksyāntare dhāraṅa koṅṅuṅaccu /  
uruṅṅa nāraṅṅavad ākr̥tim pūṅṅ-  
'isānaṅṅi' (1050) yojanatulyamadhyā // ...  
bhūgoḷattinu naṅṅuve melkizhāyulla cutṭilum  
nālu pattanam uṅṅallo nālu dikkilum iṅṅnine // ...  
ākāśagoḷamadhyattil ghaṅṅikāmaṅṅḍalasthith / ...  
pādonasaṭkaramitam muḷayoṅṅṅu ḳiri  
keṅṅṅicamecc akalam ā(ṅ)api tōrayākki / ...  
cemmeyuṅṅakkiy ivayokke varaṅṅṅu vannāl  
keṅṅṅiṅṅṅu goḷavum uṅṅan kramam ottu pinne // ...  
mūnnaṅṅcayampoṅṅu nūṅṅu raṅṅṅu kharago-  
nakṣatrasaṅṅkhyāśvitaḅ /

Col. iti *Bhūgolaṅāyam*.

Ms. With K.V. Sarma.

**Bhūtanāthapura Somayāji**

—*Praśnasāra* III

Ref. See above, p. 76, § 68.

- Bhūparīkṣā* (nat. astrol.), Mal. prose, Anon. Ms. 13494-Q.
- Bhūmipporuttam* (astrol.), Mal. prose, Anon. Ms. 13020-F.
- Bhṛgukerala* : See *Śukrakerala*.
- Bhojanādipraśnavicāra* (pra.), Mal., Anon. Ms. 13494-N.
- Maṅgalaśreṇivipra-Śisya* (17th cent.)  
—*Jyotiṣasaṅgraha* II (Mal.)  
Ref. See above, p. 66, § 44.
- Maṅgalaśseri Nampūtiri* : See *Damodara* II,
- Maccāṭṭu Iḷayatu* : See *Nārāyaṇa* VI.
- Maccāṭṭu Bhāṣā* : See *Jyotiṣabhāṣāvali*.
- Madhyamādigāṇitam* (?) (kar.), Mal. Mss. See *Ker. Mal.*, p. 108.
- Madhyamāyanaganitam* (kar.), Skt.-Mal., Anon., 125 gr.  
Ms. 1025-G.
- Madhyamāyanaprakāra* (astron.), by Mādhava of Saṅgamagrāma.  
Qn. in *Tantrasaṅgraha* of Nilakaṅṭha Somayāji.
- Do.—C, Anon.  
Beg. 'vistrīti'-tyādi, 'arkendvor'-ityādi-anayor ślokayor yukti-  
pradarśanāya ...  
Ms. IO 6301 (ff. 16-18).
- Marāṇavākya* (astrol.), Mal. prose, Anon. Ms. L. 1075-F.
- Malamāsanirṇaya* (astron.), Mal. prose, Anon. Ms. L. 1229-B.
- Malamāsavicāra* (astron.), Mal. prose, Anon., 50 gr. Ms. L.  
1229-C.
- Mahājyadyāyananam* (?), (astron.), (Mal.). Ms. 13294-0  
(350 gr.)
- Mahāyanayanaprakāra* (?) (astron.), by Mādhava of Saṅgama-  
grāma.
- Do.—C, Anon.  
Beg. 'nihatya cāpavargeṇa ...', iṣṭacāpavargeṇa iṣṭacāpam, tat-  
phalāni ca nihatya ...  
Ms. IO 6301 (ff. 12-16).

[*Mahābhāskarīyam* (astron.), by Bhāskara I]

Do.—C I, *Bhāṣya*, by Govindasvāmin. Mss. 5847, 12562-A, C. 1888-A. P. 903, P. 945, P. 977 (on ff. 59-98, not sep. catalogued), T. 844; Mad. R. 5138. Edn. by T. S. Kuppanna Sastri, *Madras Govt. Or. Ser.*, No. 130.

Do.—CC I, *Siddhāntadīpikā*, by Parameśvara. Mss. 274, T. 931. Edn. With C, above.

Do.—CC II, by Sūryadeva Yajvan.

Ref. By Sūryadeva Yajvan himself towards the end of his C on *Laghumānasa* : “pūrvam mayā ... *Bhāskarācārya-Mahātantravivaraṇam Govindasvāmyam* prathamam vyākhyātam.”

Do.—C II, *Karmadīpikā*, by Parameśvara.

Ms. Mad. R. 3842. Edn. *Ānanadāśrama Skt. Ser.*, No. 126, Poona, 1945.

Do.—C III, *Prayogaracanā*, Anon.

Beg. praṇṣmata śivam aniśam ... (1); kriyate *Prayogaracanā* ... (2); akṣarasamjñā jñeyā ... (3). kalām bibhartiti devatā-namaskāraḥ.

Mss. 8933-A, C. 166-I, C 2121-B, T. 176; Mad. R. 3034.

*Mahamārganibandhanam* (astron.), by Haridatta. Basic text of the Parahita system of Kerala astronomy. Men. In the au's. *Grahacāranibandhana*, III. 44.

[*Mahayātrā* (astrol.), by Varāhamihira]

—C by Sūryadeva Yajvan

Men. By Sūryadeva Yajvan himself at the close of in his C on *Laghumānasa* : “mayā...tato *Varāhamihirakṛtā Mahayātrā* saṅkṣepeṇa vyākhyātā.”

*Mahiṣamaṅgalam Nāmpūtiri* : See Śaṅkara III.

*Māttur Nāmpūtiri*-s of Pāñcāla-grāma (Mal. Pāññā), c. 1475-1535.

—*Muhūrtapadavī* II, by Puruṣottama

—*Muhūrtapadavī* III, by Subrahmaṇya

Ref. See above, pp. 61-62, § 34. See also Ul. II. 109-11 and Va. II. 601-2, where the two authors are not identified.

*Mādhava* : See also *Vidyāmādhava*.

**Mādhava I**, (c. 1340-1425), of Saṅgamagrāma near Cochin, teacher of Parameśvara of Vataśreṇi.

—*Golavāda*

—*Madhyarānayanaprakāra*

—*Mahājyānayanaprakāra*

—*Lagnaprakaraṇa*

—*Veṅvāroha*

—*Śilam rājñah śriyetyādi-vilīptadivakyāni*

Ref. See above, pp. 16ff. ; 51-52, § 22 ; K.V. Sarma, Intro. to his edn. of *Veṅvāroha*, pp. 5-10 ; Raja, 133-36 ; Ul. II. 98-100 ; Va. I. 387-88 ; III. 388-90.

**Mādhava II**, of Īncakkāzhvā, 16th cent., pupil of Govindamaṅgalam Nampi.

—*Praśnasāra I* (Mal.)

Ref. See above, p. 64, § 38 ; Ul. II. 475-77.

*Manasaganitam* (astron.), by Putumana Somayāji. Possibly, same as the C III (Mal.), *Mānasocitam*, on *Laghumānasa*, noticed below. Men. K. Rama Varma Raja, 'The brahmins of Malabar', *Jl. of the Royal As. Soc.* (1910), p. 635.

*Mānasocitam* or *Mānasam eṅṅum prakāram* : Name of C III (Mal.) by Putumana Somayāji (?) on the *Laghumānasa* of Muñjāla.

*Malinī-kṣiprapraśna* (pra.), Mal. prose, Anon. Ms. 14163-A.

[*Muṣṭipraśna* (pra.)]

Do.—C (Mal.), 35 gr. Ms. 8358-C.

*Muhūrtakālaprakāśikā* : See *Kālaprakāśikā*.

*Muhūrtam Bhāṣā I* (Muh.), Mal. maṅṅipravāḷa verse, Anon.

Mss. See *Ker. Mal.*, p. 113.

*Muhūrtam Bhāṣā II* (muh.), Skt.-Mal., Anon. Ms. 5033-C.

*Muhūrtam Bhāṣā III* (muh.), Mal. prose, Anon. Ms. 6007-C.

*Muhūrtakaumudī* (muh.), Mal. verse, Anon. Mss. 8345.

T. 1173.

*Muhūrtadarśana* (muh.), by Vidyāmādhava of Nīlamana, in 15 chs.

Mss. See *Ker.*, II. pp. 313-14; Ad.; Mad.; Mysore.

Edn. Or. Res. Inst., Mysore, 3 vols., 1923-26. Ref. Ul. II.95; Va. I. 443-44.

Do.—C I, *Dīpikā*, by Viṣṇu, the author's son. Mss. C. 139, C. 337, C. 2200, T. 225. Edn. With the text, above.

Do.—C II, *Bhāvaprakāśa*, by Subrahmaṇya, 3300 gr. Ms. 8355.

Ref. Ul. Sup. I. 540; Va. I. 444.

Do.—C III (Mal.), Anon.

Beg. śriyam śrīgurupādābjapāmsavaḥ pradiśanti vaḥ |  
bhavanti bhavarāśer ye sukhottarahetavaḥ //

iti. *Muhūrtadarśanamākunna* prakaraṇatte camappān tuṭaṇṇunna ācāryan atiṭe ... 'jayatyameya' (text.) iti. savitā jayati—oṭṭozhiyāte uḷḷa lokaṇṇaḷṭe prasūtikāraṇamāyulla ādityan ...

Mss. 420, 3761-A, 5853, 6043, 10921, 11083, C. 564. C. 2138, C. 2140, C. 2515-A, T. 277.

Do.—C IV (Mal.), Anon.

Beg. jayatyameyāmsu (etc.), (text). savitā jayati—ādityan yallāyilum mel varttikkunnon. ellārakkāṭṭil prādhānyam entennetattu collunnū.

Mss. CM. 564, P. 910.

Do.—C V (Mal.), Anon. Mss. 284, 621-B, 11010-A, T. 152.

Do.—C VI (Mal.), by Āzhvāñceri Tamprakkaḷ, incorporated in his *Phalasārasamuccaya* (*Muhūrta* section).

Do.—C VII (Mal.), Anon., unidentified. Ms. Mad. D. 13594 (ch. II, inc.)

*Muhūrtadīpaka* (muh.), by Nārāyaṇa, son of Keśava of Kāṇvavastu.

Mss. 1055-B, 5835-A, P. 911, P. 912. Ref. Ul. II. 107; Va. II. 612-13.

*Muhūrtanirṇaya* (muh.), (Mal.), Anon. Mss. T. 144-A, B.

*Muhūrtapadavī* I (muh.), ascribed to Govinda Bhaṭṭatiri of Talakkuḷam. Qn. In C, *Varadīpikā*, by Parameśvara IV on *Muhūrtapadavī* II. Ref. Ul. II. 110.

*Muhūrtapadavī* II (muh.), by Furuṣottama of the Māttūr Nampūtiri family from Pāñcālagrāma (Mal. Pāññā), in 36 verses.

**Beg.** pratyūhapraṇihantāram praṇipatya gaṇādhipam /  
muhūrtāvagame mārgam ṛjum kartum yatāmahe //1//  
ulkorvicalanoparāgaguḷikāḥ (etc.) //2//

**End :** V(B)ṛhadāvṛti-gehasambhavana  
dvijarājñā *Puruṣottamābhidhena* /  
gurunāthakṛpābalāt kṛtam yat  
tad idam sadviduṣām mude'stu nityam // (Ms. IO 8070)

**Mss.** See *Ker.*, II. pp. 315-18; P. 914; IO 8070; Ad.  
Edn. C. K. Vasudeva Sarma, Kozhikode, 1952. Ref. Ul.  
I. 110-11; Va. II. 602-12. Authorship. See above, p. 61.

**Do.**—C I, *Dīpa* or *Muhūrtasaraṇī-dīpa*, Anon.

**Beg.** namāmi vighnarājam tam vighnarājanivṛttaye / ... (1)  
*Muhūrtasaraṇī-dīpam* sarvasaṁśayanāśanam /  
vyākhyānam likhitum yatnam karomi janarañjanam //  
(text) ulketyādi...

**Mss.** 3172-A, 3567, 3577-E, C. 1023-C. Ref. Ul. II. 111.

**Do.**—C II, *Varadīpikā*, by Parameśvara IV, of Puradahanapura (Mal. Purayannūr), A.D. 1815, 2000 gr. **Mss.** 5880, 13481-B, L. 397, T. 33, TM. 234; Ad. Edn. Trichur. Ref. Ul. III. 476-77; Ul. Sup. I. 627; Va. II. 605-12.

**Do.**—C III, Anon.

**Beg.** ulkorvi (etc.) ulkā alātapatanam. urvicalanam bhūmi-  
kampaḥ. etayor eko vā yasmin dine dr̥śyate...

**Ms.** C. 1908-G.

**Do.**—C IV (Mal.), *Balaśaṅkaram*, by Śaṅkaran Nampūtiri of Mahiṣamaṅgalam, A.D. 1540. **Mss.** See *Ker.*, II. p. 317; *Ker. Mal.*, p. 114. Edn. *Śrī Vanchi Setu Lakshmi Series*, No. 5, Trivandrum, 1926. Ref. Ul. II. 471. Note. **Mss.** 13329-A and L. 165-B contain more matter than in the edn. above.

**Do.**—C V (Mal.), by Citrabhānu-Śiṣya(?)

**Beg.** abhivādya gaṇādhyakṣam vāgdevim ca gurūn grahān /  
*Muhūrtapadavīm* eṣa bhāṣayā vyākaromy aham //



*Muhūrtapadavī* III, C V (contd.)

iti. Muhūrtapadaviyām granthatte camappañ tuṭaṅṅunna  
ācāryan...

Mss. P. 924, P. 925, P. 926. Authorship. Suggested on the basis  
of the characteristic *maṅgala-śloka*.

Do.—C VI (Mal.), *Tamprākkaḷ Bhāṣā*, by Āzhvāñceri Tamprākkaḷ.  
Edn. Trichur.

*Muhūrtapadavī* III (muh.), by Subrahmaṇya of the Māttūr family,  
in 44 verses, 100 gr.

Beg. pratyūhapraṇihanṭṭṭ kiñcana mahaḥ sañcintya bhāsām nidhim  
bhānum ca, kriyate *Muhūrtapadavī* saṅkṣiptaśāstrāntarā...(1)  
doṣalakṣaṇabalābalādikam... (2)

Mss. P. 913, P. 215 to 22-A. Ref. Ul. II, 110. Authorship. See  
above, p. 61, and C I, below.

Do.—C I (Mal.), Anon.

Beg. 'vṛddhimdheyāddhitāyā'sau...padyair iyaṃ kṛtā

*Muhūrtapadavī* yena Subrahmaṇyam praṇaumi tam ||1||

Mss. 12576, L. 865, L. 1103-A, L. 5352-C ; Āzhvāñceri List, 81.  
Note. The gap in the above verse should have contained  
two letters, like *vagha* (°yāsā'vagha°) denoting 44, being  
the number of verses in the work.

Do.—C II (Mal.), Anon.

Beg. aham kiñcana mahaḥ bhāsām nidhim bhānum ca sañcintya  
*Muhūrtapadavī* kriyate ity anvayaḥ.

Ms. PM. 4260-A.

*Muhūrtapadavī* IV (muh.), Anon., in 32 verses. Ref. Ul. II, 110.*Muhūrtapadavī* V (?) (muh.), Anon.

Beg. cakrārdham mṛtivaidhṛtam ca guḷikaḥ  
sandhyāhīmastam viṣam  
gaṇḍāntam navadoṣaketujananam  
sāyāhnam ekārgalam /  
saṅkrāntigrahaṇaṅ ca dagdham aśanir  
vṛṣṭyulkabhūkampanam  
ṣaḍdoṣam bahulaṅ ca yāmyam ayanam  
coṣṇaṅ ca śukrekṣaṇam //

**Muhūrtapadavī V (contd.)**

**Mss.** P. 894-C (cata. as *Jātakasāra-Keralabhāṣā*), P. 947-B (cata. as *Bhāṣāsaṅgraha*).

**Do.**—C (Mal. verse), *Bhāṣāsaṅgraha*, by Vāsudeva of Vaḷḷimana, in two versions of 178 or 185 verses, respectively.

**Beg.** jyotiśśreṣṭham aham vande sahasrakiraṇam ravim /  
dineśam amarastutyam jaga- (broken) //  
tumpayum tiṅkaḷum cūṭintappante mumpile makan /  
mamānamukamuḷḷappan akalappōkkukāpadaḥ //  
vaksye namaskaricciṭṭu vijñātum bhūtanāthane /  
bālānam pozhutum mātram *Bhāṣāsaṅgraham* ity aham //  
(text) : cakrārdham etc.

**Mss.** - Version I in 178 verses : 13479-Q; version II in 185 verses : P. 894-C (cata. as *Jātakasāra-Keralabhāṣā*), P. 947-B (cata. as *Bhāṣāsaṅgraha*), T. 153. Note : Ul. (II. 270, 473) takes this as an independent work on *muhūrta* by Śāṅkaran Nampūriti of Mahiṣamaṅgalam.

**Muhūrtapadavī VI (muh.)**, by Tuppan Nampūtiri of Iṭavaṭṭikkāṭṭu family, in 40½ verses. Ref. Ul. III. 475-76.

**Muhūrtapadavī VII (muh.)**, by Nārāyaṇan Nampūtiri of Iṭavaṭṭikkāṭṭu family, in 36 verses. Ref. Ul. II. 475-76.

**Muhūrtapaddhati (muh.)**, Anon., (Ker. ?). Ms. 14045-B.

**Muhūrtam Bhāṣā, Muhūrtavidhi or Tāmaranallūr Bhāṣā (muh.)**, (Old Mal.), by a member of the Tāmaranallūr family and protégé of Ceyyūr (? Cellūr) Nārāyaṇan Nampūtiri, 300 gr.

**Mss.** 151-B, 515-A, 5835-C, 5839, PM. 4113-B, PM. 4147-A, (the last two cata. as *Muhūrtapadavī-Bhāṣā*). Ref. Ul. I. 400-1 ; Ul. Sup. I.146 ; Va. III.396.

**Muhūrtamādhaviya** : See *Muhūrtadarśana*.

**Muhūrtaratna (muh.)** by Govinda, in 4 chs. **Mss.** See *Ker.*, II. p. 318 ; *Mad.* Ref. Va. II. 499-500.

**Do.**—C by Parameśvara of Vaṭaśreṇi. **Mss.** 5853-B, C. 138, T. 144 A-B. Ref. Va. II. 500, where it is wrongly stated that the author is different from P of Vaṭaśreṇi.

*Muhūrtalakṣaṇam* I (muh.), Anon. Ms. 865-B.

*Muhūrtalakṣaṇam* II (muh.), Mal. prose, Anon., Ms. T. 144-C-4.

*Muhūrtalāñchanam* (muh.), Mal. prose, Anon., 100 gr.  
Mss. 1134-D, L. 1352-E.

*Muhūrtavicāra* (muh.), Mal. prose, Anon. Ms. L. 899-A.

*Muhūrtavidhi* I (muh.), Mal. prose, Anon. Ms. L. 139-B.

*Muhūrtavidhi* II (muh.), Mal. verse, Anon. Ms. L. 398.

*Muhūrtavidhi* : See also *Muhūrtam Bhāṣā*.

*Muhūrtābharāṇa* (muh.), by Dāmodara of the Bhāradvāja gotra,  
in 9 chs., 1000 gr. Mss. T. 240, TM. 71. Ref. Ul. II. 105-6;  
Ul. Sup. I. 210-11.

*Muhūrtāṣṭaka* (muh.), Anon., 20 gr.

Beg. Jyeṣṭhāśleṣāgnirakṣohara (etc.)

Mss. 1055-H, P. 865, P. 866.

Do.—C I, *Ācarādīpikā*, in verse, by Ravi, 130 gr.

Mss. See *Ker.*, II, p. 319; P. 865, P. 866. Ref. Ul. II. 113-14.

Do.—C II, *Dīpikā*, by Parameśvara of Vaṭaśreṇi.

Men. By him at the close of his C on the *Mahābhāskariya*.

*Maudhyādigāṇitam* (?) (kar.), (Mal.) Mss. *Ker. Mal.*,  
pp. 116-17.

*Yatrāphalam* (astrol.), Mal. verse, Anon., 20 gr. Ms. 5038-D.

*Yātramuhūrta* (muh.), Mal. prose, Anon., Ms. 10752-P.

*Yuktibhāṣā* or *Gaṇitanyāyasaṅgraha* (math.-astron. rationale), by  
Jyeṣṭhadeva, in two parts : Pt. I. Mathematics and Pt. II.  
Astronomy. 5350 gr. Mss. See *Ker. Mal.*, p. 48 (cata,  
*Gaṇitanyāyasaṅgraha*), p. 117. Edn. with Notes by Rama Varma  
Maṛu Thampuran and A. R. Akhileswara Ayyar, Trichur, 1948;  
(Pt. I only); With Notes, K.V. Sarma (Pt. II only); Gov. Or.  
Mss. Library, Madras, 1954. Skt version : See *Gaṇityukti*, Mad;  
R. 4382. Ref. Raja, 157-58; Sen, p. 73; Ul. III. 439-40;  
Ul. Sup. I. 612-16.

- Yogaphala* (astrol.), Mal. prose, Anon. Ms. 13494-J.
- Yogādiphalam* (astrol.), Mal. prose, Anon. Ms. 5109-G.
- Yogyādividhi* (astron.), Skt.-Mal., Anon. Ms. 13241-G.
- Raṇadīpikā* (astrol.), by Kumāra Gaṇaka, in 8 chs. Ms. C. 531-D.  
 Qn. in *Praśnamārga* (A.D. 1650). Edn. TSS 95. Ref. Ul. II. 112-13 ; Va. II. 725-29.
- Ravi**, (c. 1425-1530), Teacher of Nilakaṇṭha Somayāji.  
 —C *Ācaradīpikā* on *Muhūrtāṣṭaka*  
 Ref. See above, p. 55, § 25 ; Ul. II. 113-14.
- Ravisāṅkramadigaṇitam* (?) (astron.), Mal., Anon. Ms. 6132-B (200 gr.).
- Rājarāja Varmā I** : Vidvān Karīndran Ceruṅṇi Koyittampurān of Kilimanoor, (1812-46). Ref. See above, pp. 5-6.
- Rājarāja Varmā II** : A.R. Rajaraja Varma Koyittampurān, (1853-1918).  
 —*Karaṇapariṣkaraṇa*  
 —*Pancāṅgasuddhipaddhati*  
 —C *Jyotiṣaprakāśana*, on the *Goladhya* of Bhāskara II.  
 Ref. See above, pp. 80-81, § 81 ; Ul. V. 791-827 ; Ul Sup. II. 436-49 ; Va. VI. 27-65.
- Rāma I**, Teacher of the anon. au. of *Laghuhorāvivarāṇa* (Mal.).  
 Ref. See above, p. 67, § 47.
- Rāma II** : Rāman Āśān (18th cent.), astrological authority, father of Kṛṣṇadāsa. Ref. See above, p. 5 ; p. 74 § 65.
- Rāma-Śiṣya** (17th cent.)  
 —C *Laghuorāvivarāṇa* on *Laghuhorā*  
 —C on *Horā*  
 Ref. See above, p. 67, § 47.
- Ramapraśna* (pra.), Skt.-Mal., Anon. Ms. 13294-J.
- Rāma Varmā** Koyittampurān of Grāmam, (1853-1916).  
 —*Jyotiṣapradīpa*  
 Ref. See above, p. 80, § 80 ; Ul. IV. 544-46:

**Rāma Vāriyar of Kaikkulangara, (1853-97).**

—*Gauḷiśāstram* (Mal.)

—*Sāmudrikaśāstra* (Mal.)

—C (Mal.) on *Horā*

—C (Mal.) on *Praśnamārga (Pūrvārdha)*

Ref. See above, p. 80, § 81 ; P.V. Krishna Variyar, life sketch, in Mal., in his book *Maṅ marañña sāhttyakāranmār* ; Ul. IV. 267-76 ; Ul. Sup. II. 107-16 : Va. IV. 587-607.

*Ramāyaṇākṣarapraśna* (pra.), Anon. Ms. Paliyam List, 826.

*Rāsigolasphuṭānīti* (astron. rationale), by Acyuta Piṣaraṭi.

Mss. 755 (cat. as *Gaṇitayuktayah*) [ G ] (ff. 1-13) ; Mad. Mal. D. 339, pp. 90-95. Edn. With Tr. K.V. Sarma, Adyar Lib., Madras, 1955. Ref. Va. IV. 224-25.

*Rāsidvayānayanam* (?) (arith.), Anon.

Beg. rāśyor yogādighāto vargayogas tadantaram /

Ms. L. 1354-F (inc., 110 gr., with a few instructions in Mal.)

*Rāsipramāṇādiphalam* (?) (astrol.), Mal., Anon.

Beg. pantraṅṭu rāśi vaccu ayanacalanam kūṭṭi ...

Ms. L. 385-B.

*Rāsiḥphalam* (astrol.), Mal. prose, Anon. Ms. 10717-C.

*Rāsiḥphalasāropadeśa* : See under *Sāropadeśa*.

*Rāsimānādigaṇita* (?) (astron.), Mal. verse, by Śaṅkara of Mahiṣa-maṅgalam.

Beg. tumpa tinkaḷoṭu gaṅga tanneyum etc. (1) ;

candro rudro jayo vidyā nayas tena khani raveḥ /

trimśannāḍyāhni guḷiko dinapañcamavan niśi //

śrīvallabhaykku meṣādi rāsimānaññaḷ collinen /

rāgaughamunimaunam hariṇakhariṇagānimān //

Ms. C. 2297-C.

*Rāsiḥvarṇādivicāra* (astrol.), Skt.-Mal., Anon. Ms. 13194-E.

*Rāśisanjñadividhi* (astrol.), Anon. Ms. 13451.

**Rudra I** : Uzhutra Vāriyar, (c. 1325-1400), Teacher of Parameśvara of Vataśreṇi. Ref. See above, p. 50, § 21.

**Rudra II** : Uzhutra Vāriyar, (c. 1475-1550).

—*Aṣṭamaṅgalapraśna*

—*C Naukā* or *Vivarāṇa* on Horā

Ref. See above, p. 62, § 36 ; Ul. II. 114-17 ; Ul. Sup. I. 234-35 ; Va. I. 531-34.

*Rekhāpraśna* (pra.), Mal., Anon, 60 gr.

Beg. maṅḍalajñanattiṅkalum anaṣṭye kelpām māṅkaṇḍanān paṇḍu pramerkupperapurānākum vasikkumeṭam (?)

Ms. C. 1796-B.

*Rekhāpraśna* (ārūḍha-pra.), Mal prose, Anon. Ms. T. 304-C.

*Rogapraśna* (pra.), Mal. prose, Anon. Ms. 10582-C-1.

*Rogalakṣaṇa-dūtalakṣaṇādi* (pra.), Mal. prose, Anon.

Beg. praśnam vacca rāśiyuṭe aṣṭamādhipati yātoru rāśiyil ninnu ...

Ms. PM. 4077-F.

*Lakṣaṇapraśna* I (pra.), Mal. prose, Anon. Ms. T. 1496.

*Lakṣaṇapraśna* II (pra.), Mal. verse, Anon. Ms. 5109-C.

*Lagnaprakaraṇa* (astron.), by Mādharma of Saṅgamagrāma, 225 gr.

Ms. 414-B, L. 1360-C ; Mad. Mal. D, 339.

*Lagnādiphalam* (astrol.), Mal. prose, Anon. Ms. 5109-E.

*Lagnadyānayanam* (astron.), Mal. prose, Anon. Ms. 5109-K.

*Laghukalārpaṇam* (astron.), in 8 chs., 500 verses.

Beg. māyām āśritya sṛṣṭvā jagad idam akhilam svapnavat svasvarūpe.

Ms. Mad. R. 5185 (a). Ref. Va. 390-91.

*Laghujātaka* or *Laghuhorā* : See *Laghuharā*.

*Laghujātakapaddhati* (jā.), Anon.

natvādyam parameśvaram gaṇapatim ... (1)

Kṛṣṇīyād aparāc ca sāram api ... (1) ;

janmāyuktaphalāni janmasamaye ... (2)

Ms. Whish 144 (2).

*Laghudarśinī* (astrol.), by Nārāyaṇa. Ms. 844-B.

*Laghu-Praśnamārga* (pra.), Anon. Ms. Payyalikkā Illam,  
Kottayam, 31-A.

[*Laghubhāskariya* (astron.), by Bhāskara I]

Do.—C I, *Vivaraṇa* by Śāṅkaranārāyaṇa. Mss. 4258, C, 1681, T. 277.  
Edn. TSS 162. Ref. Raja, 128-29 ; Ul. I. 165-67 ; Va. 221-23.

Do.—C II *Sundarī*, by Udayadivākara (Ker. ?), (A. D. 1073). Mss.  
C. 1885, P. 942-45 ; P. 977, T. 301.

Do.—C III, by Parameśvara of Vaṭaśreṇi. Mss. 8324-B, C. 1079-A,  
C. 1348-B ; T. 19 ; Ad. ; Mad. Edn. *Ānandāsrama Skt. Ser.*,  
128, Poona, 1946.

Do.—C IV (Mal.), Anon.

Beg. karabadarasadṛśam akhilam bhuvanagatam yatprasādena.

Ms. P. 946 (inc.)

Do.—C V (Mal.), Anon.

End : grahagaṇitakarmanṇaḷuṭe nibandham saṅkṣepeṇa Bhāskaranāl collapepetṭu kazhiñṇu.

Ms. 5157 (inc., 700 gr.).

Do.—C VI (Mal.), *Bālaśaṅkaram*, by Śāṅkara of Mahiṣamaṅgalam.

Ms. C. 2146-A (inc., 350 gr.). Ref. Ul. II. 471-72.

Do.—C VII (Mal.), Anon., 1500 gr.

Beg. ellārkkum uḷḷile nilkkum mānatteyum naṭappavan /  
katiron ennabhiṣṭaṅṅaḷ ellāyppozhum varuttuka //

Mss. C. 1702, T. 286, T. 862. Ref. Ul. II. 650-51.

[*Laghumānasa* (astron.), by Muñjāla]

Do.—C I, *Vāsanā* or *Mānasagrahajñānavāsanā*, by Sūryadeva Yajvan,  
Mss. P. 949, T. 38.

*Laghumānasa* (contd.)

Do.—C II *Parameśvara*, by Parameśvara of Vaṭaśreṇi, 600 gr.

Mss. C. 760-B, T. 28 ; Ad. ; Mysore. Edn. *Ānandāśrama Skt. Ser.*, 123, Poona, 1944.

Do.—C III (Mal. prose), *Mānasagaṇitam* (?), *Mānasocitam* (?) or *Mānaasm eṇṇum prakāram*, by Putumana Somayāji (?)

Beg. gaṇeśā ninnu vandiccen *Mānasam* kathayākkuvān /  
mandacetassukaḷkellām pāṭham ākkām iteṇṭaham //  
... *Mānasam eṇṇum prakāram*. abdam vaccu pattil perukki  
appaṭi vaccu eṭṭil koṇṭu mel kūṭṭuka.

Mss. 5129-D (inc., 120 gr.), E (inc., 75 gr.). Authorship. Suggested on the basis of the tradition that Putumana Somayāji has written a *Mānasagaṇita* and the similarity in the wording of the initial verse above with certain expressions like *alpacetāsām* found in the initial verses of the other works of this author.

*Laghumānasa* : See also *Mānasa*.

[*Laghuhorā* or *Laghujātaka* (astrol.), by Varāhamihira]

Do.—C, *Laghuhorāvivarāṇa*, free rendering in Mal. verse, by a pupil of Rāma, 500 gr., A.D. 1640. Mss. 719-A, P. 4320-A.

*Lāñchanaśāstra* I (pra.), Anon.

Beg. saccidānandarūpāṇām gurūṇām karuṇāvatām /  
kaṭākṣapālyah kurvantu satatam mama maṅgalam //  
ataḥparam mṛter lakṣma vakṣye tallāñchanais saha /

Ms. T. 7.

*Lāñchanaśāstra* II (pra.), by Śaṅkara : See *Sānudrikasāra*.

*Lāṭavaidhṛtagaṇitam* (?) I (kar.), Mal. verse, Anon.

Beg. veṇṭunnetattinarkkendurāhūṇām sphuṭam ānayet /

Ms. L. 1328-D (inc., 100 gr.).

*Lāṭavaidhṛtagaṇitam* (?) II (kar.), Mal. prose, Anon.

Beg. lāṭavaidhṛtāñṇaḷe gaṇikkum prakāratte collunnū—yātoru  
māsāñṇaḷie ...

Ms. L. 1221-D (80 gr.).



*Laṭavaidhṛtadigaṇita* (?) I (kar.), Mal. prose, Anon.

Beg. lāṭavaidhṛtam eṇṇunna prakāram atha collinen /

Ms. 12687-F (130 gr.).

*Laṭavaidhṛtadigaṇita* (?) II (kar.), Mal., Anon.

Mss. 13294-A (180 gr.), C. 563-E (50 gr.), L. 638-B (550 gr.).

[*Līlavatī* (arith.), by Bhāskara II]

Do.—C I, by Paramēśvara of Vaṭāśreṇi. Mss. 5783, 10614-B, C. 295, P. 953; Ad.; Mad. R. 5160.

Do.—C II, *Karmadīpaka*, *Karmapradīpikā* or *Kriyākramakarī*, by Nārāyaṇa : I. Shorter version, 2000 gr. Mss. 6069, 8978, 12806-A, C. 169, C. 306, C. 628-A, TM. 266; Ad.; Mad. D. 13484, Mad. R. 3497. (The reading, “etan Mādhavākhyena racitam Karmadīpakam”, found in Mad. R. 3497, is an obvious interpolation, violating even the metre, in place of the normal reading “etan Nārāyaṇākhyena”.)

Do.—C III, *Karmadīpaka*, *Karmapradīpikā* or *Kriyākramakarī*, by Nārāyaṇa : II. Longer version, 6750 gr. Ms. 12814, T. 200, Mad. D. 2754(a); Ms. with K. V. Sarma. Ref. Ul. Sup. I, 227-28.

Do.—C IV (Mal.), Anon., 2100 gr.

Beg. yogāśrayam pāpaviyogahetukam  
guṇālayam hāram aśeṣaduṣkṛtām /  
kṛtīśvaram vedagirām param padam  
ghanatviṣam gopakumāram āśraye //

iviṭe dravyattiṅṭe oro saṁjñakale collunnū.

Mss. 1286-B, 5786, 2813, C. 7-A, C. 2334, L. 878-B, L. 1328, T. 15.

Do.—C V (Mal.), Anon.

Beg. abhipretārthasiddhyartham pūjito yas surair aṇi /  
sarvavighnacchide tasmai gaṇādhipataye namaḥ //  
aham tam mātaṅgānanam natvā ...

Mss. 3636, L. 839.

Do.—C VI (Mal.), Anon.

Beg. ācāryan iṣṭadevataye namaskariccu *Līlavatiye* camaykkun-  
nuṭṭennu collunnū.

Mss. 14219-C (fr., 50 gr.), C. 1992-A (inc., 2000 gr.), L. 878-B.

*Līlavatī* (contd.)

Do.—C VII (Mal.), Anon.

Beg. varāṭakañṅal 20 kūṭiyatu oru kākiṇi.

Ms. T. 890 (inc., 1500 gr.). Ref. Ul. III. 242-43.

Do.—C VIII (Mal.), Anon.

End : avarcku ellāyppozhum sukham sampattu vardhikkunnū,  
*Līlavatīyile* aṅkaparimāṇavyavahāram kazhiññū. *Līlavatīyūm* kazhiññū.

Ms. 10648 (inc., 200 gr.).

Do.—C IX (Mal.), Anon.

Beg. na guṇo na haro na hṛtir na ghaṇaḥ pṛthulas tatbā /

Ms. 12559 (inc., 1200 gr.).

Do.—C X, *Bhāskarīyagaṇitavyākhyā*, by Goda Varmā, Vidvān Iḷaya  
Tampurān of Koṭuññallūr. Men. Ul. IV. 31-32; Va. IV. 318;  
RNP IV. 400.

Do.—XI, by Dāmodaran Nampūtiri of Maṅgalaśśeri family.

Men. Va. III. 379.

*Līlavatī* II (arith.), Mal. verse, Anon.

Mss. 3637-C, 14219-C.

*Vakramaudhyādigāṇitam* (kar.), Mal. prose and verse, Anon.

Epoch : Kali day 17,01,448 (A.D. 1557).

Beg. abargaṇatte vacciṭṭu 'devavākyaññasūrya'ne /  
kaḷaṅña śeṣam saṁskruddhair hariccāl śeṣamuḷlatil //

Ms. PM. 4368-H (80 gr.).

*Vastrādīphalanirṇaya* (?) (astrol), Skt.-Mal., Anon.

Ms. T. 120 (250 gr.).

Vararuci I (4th cent. ?), legendary promulgator of the *Kaṭapayādi*  
notation.

—*Girṇaḥ śreyādi-Candravākyaṇi*.

Ref. See above, p. 43. § 3; Raja, 120-22, Ul. I. 77-81, 195; Va.  
I. 90-95.

**Vararuci II**, (Ker. ?), Apocryphal au (?)

—*Keraladvādasabhāvavākyaṃ*

—*Vararucikerala, Jātakarahasya* or *Keralanirṇaya*

—*Vārarucika*

— Certain other doubtful or apocryphal works.

Ref. See above, p. 43, § 4.

**Vararucikerala, Jātakarahasya** or **Keralanirṇaya** (astrol.) (Ker. ?)

Ref. Ul. I. 164, 165.

**Vararucivākyaṃ** : See *Girnaḥ śreyādi-Candravākyaṇi*.

**Varṣalakṣaṇa** (nat. astrol.), Skt.-Mal., Anon. Ms. 6914-A.

**Vahni**, (19th cent.), Teacher of Puruṣottama, au. of *Praśnāyana*.

[ **Vākya-karaṇa I** (kar.), ascribed to Vararuci III ]

—C (Mal.), Anon. Ms. L. 893-C.

**Vākya-karaṇa II** (astron. methodology) by Parameśvara of Vaṭaśreṇi,  
75 gr.

Beg. pūjyapādasya Rudrasya śiṣyo 'yam *Parameśvaraḥ* |  
karoti *Vākya-karaṇam* vākya-vayavasiddhaye //

Ms. C. 133-A.

**Vakyadīpikā** (astron.), by Parameśvara of Vaṭaśreṇi. Men. by him  
at the close of his C on the *Mahābhāskariya*.

**Vakyadhruvasāmsākārādi** (?) (kar.), Anon.

Beg. āniya tuṅgamadhyendū vākya-ārambhadinodaye |  
deśāntarākhyasāmskāram api kṛtvā tayor dvayoḥ //

Ms. PM. 4147-E.

**Vakyadhruvadigaṇitam** (?) (kar.), Anon.

Beg. Candradhīlagnasamyuktam kollasaṅkhyāyutam kramāt |

Ms. PM. 4147-C.

Do.—C (Mal.), Anon.

Beg. 'candradhīlagna' ennu vaccu atil kollasaṅkhyā kūṭṭi.....

Ms. PM. 4147-C.

*Vakyaśeṣam* (kar.), Mal., mnemonic tables, Anon.

Mss. See *Ker. Mal.*, pp. 130-31.

*Vākyaḷaṅkāra* (kar.), Anon., 'by a Brāhman', in 6 chs., 125 gr.

End : *Vākyaḷaṅkāra-nāmāyam grantho viracito laghu :*

*kenacid dvijavaryeṇa samāpto 'bhūd atisphuṭaḥ //*

Ms. C. 2179-B.

*Vārarucika* (astrol.), by Vararuci, in 12 chs., 875 gr. Mss. P. 960,  
P. 961, T. 506.

*Vārādiphala* (astrol.), Skt. Mal., Anon. Mss. 13194-A, L. 385-C.

*Vārādiphalanirṇaya* (astrol.), Anon.

Beg. ātmajñāni sadāsūrah paittikaḥ priyavallabhaḥ |  
caturaśratanuḥ śrīmān ravivāre prasūyate //

Mss. CM. 2197-B (cata. as *Vārāphalam* or *Pañcāṅgaphalam*),  
T. 245.

Do.—C (Mal.), Anon.

Beg. Vārādiphalanirṇayaḥ. nāyaraḥcaphalam āvatu—ātmajñāni..

Ms. T. 245.

*Vārādyaḍhipatinirṇaya* (astrol.), Mal. prose, Anon. Ms. 6007-I.

*Valmīkipraśna* (pra.), Mal. prose, Anon. Mss. C. 2289, T. 1000.

*Valmīkiśāstra* (pra.), Mal., Anon.

Beg. ini nirūpicca kāryam śubhamo aśubhamo ennu colluka.

Ms. CM. 2293. Rem. For similar works see *Dr̥ṣṭāntamāla* I, II.

*Vasiṣṭhapraśna* (pra.), Mal., prose, Anon. Ms. 5974.

Vāsūṇi Mūssatu of Veḷḷānaśseri, (1885-1914)

—C on *Pañcabodha*.

Ref. See above, p. 81, § 81; Ul. IV. 693-703; Ul. Sup. II. 373-75.

Vāsudeva I : Vāsudevasvāmi.

—*Kaladīpa*.

Ref. See above, p. 69, § 50; Va. III. 392-94.

Vāsudeva II, of Vaḷḷimana in Kaṇṇaṅgalam.

—C (Mal.), on *Muhūrtapadavī V*, in two versions.

Ref. See above, p. 72, § 58.

Vāsudeva III, teacher of the anon. au. of *Santānadipikā*.

Vidyāmādhava, son of Nārāyaṇa, of Nilamana, near Gokarṇa.

—*Muhūrtadarśana* or *Vidyāmādhavīya*

Ref. See above, pp. 48, § 15 ; Ul. II. 95 ; Va. I. 441-44.

*Vidyāmādhavīya* : See *Muhūrtadarśana*.

Vidvān Iḷaya Tampurān of Koṭunnallūr, (1800-51)

—C *Bhāskarīya-gaṇita-vyākhyā* on *Līlāvati* of Bhāskara II

—C on *Golādhyāya* of Bhāskara II

Ref. See above, p. 78, § 75 ; Ul. IV. 31 ff. ; Va. IV. 318 ; RNP IV. 400.

*Vilīptadivākyaṇi* : see *Śilam rājñah śriyetyādi*°-

*Vivāhapporuttam* (astrol.), Mal prose, Anon. Ms. 1416-C.

Do.—See also *Daśapporuttam*, *Poruttam*, *Vivāhānukūlyam*, *Velīpraśna*.

*Vivāhānukūlyam* (astrol.), by Parameśvara of Vaṭaśreṇi. Mss. C. 584-A, T. 268-B.

Do.—C I, (Mal.), Anon.

Beg. rāśi-rāśipavaśyau ... (text). rāśivaśyavum rāśyadhipa-vaśyavum bandhuśatrutvavum ...

Ms. C. 584-A.

Do.—C II (Mal.), Anon.

Beg. anantaram vivāhattinu poruttatte paṛayunnu—rāśi-rāśipa-vaśyau ... (text). rāśipporuttavum rāśyadhipapporuttavum ennu tuṭaṇṇi eṭṭu poruttaṇṇal pradhānamāyitṭu collap-peṭunnu.

Ms. T. 268-B.

*Viśvārthadipinī* : Name of C (IX) by Parameśvara on *Horā*.

*Viśamākṣaravivṛti* : Name of C (IV) by Nityapraḷāśa Yati on *Horā*.

*Viṣunirṇayādiphala* (astrol.), Skt.-Mal., Anon., 300 gr. Ms. L. 1229-E.

*Viṣuphalādivicāra* (astrol.), Mal. Anon., Ms. 13494-P.

*Viṣusāṅkramaphala* (astrol.), Mal. verse, Anon., 150 gr. Ms. 6478-C.

### Viṣṇu I

—C, *Caturasundarī*, on *Cintājñāna* of *Kṛṣṇīya* or *Kṛṣṇa*.

Viṣṇu II. son of *Vidyāmādhava*, of *Nilamana*, near *Gokarṇa*.

—C, *Dīpikā*, on the *Muhūrtadarśana* of *Vidyāmādhava*.

Ref. See above, pp. 49-50, § 16.

*Veṅṇād-dvija*, personal name not known; a native of *Veṅṇād* (S. Travancore).

—*Jātakodaya* or *Uḍu-jātakodaya*

*Veṅṇāroha* : See also *Candrasphuṭāpti*, *Dṛg-veṅṇārohakriyā*.

*Veṅṇāroha* (kar.), by *Mādhava* of *Saṅgamagrāma*, for the accurate computation of the moon, in 74 verses. c. 1400.

Mss. 10929-C ; Skt. Col., Trippunithura ; Eḷamprakkoṭṭu Mana, Eravoor (Cochin), all with C of *Acyuta*.

Edn. K.V. Sarma, with elaborate Intro., Skt. College, Trippunithura, 1956. Ref. Ul. II. 99-100 (where the work is wrongly described to contain only 59 verses); Va. III. 388-90.

Do.—C (Mal.), by *Acyuta Piṣaraṭi*. Mss. With the text mss. above.

Edn. K. V. Sarma, with text above. Ref. Ul. II. 99-100, 651-52.

*Veṅṇārohakriyā* (kar.), Anon. Mss. 5867, (ff. 163-65). Edn.

K.V. Sarma, as App. II to his edn. of *Veṅṇāroha*, above.

*Veṅṇārohaṣṭaka* (kar.), by *Putumana Somayāji*. Ms. 404 (last folios).

*Velipraśna* (pra.), Mal. prose, Anon. Ms. C. 565-G.

*Vaidyanatha-Śiṣya* a native of *Bhūtanāthapura*.

—*Praśnasāra* III.

*Vaidhṛta* : See also *Lāṭavaidhṛta*, *Vyatiṣṭāitavidhṛta*.

*Vaidhṛta* (?) (kar.), Mal., Anon., 80 gr. Epoch : Kali day 17,85,699 (AD. 1788).

Beg. vaidhṛtakali 'dhūlikṣami hi sevyah'.

Ms. 14219-B.

*Vaidhṛtagaṇita* (kar.), Mal., Anon.

Beg. vaidhṛtam aṇiyum prakāram—oru graham meṣādiyāyi ...

Ms. 5109-A (inc., 85 gr.).

*Vaidhṛtadyānanam* (?) (kar.), Mal., Anon.

Beg. atātu māsam patinañcām tiyati udayattinte ādityasphuṭam  
vaccu raṇṭu tavaṇa ayanam kūṭṭi ...

Ms. 13494-I (180 gr.)

*Vyatīpātagaṇitam* (kar.), Anon.

Beg. vyatīpātarkṣam abhūhya sāyanāhi-ravi nayet /  
rāhos tu kṣepacalanam parakrāntim vidhor api //

Ms. CM. 595-F.

*Vyatīpātavaidhṛta* (kar.), Anon.

Beg. vyatīpātendusiddhyartham upāyo 'tha pradarsyate /

Mss. C. 595-E, C. 2085-E, L. 1167-A.

Do.—C (Mal.), *Pāṭugaṇippān-Bhāṣa*.

Beg. pātum piṭappum eṇṇēṇṭil collunnuṇṭu curukki ṇān /  
iṣṭagrahayor arkan erunnāḷ udayattinu //  
arkanil graham erunnāḷ eṇṇukastamayattinu /  
minattil oruvan nilppu mattevan meṣarāṣiyil //

Mss. C. 595-F, C. 2085-E, L. 1167-A, PM. 4078-D, PM. 4158-D.

*Vyatīpātadigaṇita* I (kar.), Anon. Ms. 1015-A (200 gr.)

*Vyatīpātadigaṇita* II (kar.), Mal., Anon. Ms. 13057-A (inc.,  
84 gr.)

*Vyatīpātadigaṇita* III (kar.), Mal., Anon. Ms. 13389-A (inc.,  
115 gr.)

*Vyatīpātāṣṭaka* I (kar.), Anon. Beg. candra ... Mss. of the work are  
not known but that of its C is known.

Do.—*Vṛtti*, in verse, by Parameśvara of Vaṭaśreṇi. Ms. 788.D.

*Vyatipātāṣṭaka* II (kar.), Anon.

Ref. Two verses beg. with *saṁskṛtyāyanayor bahvoḥ* and *visarpaś śaśibāhor yat*, quoted by Nārāyaṇa in his C (I) on *Pañcabodha* IV, verse I. 2. It is not known whether *Vyatipātāṣṭakas* I and II are the same.

Vyāghrapāda, apocryphal author.

—*Aṅkaṇaśāstra*, *Grahasamaya* or *Navagrahasamaya*

Ref. See above, p. 47, § 11.

*Śakābdasaṁskārikriyā* (astron.), Mal., an exposition of *Karaṇapaddhati*, I. 12, 13 depicting the *Śakābdasaṁskāra* of *Grahacāranibandhana*. Anon., 100 gr. Ms. 5820-C. Edn. App., (pp. 307-11), to the edn. of *Karaṇapaddhati*, Madras, 1956.

*Śakunamuṣṭi* : See *Dṛṣṭāntamālā*.

*Śaṅkara* I (c. 1475-1575), younger brother of Nilakaṇṭha Somayāji of the Garga gotra, hailing from the Keḷallūr family. Ref. See above, p. 57, § 27.

*Śaṅkara* II : Śaṅkara Vāriyar (c. 1500-60) of Tṛkkuṭaveli family., follower of Nilakaṇṭha Somayāji.

—*Karaṇasāra*

· C on Do.

—C *Kriyākalāpa* on the *Tantrasaṅgraha* of Nilakaṇṭha Somayāji

—C *Laghuvivṛti* on the *Tantrasaṅgraha*

—Anon. work on astron., quoted by himself in his *Laghuvivṛti*, on *Tantrasaṅgraha*, II. 15, 16.

Ref. See above, pp. 58-59, § 31 ; Raja, 155 ; Ul. II. 120-21.

*Śaṅkara* III : Śaṅkaran Nampūtiri, (1494-1570), of the Mahiṣamaṅgalam (Mal. Mazhamāṅgalam) family, near Trichur, pupil of Parameśvara of Vāzhamāveli.

—*Ayanacalanādigaṇitam* (Mal.)

—*Kaladīpaka* I (shorter version) (Mal.)

—*Kaladīpaka* II (longer version) (Mal.)

—*Gaṇitasāra* (II) (Mal.)



**Śaṅkara III (contd.)**

- Candrogaṇitakrama* (Mal.)
- Jātakākrama* (Mal.)
- Jātakasāra* I (Skt.)
- Jātakasāra* II (Mal.)
- Pañcāṅga* (muhūrta) for 1000 years.
- Praśnamāla* (Skt.)
- Rāṣimānādigaṇita* (Mal.)
- C (Mal.) *Balaśaṅkaram* on *Kāladīpaka* II
- C (III) (Mal.) Do. on *Pañcabodha* IV
- C (IV) (Mal.) Do. on *Muhūrtapadavī* II
- C (VI) (Mal.) Do. on *Laghubhāskarīya*
- C (Mal.) *Pañcabodhakriyākrama* on *Pañcabodha* II
- C (II) (Mal.) *Pañcabodhārthadarpaṇa* on *Pañcabodha* IV
- C (Mal.) on his own *Praśnamāla* (?)

Ref. See above, pp. 62-64, § 37 ; Raja, 155-56 ; Ul. II. 269-72 ; 469-75 ; Va. II. 613-22.

**Śaṅkara IV** of Muktisthala (Mal. Mūkkōla), pupil of Nārāyaṇa and Dāmodara, and protégé of the Zamorin of Kozhikode.

- Āyuhpraśna*
- Sāmudrikasāra*, *Āruḍhapraśna* or *Lāñchanaśāstra*

Ref. See above, p. 75, § 66 ; Ul. III. 86-87 ; Va. II. 718-23.

**Śaṅkara V**

- Jātakasāra* III (Mal.)
- Praśnasāra* I (Mal.)
- Praśnānuṣṭhānapaddhati* I (?)
- Praśnānuṣṭhānapaddhati* II

Ref. See above, p. 75, § 67.

**Śaṅkara VI**, Teacher of the anon. au. of *Ācāradarśana*.

**Śaṅkara VII**, (19th cent.), Teacher of Puruṣottama (au. of *Praśnāyana*).

**Śaṅkara VIII**, Teacher of Parameśvara, (au. of C IX, *Viśvārthadīpinī* or *Jātakacandrikā*, on *Horā*).

**Śaṅkara IX**: Śaṅkarakavi.

- C on *Muhūrtapadavī* III

Śaṅkaranārāyaṇa, (c. 825-900), court astronomer of King Ravi Varmā of Mahodayapuram.

—C *Vivarāṇa* on the *Laghubhāskariya* of Bhāskara I

Ref. See above, p. 45, § 7 ; Raja, 128-29 ; Ul. I. 165-67 ; Va. IV. 221-23.

Śaṅkara-Varmā or Appu Tampurāṇa, (1800-38), a prince of the royal house of Kaṭattanād in N. Malabar.

—*Sadratnamāla*

—C (Mal.) on Do.

Ref. See above, p. 78, § 76 ; Raja, 165-66 ; Sen, p. 191 ; Ul. III. 499-501 ; Ul. Sup. I. 635-37 ; Va. IV. 384-93.

*Śilam rājñah śriye'tyādi viliptādi-Candravākyāni* (kar.) by Mādhava of Saṅgamagrāma. Mss. C. 2297-C, MC. 595-A, P. 4116-B ; Eḷamprakkoṭṭu Mana, Eravoor (Cochin). Edn. K. V. Sarma, with Notes, as App. I to his edn. of *Veṅvāroha*, Skt. College, Trippunithura, 1956.

*Śukrakerala, Bhṛṅgukerala* or *Keralarahasya* (Ker. ?). Ref. Ul. I. 164, 165.

*Śuddhacandrāḍiganīta* (?) (kar.), Mal., Anon.

Beg. candrane sūkṣmamāyitṭu gaṇippān kriya collinen /  
Mss. 5812-B, 12686-C.

*Śuddhacandrārkaḍiganīta* or *Sūkṣmacandrārkaḍiganīta* (?) (kar.), Mal., Anon.

Beg. śuddhamāyi gaṇikkenṭṭu candrārkanmāreyēnkilu /  
Mss. 10856-E, 13225, 13294-L, 13298, L. 336-G, L. 1167.

*Śubhāśubhanimittāni* (nat. astrol.), Skt.-Mal., Anon.

Beg. guḷiko viṣṭi gaṇḍāntam viṣoṣṇaikārgaḷā ami /  
varjyāḥ sarpaśiro lāṭo vaidhṛtaś ca sukarmasu //

Ms. C. 49-C (200 gr.)

Śyāmalavāraṇarāja, a prince.

—C on the *Kāladīpa* of Vasudevasvāmi

Ref. See above, pp. 69-70, § 51 ; Va. III. 392-93.

*Śrāddhacandrādiganana-kriyāsaṅgraha* : See *Kriyāsaṅgraha*.

*Śrāddhacandrādiganita* I (kar.), Anon., misc. calculations, 1400 gr.  
Ms. 5812.

*Śrāddhacandrādiganita* II (kar.), Mal. prose, Anon. Mss. See  
*Ker. Mal.*, p. 148.

**Śrikanṭha** of Veḷḷārakkaḍ in Cochin.

—C (Mal.), on the *Jātakapaddhati* of Parameśvara (?)

**Śrikumāra**, son of Nilakanṭha and pupil of Nārāyaṇa, of the village of  
Dvipakānana (? Mal. Ānakkāḍ).

—*Praśnāmṛta*

Ref. See above, p. 76, § 70.

*Śrīpatipaddhati* : See *Jātakakarmapaddhati*.

**Śrīvallabha**, Teacher of the anon. au. of *Ācāradarśana*.

*Slokapañcāśikā* (muh.), Anon. (Ker.?)

Beg. gurum bhaktyā namaskṛtya tatprasādād yatāmahe /  
vivāhādipratiṣṭhāntakarmanām kālavittaye //

Ms. P. 965.

*Ṣaḍvargaphalam* (astrol.), by Parameśvara of Vaṭaśreṇi. Mss. C.  
133-B, T. 116-B.

*San̄kramadhruvānāyana* (kar.), Mal. prose, Anon., 40 gr. Ms.  
13225-C.

*San̄kramadhruvānāyanādi* (?) (kar.), Anon. Epoch, Kali year  
4597 (A.D. 1495).

Beg. 'sindhuśobho' nitābdaghne śāstrārthe jayanāḍikāḥ /

Ms. L. 1328-E.

*San̄krāntidhruvānāyana* (kar.), Mal. prose, Anon., 15 gr. Ms.  
13294-F.

*San̄krāntivākya* I (kar.), Anon., 10 gr.

Beg. āgāmi mitram vibudhākṛtīnām /  
nanarta śaurir vanabhūratajñāḥ //

Ms. CM. 595-G.

- Saṅkrantivākya* II (kar.), Mal. prose, Anon. Ms. 12686-B.
- Saṅkrantisphuṭadigaṇita* (?) (kar.), Mal. prose-verse, Anon. Epoch, Kali day 17,21,462 (A.D. 1613).  
 Beg. 'pṛitāsvādyarasāyano'radivasān modāḍhyaputram tyajet.  
 Mss. 1005-C (inc., 130 gr.), L. 1175-C.
- Saṅkrantiyadigaṇita* (?) (kar.), Mal., Anon.  
 Beg. śṛṅgāṇi meror divi dhūpitāni  
 cakre ca śakro nava viśrutāni /  
 praṇauti rudram bhayavaṁśabhinnam  
 varam hi bhakto havi divyayānaḥ //  
 Ms. L. 1173 (160 gr.).
- Saṅgrahasādhana-kriyā* (kar.), by Azhvāñceri Tamprākkaḷ, 150 gr., on computation-procedures implied in his *Jyotiśśāstrasāṅgraha*,  
 Beg. *Saṅgrāhe* paṭhyamānānām sādhanānam kriyocyate /  
 Mss. C. 2431-C, L. 1355-A, TM. 233-D.
- Do.—C (Mal.), by the author himself. Mss. L. 1177, L. 1218, T. 233-C.
- Saṅgrāma-*vi*jayodaya* (nat. astrol.), Anon., (Ker. ?). Q by Rudra II (16th cent.) in his C on the *Horā*. Mss. Ker., Mad. Edn. TSS 123. Ref. Ul. II. 111-12; Ul. Sup. I. 215.
- Sadratanamāla* (kar.), by Śaṅkara Varmā, A.D. 1823, 6 chs., 300 gr.  
 Mss. 8322-B, C. 2136; Ad.; Mad. Edn. Serially in *Kavano-dayam*, (Mal. Jl., Kozhikode), vol. 16 (1898). Ref. Raja, 165-66; Sen, p. 191; Ul. III, 499-501; Va. IV. 384-93.
- Do.—C (Mal.), by the author himself. Mss. 8322-B, T. 1175. Edn: up to VI. 32, with the text above. Ref. Ul. III. 501; Ul. Sup. I. 636-37; Va. IV. 389-93.
- Santanadīpikā* (astrol.), Anon., by a pupil of Vāsudeva, 100 gr.  
 Beg. gurunātham namaskṛtya gaṇanātham praṇamya ca /  
 Vāsudevam gurum dhyātvā vaksye *Santanadīpikā* //  
 Mss. 610-A, 1416, 12810-B, C. 134-C, P. 968, PM. 4077-D, T. 286-A; Ad.; Mad. Edn. G. Kocchusankaran Vaidyan, S. T. Reddiar and Sons, Quilon, 2nd edn., M.E. 1105. Ref. Ul. III. 90; Ul. Sup. I. 464-65; Va. II. 501.

*Santanadipraśnavicāra* (pra.) Skt.-Mal., Anon. Ms. 13494-B.

*Samudravākya* : See *Kujādipañcagraha-mahāvākya*.

*Sampradāyapradīpikā* : Name of C by Govindasvāmin on *Parāśarahorā*.

[*Sāmudrikalakṣaṇa* I (physiognomy), Anon.]

Do.—C I (Mal.), Anon.

Beg. munnīl āyussulakṣaṇam arika. āyussilleñkil maṭṭulla  
lakṣaṇam nokkeṇṭa.

Ms. P. 970-A.

Do.—C II (Mal.), Anon.

Beg. munnīl āyussine parikṣikkaṇam. pinne lakṣaṇatte collaṇam.

Ms. P. 971-B.

Do.—C III (Mal.), Anon. Mss. 13204-A, C. 2079-B, L. 101 B,  
L. 216-B.

Do.—C IV (Mal.), unidentified ; possibly, one of the above.

Ref. Va. III. 642-45.

*Sāmudrikalakṣaṇa* II (physiognomy), Skt.-Mal., Anon. Mss.  
12721-C, 13389-B, 14311-B.

*Samudrikalakṣaṇa* III (physiognomy), Mal. prose, Anon. Mss.  
L. 206-B, T. 126-A-2.

*Samudrikaśāstra* (physiognomy), (Mal.), by Rāma Vāriyar of  
Kaikkulangara. Ref. See above, p. 80, § 81.

*Samudrikasāra*, *Ārūḍhapraśna* or *Lāñchanaśāstra*, (omenology-pra.),  
by Śaṅkara of Muktisthala. Mss. L. 101-A, C. 137-B (cata.  
*Ārūḍhapraśna*); Ad. Ref. Ul. III. 86-87; Va. II. 723  
(*Ārūḍhapraśna*).

Do.—C I (Mal.), Anon., 150 gr.

Beg. gaṇeśam ṣaṇmukham rudram umādevim sarasvatīm /  
samvāndya bhāṣayā vacmi *Lāñchanam* tu yathāśrutam /  
āyupraśne jivatām iti. tatrātha jivata iti. vṛddha-  
daiśanattinnu paññikkūṭṭam.

Ms. C. 137-C.

*Samudrikasāra* (contd.)

Do.—C II (Mal.), Anon.

Beg. aviṭe naṭe kaittalattiluḷḷa sthānañṇaḷeyum aviṭeyuḷḷa rohiṇi  
tuṭaṇṇiyuḷḷa rekhakaḷeyum ...

Ms. L. 101-A.

*Sārasaṅgraha* : See also *Praśnasārasaṅgraha*.*Sārasaṅgraha* (astrol.), Anon., in 9 chs.

Beg. chāya-jalayantrādyair avagamyā dyugolanāḍikāḥ praśne /  
sāvayavās tābhiraḥ ayam prāglagnaividhir nigadyate spaṣṭam //

Ms. C. 134-B.

[*Sāropadeśa* (astrol.), Anon.]

Do.—C (Mal.)

Beg. (of text) : Meṣādirāśiphalam—  
piṅgākṣaḥ paittikaḥ kroddhi sabhāmānyaḥ suvikramaḥ /  
lubdhaḥ kṛti ca capalo meṣarāśyām tu jāyate //

Ms. Mad. D. 13914.

*Siddhāntadarpaṇa* (siddhānta), by Nīlakaṇṭha Somayāji, in 32 verses.

Mss. See Intro. to edn. Ed. and Tr. by K. V. Sarma, Adyar  
Library, Madras, 1955. Ref. Va. IV. 225.

Do.—C by the author himself. Ms. P. 975.

*Siddhāntadarpaṇa-siddha-paryayādayaḥ* (astron.), Anon., 17 verses.

Ms. 5867 (ff. 169-72). Ed. and Tr. by K. V. Sarma, with the  
edn. of *Siddhāntarpaṇa* above.

*Siddhāntadarpaṇastha-paryaya-bhūdināni* (astron.), Anon., 3 verses.

Mss. C. 2740 (fol. 98 b), C. 2314 (fol. 74). Ed. and Tr. by  
K. V. Sarma, in the edn. of *Siddhāntadarpaṇa*, above.

*Sundararajapraśnottara* (astron.), by Nīlakaṇṭha Somayāji.

Mss. Yet to be identified, but the work is mentioned by both  
Nīlakaṇṭha in his *Āryabhaṭīya-bhāṣya* (TSS 185, p. 149)

*Sundararājaprasnottara* (contd.)

and Sundararāja in his C on the *Vākyakaraṇa* (Edn. T.S.K. Sastri and K.V. Sarma, K.S.R. Inst. Madras-4, 1962, p. 119).

*Sundarī* : Name of C by Udayadivākara on the *Laghubhāskariya* of Bhāskara I.

*Subodhārthini* : Name of anon. C on *Horā*.

Subrahmaṇya I, a Nampūtiri of the Māttūr family, c. 1475-1535.

—*Muhūrtapadaṅī* III (A.D. 1531).

Subrahmaṇya II, (1835-1903), a Tirumunpu of the Kunnattu family in Payyannoor, in N. Malabar.

—C *Bhāvaprakāśa* on the *Muhūrtadarśana* of Vidyāmādhava.

Ref. See above, p. 79, § 78 ; Ul. Sup. I. 540 ; V. I. 444.

Subrahmaṇya III (? alias Parameśvara, pupil of Śāṅkara)

—C (IX), *Jātakacandrikā* or *Viśvārthadīpinī* on *Horā* (acc. to Ms. 5581).

Subrahmaṇya Śāstri, (1828-88), of the Nalleppaḷḷ village in Cochin.

—*Agaṇitam* (kar.)

Ref. See above, pp. 78-79, § 77 ; Ul. IV. 292 : Ul. Sup. II. 122-23 ; Va. IV. 607 ; RNP IV. 481-82.

*Sūkṣmacandrārkaṅṇita* : See *Śuddhacandrārkaṅṇita*.

*Sūkṣmacandrasphuṭādigāṅṇita* (kar.), Mal. prose, Anon.

Ms. 12686-C.

*Sūryagrahaṅṇitaṅṇitam* (ecl.), Mal. verse, Anon. 50 gr.

Ms. L. 765-D.

*Sūyacandracchāyāṅṇitam Bhāṣā* (?), (kar.), Anon., Mal. verse.

Beg. pāṭum piṅappum eṅṅeṅṅum prakāram iha collinen /  
iṣṭagrahayor arkan eṅṅnāḷ udayattinu //  
ādityād graham eṅṅum nāḷ eṅṅukāstamanattinu /  
ādityane sphuṭikkeṅṅam appoḷ veṅṅum grahattinu //

Mss. PM. 4027, 4158-E.

*Sūryacchayadigaṇita* I (?) (kar.), Mal., Anon.

Beg. sūryacchāya gaṇikkunna prakāram atha collinen /  
talkālasāyanārkkannu caram meṣādi uttaram //

Mss. 5109-D (cata. *Sūryacchayāgaṇita*, 70 gr.), L. 251-C (cata. *Candracchayāgaṇita*, 320 gr.), 5042-D, 10647-E, 13493-E, all differing slightly from one another.

*Sūryacchayadigaṇita* II (kar.), Mal. verse, Anon. Mss. 5042-D, 5109-D, 13493-E.

Sūryadeva Yajvan, (1191-c. 1250), of Nidhruvagotra

—C *Prakāśa* or *Prakāśikā* on *Āryabhaṭīya*

—C *Jātakalāṅkāra* on the *Jātakakarmapaddhati* of Śrīpati

—C on the *Mahābhāskariya-bhāṣya* of Govindasvāmin

—C on the *Mahāyātra* of Varāhamihira

Ref. See above, p. 48, § 14; Raja, 131-32; Sen, p. 214; Ul. II. 97-98; Ul. Sup. I. 219; Va. I. 390-92.

*Sūryamadhyamadigaṇita* (?) (kar.), Mal., Anon. Ms. 13394-I.

[*Sūryasiddhānta* (siddhānta)]

Do.—C I, *Vivaraṇa* by Parameśvara of Vaṭaśreṇi. Ms. 8358-J.

Do.—C II (Mal.), by Acyuta Piṣāraṭi (?)

Beg. gurūṇām caraṇāmbhojaparāgaparamāṇavaḥ /  
manomukuram asmākam punlyur anuvāsaram //

aviṭe *Sūryasiddhāntamākunna* ... gaṇitatte camappān  
tuṭānnunna ācāryan ...

Mss. 3636-C, 8358-A, T. 251. Authorship. Suggested on the basis of the characteristic *maṅgala-śloka* of Acyuta Piṣāraṭi, which occurs in his *Uparāgakriyākrama-vyākhyā*, *Karaṇottama*, *Jātakabharāṇa* and *Veṅvāroha-vyākhyā*, and also on the similarity of the beg. of the present C with the beg. of Acyuta's *Veṅvāroha-vyākhyā*.

*Sūryasiddhānta-saṅgraha* (siddhānta), (Ker. ?). Ms. Cranganore Palace List, 4.



*Snryoparagakriya* (ecl.), Mal., Anon.

Beg. nayi jivas surāgiṇo narastuṅga-śarāsanah |

Ms. 931-C (inc , 100 gr.)

[*Skandaśārīraka* (nat. astrol.) ]

Do.—C (Mal.), Anon. Ms. P. 979 (interspersed with Skt.).

*Sthānaphalādi* (astrol.). Mal., Anon. Ms. 8269-B.

*Sphuṭanirṇaya* (astron.), by Acyuta Piṣāraṭi, in 6 chs., devoted respectively, to *Saṅkhyakathana*, *Madhyamānayana*, *Mandasphuṭānayana*, *Bhagolasphuṭānayana*, *Bhūgolasphuṭānayana* and *Bhūprṣṭhasphuṭānayana*.

Mss. C. 809-C, C. 964-B, C. 1945-B ; Mad. R. 3799 (b) ; Kanippayyoor Mana, Kunnamkulam ; Eḷamprakkottu Mana, Eravoor ; M.S. Srinivasa Sastri, Palghat.

Ref. Sen, p. 202 (where it is noticed as anon. and the subjects of its Chs. IV, V and VI given, wrongly, under the common heading *Bhūgo[la]sphuṭānayana*) ; Va. IV.225. Cr. Edn. by K.V. Sarma.

Do.—C, *Vivṛti*, by the author himself. Mss. C. 697-C, C. 809-C, C. 964-B, C. 1945-B ; Mad. R. 3792 (b) ; M.S. Srinivasa Sastri.

Ref. Sen, p. 202. Cr. Edn. by K.V. Sarma.

*Sphuṭanirṇaya-nirṇīta-paryayadayaḥ* (astron.), Anon., 14 verses.

Beg. abhivandya gurum bhaktyā kalpakālaprakīrtitāḥ |  
*Sphuṭanirṇaya-nirṇīta* varṇyante *paryayadayaḥ* ||

Ms. With K.V. Sarma. Cr. Edn. K.V. Sarma.

*Sphuṭanirṇaya-bhagaṇāḥ* : See *Tantrasaṅgrahāt Sphuṭanirṇaya-bhagaṇāḥ*. Cr. Edn. by K.V. Sarma.

Haridatta, (c. 650-700), promulgator, in A. D. 683, of the Parahita system of astronomy in Kerala.

—*Grahacāranibandhana*

—*Mahāmārganibandhana*

Ref. See above, pp. 7-9 ; 43-44, § 5 ; K.V. Sarma, Intro. to the edn. of *Grahacāranibandhana*, Madras, 1954 ; Raja, 123-26.

[*Horā* (jā.), by Varāhamihira]

Do.—C I, by Kṛṣṇa. Ms. Public Library, Trivandrum, 35.

*Hora* (contd.)

Do.—C II, in verse, by a disciple of Kṛṣṇa.

Beg. prāyeṇa mandabudcchinam manuṣyāṇām kalau yuge /  
laghunaiva prakāreṇa Horeyam upadiśyate //  
āyur hi trividham loke pūrṇa-madhyaḥpanāmabhiḥ /

End. Kṛṣṇācāryasya Śiṣyeṇa Horeyam upapāditā /  
Kṛṣṇācāryaprasādēna prasādāc ca vivasvataḥ //

Ms. IO 6381-D.

Do.—C III, *Daśādhyāyī*, by Govinda Bhaṭṭatiri of Talakkuḷam, 3800 gr.  
Mss. 957, C. 2141-A ; Mad. D. 14064. Ed. Bombay, Saṁ.  
1969 (A.D. 1912) ; Palghat, (1905). Ref. Raja, 132-33 ;  
Ul. I. 167-79, II. 110 ; Va. I. 353-59.

Do.—C IV, *Prakāśikā* or *Viṣamākṣaravivṛti* by Nityaprakāśa Yati.

Mss. C. 136, C. 227, P. 997, T. 90 ; Ad.

Do.—C V, *Subodhārthini*, Anon., (Ker. ?)

Beg. ātmāyate vāsarapo 'khilānām  
aṅgāyate janmavivarjitānām /  
dīpāyate yo jagatām abhiṣṭam  
dadhātu naḥ so 'nyatarānapekṣaḥ (1) ; ...  
yā Horā racitā ... (2) ; athācāryeṇāsya śāstrasyāvighna-  
parisamāptyartham ...

Mss. C. 1244 ; Ad. ; Mad.

Do.—C VI, *Vivaraṇa* or *Naukā* by Rudra, A.D. 1527, 6000 gr.

Mss. 14267-B, C. 2237 ; Ad. ; Mad. ; Tir. Edn. TSS 91,  
(Trivandrum, 1926 ; 2nd edn., 1958). Ref. Ul. II. 114-17 ;  
Va. I. 531-34.

Do.—C VII, *Pāṭhyam*, Anon. Ms. P. 892 (inc., 3000 gr.)

Do.—C VIII, *Pārameśvarī* or *Horābhiprāyanirṇaya*, by Parameśvara,

Beg. arkendvārajñāvāgiśaśukramandatamodvijāḥ /  
praṇamya kriyate spaṣṭo Horābhiprāyanirṇayaḥ //  
mūrtitve iti. ravir no vācam dadātu ityarthāḥ.

Mss. C. 135-A, C. 2110, T. 79 ; Ad. Edn. TSS, Trivandrum,  
1963.

Do.—C IX, *Jātakacandrikā* or *Viśvārthadīpinī*, by Parameśvara, pupil  
of Śaṅkara.

*Horā, C IX (contd.)*

**Beg.** yasyaikadeśam āsṛitya modate nikhilam jagat /  
 tasmai namo 'stu bhagavate parāya paramātmane //  
 namāmi śirasā devam Śaṅkaram gurum ātmanaḥ /  
 yasya prasādenājñānam akhilam me nirākṛtam //  
*Horātantrābdhitārāya śāstrapoto nirūpitaḥ /*  
*Varāhmihireṇāśya vyākhyānam kriyate mayā //*  
 mūrtitve (text) ...

**Mss.** 3634, 5851, 10535, C. 1366-B, L. 552-B, T. 732. **Note.**  
 Ms. 5851 names the au. also as 'Subrahmaṇya.' **Ref.** Va.  
 III. 394.

**Do.**—C X, Anon., by a pupil of Pūrṇaprajña or Pūrṇaprabodha.

**Beg.** aviratam atitiṣṭhan maṇḍalācaṇḍabhānor-  
 niravadhini jate jassyandasandīpitāśaḥ / ... (1)  
 nikhilajagadupāsyō nityaśō yas trisandhyam  
 dīśatu mama rameśō jyotiṣām eṣa bodham //  
*Pūrṇaprajñādikāneka-sadguṇā madgurūttamāḥ /*  
*sādhayeyur iman santo māmakinamanoratham //*  
 ... asmin *Horāśāstre* mūrtitva ityādinā prārambha-  
 samuciteṣṭadevatānamaskāraślokena ...

**Ms.** CM. 6-C (cata. *Arūḍharāśīkathanam*).

**Do.**—C XI, *Bṛhajjātaka-prathamāślokavyākhyā*, Anon.

**Ms.** TM. 144-C-1 (45 gr.).

**Do.**—C XII (Old Mal.), *Prakāśikā* by Nityaparakāśa Yati.

**Beg.** mūrtitve ... enpatu śaśabhṛttinuṭe mūrttitvam ākkaṭṭu,  
 apunarjanmākkalukku vartmāvāyi, yajvākkalukku kratuvu-  
 māyi, jyotiṣamkalukkellām svāmiyumāy, ...

**Ms.** P. 995. **Note.** This C is diff. from this au.'s Skt. C *Prakāśikā*  
 on *Horā*.

**Do.**—C XIII (Mal.), *Horāvyākhyānam Tamizhkkuttu*, Anon.

**Beg.** Horāśāstrate camappān tuṭaṇṇunna ācāryan iṣṭadevatā-  
 vandanam ceyyunnu i ślokaṁ koṭṭu.

**Mss.** C. 590, C. 2524, T, 133-B, F.

*Horā* (contd.)

Do.—C XIV (Mal.), Anon.

Beg. natvā gaṇapatim devim vācam ācāryakovidān /  
*Varāhamihirācāryam śrīśūryādinavagrabān* //  
 gurum gurūttamam cāpi tathā saḥṛdayān api /  
 pārampariyagatam śāstram *Horārtham* prakāṣyate //

mūrtitve ... itin poruḷ—sa raviḥ vācam dadātu. aññane  
 ellāmirkkunna ravi namukkāyikkoṇṭu vākkine taruvonāka.

Ms. T. 133-D.

Do.—C XV (Skt. and Mal.), Anon.

Beg. bhūyobhiḥ paṭubhiḥ paṭudhiyām horāphalajñaptaye  
 śabdanyāyasamanviteṣu bahuśaḥ śāstreṣu dṛṣṭeṣv api /  
 horātantramahārṇavapratarāṇe bhagnodyamānām aham  
 svalpam vṛttavicitram arthabaulam śāstraplavam prārabhe //

Ms. PM. 4385.

Do.—C XVI (Mal.), Anon.

Beg. mūrtitveti. sa raviḥ naḥ vācam dadātu. ā ravi namukku  
 vākkine taruvūtāka. śāśabhṛtaḥ mūrtitve parikalpitaḥ=  
 śāśabhṛttiṅṭe mūrttitvattiṅkal parikalpitanāyirunnoruttan.  
 śāśabhṛttiṅṭe=candraṅṭe. mūrttitvattiṅkal=vṛttākāramāyiri-  
 kkiṅṭa dehattiṅkal. paritaḥ=cuttākāreṇa kalpitamāyiri-  
 kkunna ...

Ms. PM. 4155-A.

Do.—C XVII (Mal.), *Horāvyākhyānam*, Anon.

Beg. sa raviḥ naḥ vācam dadātu. ā ravi namukku vākkine taru-  
 vūtāka. sarvaprakāśanāyi jñānasvarūpanāyiripporuttan...

Col. (C. 2226-A) : its horāśāstre Bṛhajjālaka-*Viṣamākṣaravivṛtau*  
*Prakāśikāyām Utpalāyām* Drekkāṇādhyāyaḥ pañcaviṃśaḥ.

Mss. 6551, 12974-B, L. 521.

Do.—C XVIII (Mal.), *Horāvyākhyānam*, Anon. Ms. 872-A.

Do.—C XIX (Mal.), Anon.

Beg. ā ravi praśna-jātaka-muhūrttādikaḷil satyayāyirikkunna  
 vākkinettarūtāka. sarvaprakāśanāyi jñānasvarūpanāyiri-  
 kkiṅṭoruttan ādityan. candraṅṭe śarīramakakkalpiccirunno-  
 ruttan.

Ms. P. 999. Note. Related to C XVII, above.

*Horā* (contd.)

Do.—C XX (Mal.), Anon.

Beg. (Ch. 21) lagnattiṅkaḷ ninnu putrakaḷatrabhamkaḷ śubhapati-  
prāptaṅṅaḷāyirikkumpoḷ ...

Ms. P. 996.

Do.—C XXI (Mal.), *Horāphalaratnāvali*, apocryphally attributed to  
Kaṅṅaśśa Paṅikkar.

Beg. Kaṅṅaśśan ennuḷḷa Paṅikkaraccan  
khaṇḍiccu mattuḷḷa mataṅṅaḷellām /  
nirṅṅita-*Horāphalaratnasāram*  
varṅṅiccu collunniha śiṅṅyanoṅṅāy //

iviṅṅe kavi uṅṅākkān bhāviccirikkunna granthatte ...

Edn. Sri Rama Vilasam Press, Quilon, M.E. 1102. Ref. Ul.  
I. 350-51 ; Ul. Sup. I. 129.

Do.—C XXII (Mal. verse), by a pupil of Rāma. Men. in the beg. of  
the au.'s *Laghuhorāvivaraṅṅam* ; cf. :

rānaśśāstraṅṅaḷ kaṅṅṅiṅṅu rānāvṅṅittaṅṅaḷāḷ punaḷ /  
'*Horāśśāstram* camacciṅṅṅaṅṅāryāvṅṅittaṅṅaḷāḷ punaḷ //  
Laghuhora camaykkunnen ...

*Horāphalaratnāvali* by Kaṅṅaśśa Paṅikkar : See *Horā*, C XXI.

*Horābhiprāyanirṅṅaya* by Parameśvara : Name of C VIII on *Horā*.

*Horāsāra* (jā.), Anon.

Beg. pāśśāṅṅkuśa-svarada-cūṅṅaphalam dadhānam ... (1) ;  
jayati jagadekahetur viśvātmā ... (2) ;  
nimiśādivatsarāntam ... (3)

Mss. C. 226, C. 772, C. 2112-A, P. 1001 ; Ad.

*Horasāroccaya* (jā.), by Acyuta Piṅṅāraṅṅi, in 7 chs. Mss. 8327-A,  
8327-B (with C). Ref. Ul. II. 324.

Do.—C (Mal.), *Horātantram Paribhāṅṅa*, Anon. Ms. 8327-B.

Ref. Chirakkal T. Balakrishnan Nair, 'Horātantram Paribhāṅṅa',  
*Sahitya Parishat Traimāsikam*, (Mal., Ernakulam), 5 (M;E.  
1112) 417-20 and Ul. II. 651, where it is attributed to  
Acyuta Piṅṅāraṅṅi himself. For a refutation of this view,  
see K.V. Sarma, Intro. to his edn. of *Rāśigolasphuṅṅānti*,  
p. 7.

**X An Unidentified Astronomer.** About a dozen metrical tracts on different astronomical topics, couched in simple Malayalam verse, have been recorded, which, from their very similar narrative style and identical expressions, seem to be from the same pen, possibly, even sections of an extensive work which used to be studied individually and, so, are now generally found distributed in different manuscripts. Their author, however, prefers to remain anonymous. These works are as follows :

*Similar expression in the initial verse*

— <i>Gāṇitam-Bhaṣā</i> II (Mal.)	prakāram	atha	collinen
— <i>Pañcabodha</i> IX „	Do.	Do.	Do.
— <i>Lātavaidhṛtādigaṇita</i> „	Do.	Do.	Do.
— <i>Sūryacchāyādigaṇita</i> I „	Do.	Do.	Do.
— <i>Candragaṇita</i> „	gaṇippān	iha	Do.
— <i>Candrasphuṭādigaṇita</i> II „	Do.	Do.	Do.
— <i>Sūryacandracchāyāgaṇita</i> „	Do.	Do.	Do.
— <i>Candrasphuṭādigaṇita</i> „	Do.	kriya	Do.
— <i>Śuddhacandārkagaṇita</i> „	Do.	Do.	Do.
— <i>Grahaṇagaṇita</i> X „	collunnuṭu	curukki	ñān
— <i>Chāyāgrahaṇagaṇita</i> II „	Do.	Do.	Do.
— <i>C on Vyatīpātavaidhṛta</i> „	Do.	Do.	Do.

## A D D I T I O N S

Page 86 : Acyuta II : Acyuta Piṣāraṭi

Add : —C on *Sūryasiddhanta*

„ 101 : *Keralācārya*. See also below in Ch. VI.

„ 118 : Citrabhānu-Śiṣya

Add : —*Grahaṇāṣṭaka* III (?)

—*Praśnaprakāśikā* I (?)

—*Praśnabhāṣā* I (?)

—C IV on *Pañcabodha* II (?)

—C V on *Muhūrtapadavī* II (?)

„ 142 : *Praśnaprakāśikā* I

Add : By Citrabhānu-śiṣya (?). Authorship. Suggested on the basis of the characteristic *maṅgala-śloka*.

## CHAPTER VI

### A BIBLIOGRAPHY OF KERALA-BASED JYOTIṢA LITERATURE

There exist, in regions outside Kerala, in Sanskrit and in other Indian languages, a considerable number of astrological texts which proclaim themselves as Kerala Jyotiṣa and, as such, might, in a way, be called 'Kerala-based jyotiṣa texts'. The possible origin, nature and major trends of these texts have been discussed briefly elsewhere in this book (see pp. 38-40). These works can be identified by one or more of such indications as : (1) the definite mention of their non-Keralite authorship ; (2) the addition of the expression 'Kerala' to their titles, apparently intended to distinguish them from other regional or all-India texts of the same or similar titles ; (3) their high popularity outside Kerala which is matched only by their being practically unheard of in Kerala, the reason for which is obviously that, in a conservative society, one would scarcely go in for a low-rate alien imitation or improvisation when the full original is with oneself. Most of these works are anonymous or ascribed to apocryphal authors. Some claim to be parts of larger works. It is but natural that, while manuscripts of these works occur in good numbers outside Kerala, indicating their popularity in trans-Kerala regions, in Kerala itself, their manuscripts are well-nigh absent. It is a moot point as to what extent these texts are indebted to Kerala Jyotiṣa in the matter of their tradition, teachings or inspiration. In some cases, it might be regular borrowal, in others restricted to their nature and contents and in still others only to the ideas. In certain cases, it is even possible that Kerala has lent nothing more than its name ! The lack of definitive authorship and the amorphous nature of contents of some of these works, naturally, make their identification difficult. This is especially so, in the case of works which appear under different titles and in varied extent, a fact which is reflected in the following *Bibliography*, as well. Certain methods to ascertain the indebtedness of individual texts to Kerala Jyotiṣa and to pursue this interesting study have been suggested above (see p. 41).

In the following pages, an attempt has been made to document information about 'Kerala-based' Jyotiṣa works, in Sanskrit, from various sources, and present the same with suitable annotations and references about the availability of manuscripts and editions thereof



but without any serious effort at the correlation of allied texts. The nature of the different texts is indicated by adding, after their titles, their subjects in abbreviation: 'kar.' for *Karaṇa*, 'jā.' for *Jataka*, 'pra.' for *Praśna*, 'muh.' *Muhūrta*, 'astrol.' for General Astrology, 'nat. astrol.' for Natural Astrology, etc. The general abbreviations employed in the *Bibliography of Kerala Jyotiṣa literature*, above, have also been made use of, as necessary.

In the case of texts whose manuscripts, as available in the different manuscripts repositories, have been noticed in the *Catalogus Catalogorum* (CC) of Aufrecht or the *New Catalogus Catalogorum* (NCC), I-VI, of the Madras University, the CC or NCC references are given. And, in the case of texts which have not been noticed in the CC or the NCC, or which exhibit some peculiarity or other, they are referred directly to the relevant Manuscripts Catalogues or other sources, using The undermentioned additional abbreviations :

- Lucknow, Skt. Parishad *A catal. of Mss. in the Akhila Bharatiya Skt. Parishad, Lucknow, compiled by Daulat Ram Juyal, Lucknow, Vos. I-II, 1963, 1969. (Ref. by vol. and pp.)*
- Mysore *Cata. of Skt. Mss. in the Govt. Lib., Mysore, and its Supplemental Cata., in 4 Pts., Mysore, 1922-1955 (Ref. by vol. and pp.)*
- Nepal Vir. *Nepāla- Rājakīya-Vīraputakālayastha- Hastalikhita-Samasta-pustakanām Saṅkṣipta-sūcīptam, Ed. Buddhi Sagara, Kathmandu, Sam. 2020. (Ref. by pp. and nos.)*
- Raj. Jaina *Rājasthān kī Jaina Śāstra Bhandārom kī Granthasūcī, Ed. by Kastur Chand Kasaliwal etc. Jaipur, Vols. I-IV, 1949-1962. (Ref. by vol. and pp.)*
- Raj. Jodh. *A cata. of Skt. and Pkt. Mss. in the Rajasthan Or. Res. Inst. (Jodhpur Collection), ed. by Muni Jinavijayaji, Pts. I-III B, Jodhpur, 1963-68. (Ref. by vol. and pp.)*
- Varanasi *A des. cata. of Skt. Mss. acquired and deposited in the Skt. Univ. Lib. (Sarasvati Bhavana), Varanasi, during the years 1791-1950, vols. I-XII, Varanasi, 1953-65. (Ref. by vol. and pp.)*
- V.V.R.I. *Catalogue of V. V. R. I. Manuscript Collection, in two Parts. ep. by Vishva Bandhu, Hoshiarpur, 1959. (Ref. by pt. and pp.)*

## BIBLIOGRAPHY OF AUTHORS AND WORKS

- Akṣarakeralī* or *Akṣarakevalī* (pra.). Mss. See NCC I (rev.), 11.
- Akṣaracintāmaṇi* (pra.) from *Keralamata* ascribed to Śiva. Ib., 12.
- Akṣaracūdāmaṇi* (pra.), related to *Keralapraśna* V attributed to Keralācārya. Ib.
- Appāsūri*, *alis* Nṛhari or Nṛsimha  
—C, *Śāradāgama*, on *Uḍudayapradīpa*
- Avajadapraśna* or *Keralipraśna*, from the *Rudrayāmala*, Ib., 412.
- Uḍudayapradīpa* (jā.), described in some mss. as *Keraligrantha* and *Keraliracita*. Mss. NCC II. 289-90. Ascribed to Keralācārya in Ms. Ker. 1521. Edn. with Tr., Royal Victoria Press, Madras, 2nd edn., 1900. For other edns., see NCC II 289.
- Do—C I. Ancn., Ib. 290.
- Do.—C II, *Uddyota* by Bhairavadatta, son of Harirāma. Ib.  
Edn. Bombay, 1875 ; with Hindi C, Banaras, 1868.
- Do.—C III, *Tattvadīpikā* by Jivanātha Jhā, son of Śambhunātha. Ib.
- Do.—C IV, *Śāradāgama* by Appāsūri *alias* Nṛhari or Nṛsimha. Ib.
- Do.—C V, *Snehakūpikā* by Bālakṛṣṇa, son of Jyotiḥsvarūpa. Ib.
- Do.—C VI, by Cola. Ib.
- Do.—C VII, by Paramasukha. Ib.
- Do.—C VIII, by Mayūreśvaropadhyāya. Ib.
- Uḍupakerala* (jā.), attributed to Prajāpati. Ib.
- Kerala*° : See also *Keralī*°, *Keralīya*°.
- Kerala* or *Keralī* (astrol.) Mss. NCC V. 43.
- Keralagranthodāraharāṇa* (astrol.), by Mūladeva, possibly a C on his *Keralapraśna*. Ib.
- Keralacandrikā* (jā.) Ib. (*Dvādaśabhāva*). See also *Keraladvādaśabhāva*.

*Keralacintāmaṇi* (astrol.) Ib.

*Keralacūḍāmaṇi* (pra.) See also *Keralapraśna* or *Divyacūḍāmaṇi* and *Cūḍāmaṇikerālī*.

*Keralajātaka* (jā.) NCC V. 43. See also *Keralīyam Jatakam*.

*Keralajātakananda* or *Keralarahasya* : See *Keralarahasya*.

*Keralajñāna* or *Keralīyajñāna* (pra.) NCC V. 43. Some as *Keralapraśna*.

*Keralajyotiṣa* or °*jyautiṣa* (astrol.) Ib.

*Keralatattva* (astrol.) Ib.

*Keraladīpikā* I (astrol.) Men. in *Keralacandrikā*, Mad. D. 14026.

*Keraladīpikā* II (astrol.), by Krahā...śa, son of Cannayajvan.  
Ms. NCC V.43.

*Keralanāḍi* (astrol.) Ib.

*Keraladvādaśabhāvaphala* I (jā.), in verse. Ib.

*Keraladvādaśabhāvaphala* II (jā.), in prose. Ib.

*Keralapañcapakṣī* (prognostication), from *Svaravicāra*. Ib.

*Keralapāśavalī* (prognostication), ascribed to Garga. Ib. See also *Pāśakakevalī*.

*Keralapradīpa* (astrol.). Ib. Possibly, *Jañānapradīpa* or *Keralabṛndāvana* of Padmanābha.

*Keralapraśna*(*grantha*) I (pra.) Mss. NCC V.44 ; Varanasi, IX. 304.

*Keralapraśna*(*grantha*) II (pra.), ascribed to Garga. Ib.

*Keralapraśna* III (pra.) Invokes Kūṣmāṇḍi ; the last verse of the work describes the work as the *Pāśakakerālī* of Garga. Ib.

*Keralapraśna* IV (pra.), Prognostication with arecanuts. Ib.

*Keralapraśna* V or *Divyacūḍāmaṇi*, ascribed to Keralācārya. Related to *Akṣaracūḍāmaṇi* and *Cūḍāmaṇisāra*. Ib. Edn. in Telugu script with Telugu gloss, Vavilla Press, Madras, 1944 ; Banaras, Sam. 1731. See also *Cūḍāmaṇikerālī*.

- Keralapraśna* VI or *Keralapraśnaprakaraṇa* or *Keraliyajñāna*, (pra. based on letters.) Ib.
- Keralapraśna* VII (pra.), in 67 verses. Ib. Edn. with Hindi. Tr., Lakshmipur, Bombay, 1913.
- Keralapraśnagrantha* (pra.), by Mūladeva. Mss. NCC V.44.
- Do.—C (?) *Keralagranthodāharaṇa*, by the author himself. Ib. 43.
- Keralapraśnaḥ* (pra.) Mss. Varanasi, IX. 288, 298.
- Keralabayalis* : Name of *Uḍudāyapradīpa* attributed to Keralācārya.
- Keralabṛndāvana* or *Jñānapradīpa* (astrol.), by Padmanābha. Mss. NCC V. 44.
- Keralabhāgya* (astrol.) Ib.
- Do.—C. Ib.
- Keralabhāṣya* (astrol.), Ib. On *Keralavacanāni* (?)
- Keralamata* (astrol.), ascribed to Śiva : See *Akṣaracintāmaṇi*.
- Keralamatapraśnasaṅgraha* (pra.) by Mihirabhaṭṭa. Ms. VVRI I. 82.
- Keralayātra* (nat. astrol.) Ms. NCC V. 45.
- Keralayogāvalī* (astrol.) Ib.
- Keralaratnamañjarī* (astrol.) by Viśvanātha Bhaṭṭa, Ib.
- Keralaratnakara* (astrol.) Ib.
- Keralarahasya* or *Keralajātakānanda* (astrol.), by Śukrācārya. Ib.
- Keralarājayogasāra* (astrol.) Ib.
- Keralavacanāni* (astrol.) Ib.
- Do.—C, *Keralabhāṣya*, by Dhunḍhirāja. Ib.
- Keralaśāstra* I (astrol.), Ib., 47 ; Varanasi, IX, 314. See also *Keralīśāstra*.
- Keralaśāstra* II, Sn. *Gargasamhitā* (pra.) NCC V.45.
- Do.—C, *Gargamanoramā*. Ib.
- Keralaśāstrasūtra* (astrol.) attributed in one of its mss. to a demoness named Nikaṣā.
- Do.—C. Ib.

*Keralaslokaśūtra* (astrol.) Ib.

*Keralasāra* (astrol.) Ms. Varanasi, IX. 286.

*Keralasiddhānta* (pra.), couched in the form of a dialogue between the divine couple, Pārvati and Parameśvara, Ref. Ul. Sup. I. 228.

*Keralasūtra* I (astrol.) Ms. NCC V.47.

*Keralasūtra* II (astrol.), ascribed to Marici, Ib ; Varanasi, IX. 296.

*Keralasūtra* III (jā.), by Śrī (?). Ms. Mad. T. 1981 (d).

Tr. in *Missing links of Hindu astrology*, No. 11, Bombay, 1963.

*Keralahorā* (jā.). Ref. Ul. Sup. I. 229.

Do—C by Sarvartu Paṇḍita, written at the instance of Gopāla, at Vijayanagar. Ms. NCC V. 47.

*Keralācārya*. Despite the Kerala tradition that he was the minister of a Kerala King, it is not unlikely that he is an apocryphal or non-Kerala author. See above, pp. 46-47.

—*Uḍudāyapradīpa*

—*Keralapraśna* V or *Divyacūḍamaṇi*

—*Mātrācūḍamaṇi*

—See also above, pp. 101-2.

*Keralipraśna* or *Avajadapaśna*, from the *Rudrayāmala*. NCC V. 48.

*Keralī*° : See also Kerala°.

*Keralī* I (astrol.) or *Kerala*. Ms. NCC V.43.

*Keralī* II (nat. astrol.) Ib. 48.

*Keralī* III (pra.) by Rāvaṇa. Ib.

*Keralī* IV (pra.), or *Pāśakeralī*, prediction based on throwing the dice, ascribed to Garga. Ib. See also *Pāśakakeralī*.

*Keralīgrantha* (jā.), or *Uḍudāyapradīpa* or *Jātakacandrikā*, by Venkaṭeśa. Ib.

*Keralīcūḍamaṇi* (pra.) Ib. See also *Keralapraśna* or *Divyacūḍamaṇi*.

*Keralī(ya)jātaka* (jā.) Ib. See also *Keralajātaka* and *Keralīyam Jātakam*.

- Keralī(ya)jñāna* (pra.) Ib. See also *Keralajñāna*.
- Keralīdaśāprakāra* (jā.) Ib.
- Keralīpraśna* (pra.) Mss. Varanasi IX. 294, 302. See also *Keralapraśna*.
- Keralīpraśnabhāṣā* (pra.) Ms. Nepal Vir, 28.
- Keralīpraśna(vicāra)*, (pra.) Ib. ; Nepal Vir, 28.
- Keralīpraśnasāṅgraha* (pra.) Mss. NCC V.48.
- Keralīpraśnasāra* (pra.) Ib.
- Keralīya* (jā.) Ms. Mad. T. 2233 (g) (*Jīvakādhyāya*).
- Keralīyajātakasāṅgraha* (jā.) Ms. Mysore, I. 332.
- Keralīya(jyotiṣa)* (jā.) Ms. Mad. T. 1623.
- Keralīyaiñāna* (pra.) Mss. Tanjore, D. 11685, 24078. See also *Keralajñāna*.
- Keralīyanakṣatradāśāphala* (jā.) Ms. NCC V.48.
- Keralīyapraśna* (pra.) Mss. Ib. ; Raj. Jodhpur, III-B. 508.
- Keralīyapraśnaratna* (pra.), by Nandarāma Paṇḍita.  
Edn. with Hindi C, Lakshmi Venkatesvara Press, Bombay : Kalyan, 1923-24.
- Keralīyapraśnaratnākara* (pra.) Men. Ul Sup. I. 228.
- Keralīyabhāṣāsāra* (astrol.) Ms. NCC V. 49.
- Keralīyāsūtra* (jā.) Ms. Mad. 1981 (d), on *dvādaśabhāva*.
- Keralīyam Jātakam* (jā.) Ms. Mysore, I. 332.  
See also *Keralajātaka*.
- Do.—C. Ms. Mysore, I. 332.
- Keralīyam jātakam (Sāṅgraha)* (jā.), Ms. Mysore, I. 332.
- Keralīśakuna* (omenology), ascribed to Vyāsa. Ms. NCC V.49.
- Keralīśakunāvalī* (omenology), by Bhañjana Mīśra. Ib.
- Keralīśāstra* (astrol.) Ms. Nepal Vir. 28. See also *Keralāśāstra*,  
Do.—C (Newari). Ms. Nepal Vir, 28.

*Keralīsammatākoṣṭhiprakaraṇa* (astrol.) Ms. NCC V.49.

*Keralīsārasaṅgraha* (astrol.). Ib.

**Krahā** ... śa, son of Canna Yajvan.

—*Keraladīpikā*

**Garga**

—*Keralapāsāvalī*

—*Keralaprasnagrāṇtha*

—*Keralī* or *Pāsakeralī*, all related.

*Cūdmanīkeralī* (pra.), Ms. IO 3126. See also *Keralaprasna V* or *Divyacūḍāmaṇi*.

*Cūdmanīsāra* (pra), by Lakṣmaṇa, a résumé of the *Divyacūḍāmaṇi* or *Keralaprasna V* of Keralācārya. Ms. CC I. 189.

**Cola**

—C (VI) on *Uḍudāyapradīpa*.

*Jātakaratnāvalī* (*Keralīyā*), (jā.) Ms. Raj. Jodh. II-B. 320.

**Jivanātha Jhā**, son of Harirāma

—C *Tattvadīpikā* on *Uḍudāyapradīpa*

*Jñānapradīpa* (°ka °pikā) : Same as *Keralabṛndāvana* by Padmanābha.

**Dhuṇḍhirāja**

—*Keralabhāṣya* on *Keralavacanāni*

*Dvādaśbhāva*(*phālā*) : See *Keralacandrikā* and *Keraladvādaśbhāvāphala*.

**Nandarāma Paṇḍita**

—*Keralīya-prasnaratna*

**Nikaṣā**, a demoness

—*Keralaśāstrasūtra*

**Nṛhari** or **Nṛsimha**, alias Appāsūri

—C, *Śaradāgama*, on *Uḍudāyapradīpa*

**Padmanābha**

—*Keralabṛndāvana* or *Jñānadīpa* (°paka, °pik a)

—*Keralapradīpa* (possibly same as the above work)

*Paramasukha*— C on *Uḍudāyapradīpa*

*Parahita* (kar.), apparently by a Tamil astronomer, based on the Kerala Parahita school. Epoch : Kali-day 16,83,312 (A.D. 1507). Couched in corrupt Sanskrit.

Beg. hariharavidhikhecarān praṇatvā  
kalidivasāt 'priyabāla-jātako'nāt /  
bhavati hi varabhaumavārapūrvam  
parahitakhaṇḍam iti bruvanti santah //

guṅkārah kulam bhānoḥ *etc.*

Ms. Tanjore D. 11719 (70 gr.)

*Pāśakakeralī* : See *Pāśakevalī*.

*Pāśakakevalī* (prognostication by dice throw), sometimes spelt as *Pāśakakeralī*, *Pāśakevalī* or *Pāśakevalī*, attributed to Garga.

Mss. CC I. 336 ; Lucknow, Skt. Parishad, I. 232.

*Pāśakevalī* I or *Jñānabhāskara* (nat. astrol.) Ms. Raj. Jaina, IV.286.

*Pāśakevalī* II or *Keralapraśna* (pra.), by Garga. Mss. Raj. Jaina, II. 272 ; IV. 286 ; Raj. Jodh. II-B. 330 ; Tanjore D. 11496.

Do.—C *Ṭika*. Mss. Raj. Jodh., II-B. 330.**Prajāpati**—*Uḍupakerala*

*Praśnakeralī* (pra.), by Bhojarāja. Ms. Varanasi, IX. 50.

*Praśnabhārgava-kerala* (pra.). Ms. CC I. 358.

*Praśnavidyā* (pra.), from *Keraliya*. Ms. NCC V. 49.

**Bālakṛṣṇa**, son of Jyotiḥsvarūpa—C, *Snehakūpikā*, on *Uḍudāyapradīpa*.



*Bharagva-pañcāṅgam* (astrol.), by Vararuci IV.

End : ity evam *Bhārgavam nāma Pañcāṅgam Bhārgavoditam* |  
viditvā manujo yas tu kurute kāryam anvaham //

Col. iti *Vararuci-viracitam Bhārgavapraṇītam Pañcāṅgam samā-*  
*ptam.*

Ms. Mad. D. 14055.

**Bhañjana Mīśra**

—*Keralīśakunāvalī*

**Bhairavadatta**

—C, *Uddyota*, on *Uḍudāyapradīpa*

**Bhojarāja**

—*Praśnakeralī*

**Mayūreśvaropādhyāya**

—C on *Uḍudāyapradīpa*

**Marici**

—*Keralasūtra*

*Matracūḍamaṇi* (jā. ?), by Keralācārya. Ms. Imperial Museum  
(now in the Asiatic Soc., Calcutta), 10737.

**Mihira Bhaṭṭa**

—*Keralamata-praśnasaṅgraha*

**Mūladeva**

—*Keralapraśnagrantha*

—*Keralagranthodāharaṇa*, possibly C on above.

**Rāvaṇa**

—*Keralī* (pra.)

**Lakṣmaṇa**

—*Cūḍamaṇisāra*

Vararuci III, Tamil astronomer of Kanchipuram who adapted the  
Parahita system of Kerala astronomy in the Tamil region.  
c. 1300 A.D.

—*Vakyakarṇa* or *Vakyapañcadhyāyī*

## Vararuci III (contd.)

Ref. T. S. K. Sastri and K. V. Sarma, Intro. to *Vākya-karaṇa*, (Madras, 1962), pp. vi-ix.

## Vararuci IV

—*Bhārgavapañcāṅga*

*Vākya-karaṇa* I or *Vākya-pañcādhyāyī* (kar.), by Vararuci III. Basic manual of the *Vākya-pañcāṅga* of the Tamil country. In five chapters devoted, respectively, to *Ravicaṇḍrarāhusphuṭa*, *Tārāgrahasphuṭa*, *Tripraśna*, *Grahaṇa* and *Udayāsta-mahāpātāḥ*.

Mss. See Intro. to edn. Cr. Edn. with detailed Intro., Summary of contents and Appendices, by T. S. Kuppanna Sastri and K. V. Sarma, K.S.R. Institute., Madras-4, 1962.

Do.—C I, *Laghu-dīpikā* or *Laghu-prakāśikā* by Sundararāja.

Mss. See Intro. to edn. Cr. Edn. by T. S. K. Sastri and K. V. Sarma, with the edn. of the text, above.

Do.—C II, *Sundararājīya* or *Vāsanā-prakāśikā* by Sundararāja, being more extensive than C I above.

Men. by the au. himself in his C I, edn., pp. 3, 21, 24, 49, 90, 107; See also the intro. to his C I :

śri-*Nilakaṇṭhānḡhriniviṣṭacetāḥ*  
śri-*Somadevānujighṛkṣayaiva* /  
*vicitravākyaair vivṛtam punaś ca*  
*prakāśaye 'ham karaṇam laghiyaḥ* /

*Vākya-karaṇa* II (*Prakṣiptādhyāya*) (kar.), ch. VI, in 37 interpolated verses. Ms. See edn. Edn. By T. S. K. Sastri and K. V. Sarma, as App. to the edn. of *Vākya-karaṇa*, above.

*Vākya-karaṇa* III, related to *Vākya-karaṇa* II. Ms. Ker. P. 955.

## Viśvanātha Bhaṭṭa

—*Keralaratnamañjarī*

Veṅkaṭeśa, of the Kāśyapagoṭra, pupil of Acyuta I

—*Keralīgrantha*, *Uḍudāyapradīpa* or *Jātakacandrikā*

—*Devakerala* of Acyuta II, redaction of Part II

**Vyāsa**

—*Keralīśakuna*

**Śiva**

—*Keraḷamata*

**Śukra Ācārya**

—*Keralajātakānanda* or *Keralarahasya* or *Śukrakerala*

*Śukrakerala* : See *Keralajātakānanda*.

**Śri (?)**

—*Keralasūtra* or *°śāstra*

**Sarvartu Paṇḍita**, protégé of Gopāla of Vijayanagar.

—C on *Keralahorā*

**Sundararāja**, Astronomer of the Tamil country, resident of the banks of river Kāveri, son of Anantanārāyaṇa and protégé of Somadeva ; admirer and contemporary of Nilakaṇṭha Somayāji, with whom he had correspondence on astronomical problems (see above, pp. 175-76, *Sundararāja-praśnottara* by Nilakaṇṭha Somayāji).

—C I, *Laghudīptikā* or *Laghuprakāśikā* on *Vākyakarāṇa* of Vararuci III.

—C II *Sundararājīya* or *Vāsanāprakāśikā*, a more extensive C on *Vākyakarāṇa* of Vararuci III.

Ref. T. S. K. Sastri and K. V. Sarma, Intro. to *Vākyakarāṇa*, Madras, 1962.

---

**Note.** Since most of the works noticed above are anonymous, that fact is not indicated against each work with the symbol 'anon'. However, when the real or apocryphal author of a work is known, the fact is duly indicated.

## SUBJECT INDEX

[NOTE: The entries in the bibliographical chapters, viz., chs. V-VI (pp. 82-196) are, by themselves, arranged according to the Devanāgarī alphabet and, so, are not included in this index. They might be referred to directly. Numbers in thin type indicate casual references and those in thick type to detailed notices.]

- Ācaradīpikā*, 55  
*Ācārasaṅgraha*, 53  
 Acyuta I, 46  
 Acyuta II, Piṣāraṭi, 5, 13, 31, 33, 35, 60, 64-65, 70  
*Aganīta*, of Mādhava I, 51  
*Aganīta*, of Nalleppalli Subrahmaṇya Śāstri, 79  
*Aganītagrahacāra*, 34, 51, 52  
*Aganīta-pañcāṅga*, 34, 51, 52  
 Agnidatta, 76  
*Aitihyamālā*, 42n, 49n, 64n  
 Aiyar, A.R. Akhileswara, 12, 60  
 Aiyar, S. Parameswara: See under Ulloor  
 Aiyar, S. Venkitasubramonia, 65n.  
 Aiyar, T.V. Vedamurthi, 12, 21n, 23n, 26n.  
*Akṣaracintāmaṇi*, 39  
*Akṣarakevalīpraśna*, 39  
*Akṣaraprasna*, 37  
 Almanacs, 34  
 Anandaprakāśa, 50  
*Ankaṇaśāstra*, 47  
 Araṇappuram, 64  
*Araṇmuḷavilāsam Haṁsappāṭṭu*, 5  
*Ārūdhaprasna*, 75  
 Āryabhaṭa, 9, 27, 29, 31, 44n;—his system as basis of Kerala astronomy, 6, 8, 11  
*Āryabhaṭīya*, 29;—as basis of Parahita astronomy, 6, 8, 11  
 „ C by Kṛṣṇa II, 70  
 „ C by Kṛṣṇadāsa, 74-75  
 „ C by Ghaṭigopa, 77-78  
 „ C by Nilakaṇṭha I, 16n, 55, 56, 57  
 „—C by Parameśvara I, 41, 53  
 „—C by Sūryadeva Yajvan, 48  
*Aṣṭamaṅgalaprasna*, 37, 62  
 Astronomical constants, revision of, 35; -rationale, 34-35  
 Attimattam, 64  
*Ayanacalanādiganīta* 63  
*Āyudhaprasna*, 37  
*Āyuhprasna* 74  
 Azhvāñceri Tamprakkal, 36, 38, 56, 57, 71-72. See also Kauṣītaki Ādhyā- and Netranārāyaṇa  
*Balabodhinī*: C on *Jātakapaddhati*, 70  
 Bālagangadharan, K., 12, 41  
*Balapindavum Āyurdayavum*, 77n  
*Balaprabodhinī*, C on *Jātakapaddhati*, 70  
 Bālarāman Pilla, 5  
*Bālaśaṅkaram*, C-s by Śaṅkara III, 62, 63  
 Ball, W.W.R., 15n  
*Bhādīpikā*, 53  
*Bhādradīpa(-ganīta)*, 31, 35, 36, 65, 66  
 Bhāradvāja-dvija, 35, 73-74  
*Bhāṣā-golayukti*, 74  
*Bhāṣā-Jātakapaddhati*, 5, 74  
*Bhāṣāsaṅgraha*, 63, 72  
 Bhāskara I, 30, 74  
 Bhāskara II, 11, 12n, 20, 30, 36, 78  
*Bhaṭadīpikā*, C on *Āryabhaṭīya*, 41n  
*Bhaṭa-saṁskāra*, 9, 44  
*Bhāvacināmaṇi*, 57n  
*Bhāvacināvali*, 57  
*Bhāvaprakāśaka*, C on *Muhūrtadarśana*, 79  
*Bhūgolañāyam*, 66  
*Bhūparīkṣā*, 38  
 Bhūtanāthapura Somayāji, 37, 76  
*Bibliography of Sanskrit works on astronomy and mathematics*, 42  
 Boyer, C.B., 15n  
*Bṛhajjātaka* 30, 36; See also *Horā*,

- Byhatkarmanibandhana*, 45n  
*Byhatsamhita*, 37  
 Cājori, 12n  
*Camatkāracintāmaṇi*, C by Punnaśēri  
 Nilakaṇṭha Śarmā, 81  
*Candracchāyaganita*, by Nilakaṇṭha I,  
 54, 56  
*Candracchāyaganita*, of Parameśvara I,  
 33, 53  
*Candraganitakrama*, of Śaṅkara III,  
 63  
*Candragrahaganita*, 33  
*Candrakalānāḍī*, 46  
*Candranāḍī*, 46  
*Candrasphuṭaganita*, 32  
*Candrasphuṭāpti*, 33  
*Candra-sūryoparāga-ganita*, 33  
 Cantor, Moritz, 12n, 17n  
*Caturasundarī*, C on *Cintājñāna*, 47  
*Ceriyā Kāladīpakam*, 63  
*Chāyaganita* (Shadow computation),  
 33  
*Chāyāṣṭaka*, 65  
*Cintājñāna*, 27  
 Circumradius, Lhuiler's formula, 19-20  
 Citrabhānu, 31, 57  
 Citrabhānu-Śiṣya, 57  
 Dakṣiṇāmūrti Mūssatu, 5  
 Dāmodara I, 54-55, 56, 60  
 Dāmodara II, of Maṅgalaśreṇi, 65-66  
 Dāmodara III, of Bhāradvājgotra, 70,  
 75  
 Dāmodara, ancestor of Dāmodara III,  
 70  
 Dāmodaran Nampūtiri of Maṅgalaśēri,  
 37, 66  
*Daśādhyāyī*, C on *Horā*, 41n, 49  
 Deśmaṅgalalam mss. collection, 62n  
*Devakerala*, 46  
*Devaśarmā*, 50  
*Dhruvavum Khaṇḍavum*, 36  
*Drgganita*, 2, 5, 9, 33, 50, 53  
*Drg-Veṅvārohakriyā*, 33  
*Dṛkkaṇṇa*, 60  
 Dṛk-system, 9-10  
*Durgamārthāpradarśinī*, C on *Praśna-*  
*mārga*, 67  
 Dvivedi, Padmakara, 41n  
 Dvivedi, Sudhakara, 41  
 Eclipse-computation, 33  
*Ekaviṃśatipraśnakrama*, 36  
 Elaṅkunnappuzha Naṭaykkal Kovila-  
 kam, 52  
*Gaṇakatarāṅginī*, 41  
*Gaṇitādhyāya*, C by Goda Varma, 78  
*Gaṇitanirṇaya*, 81n  
*Gaṇitanyāyasaṅgraha*, 60  
*Gaṇitaprakāśikā*, 81n  
*Gaṇitasāra*, of Śaṅkara III, 31, 63  
*Gaṇitasārasaṅgraha*, 72  
*Gaṇita-yuktayah*, 35, 73  
*Gaṇita-yukti*, 35  
*Gaṇitayuktibhāṣā*, 60  
 Garga, 39  
*Gauliśāstra*, 80  
 Ghaṭṭigopa, 30, 77-78  
 Goda Varma Koyittampurān of Kili-  
 mēnūr, 77n  
 Goda Varmā, Vidvān Ilaya Tampurān,  
 78  
*Golādhyāya*, C by A.R. Rājarāja  
 Varma, 81  
*Golādhyāya*, C by Goda Varmā, 78  
*Goladīpikā*, 35, 53  
*Golavāda*, 52  
 Golavid, Mādhava I, 52  
*Golayukti*, *Bhāṣā*-, 74  
 Gopāla, 39  
 Govinda, prince of Cempakaśēri, 50  
 Govinda I, Bhaṭṭatiri of Talakkuḷam, 5,  
 36, 41n, 45n, 49, 53, 54, 77  
*Govindakṛti*, 27, 44  
*Govindapaddhati*, 45  
 Govinda Pillai, P., 42  
 Govinda Piṣāraṭi, 71  
 Govinda-śiṣya, 70  
 Govindasvāmin, 3, 14, 27, 28, 44, 45, 48  
 G.P. Convergent Series, 18-19  
*Grahacāranibandhana*, 6, 7, 8, 31, 44  
*Grahacāranibandhanasaṅgraha*, 9  
*Grahaṇādi-grantha*, 33, 44, 56  
*Grahaṇa-ganita*, 33  
*Grahaṇamaṇḍana*, 4, 5, 33, 53  
*Grahaṇanirṇaya*, 56  
*Grahaṇa-nyāya-dīpikā*, 33, 35, 53

- Grahaṅṣṭaka* I, by Parameśvara I, 33, 53  
*Grahaṅṣṭaka* II, by Putumana Somayāji, 69  
*Grahaṅṣṭaka-s*, 33  
*Graha-parīkṣākrama*, 35, 56  
*Grahasamaya*, 47  
 Gregory and Leibnitz's Series for the Inverse tangent, 20-22  
 Gupta, R.C., 12, 14n, 15n, 16n, 27n  
 Haridatta, 6, 7, 8, 9, 31, 43  
*Horā*, 30, 38, 64, 67  
 „ C by Govinda I, 49  
 „ C by Kṛṣṇa, 47  
 „ C by Nityaprakāśa Yati, 50  
 „ C by Parameśvara II, 73  
 „ C by Parameśvara III, 73  
 „ C by Rāmaśiṣya, 67  
 „ C by Rāma Vāriyar, 80  
 „—C by Rudra II, 62  
*Horābhiprāyanirṇaya*, 73  
 Horary astrological literature, 36  
*Horāsāra*, by Rāmaśiṣya, 67  
*Horāsāroccaya*, 65  
 Infinite G. P. convergent series, 18-19  
 Inverse tangent, Gregory and Leibnitz's series, 20-22  
*Iṭakkāṭṭu Kūkkaniyāl*, 37, 67  
*Iṭakkāṭṭu* (Panakkāṭṭu) Nampūtiri, 66-67, 79  
*Iṭakramañceri* Nampūtiri, 31, 35, 65, 66  
*Jātaka*, works in Kerala, 35  
*Jātakābharāṇa*, 65  
*Jātakacandrikā*, C on *Horā*, 73  
*Jātakādeśamārga*, 36, 69, 75  
*Jātakādeśaratna*, 76, 79  
*Jātakakarmapaddhati*, 30, 36, 53  
 „ C by Parameśvara I, 53  
 „ C by Sūryadeva Yajvan, 48  
*Jātakakrama*, 36, 63  
*Jātakālanākāra*, 39  
*Jātakānītimārga*, 36, 38, 71  
*Jātakapaddhati*, by Parameśvara I, 36, 53  
 „ C *Bālabodhinī*, 71  
 „ C by Kṛṣṇadāsa, 74  
*Jātakapaddhati*, C by Śrikanṭha, 77  
*Jātakarahasya*, 43  
*Jātakasāra*, 36, 75  
*Jātakasārasaṅgraha*, 36, 38, 71, 72  
*Jātakodaya*, 36, 71  
 Jayadeva, Ācārya, 46n  
 Juschkewitsche, A.P., 12n  
*Jyāh*, 36  
 Jyeṣṭhadeva, 5, 12n, 35, 59-60, 73  
 Jyeṣṭhadeva-Śiṣya, 60-61  
*Jyotiṣabhāṣāvalī*, 76  
*Jyotiṣapradīpa*, 80  
*Jyotiṣaparakāśana*, C on *Golādhyaya*, 80  
*Jotiṣasaṅgraha* (II), 65, 66  
*Jyotiṣa-vākyaṇi*, 36  
*Jyotiṣśāstrasāṅgraha*, 38, 71, 72  
*Jyotiṣśāstrasubodhinī*, 69n, 81  
 Kaikkulangara Rāma Vāriyar, 80  
*Kāladīpa*, 69  
*Kāladīpaka*, 63 ; —C on, 63  
 Kalyāṇavarman, 38  
*Kaṇakkatikāram*, 36, 65  
*Kaṇakkucodyam*, 36  
*Kaṇakkunūl*, 36  
*Kaṇakkusāram*, 36, 65  
*Kaṇakkusāstram*, 36, 74  
 Kanippayoor Sankaran Namputirippad, 77  
*Karaṇa* type of works, 30-32  
*Karaṇadarpaṇa*, 31, 73 ; —C, 74  
*Karaṇāmṛta*, 31, 57  
*Karaṇapaddhati*, 18, 26, 31, 34, 51, 68  
*Karaṇapariṣkaraṇa*, 80  
*Karaṇasāra*, 31, 59, 63  
*Karaṇottama*, by Acyuta II, 31, 64 ;  
 —C by Acyuta, 65  
 —C by Keraliya-dviija, 70  
*Karmadīpikā*, C on *Līlāvati*, 58  
*Karmapradīpa*, C on *Līlāvati*, 58  
*Karmapradīpikā*, C on *Līlāvati*, 58  
 Kaṭapayādi notation, 6-8, 27  
 Kauṣitaki Āḍhya Netraṅgīyaṇa, 56  
 Kaye, G.R., 12n, 41  
 Keith, A.B., 12n  
 Kerala astrology, Horary astrology, 36  
 Kerala astronomers ; —earlier documentation, 41-42  
 —biography and works, 43-81  
 —bibliography of, 82-184

- Kerala astronomy,  
 —salient features, 1-10  
 —spirit of enquiry, 1-3  
 —stress on observation and experimentation, 3-4  
 —concern for accuracy, 4  
 —researcher's outlook, 4-5  
 —continuity of tradition, 5-6  
 —basic features, 6-7  
 —basic principles, 7  
 —Parahita system, 7-9  
 —Dr̥k system, 9-10  
 —anticipation of modern mathematical discoveries, 11-38  
 —some highlights, 27-28  
 —moon computation, 32  
 —eclipse computation, 33  
 —shadow computation, 33-34  
 —*Ven̄vāroha* method for the moon, 32-33  
 —long-range almanacs, 34  
 —astronomical rationale, 34-35  
 —practical astronomy, 35  
 —astronomical constants, revision of, 35-36  
 —major trends of the literature, 29-40  
 —classical texts, 29-30  
 —Mathematical literature, 36  
 —Malayalam versions of Skt. texts, 38  
 —important astronomers and their works, 41-81  
 —later phase, 80-81  
 —modern times, 81  
 —bibliography of literature, 82-184  
 —bibliography of Kerala-based texts, 185-96
- Keralācārya, 46  
*Kerala-dvādaśabhāva-phalam*, 43  
*Kerala-dvādaśabhāvavākyaṇī*, 43  
*Kerala-granthodāharana*, 39  
*Kerala-horā-vyākhyā*, 39  
*Kerala-jātakānanda*, 39  
 Kerala jyotiṣa, —*Muhūrta*, 36-37  
 —natural astrology, 37-38  
 —*Praśna*, 37  
 —outside Kerala, 38-40  
 See also under Kerala astronomy

- Keralamata*, 39  
*Kerala-praśna*, 39, 40  
*Kerala-praśna-grantha*, 39  
*Kerala-rahasya*, 39, 43  
*Kerala-sāstra*, 39  
*Kerala-śāstra-sūtra*, 39  
*Kerala-sūtra*, 39  
*Keralayātrā*, 40  
*Keralī*, 39, 40  
*Keralī-praśnavicāra*, 39  
*Keralī-śakuna*, 40  
 Keraliya-dvija, commentator on  
*Karaṇottama*, 70  
*Keraliyā-jātaka*, 39  
*Keraliyā-jātaka-saṅgraha*, 39  
*Keraliyā-jñāna*, 39  
*Keraliyā-praśnaratna*, 39  
*Keraliyā-śakunāvālī*, 39  
*Keraliyā-Vararuci-vākya*, 43  
 Kern, H., 53n  
 Keśava, brother of Dāmodara III, 70  
*Khaṇḍavum dhruvavum*, 36  
*Kirātārjunīya*, C by Vidyāmādhava, 48  
 Koccukṛṣṇan Āśān (Kṛṣṇadāsa), 70, 74-75  
 Koru, P.K., 23n, 68n  
 Koṭungallūr royal house, 73  
 Koyikkara, 64  
*Kriyā-*, *Kriyākrama*, connotation of, 35  
*Kriyākalāpa*, C on *Tantrasaṅgraha*, 59  
*Kriyākramakarī*, C on *Līlāvati*, 20, 22, 24, 25, 26, 34, 46, 58, 59  
*Kriyāsaṅgraha*, 31  
 Kṛṣṇa I, (Kṛṣṇācārya), 41n, 47  
 Kṛṣṇa II, 70  
 Kṛṣṇadāsa (Koccukṛṣṇan Āśān) 5, 31, 70, 74-75  
 Kṛṣṇan Āśān, 5  
 Kṛṣṇa-śiṣya, 47  
 Kumāra Gaṇaka, 38, 50  
*Kuṭṭākāra gaṇita*, 27-28  
 Kuṭṭamaśśeri Narayana Pisharati, 76  
*Laghubhāskarīya*, 74  
 —C by Parameśvara I, 53 ;  
 —C by Śāṅkara III, 63  
 —C by Śāṅkaranārāyaṇa, 27, 30, 45  
 —C by Udayadivākara, 45  
*Laghudarśinī*, 65

- Laghuhorā*, C by Rāmaśiṣya, 67  
*Laghujātaka*, C by Rāmaśiṣya, 67  
*Laghukālārpana*, 31  
*Laghumānasa*, 30  
 —C *Mānasaganita*, 69  
 —C by Parameśvara I, 53  
 —C by Sūryadeva Yajvan, 48  
*Laghuvivṛti*, C on *Pañcabodha* IV, 58  
*Lagnaprakarāna*, 51  
 Lambert, 22  
*Lampāka*, 38  
*Lāñchanasāstra*, 75  
 Leibnitz, Power series for  $\pi$ , 22-23 ;  
 —Series for inverse tangent, 20-22  
 Lhuiler's formula for the circum-  
 radius of a cyclic quadrilateral, 19 20  
*Līlāvati*, 19, 20, 24, 25, 26, 30, 34, 36,  
 53, 65  
 — C on, 36  
 —C by Dāmodara II, 60  
 —C by Nārāyaṇa I, 34, 46, 58  
 —C by Parameśvara I, 53  
*Lives of Hindu astronomers*, 41  
*Maccāṭṭu Bhāṣā*, 76  
*Maccāṭṭu Iṣayatu*, 76  
 Macdonell, A A., 12n  
 Mādhava I, of Saṅgamagrāma, 17, 18,  
 20, 22, 23, 24, 25, 26, 32, 34, 51-52, 74  
 Mādhava II, of Iñcakkāzhvā family,  
 37, 55, 64  
*Madhyamānayanaprakāra* of Mādhava  
 I, 51  
*Mahābhāskarīya*, 30  
 —C by Govindasvāmin, 3, 14, 15, 27,  
 44, 53  
 —C by Sūryadeva Yajvan, 48  
*Mahācchāyā*, 33  
 Mahādeva, father of Panakkāṭṭu Nam-  
 pūtiri, 67  
*Mahājyānayanaprakāra*, of Mādhava  
 I, 51  
*Mahāmārganibandhana*, 7, 44  
*Mahāśaṅku*, 33  
*Mahāyatṛā*, C by Sūryadeva Yajvan, 48  
 Mahodayapuram, 45  
 Malayalam versions of Skt. texts,  
 38  
*Māmāṅkam* (Mahā-magha), 8  
*Mānasaganitam*, C on *Laghumānasa*,  
 69  
*Maṅgalaśreṇivipra-Śiṣya*, 66  
 Maṅikkāran Tampurān, 77n  
*Mantrasāra*, 75  
 Marar, K. Mukunda, 12, 21n, 22n, 23n,  
 25n, 26n  
 Marīci, 39  
 Mathematical literature of Kerala, 36  
 Māttūr Nampūtiri, 61-62  
 Mecceri, 64  
 Melattol Agnihotri, 43  
 Menon, K. Sankara, 62n, 74n  
 Menon, Puthezhattu Rama, 76n  
*Muhūrta* literature in Kerala, 36-37  
*Muhūrtadarsana*, 36, 38, 48, 79  
 —C by Subrahmaṇya, 79  
*Muhūrtadīpaka*, 62  
*Muhūrtadīpikā*, C by Ravi Nampūtiri,  
 56  
*Muhūrtam Bhāṣā*, 49  
*Muhūrtamādhavīya*, 48  
*Muhūrtapadavī* I, 49, 50n, 77  
 —II, 72 ; —C by Śaṅkara III, 63  
 —V, 72  
 —VI, 73  
 —VII 73  
*Muhūrtapadavī-s*, 37  
 —of Māttūr Nampūtiris, 61  
*Muhūrtaratna*, 36, 45n, 49  
*Muhūrtāṣṭaka*, 54  
*Muhūrtavidhi*, 49  
 Mūladeva, 39  
 Muñjāla, 30, 48  
 Moon computation, 32  
 Nalleppalli Subrahmaṇya Śāstri, 34,  
 78-79  
 Nambiar, K. Damodaran, 6n  
 Nandarāma Paṇḍita, 39  
*Naraceṣṭā*, 38  
 Nārāyaṇa I, 33, 34, 45, 46, 57-58



- Nārāyaṇa II, of Kāṇṇavastu, 62  
 Nārāyaṇa III, 65  
 Nārāyaṇa IV, of Iṭavaṭṭikkāṭ, 73  
 Nārāyaṇa V, of Peruvanam, 30, 74  
 Nārāyaṇa VI, Ilayatu of Maccāṭ, 76, 79  
 Nārāyaṇa, teacher of Parameśvara I, 53  
 Nārāyaṇa, teacher of Śaṅkara IV, 75  
 Nārāyaṇa, teacher of Śrīkumāra, 76  
 Nārāyaṇan Nampūtiri, of Ceyyūr (Cellūr ?), 50  
 Natural astrology, 37-88  
 Nāvāyikkulaṭtu Āzhāti, 5  
 Naukā, C on Horā, 62  
 Navagrahasamaya, 47  
 Nāzhikamaniyuṭe yukti, 35  
 (Netra) Nārāyaṇa (Āzhvāñceri Tamprakkal), 58  
 Newton's Power series for the sine and cosine, 16-18  
 Newton-Gauss Interpolation formula, 14-15  
 Newton-Stirling Interpolation formula, 14  
 Nikaṣā's Jatakālaṅkāra, 39  
 Nilakaṇṭha I, Somayājīn, 2, 5, 19, 22, 26, 28, 30, 34, 35, 44, 45, 54, 55, 56, 57, 58, 60, 64, 73  
 Nilakaṇṭha II, 65  
 Nilakaṇṭha, of Bhāradvāja gotra, 75  
 Nilakaṇṭha, father of Śrīkumāra, 76  
 Nilakaṇṭha Śarmā, Punnaśseri Nampi, 81  
 Nityaprakāśa Yati, 50  
 Nyāya or yukti (rationale), 35  
 Nyāyaratna, 35, 68-69, 74  
 Padmanābha, 38  
 Pakiṭapraśna, 37  
 Pakṣisāstra, 38  
 Pallimattam, 64  
 Panakkāṭṭu (Iṭakkāṭṭu) Nampūtiri, 37, 38, 66-67, 79  
 Pañcabodha, genre of texts, 31, 32  
 —II, C by Śaṅkara III, 63  
 —III, 69, 78  
 —IV, 58; —C by Śaṅkara, 63  
 Pañcabodha VII, 74  
 —XI, C by Vāsunnī Mūssatu, 81  
 Pañcabodha-gaṇitasāra, 31  
 Pañcabodhakriyā-Bhāṣā, 81  
 Pañcabodhārthadarpaṇa, C on Pañcabodha IV, by Śaṅkara III, 63  
 Pañcabodhasataka, 31, 67  
 Pañcāṅgasuddhipaddhati, 80  
 Panikkar, R. Narayana, 42, 77n, 79n, 84  
 Parahita system, 7-10, 31  
 Parameśvara I, of Vaṭasreni, 2, 3, 4, 5, 9, 19, 30, 31, 33, 34, 36, 37, 41, 50, 52-54, 56, 71, 74, 77  
 —Mal. Qn. from, 75  
 Parameśvara II, 73  
 Parameśvara III, 73  
 Parameśvara, IV, of Puradahanapura, 76-77  
 Parameśvara, (? Panakkāṭṭu Nampūtiri) 67  
 Parameśvara, teacher of Ghaṭigopa, 77  
 Parameśvaran Pottī of Vāzhamāveli house, 63, 64  
 Pārameśvarī, C on Praśnaṣṭapañcōśikā, 73  
 Parāññoṭṭu Nampūtiri, 58  
 Parāśarahorā, C on, 45  
 Pāyayil Rāman Nampūtiri, 60n  
 Pāśaka-keralī, 39  
 Pāzhūr Kaṇiyār, 49  
 Phalasārasamuccaya, 38, 71, 72  
 —Bhāṣā, 71, 72  
 Pi (π), approximations to the value of, 22-27  
 Pillai, K. Raghavan, 47n, 64n, 73n, 79n  
 Pillai, P. Govinda, 42  
 Pisharoti, Kuṭṭamaśseri Narayana, 76n  
 Poduval, V.P. Kunlikkanna, 81n  
 Potuval, K.V.A. Rama, 81n  
 Prakāśikā, 74  
 Prakaṭārtha, C on Parāśarahorā, 45  
 Praśna literature of Kerala, 37  
 Praśnalakṣaṇa, 37  
 Praśnamālā, 37, 63  
 —Bhāṣā, 63  
 Praśnamārga, 37, 38, 64, 66, 67, 79  
 —C by the author, 67

*Praśnamārga* (contd.)

- C by Punneśsari Nilakaṅṭha Śarmā, 81  
 —C by Rāma Vāriyar, 80  
*Praśnāmṛta*, 37, 76  
*Praśnānuṣṭhānapaddhati*, 37, 75  
*Praśnaphalaprāptikālanirnaya*, 47  
*Praśnarīti*, 37, 66, 67  
*Praśnasāra* by Bhūtanāthapura Somayāji, 37, 76  
*Praśnasāra*, of Mādhaba of Iṅcakāzhvā, 37, 5f, 64  
*Praśnasāra*, by Śaṅkara V, 37, 63, 75  
*Praśnaṣaṭapañcāsikā*, 30, 37, 54  
 —C by Parameśvara I, 54  
 —C by Parameśvara II, 73  
*Praśnāyana*, 37, 76n, 79, 80  
 Pṛthuyasas, 30, 37, 54  
 Pulimukhattu Pottī, 5  
 Puliyoor Purushottaman Nampūtiri, 56n, 81n  
 Punnaśsari Nampi Nilakaṅṭha Śarmā, 81  
 Punnorkkoṭṭu Mana, 69  
 Puruṣottama I, of Māttūr, 37, 61-62  
 Puruṣottama II, 31, 67-68  
 Puruṣottama III, Mūssatu of Kūttaleṭattu Mana, 37, 76n, 79-80  
 Putumana Somayāji, 31, 33, 35, 36, 68-69, 74, 76, 78  
 Raja, K. K., 41, 42, 45ff.  
 Rajagopal, C. T., 12, 17n, 21, 26, 22n, 23n, 25n, 26n  
 Rājarāja Varma I, Vidvān Karindran Ceruṅṅi Koyittampurān of Kilimānūr, 5  
 Rājarāja Varma II, A.R., 80-81  
 Rāma-śiṣya, 67  
 Rāma-Vāriyar of Kaikkulangara, 80  
 Rāma-Varma, King of Kerala, 11th cent., 46  
 Rāma-Varma Koyittampurān of Grāmam, 80  
 Rāma-Varma Maru Thampurān, 12, 60n, 65n

- Rāman Āśān, 5, 74  
*Raṅgāpikā*, 38, 50  
 Ranganatha Josyar, 46n  
*Rāśigola-sphuṭānīti*, 13, 35, 64  
 Rāvāṇa, 39  
 Ravi Nampūtiri 55  
 Ravi Varma, Cera king of Mahodayapuram, 9th cent., 45  
 Ravi Varma, King of Kerala, 44  
 Ravi Varma, King of Veṭṭattunād, 64  
 Reduction to the ecliptic, 12-13, 35  
*Rekhāśāstra*, 38  
 Robinson, G., 15n  
*Rogapraśna*, 37  
 Rudra I, 50, 53  
 Rudra II, Vāriyar, 62  
*Rūpānayanapaddhati*, 63  
*Sadratanmālā*, 7, 8, 11, 23, 30, 78  
 —C, 78  
*Ṣadvargaphalam*, 53  
*Śakābda-saṃskāra*, 9, 44  
 Śaktan Tampurān, 76  
*Sampradāyapradāpikā*, C on Parāśara-horā, 45  
*Samudrikalakṣaṇa*, 38  
*Sāmudrikasāra*, 38, 75  
*Sāmudrikasāstra*, 80  
*Saṅgrahasādhana-'kriyā'*, 35, 38, 71  
 Śaṅkara, teacher of Parameśvara III, 73  
 Śaṅkara, I, of Kelallūr, 55, 57  
 Śaṅkara II (Śaṅkara Vāriyar of Tṛkkuṭaveli), 31, 58-59  
 Śaṅkara III (Śaṅkaraṇ Nampūtiri of Mahiṣamaṅgalam), 30, 31, 34, 36, 37, 59, 62-64, 75n  
 Śaṅkara, IV, of Muktisthala, 38, 75  
 Śaṅkara V, 37, 75  
 Śaṅkarācārya, 7n  
 Śaṅkaraṇārāyaṇa, 27, 30, 44, 45  
 Śaṅkara-Varman, 7, 8, 30, 78  
*Śaṅku*, 33  
 Sankunni, Kottarathil, 43n, 49n, 64n.  
*Sārāvali*, 38  
 Saraswathi, T. A., 12, 18n, 19n, 20n, 21n, 26n, 28

- Sarma, K.V., 2n, 4n, 5n, 7n, 8n, 9n, 10n, 12n, 13n, 16n, 43n, 44n, 51n, 52n, 53n, 54n, 55n, 56n, 57n, 60n, 62n, 64n, 65n, 68n, 69n
- Sarvartu Paṇḍita, 39
- Sastri, T.S. Kuppanna, 3n, 12, 14n, 43n, 44n, 45n, 53n, 56n
- Sastry, Shama, 41n
- Sen, S.N., 42
- Shadow computation, 33-34
- Shukla, K.S., 46n
- Siddhāntadarpana*, 35, 56 : —C, 56
- Siddhāntadīvikā*, 3, 52
- Siddhāntasiromaṇi*, C by Goda Varmā, 78
- Sine and Cosine functions Series, 15-16
- Śiva, *Kerala-mata* of, 39
- Smith, D.E., 12n, 19n
- Somayaji, Arka, 12n
- Sphuṭanirṇaya*, 13, 14, 64, 65
- Śrāddha-candrādi-gaṇita*, 32
- Śrī, mother of Panakkāṭṭu Nampūtiri, 67
- Śrīkaṇṭha Vāriyar, 77
- Śrīkumāra, 37, 76
- Śrīpati, 30, 36, 48, 54
- Subrahmaṇya I, of Māttūr, 61-62
- Subrahmaṇya, of Kunnattu family, 37, 79
- Subrahmaṇya Sastri, 78-79
- Śuddha-candra-kriyāgaṇita*, 32
- Śuddha-Dṛggaṇitam*, 81n
- Śukrācārya, 39
- Sūkṣma-candra-sphuṭādi-gaṇita*, 32
- Śūlapāṇi Vāriyar, 74
- Sundararāja-praśnottara*, 35, 56
- Sundarī*, C on *Laghubhāskariya*, 45
- Sūryadeva Yajvan, 30, 48
- Sūrya-grahaṇa-gaṇita*, 33
- Sūryasiddhānta*, 30  
—C by Acyuta II, 65  
—C by Parameśvara I, 53
- Śyāmalavāraṇarāja, 69-70
- Tāmaranallūr, 49-50
- Tāmaranallūr Bhāṣā*, 49
- Tāmbūla-praśna*, 37
- Tamprakkal Bhāṣā*, 72
- Tantrasaṅgraha*, 11, 18, 30, 56, 60  
—C by Jyeṣṭhadeva-Śiṣya, 60  
—C by Śaṅkara Vāriyar, 16n, 58, 59n
- Tantrasāra*, 30, 74
- Taylor series for sine and cosine functions, 15-16
- Tṛppāṇikkara Potuvāl, 5
- Tuppan Nampūtiri of Iṭavaṭṭikkāṭ, 72-73
- Tycho Brahe's reduction to the ecliptic, 12-14
- Udayadivākara, 30, 45-46
- Ulloor S. Parameswara Aiyar, 5n, 8n, 42, 45 ff.
- Uparāgakriyākrama*, by Acyuta II, 14, 33, 60  
—by Nārāyaṇa I, 33, 58
- Uparāgapariccheda*, of *Pañcabodhaśataka*, 67
- Uparāgavimśati*, 33, 65
- Vaidyanātha, 76
- Vākkāṭ, 64
- Valiya Kāladīpakam*, 63
- Vākyakarāṇa*, of Parameśvara I, 35, 53  
—of Vararuci, 43, 56
- Vākyadīvikā*, 53
- Vākyapañcāṅga*, 43
- Varadīpikā*, C on *Muhūrtapadaṅgi* II, 77
- Varāhamihira, 30, 36, 37, 38, 47, 48, 62, 67
- Vararuci I, 43
- Vararuci II, 43
- Vararuci-Kerala*, 43
- Vararuci-Vākyas*, 6, 43
- Vararucika*, 43
- Variyar, P.V. Krishna, 80n
- Varma, A.R. Rajaraja, 80-81
- Varma, Vaṭakkumkūr Rajaraja, See under Vaṭakkumkūr
- Vāsudeva I (Vāsudevasvāmi), 69
- Vāsudeva II, of Vallimana, 63, 72
- Vāsuṇṇi Mūssatu, 81
- Vaṭakkumkūr Rajaraja Varma, 42 ff.
- Vellānaśśeri Vāsuṇṇi Mūssatu, 81
- Vepāḍ-brāhmaṇa, 71

- Venkataraman, A., 12, 17n, 18n, 26n, 60n
- Venṅāroha*, 51
- Venṅāroha* method for the moon, 32-33
- Venṅārohakriyā*, 33
- Venṅārohāṣṭaka*, 33
- Vidvān Iḷaya Tampurān of Koṭuṅṅallūr, 78
- Vidyāmādhava, 36, 38, 41n, 48-49, 78
- Vijñānadīpika*, 64n
- Viṣamākṣaravivṛti*, C on *Horā*, 50
- Viṣamārthadāpiṅī*, C on *Horā*, 73
- Viṣṇu I, of Nilamana, 47, 48-49
- Vivāhānukūlyam*, 53
- Vivarāṇa*, C on *Horā*, 62
- Vyāghrapāda, 47
- Whish, Charles M., 11, 12n
- Whiteside, D.T., 12n
- Whittaker, E., 15n
- Yajña, 70
- Yukti* or *nyāya*, (rationale), 35
- Yuktibhāṣā*, 11, 12, 16n, 17n, 18, 20, 21, 23, 24, 25, 26, 28, 35, 36, 60, 73
-