THE DRAVYAPARĪKṢĀ OF ṬHAKKURA PHERŪ

An Assayer's Manual from the Khaljī Court of Delhi

Translated and commented by
Sreeramula Rajeswara Sarma

THE DRAVYAPARĪKṢĀ OF ṬHAKKURA PHERŪ

An Assayer's Manual from the Khaljī Court of Delhi

© Sreeramula Rajeswara Sarma
Duesseldorf, Germany

First published in January 2021 at www.srsarma.in

To Dr Vijay V. Bedekar,

who shares and supports my interest in

History of Science in India,

in friendship and admiration

PREFACE

When I read the *Ṭhakkura-Pherū-viracita-Ratnaparīkṣādi-sapta-grantha-saṃgraha* in the early 1980s, I was greatly fascinated by the life and work of Ṭhakkura Pherū. Pherū, who belonged to the Kharatara sect of Śvetāmbara Jains, held a high office at the treasury and the mint of the Khaljī Sulṭāns of Delhi in the first quarter of the fourteenth century and wrote on diverse scientific and technical subjects in Apabhraṃśa verse. He was thus a mediator between Sanskrit and Islamic traditions of learning, between the elite Sanskrit and popular Apabhraṃśa, and also between the *śāstra* and commerce.

Of his seven published works, the *Ratnaparīkṣā* on gemmology, the *Gaṇitasārakaumdī* on mathematics and the *Dravyaparīkṣā* on assay and exchange of coins contain much original material, based on Pherū's wide reading of relevant texts and on his practical experience.

The *Ratnaparīkṣā* follows the traditional pattern of the Sanskrit texts on *ratna-śāstra* in classifying and describing different types of gems; but it also offers a very detailed tariff of prices, which must be valid for the Delhi region in the first quarter of the fourteenth century.

The *Gaṇitasārakaumudī* emulates the earlier texts like the *Pāṭīgaṇita* of Śrīdhara to a large extent, but offers much additional material. It is the first text to discuss the magic squares; in the section on solid geometry, it notices the new architectural forms like the arch and dome which are introduced from the Islamic world about this time.

The *Dravyaparīkṣā,* which means the examination of the metal content of coins, dwells briefly on the techniques of assay and then provides the name (*nāma*), provenance (*ṭhāma*), weight (*tullu*), metal content (*davvo*), and the exchange value in terms of the Khaljī currency (*mullu*), of some 260 types of coins issued by various kingdoms of northern India in the twelfth, thirteenth and early fourteenth centuries. The uniqueness of this text cannot be overemphasized.

When I was reading Pherū's *Ratnaparīkṣā*, I heard that the Department of Geology of Aligarh Muslim University was offering a diploma course in Gem Testing and the Art of Lapidary. I attended this course which helped me in understanding the modern methods of classification and identification of gems; it also helped me in evaluating the scientific content of the *ratnaśāstra* texts. In the light of this knowledge, I prepared an edition of Pherū's *Ratnaparīkṣā,* in 1984, with a Sanskrit *chāyā,* English translation, and gemmological, historical and cultural notes.

A visiting professorship at Kyoto University in 2002 provided me the rare opportunity to study Phurū's *Gaṇitasārakaumudī* together with Professors Takao Hayashi of Doshisha University, Takanori Kusuba of Osaka University of Economics and Michio Yano of Kyoto Sangyo University. Our joint study of this text came out in 2009.

The *Dravyaparīkṣā* was published with a partial English translation by V. S. Agrawala in 1966 and a complete Hindi translation by Bhanwar Lal Nahata in 1976. I wished to prepare an annotated translation in English, with an explanation of the chemical and metallurgical processes described in verses 1-50, a thorough analysis of

the coin catalogue (in verses 51-149) and a comparison of the data provided there with the actual specimens and their modern assays.

I have prepared an English translation and commentary, but certain technical terms and metallurgical processes eluded my comprehension. I had hoped to visit the numismatic collections in different museums and obtain photographs of the coins mentioned in the *Dravyaparīkṣā,* but could not do so because much of my time and resources in recent decades were taken up in visiting over a hundred museums in India, Europe and North America for the preparation of *A Descriptive Catalogue of Indian Astronomical Instruments.* Even with these shortcomings, I do hope that my present work would be able to draw attention of a wider readership to the singular importance of Ṭhakkura Pherū's *Dravyaparīkṣā* and hopefully to induce some future numismatist to undertake a more comprehensive study of the *Dravyaparīkṣā.*

It is my pleasure to dedicate this work to Dr Vijay V. Bedekar as a small token of my appreciation of his valuable services to the cause of History of Science in India. In spite of his busy schedule as the Chairman of the Vidya Prasarak Mandal which maintains several educational institutions in Maharashtra, he devotes much time for the promotion of the study of India's history, culture and science. Under the auspices of the Institute for Oriental Study, Thane, he conducted some 35 annual seminars between 1982 and 2009; several of these dealt exclusively with the history of science. Most noteworthy is that in connection with the 900th birth anniversary of the great mathematician and astronomer Bhāskarācārya he organised in September 2014 an international conference, the proceedings of which appeared in an erudite volume entitled *Bhāskara-prabhā.*

At a personal level, since I moved from Aligarh to Düsseldorf, my main access to an academic library has been through the courtesy of Dr Bedekar, who built up, at his Institute for Oriental Study, a rich collection of books dealing with the history of science in India. Whenever I needed some material, he has been promptly sending me digital copies through the efficient librarians at his Institute for Oriental Study.

CONTENTS

ABBREVIATIONS

DP	*Dravyaparīkṣā* by Pherū
DU	*Dhātūtpatti* by Pherū
GSK	*Gaṇitasārakaumudī* by Pherū
JS	*Jyotiṣasāra* by Pherū
PSM	*Pāiasaddamahaṇṇavo*
RP	*Ratnaparīkṣā* by Pherū
VS	*Vāstusāra* of Pherū

dr	*dramma*
g	gram
H	Hindi
j	*java*
m	*māṣa*
S / Skt	Sanskrit
r	regnal years
ṭ	*ṭaṃka*
to	*tolā*
wt	wight
v	verse
vv	verses

UNITS OF WEIGHT AND THEIR EQUIVALENTS IN THE METRIC SYSTEM

1 *visuva*		(= 0.003 g)
20 *visuvas*	= 1 *java*	(= 0.057 g)
16 *java*	= 1 *māṣa*	(= 0.917 g)
4 *māṣas*	= 1 *ṭaṃka*	(= 3.668 g)
3 *ṭaṃkas*	= 1 *tolā*	(= 11.003 g)
20 *tolas*	= 1 *ser*	(= 220.06 g)
40 *sers*	= 1 *maṇ*	(= 8802.4 g = 8 kg 802 g)

INTRODUCTION

Of the rich contributions made by the Jains to the intellectual history of India, an important but not so well explored aspect is their role as mediators between the Islamic and Sanskrit traditions of learning.[1] Several Jain Ācāryas are said to have mastered Persian and composed poems in this language. Thus in the fourteenth century Jinaprabha Sūri composed a hymn entitled *Ṛṣabhajinastavana* in Persian language, but employing Prakrit and Sanskrit metres.[2]

More interesting still is that they also took leading part in propagating Persian language, remarkably enough through the medium of Sanskrit. Some time ago I made a brief survey of Sanskrit manuals for learning Persian when I noticed about fifteen works which were composed during the period between AD 1364 and 1764.[3] The earliest known Sanskrit manual for learning Persian is the *Yavananāmamālā* composed in 1364 by Vidyānilaya who appears to be a Jain. The *Jinaratnakośa* mentions three manuscripts of this text, which are preserved in some private manuscript collections. A year later, i.e. in 1365, another manual was produced in Gujarat. It is called *Śabdavilāsa* and also *Pārasīnāmamālā* and was composed by Salakṣa of Prāgvāṭagotra, who was a minister of King Haribhrama of Ilāvaraṇa or Ilādurganagara (modern Idar).[4] In subsequent times also, Jains and Gujarati scholars composed Sanskrit manuals for learning Persian.

It is also worth mentioning that the Jain monk Mahendra Sūri, pupil of Madana Sūri of Bhṛgupura (Baroch in Gujarat), wrote the very first Sanskrit manual on the construction and use of the astrolabe — the Islamic astronomical instrument *par excellence* — at the court of Fīrūz Shāh Tughluq in 1370. Impressed by the versatile functions of the astrolabe, Mahendra Sūri called it *yantra-rāja* (king of instruments) in Sanskrit.[5] Towards the end of the fifteenth century, another Jain scholar, Muni

---

1 Truschke 2020.

2 Jain 1950.

3 Sarma 1966; Sarma 2002.

4 Shah 1972.

5 Mahendra Sūri; Sarma 2000; Sarma 2021, Appendix D1.

Megharatna, pupil of Vinayasundara of Vaṭagaccha, wrote a small manual under the title *Usturalāva-yantra* in 38 stanzas.[6]

0.1 Pherū's Life

To this tradition belongs the Jain polymath Ṭhakkura Pherū, who is a mediator in several respects: mediator between Sanskrit and Islamic traditions of learning, mediator between the elite Sanskrit and popular Apabhraṃśa, and also mediator between the *śāstra* and the commerce. He held a high office at the treasury of the Khaljī Sulṭāns of Delhi in the first quarter of the fourteenth century and wrote on diverse scientific and technical subjects in Apabhraṃśa verse.

The credit for bringing to light Pherū's work goes to the two Jain savants Agar Chand Nahata of Bikaner and his nephew Bhanwar Lal Nahata of Kolkata.[7] Sometime around 1946, they discovered in the Śrī-maṇi-jīvana Jain Library in Kolkata a manuscript containing the works of Ṭhakkura Pherū. The manuscript, consisting of 60 folios, was copied for his own use by a certain Purisaḍa, son of Sāhu Bhāvadeva, in 1347 AD, probably in Pherū's lifetime itself or immediately thereafter.[8]

The manuscript contains the following seven texts: *Kharataragaccha-yugapradhāna-catuḥpadikā* (composed in AD 1291) which contains a eulogy of the pontiffs of the Kharatara sect, *Jyotiṣasāra* on astronomy and astrology (1315), *Vāstusāra* on architecture and iconography (1315), *Ratnaparīkṣā* on gemmology (1315), *Dhātūtpatti* (n.d.) on metals and perfumery articles, *Gaṇitasārakaumudī* (n.d., but before 1318) on mathematics, and *Dravyaparīkṣā* (1318) on assay and exchange of coins.

The Nahatas recognized immediately the unique nature of these texts and desired to publish them with translations and annotations by some leading scholars. During the next fifteen years they appear to have shown the manuscript or its transcript to several renowned scholars like Vasudeva Saran Agrawala, Moti Chandra, Dashrath Sharma, and Jinavijaya Muni. The Nahatas were keen that Vasudev Saran Agrawala should

---

6 Sarma 2000.

7 A proper account of the lives and literary work of these two scholars and entrepreneurs has yet to be written; cf. Nahata Festschrift 1976; Nahata Festschrift 1986.

8 On the copyist's colophons, see SaKHYa 2009, pp. 6-7.

translate and annotate especially the *Dravyaparīkṣā* on numismatics. Agrawala also recognized the uniqueness of this text, but due to the pressure of his administrative and academic duties, could not fulfill the wishes of the Nahatas.[9] Finally, in 1961, the Nahatas published the text of the seven works under the title *Ṭhakkura-Pherū-viracita-Ratnaparīkṣādi-sapta-grantha-saṃgraha* from the Rajasthan Oriental Series, edited by the great savant Jinavijaya Muni.[10] This edition did not contain any translation or annotations as the Nahatas originally envisaged, but the noted art historian Moti Chandra contributed an introduction to the *Ratnaparīkṣā,* giving an overview of the literature on gemmology and the topics discussed in this subject.

From these works, we can glean some details of Pherū's personal life.[11] Pherū's earliest known work is dated 1291 and the last chronological reference to him relates to 1323 as will be shown below. It is therefore probable that Pherū was born sometime in the second half of the thirteenth century, perhaps around 1270. He mentions frequently that he belonged to a town called Kannāṇā or Kannāṇa-pura, which survives today as Kaliyana at 28°33´ N; 76°12´ E in the Bhiwani district of the Haryana state.[12] He was born in the Śrīmāla caste and was a member of the Kharatara sect of the Śvetāmbara Jains. His father was Ṭhakkura Candra, and his grandfather Kalaśa had the title *siṭṭhi* (Sanskrit: *śreṣṭhin*), "merchant-banker". In his *Ratnaparīkṣā,* he states that he was composing the work for his son Hemapāla, who therefore seems to have been embarking on the gem trade. The *Dravyaparīkṣā* was written for his son and brother to initiate them into the profession of money exchangers. Apparently, the family was engaged in the trade of gems and luxury goods, and in banking and money exchange.

---

9 Agrawala, however, brought out several minor publications on Pherū's works, viz., Agrawala 1951-52, Agrawala 1954, Agrawala 1964-65, Agrawala 1966 and Agrawala 1969.

10 SGS.

11 The verses in Pherū's different works that carry personal information about him are put together in Natata 1976, pp. 8-10.

12 Cf. Sarma 1984, pp. 1-20.

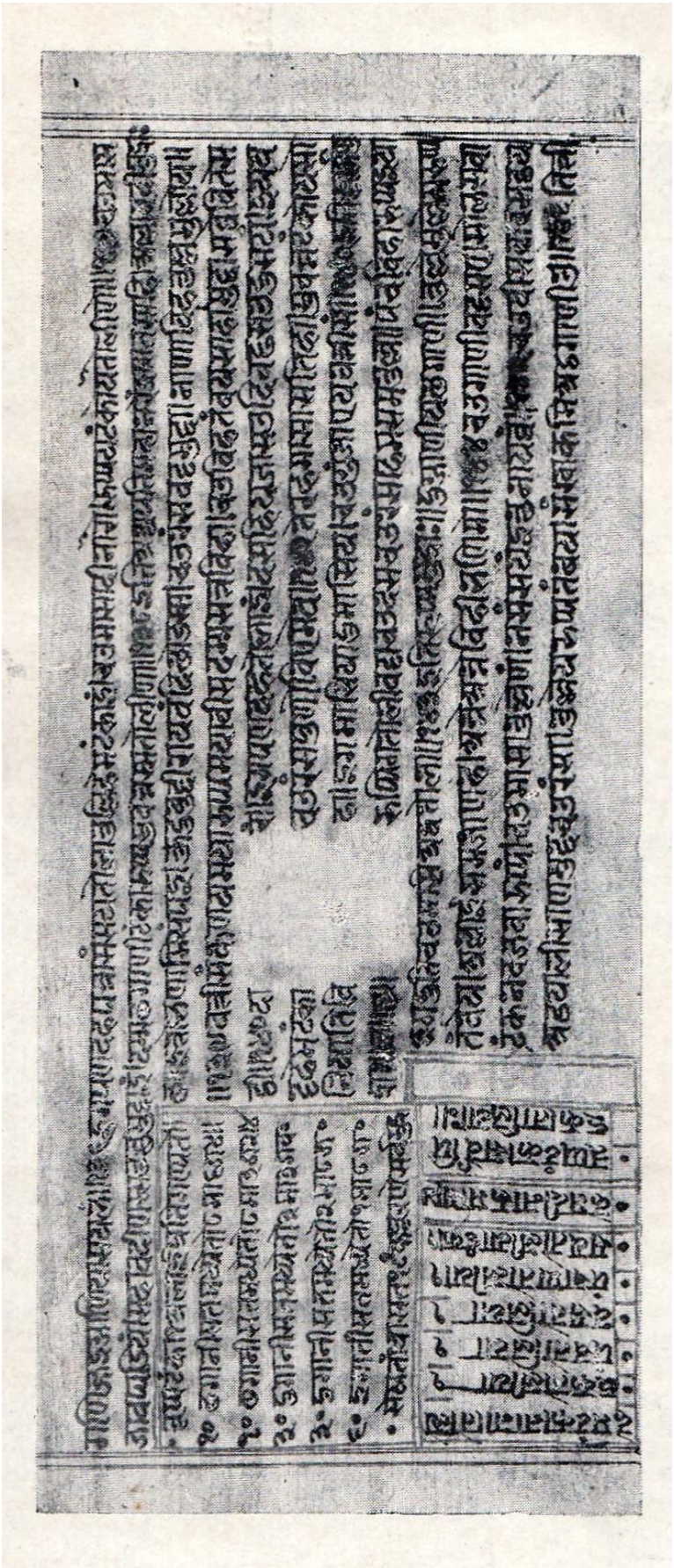


Figure 1: The Manuscript of the *Dravyaparīkṣā,* penultimate page (from SGS)

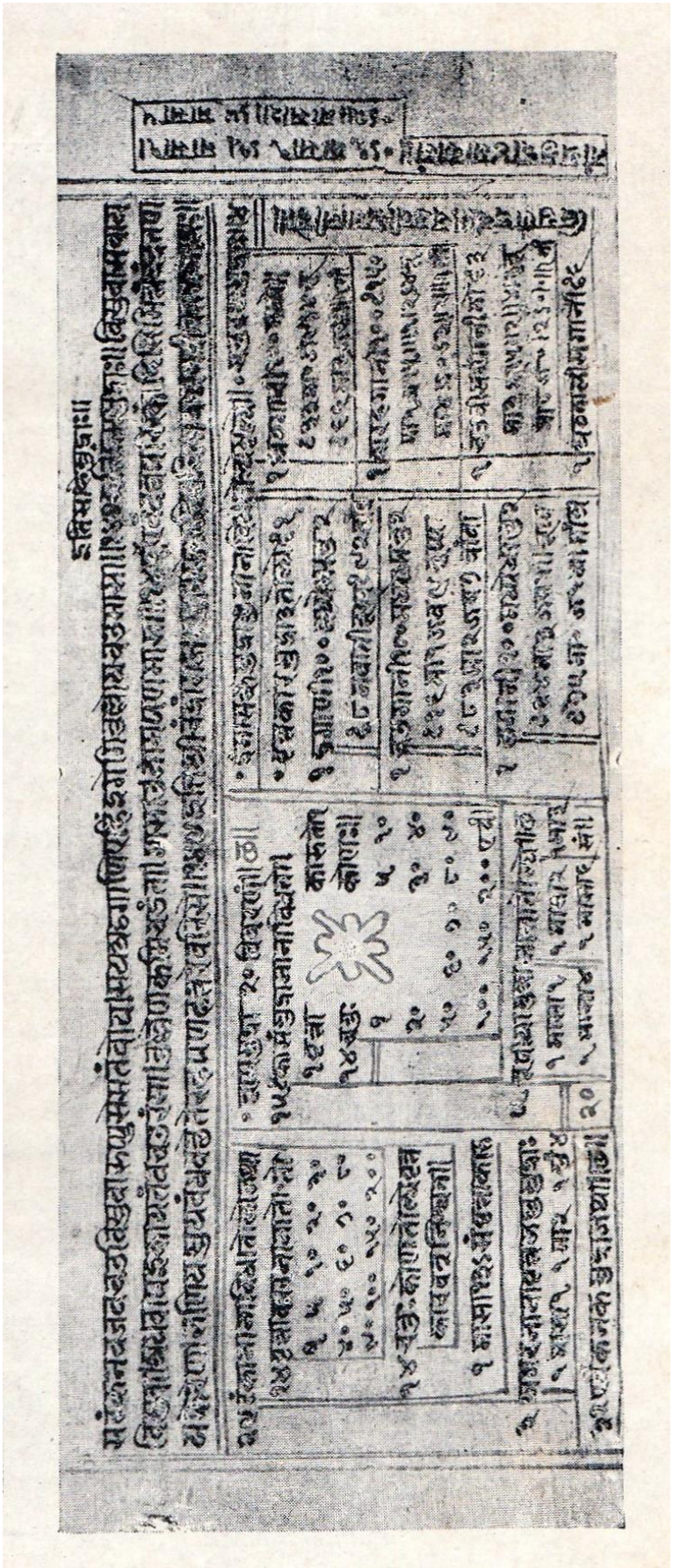


Figure 2: The Manuscript of the *Dravyaparīkṣā,* last page (from SGS)

Nothing is known about his early life and education. In the *Kharataragaccha-yugrapradhāna-catuḥpadikā,* he states that he composed this work at Kannāṇā in 1291 in the presence of Vācanācārya Rājeśekhara. It is likely that he was brought up and educated at Kannāṇā, and Rājaśekhara may have been one of his teachers. His education was wide-ranging. Besides the Jain religious texts, he also studied several Sanskrit and Prakrit texts on astronomy, astrology, mathematics and architecture. His writings, moreover, reveal his practical experience in the trade of gems and perfumery articles, and in minting and money exchange.

When the Delhi Sultanate was established towards the end of the twelfth century, the Sulṭāns did not begin fresh coinage with Arabic legends. Instead, they adapted the fabric of existing Chauhan coinage and added their respective names in Nāgarī script. Because banking and minting in the Gujarat-Rajasthan-Delhi region was largely controlled by the Jains,[13] their cooperation was sought by the Sulṭāns for conducting banking and minting operations. Especially the Jains of Śrīmāla clan, to which Pherū belonged, were known for their expertise in minting and banking.

In the *Lekhapaddhati,* a collection of model documents from the early medieval Gujarat, the coins used in various public and private transactions are often described as *śrī-śrīmālīya-khara-ṭaṃkaśālā-hata-triparīkṣita*, implying that the coins were struck (*hata*) in a mint (*ṭaṃkaśālā*) belonging either to the city of Śrīmāla (modern Bhinmal, 25° 0′ N; 72° 15′ E, in the state of Rajasthan) or to persons belonging to the Śrīmāla clan, and that these coins were tested three times (*triparīkṣita*) for their metal content, or more precisely for the content of silver or gold. It is not clear what *khara* in this expression denotes. It is possible that it refers to the *kharatara-gaccha* of Śvetāmbara Jains. Then the expression would mean that coins were produced at a mint maintained by Śrīmāla Jains of the Kharatara sect, to which Pherū also belonged. After minting the coins, these were tested three times to ensure that they had the correct weight and contained the correct amount of gold or silver, which determined the intrinsic value of the coin. The fact that this expression occurs in as many as twelve documents shows that this must have been a standard formula in the early medieval Gujarat to express the

---

13 Deyell 1999, p. 247.

genuineness of a particular coin.[14] Owing to these commercial and monetary reasons, the Jains had good relations at the Delhi court. Several of them were also employed there.

Coming from a family of merchant-bankers, Pherū found a ready appointment at the treasury of the Khaljī Sulṭāns of Delhi. It not known precisely when he entered the services of the Sulṭāns, but it must have been quite some years before 1315, because in this year he completed the *Ratnaparīkṣā,* "after having seen with his own eyes the vast ocean-like collection of gems in the treasury of ᶜAlā' al-Dīn, the [sole] emperor of the Kali age" (*allāvadīṇa-kalikāla-cakkavaṭṭissa kosamajjhatthaṃ rayaṇāyaru-vva rayaṇuccayaṃ ca niya-diṭṭhiye daṭṭhuṃ*) (RP 4). Pherū continued the service under ᶜAlā' al-Dīn's successors, Shihāb al-Dīn ᶜUmar (r. 1316) and Quṭb al-Dīn Mubārak Shāh (r. 1316-1320) and possibly also under Ghiyāth al-Dīn Tughluq (r. 1320-1325). In 1318 Pherū occupied a high position at the mint of Quṭb al-Dīn. The *Dravyaparīkṣā,* which Pherū completed in that year, was based on his experience at the Delhi mint (*siri ḍhilliya ṭaṃkasāla*).

Pherū is mentioned twice in a contemporary chronicle entitled *Kharatara-gacchālaṃkāra-yugapradhānācārya-gurvāvalī,* which describes the lives and activities of the pontiffs of the Kharatara sect from the beginning of the eleventh century up to 1336. This chronicle narrates that in the spring of 1318 Ṭhakkura Acala Siṃha secured a decree (*farmān*) from Sulṭān Quṭb al-Dīn Mubārak which granted him permission to organize a pilgrimage of the Jain community. Along with other prominent Jains of Delhi, Pherū joined the pilgrim group and visited, among other holy places, Pherū's native place Kanyānayana and worshipped Vardhamānasvāmin there.[15] In 1323 Pherū joined another pilgrimage to Śatruñjaya in Gujarat. This was organized by a wealthy resident of Delhi named Rayapati, who was also of the Śrīmāla caste, under a decree from Sulān Ghiyāth al-Dīn Tughluq.[16] It is not known whether Pherū occupied any official position at this date, but his very mention by name among the prominent Jains

---

14 Strauch 2002, pp. 139, 171, 174, 177, 180 et passim.

15 Jinapāla, pp. 66-67.

16 Ibid., pp. 72-74.

of Delhi suggests that he may have continued his services under Ghiyāth al-Dīn Tughluq as well.

What is the significance of Pherū's title "Ṭhakkura"? In the *Kharatara-gacchālaṃkārayugapradhānācārya-gurvāvalī,* there are names of several prominent Jains of the period; among these some have the title "Ṭhakkura". All such persons are residents of Delhi and appear to be somehow connected to the Sulṭān's court. I venture therefore to think that the title "Ṭhakkura"[17] was given or assumed by those Jain bankers who were employed at the Delhi court. In Pherū's own family, his father is referred to as Ṭhakkura Candra, while the grandfather did not have this title; he is merely referred to as Siṭṭhi Kalasa. Thus it is probable that already Pherū's father Candra entered the service of the Sulṭān's and that Pherū followed his father's footsteps.

V. S. Agrawala wrote that Pherū was the mint master at Delhi,[18] and since then everybody has been repeating it.[19] However, there is no clear evidence to support this view. But Pherū himself does not claim that he was the head of the mint. At the beginning of the *Dravyaparīkṣā*, Pherū merely states that he was "employed at the Delhi mint" (*siri ḍhilliya ṭaṃkasāla kajjaṭhiye*).[20] More important is the following. The coinage of the Sulṭāns carry several imperial and religious titles in Arabic. The gold and silver coins of ᶜAlā' al-Dīn carry the legends *sikander al-thānī yamīn, al-khilāfat, nāṣir amīr al-mū'minīn* (the second Alexander, the right hand of the Caliphate, helper of the Commander of the Faithful). But Quṭb al-Dīn dispensed with the nominal allegiance to the Caliphate and called himself the *khalīfa rabb al-ᶜalamīn,* (Caliph, the lord of the two Worlds), *al-imām al-aʿzam* (Most High Imām) and *sikandar al-zamān* (the Alexander of the Age).[21] It is naturally the responsibility of the mint master to see that these religious titles in Arabic are correctly reproduced on the coinage. Such responsibility would certainly not have been conferred upon a non-Muslim like Pherū.

---

17 It is not clearly known whence this term originated. Today, a modified form "Thakur" refers to a land-owning caste in Northern India, while it was the title of some Brahmin families in Bengal, where it was anglicized as "Tagore" as in the name of the poet Rabindra Nath Tagore.

18 Agrawala 1951-1952, p. 321: *ṭhakkura pherū alāuddīn khaljī ke dillī kī taṃkasāl ke adhyakṣa the*; this is repeated in his subsequent publications.

19 For example, Gupta 1969, 87-89.

20 DP 2.

21 Goron & Goenka 2001, pp. 40-44.

Moreover, had Pherū been the mint master, the *Dravyaparīkṣā* would have contained some information on the process of minting which is totally absent in the *Dravyaparīkṣā*. What this work contains are brief descriptions of the techniques of assay and purification of precious metals and a detailed account of exchange of coins. These, as Pherū himself says, were written down for the sake of his brother and son, who may have been embarking on a career as assayers and money-exchangers. Thus, the *Dravyaparīkṣā* is primarily a manual on assay and money exchange. It would be safer, therefore, to assume that Pherū was the assayer or the assay master at the Delhi mint under Sulṭān Quṭb al-Dīn Mubārak.

0.2 Pherū's Oeuvre

Leaving aside the *Kharataragaccha-yugapradhāna-catuḥpadikā,* which is a small work of piety, the other six texts composed by Pherū deal with diverse scientific and technical subjects, a knowledge of which was apparently required by successful merchant-bankers of those times. It is to Pherū's credit that he composed these scientific texts, not in the scholarly Sanskrit, but in the popular Apabhraṃśa so that these texts were easily accessible to a wider range of people. All his seven works are composed in verse form; mostly in *gathā* metre, interspersed occasionally with other metres such as *Uggāhā*, *Dohā, Aḍilla, Pādākulaka, Chappaya, Khaṃdha,* and *Rolā.*

But the titles, subheadings, colophons, subcolophons in these are in prose, in a kind of popular Sanskrit, where the rules of phonetics or sandhi are not strictly observed. Thus we have expressions like *iti muttāhala-parīkṣā* instead of *muktāphala-parīkṣā*; *iti māṇikyaparīkṣā samattā,* instead of *samāptā; Dhātotpattī* instead of *Dhātūtpatti* and so on. We should not attribute these divergences to Pherū's ignorance of correct Sanskrit, or to the ignorance of the copyists. I am inclined to think that these are examples of a kind of popular Sanskrit that was employed in certain strata in the fourteenth century Delhi.

Be that as it may, Pherū's scientific writings in Apabhraṃśa differ from the earlier or contemporary Sanskrit scientific texts, not merely in language, but in several other important respects. Sanskrit scientific writings, like other Sanskrit writings, are normative in nature, and avoid any spatial or temporal reference.

This will be clear, for example, from the metrology, or the units of measurement, employed in mathematical texts. Whether it is Āryabhaṭa writing at Kusumapura in Bihar towards the end of the fifth century, or Bhāskara I at Valabhī in Gujarat in the first half of the seventh century, or Bhāskara II in Maharashtra in the middle of the twelfth century, they all use what is called the Māgadha-māna, "the [units of] measurement of Magadha". Not so in the case Pherū's writings, which allow us to reconstruct the metrology employed in the Delhi-Haryana region in the first half of the fourteenth century.

Moreover, Sanskrit writers generally state that they had studied all the works of the *purvācāryas* and are giving merely a summary of their past writings. Thus, they lay greater emphasis on their *śāstra-jñāna.* Pherū also mentions the *śāstras* he has read, but lays stress on his practical experience, stating often *niyadiṭṭhiye daṭṭhuṃ,* "having seen with own eyes" or *paccakkhaṃ aṇubhūyaṃ,* "having directly experienced".

0.2.1 Dhātotpatti

The *Dhātotpatti,* or more correctly *Dhātūtpatti* (DU, literally, "origin of minerals"), consisting of 57 *gāthās,* is rather an intriguing text.[22] In the form it has come down to us, it contains three unconnected sections: (1) mythical origin of minerals; (2) extraction and purification of metals like brass (*pittali*), copper (*tambaya*), lead (*sīsaya*), tin (*raṃgaya*), bronze (*kaṃsaya*), mercury (*pāraya*), red lead (*hiṃguliya*) and vermillion (*sindūra*); (3) properties, varieties, provenance and prices of perfumery articles like camphor (*kappūra*), aloe-wood (*agara*), sandal (*caṃdaṇu*), musk (*katthūriya, miyanāhī*), and saffron (*kuṃkuma*). There is no invocation at the beginning, nor a concluding verse at the end, nor there is any date of composition. Perhaps it is part of a larger work that is no longer available.

The middle section of the book with the extraction at metals should be interesting for the history of metal technology, but Pherū's account is extremely brief. For example, this is all he says about the extraction of mercury:

---

22 SGS, III, pp. 39-44 (text only); Agrawala 1951-52; Nahata 1976.

"Place the mercury ore in the kiln, cover it with cow-dung, and fire it with low heat. The mercury will rise up."[23]

The third section on the perfumery articles is somewhat more elaborate. Here are mentioned the places of their occurrence and their prices which must be of contemporary relevance. It is possible that Pherū family was engaged in the trade these expensive articles, along with the gems.[24]

0.2.2 Jyotiṣasāra

The *Jyotiṣasāra* (JS), literally "the Essence of Astrology" was composed in 1315 and consists of 242 *gāthās.*[25] At the beginning of the work, Pherū mentions that he consulted the writings of Haribhadra, Naracandra, Padmaprabha Sūri, Yavana, Varāhamihira, Lalla, Parāśara and Garga. The work deals primarily with the determination of auspicious and inauspicious moments for various undertakings.

0.2.3 Vāstusāra

The *Vāstusāra* (VS), also known as *Vāstusāra-prakaraṇa,* on architecture and iconography was completed in the Saṃvat year 1372, on the auspicious day of Vijayadaśaṃī (*nayaṇa-muṇi-rāma-caṃda varisammi vijayadasamīe*) which corresponds to 9 September 1315.[26] It contains 205 *gāthās* and is divided into three chapters, viz., *Gṛhalakṣaṇa-prakaraṇa* on residential architecture, *Bimbaparīkṣā-prakaraṇa* on iconography of Jina images and *Prāsādavidhi-prakaraṇa* on temple architecture. The first chapter on residential architecture commences with the astrological aspects of the house construction and goes on to prescribe the dimensions of the houses for the king, his army chief, minister, crown prince, king's younger

---

23 DU 16:
pārassa dhāhu ṭhaviyaṃ tassovari gomayadda kuḍhi kujjā |
maṃdaggi dhamiyamāṇo uḍḍivi saṃcaraï tassa mahe ||
Pherū also suggests an alternative method of extracting mercury, which is more magical than metallurgical, cf. Sarma & Sahai 1995.

24 On the perfumery articles in India, cf. McHugh 2012.

25 SGS, III, pp. 1-40.

26 SGS, III, pp. 75-103; Kulkarni 1987.

brother, queens, royal astrologer and royal physician, in this order. These topics are mostly derived from the earlier texts on *Vāstuśāstra* and have of little contemporary relevance. As against this, the two succeeding chapters have much valuable information on Jain religious life of the period.

The second chapter deals very lucidly and in great detail with the iconography and iconometry of several types of Jina images, seated, standing and so on, their thrones or pedestals, their retinue, decorations on the seats and on the back ground.

The third chapter discusses the construction of different types of temples. Here the dimensions and relative proportions of different constituent parts of the temple like the plinth, wall, tower, flag and flag pole are given very clearly. Pherū's description of the vertical and horizontal mouldings are indeed very valuable. The chapter concludes with an interesting account of domestic shrines (*gihadevala, gihadevālaya*).[27]

One might wonder the relevance of this subject to Pherū's professional career. But as a pious and wealthy Jain, Pherū must have been in a position to sponsor the construction of temples, as an informed and knowledgeable patron. From the *Kharataragacchālaṅkāra-yugapradhāna-gurvāvalī* and similar other sources, we learn that Delhi Sulṭāns did not generally interfere with temple construction and temple worship in their territories. V. S. Agrawala believes that Pherū's *Vāstusāra* "must have served as a practical handbook for architects of Jain temples in the early Sultanate period."[28] Therefore, it would be interesting to study the architecture and iconography of Jain temples constructed in Haryana region at this period in the light of Pherū's work.

---

27 VS 3. 43-48; cf. Schröder 2015 for an excellent study of a wooden Jain domestic shrine preserved in the Museum für Asiatische Kunst at Berlin, in which study the Berlin shrine is compared to five similar specimens kept in Museums in India, UK and USA, with illustrations. However, Schröder errs in thinking that Pherū prohibits the use of a shrine inside the private houses (p. 350); what Pherū prohibits is not the use of domestic shrines per se, but the setting up of flagpoles on the top of domestic shrines (VS 50: *gihadevālayasihare dhayadaṃḍaṃ no karijja kaïyāvi*).

28 Agrawala 1966.

0.2.4 Ratnaparīkṣā

On gems Pherū wrote a small work of 132 stanzas with the title *Ratnaparīkṣā* (RP)[29] on the basis of the Sanskrit works by Buddhabhaṭṭa, Bṛhaspati and others, and more importantly on the basis of *his* practical knowledge. He states that he has "seen with his own eyes the vast ocean-like collection of gems in his treasury of ᶜAlā' al-Dīn Khaljī, the [sole] emperor of the Kali Age" (*allāvadīṇa-kalikāla-cakkavaṭṭissa kosamajjhatthaṃ rayaṇāyaru-vva rayaṇuccayaṃ ca niyadiṭṭhiye daṭṭhuṃ*) (RP 4). His family must have been in the gem trade, and Pherū may have been trained by the senior members of the family. Above all, he had the opportunity to see the vast collection of gems in the treasury of ᶜAlā' al-Dīn Khaljī. Pherū must have been an expert gemmologist and a high official in the treasury; otherwise, he would not have had access to ᶜAlā' al-Dīn's gem collection.

The RP, emulating the earlier texts, commences with the mythological and astrological aspects of gems, and then goes to discuss the individual gems, the places of their occurrence, their qualities, defects and prices. Indian tradition classifies the nine varieties of gems into the superior *mahāratnas* (precious stones) and the inferior *uparatnas* (semi-precious stones). The *mahāratnas* are five: diamond, pearl, ruby, sapphire and emerald, in this order. The *uparatnas* are four: coral, topaz, zircon and beryl. Pheru follows this scheme partially. He treats the five *mahāratnas* in the same sequence in great detail; then he mentions cursorily not four but eight inferior gems; namely coral (*vidduma,* Sanskrit *vidruma*), cat's eye (*lhasaṇio,* Sanskrit *laśunaka*), beryl (*vaïḍujja* = *vaidūrya*), rock crystal (*phaliha* = *sphaṭika*), topaz (*puṃsarāya* = *puṣyarāga*), chrysoberyl (*kakkeyaṇa* = *karketana*), *zircon* (*gomeya* = *gomedaka*) and *bhīsama* (= *bhīṣma*) which seems to be a kind of white chalcedony.

Having thus discussed the gems mentioned in the traditional *śāstra* (*satthutta rayaṇā*), Pherū goes on to add something entirely new, namely the gems imported from the Greater Persia (*parasī rayaṇā*). These are spinel (*lāla*) from Badakhshan, cornelian (*akīka*) from Yemen and turquoise (*perujja*) from Nishabur and Mosul (RP 103-106).

---

[29] SGS, III, pp. 1-16 (text only); Nahata & Nahata (text with Hindi translation); Sarma 1984 (text, Sanskrit *chāyā*, Translation into English and Commentary).

Likewise, what is new in the RP is a very detailed tariff of prices of different kinds of gems, which increases exponentially according as the weight increases. It is very likely that this tariff is contemporary, that is, valid for Delhi region in the first quarter of the fourteenth century.

0.2.5 Gaṇitasārakaumudī

The *Gaṇitasārakaumudī* (GSK), also known as *Ganitasāra,* is not dated, but there are reasons to believe that it must have been composed much earlier than 1318 when he wrote the last known work *Dravyaparīkṣā.*[30]

The GSK is divided into five chapters and contains 311 stanzas. Thus, it is the largest of Pherū's seven works. It is not only the first full-fledged mathematical text in Apabhraṃśa, it also extends the range of mathematics beyond the traditional framework of the earlier Sanskrit texts and includes diverse topics from the daily life where numbers play a role.

Pherū states that he derived some material from the past teachers (*puvva ayaria*), some from his own direct experience (*kiṃci aṇubhūya*) and some from his contemporaries (*kiṃci suṇiūṇa,* literally, some having heard", i.e., "having heard from contemporaries"). The past teachers or the previous writers on mathematics who influenced Pherū are mainly Śrīdhara of the eight century who was the author of the *Pāṭīgaṇita* and the *Triśatikā* and Mahāvīra who composed the *Gaṇitasārasaṃgraha* in the ninth century. Of these two, the influence of the former's *Pāṭīgaṇita* and *Triśatikā* is greater.

The first three chapters of the *Gaṇitasārakaumudī* are structured like the earlier mathematical texts in Sanskrit and treat traditional topics like fundamental operations, fractions, series, proportion, plane and solid geometry and so on.

What Pherū had learnt from his own experience and from that of his contemporaries is included as supplementary material in the fourth and fifth chapters. Pherū may have gathered this material from diverse sources of floating or oral literature, or also from contemporary Indo-Persian sources. Because of this reason, there are

---

30 SGS, III, pp. 41-74; SaKHYa 2009.

occasional repetitions, and a certain looseness of structure in the fourth and fifth chapters. Pherū's aim is not to merely compose just one more neutral text on mathematics, but to produce a practical manual which is useful for all numerate professionals like bankers, traders, accountants and masons.

The value of the GSK lies, to a large extent, in this supplementary material, which offers us a glimpse into the life of the Delhi-Haryana-Rajasthan region in the early fourteenth century as no other mathematical work does.

The supplementary material includes mechanical shortcuts in commercial arithmetic, mathematical riddles, rules for converting dates from the Vikrama era to Hijrī era and vice versa, and classification and construction of magic squares. These topics were not touched upon in any mathematical text before.

Let us take Pherū's calendar conversion formulas first. Vikrama calendar follows a luni-solar system while the Hijrī calendar is purely lunar. Since both calendars were employed in the Delhi region and elsewhere in the fourteenth century for administrative and other purposes, there was a need to devise methods to convert the dates from one era to another. Pherū was the first person to formulate rules for this purpose.[31] Three centuries later, in 1643, Śrīmālajit, or Śrīmālajī from Śrīsthala in Gujarat, who was the court astrologer of Shāh Jahān at Argalāpura (Agra) and received from him the title Vedāṅgarāya, devised another set of formulas for converting dates from the Śaka era to the Hijrī era and vice versa.[32] His rules were an improvement upon Pherū's rules, but both were not very accurate.

Towards the end of the nineteenth century Herman Jacobi prepared tables for conversion of Indian dates,[33] and so did Robert Sewell and Shankar Balakrishna Dikshit.[34] Today, there is available a computer program called PANCANGA, created by Professor Michio Yano of Kyoto Sangyo University, with the help of which the

---

31 GSK 4.17; cf. SaKHYa 2009, pp. 77, 166-167; Subbarayappa & KVSarma 1985, pp. 59-60; Sarma 1990.

32 Subbarayappa & KVSarma 1985, pp. 60-61; Sarma 2009.

33 Jacobi 1982.

34 Sewell & Dikshit 1896.

Indian dates in Vikrama and Saka era can easily be converted into Christian dates.[35] Compared to the Indian luni-solar calendar, the Hijri calendar is less complicated, and there are now several computer programs for its conversion.[36] Among all these scholars, our Pherū was the first in India who attempted to tackle the problem; and deserves credit for his pioneering efforts.

Pherū was pioneer in another field as well, namely the magic squares. These are arrangements of different numbers in a square grid of cells so that the sum of the numbers in any column, or row, or hypotenuse yields the same total. In Sanskrit these are called *sarvato-bhadra-yantras*, or *bhradra-yantras* for short. These occur for the first time in Varāhamihira's *Bṛhatsaṃhitā.*[37]

The magic squares appear to play some important role in Jain culture, though I am not aware of any systematic study having been made so far of the exact significance of the magic squares in Jain culture. I may cite some examples: in the Pārśvanātha Temple at Khajurāho, a magic square of order four was engraved on the right jamb, and the engraving is said to have done between 950 and 970 AD. The LD Institute at Ahmedabad has a manuscript of a Sanskrit commentary by Śīlasiṃha Sūri on a Prakrit text called *Koṣṭhakacintāmaṇi,* which contains an extensive treatment of magic squares. Hiralal R. Kapadiya published a short paper, drawing attention to the relation between certain Jain hymns and magic squares.[38] I also came across magic squares in some Jain manuscripts.

On 20 April 1986, I was fortunate to attend a mathematical *avadhāna* by Sadhvishri Sheel Prabhā-jī of Terahpanthi sect from Ladnun. One of the seven tasks she performed was to design a magic square of order five, i.e. a square having 5 times 5 cells, in which the sum would be a number given by any member of the audience. A person in the audience gave the number 695 for which she created a magic square with an amazing speed and with closed eyes. She dictated the numbers which somebody copied into the grid on the blackboard. In the light of all these instances, it is essential

---

35 https://www.cc.kyoto-su.ac.jp/~yanom/pancanga/
[also bit.ly/3mU9PhC, last accessed in January 2021]

36 See also Weight 1936, Appendix F.

37 On the history of magic squares in India, see Hayashi 2014.

38 Kapadiya 1934.

that a study is made of the significance and importance of the magic squares in Jain culture.

Pherū was the first mathematician in India to classify the magic squares into three groups, namely odd (*visama*), even (*sama*) and evenly-odd (*sama-visama*), and to devise methods to construct these three types of magic squares.

The thirteenth and fifteenth centuries saw several innovations in architecture introduced by the Sulṭāns of Delhi. These find an echo in the GSK, in the section of solid geometry, where Pherū lays down rules for calculating the volumes of domes (*gomaṃta,* from Persian *gumbad*), square and circular towers with spiral stairways in the middle (*pāyaseva*), minarets with fluted columns (*munāraya,* from Persian *mīnār*), arches (*tāka,* from Persian *tāq*), bridges erected on supporting arches (*pulabaṃdha*, from Persian *pul* and Sanskrit *bandha*) and so on. The mathematical relevance of these rules lies in the fact that the chief mason or the merchant supplying the building material will be able to calculate the number of bricks or stones needed for these constructions. These references to the arch and dome are also historically significant, because the true arch and the true dome were employed successfully for the first time in India in the Alai Darwaza, the gateway erected in 1311 by ᶜAlā' al-Dīn Khaljī as part of his extension plans to the Quwwat-ul-Islam mosque, which contains the famous Qutub Minar.

Likewise, in a section called *vastrādhikāra,* Pherū mentions different kinds of silk, woolen and cotton materials, the rate of shrinkage or loss in washing, sewing and cutting, and the area of cloth required to make various kinds of tents.

Finally there is an interesting section listing the average yield per *bīghā* of several kinds of grains and pulses per *bīghā*, the proportions of different products derived from sugar cane juice, and the amount of ghee that can be obtained from milk. This valuable data has naturally attracted the attention of economic historians.[39] Pherū informs us that in the spring harvest, wheat yield is 45 *maṇ* per *bighā*, *masūr dāl* 32 *maṇ*, *chanā dāl* also 32 *maṇ*, mustard, cumin seed and coriander seed also 10 *maṇ* each, and so on. The yield in the autumn harvest is sesamum and cotton 16 *maṇ* each; flax and sugar cane 10 *maṇ* each and so on.

---

39 Habib 1982.

Thus, the GSK throws valuable light on the development and popularization of mathematics in northern India in the early fourteenth century and also on the economic conditions of that period.

1.0 The Dravyaparīkṣā

Chronologically the last and in content the most unique is the *Dravyaparīkṣā* (DP)[40] which Pherū composed in 1318 in the reign of Quṭb al-Dīn Mubārak, on the basis of his direct experience while he was employed in the Delhi mint (*siri ḍhilliya taṃkasāla kajjaṭhie aṇubhūya karivi…*).[41] It consists of 149 *gāthās.* As in other works, here also the title of the work is in Sanskrit; within the text there are many section headings, colophons and sub-colophons which are in a kind of mixed Sanskrit; e.g., *iti svarṇa vivahāraṃ, vivaraṃ jantreṇāha, iti draṃmamudrāḥ* etc. There occur also some technical terms taken from the Persian, like *cāsanī,* which will be discussed below.

But it is the main language of the text, viz. Apabhraṃśa, that causes serious problems in understanding. When I came across Pherū's works for the first time many years ago, I was impressed that he wrote on so many scientific topics in the popular Apabhraṃśa, and in my youthful enthusiasm wrote a paper with the title "Popularisation of Science in the fourteenth century".[42] But when one begins to study the texts closely, the Apabhraṃśa verses with the elision of many consonants and with the frequent elongation of vowels for metrical purposes[43] prove to be an inadequate medium for scientific communication. When the subject is somewhat known, one can with some effort restore the consonants and draw some sense out of the text. Even then with undifferentiated case endings it is often difficult to know which is the multiplier and which is the multiplicand. But when the subject is new, it is often difficult to derive any

---

40 SGS, III, pp. 17-38 (text only); Nahata 1976 (text with Hindi translation).

41 In the concluding verse of the DP, Pherū mentions that he has expounded the subject briefly for the sake of his son and brother in the year 1375 of the Vikrama era; cf. DP 149:
evvaṃ davvaparikkhaṃ disimittaṃ caṃdataṇaya phereṇa |
bhaṇiya suyabaṃdhavatthe teraha paṇahattare varise ||

42 Sarma 1986; reprinted as Sarma 1987 and Sarma 1991.

43 Pherū even modifies his own name for metrical reasons as "*phira*" in 4ab: *taṃ bhaṇaï kalasanaṃdaṇa caṃdasuo phira [a]ṇubhāya taṇayatthe* and as "*phera*" in 149ab: *evvaṃ davvaparikkhaṃ disimittaṃ caṃdataṇaya phereṇa.*

sense out of the brief verses. When my Japanese friends and I were working on the GSK, the mathematics was not difficult to understand, but when the subject was the calculation of the area of cloth required to cover various types of tents, our collective linguistic and mathematical expertise failed to cope with. We looked at the pictures of tents in the Mughal miniatures of the seventeenth century; we talked to contemporary tent makers of the twentieth century, but all in vain. Pherū's discussion of tents is certainly valuable for the cultural history of the fourteenth century, but the correct apprehension remains still elusive.[44] The DP also throws up similar problems, as will be shown below.

As stated earlier, Pherū was the assay master at the mint of Quṭb al-Dīn Mubārak Shāh, and he composed the DP for his younger brother and son on the basis of his direct experience at the Delhi mint. The term *dravya-parīkṣā* means the examination of the metal content (*dravya*) in the coins. As there was no official rate of exchange at that time for different currencies, the official or private money exchangers priced a coin on the basis of its metal content, e.g. by ascertaining the amount of pure gold or pure silver in a particular coin. Such a determination of the metal content in artifacts is called assay.

Since the coins issued by several kingdoms in different periods of time continued to be in circulation, it was necessary to determine their intrinsic value by assay and to fix their exchange rate in terms of the local currency. Pherū calls this money exchange *nāṇavaṭṭa* (Sanskrit: *nāṇaka-vartana*). From this is derived the term *nāṇavaṭī* in the sense of money exchangers. The word survives still as a surname in Gujarat. How important this profession was can be seen by the number of related surnames like Parekh/Parikh (from Sanskrit *parīkṣaka*) or Potdar/Poddar[45] (from the Persian *fotah-dār*).[46]

The DP can be divided into two parts. The first part, consisting of 50 verses, deals with the techniques of assaying and thus provides the necessary technical background for currency exchange, while the second part, in 99 verses, offers valuable data on about 260 coin types, which include not only the coins issued by the Khaljī Sulṭāns, but also

---

44 SaKHYa 2009, pp. 28-29, 36, 77-78, 86, 189.

45 Wilson 1855, s.v.

46 Assayers and money-exchangers were also designated by the Persian term *ṣarrāf* which was anglicized as "shroff". On the importance of this profession, cf. Mehta 1991, pp. 66-67 et passim.

by various kingdoms in northern India in the twelfth, thirteenth and early fourteenth centuries.

In the first part, the chemical and metallurgical processes are described very briefly, in the same manner as is done in the DU, an example of which is cited above. This first part abounds also in many contemporary terms for technical processes. When these terms are not attested anywhere, it is difficult the understand the short processes from Pherū's brief descriptions, like the *Sallāhikā-vidhi* described in verses 15-16. Fortunately, in his *Ā'īn-i Akbarī,* Abū al-Faḍl gives a more detailed account of the Mughal mint in the reign of Akbar, which account helps us in understanding Pherū's obscure verses to a certain extent.

Figure 3: Mughal Mint, British Museum (1974 6-17 09 27a) (photo by S. R. Sarma)

Blochmann's English translation of the *Ā'īn-i Akbarī* contains several line drawings depicting the Mughal mint. I understand, however, that these drawings were not based upon any contemporary Mughal miniature painting, but were commissioned by Syed Ahmad Khan for his edition of the *Ā'īn-i Akbarī* and that these were reproduced in Blochmann's translation. But luckily, there are some contemporary Mughal miniatures depicting the Mughal mint. One is in the British Museum (Figure 3). I have seen another painting of the Mughal mint in the Schönbrunn Palace in Vienna. Here, in a large hall of audience called the Millionenzimmer, the walls are adorned with some two hundred and odd Mughal miniature paintings, one of which depicts the Mughal mint. [47]

The uniqueness of the *Dravyaparīkṣā* cannot be overemphasized; there has not been such a text before or afterwards in India. John S. Deyell evaluates the DP in these words:

> "It (sc. the DP) concerns the contemporary coinage issued under his direction, discussing denominations, metrology and metal content. In addition, Pheru undertook a thorough survey of the various Indian and foreign coins which were tendered at the mint for melting and reminting. The author, being well informed, was able to supplement the usual banker's nicknames for different coins with his observations on the political and geographic origin of the coins encountered. In this the *Dravya Parīkshā* provides the key to many obscure early medieval coinage series."[48]

1.1.1 Assay by Touchstone

The assay or measuring the degree of fineness of precious metals was mainly of two types: either with the touchstone (*nikaṣa* or *kaṣa*) or by fire. Gold or any other metal, when rubbed against the rough surface of the touchstone, leaves on it a streak of very fine powder which shows a more consistent colouration than the same mineral in a massive form. Thus, the colour of the streak is a more accurate index of the quality of

---

47 On the arrangement of the paintings and the subjects of some of the paintings, see Koch 2004. She, however, does not mention the painting of the mint.

48 Deyell 1999, p. 253.

the mineral than its surface colour. There are reports of skilled jewellers being able to estimate the fineness of gold just by the feel of the piece between the fingers[49] or just by one look at the streak on the touchstone. However, the general practice is to prepare a series of gold pieces with descending degrees of fineness for the sake of comparison. The gold to be tested is rubbed on the touchstone and the streak thus produced is compared with the streaks of reference gold pieces.

On the touchstone, Theophrastus (c. 371- c. 287 BC) is said to have stated the following:

> "The nature of the stone which tries gold is also very wonderful, as it seems to have the same power with fire. … The trial by fire is by the colour and by the quantity lost by it; but that by the stone is made only by rubbing the metal on it: the stone seeming to have the power to receive separately the distinct particles of different metals."[50]

In India, this method of testing the purity of gold was mentioned first in the *Arthaśāstra* of Kauṭilya which was composed and redacted between the second century BC and the third century AD. Here gold is measured in a scale of 1 to 16.[51] Today we measure the fineness or purity of gold on scale of 1 to 24. In India, it was measured traditionally on a scale of 1 to 16. The degree of fineness, or touch, is denoted by the Sanskrit term *varṇa.* Thus, purest gold is of sixteen *varṇas*, and is accordingly designated *ṣoḍaśa-varṇaka-svarṇa.* For easy handling, the reference gold pieces were cast in an elongated shape like pencils (*śalākā*). Such test sticks are called *varṇa-śalākās, suvarṇa-śalākās, parīkṣā-śalākās* or just *śalākās.* The series of gold pieces with regularly descending degree of fineness is known as *varṇamālikā.*[52]

The preparation of the reference or test sticks involves the calculation of the proportions of gold and base metals in each stick. Starting from Śrīdhara's *Pāṭīgaṇita* of the ninth century, Sanskrit mathematical texts contain a small section called the "Mathematics of Gold" (*suvarṇa-gaṇita*) where they teach how to calculate the

---

49 Thomas 1981, pp. 181-182.

50 As cited by Hoover & Hoover in: Agricola, p. 252, n. 37.

51 *Arthaśāstra* 2.13.15-16.

52 Cf. Sarma 1983.

proportions of gold and base metal in an alloy of a certain degree of fineness or how to exchange certain amount of gold of fineness *x* against gold of fineness *y,* and similar problems.[53] These texts show the prevalence of gold assay by the touchstone. They also show that the fineness of gold was measured in a scale of 1 to 16 at least up to the twelfth century.

But in Pherū's time, the purity of gold was not measured any more on the scale 1 to 16, but on a new scale of 1 to 12. This new scale is akin to the modern scale of 1 to 24 carats, but it has not been possible to find out why this change occurred. In Pherū's Apabhraṃśa, the term *varṇa* became *vannī,* and the purest gold was described as *vārahi vannī,* "that which has twelve *varṇas*";[54] and the Sanskrit term *varṇamālika* for the series became *vanamālikā.*[55]

Pherū envisages a series of 48 test sticks, each less by a quarter *vannī* than the previous stick. For producing these, a mixture of 23 parts silver and 77 parts copper, which is called *rīsa,* is added to pure gold in different proportions.[56] Thus

47 parts pure gold + 1 part mixture produces gold of 11 ¾ *vannī,*

46 parts pure gold + 2 parts mixture produces gold of 11 ½ *vannī* and so on.

It is not known how silver was graded before Pherū's time, but Pherū grades it on a scale of 1 to 20, purest silver being called 20-*visuvā* silver. For producing the reference sticks to test the purity of silver, the pure silver is degraded by the addition of a mixture (*rīsa*) consisting of 4 parts pure copper and 16 parts pure brass.[57] Pherū does not say how many test sticks are prepared for testing the fineness of silver, but it is reasonable to presume that at least one stick is made for each *visuvā.* Thus, a series of 20 sticks may have been prepared for measuring the fineness of silver on the scale of 1-20.

Pherū's gold scale of 1 to 12 was continued at the Mughal mint during the reign of Akbar in the second half of the sixteenth century, as narrated by Abū al-Faḍl in his

---

53 The DP also has a small section (*vv.* 38-41) dealing with the "mathematics of gold" (*svarṇa-vivahāra*). In the GSK, the mathematical problems occur at 1.69; 3-15-25; cf. SaKHYa 2009, pp. 14, 20-21 (text), 53, 63-65 (translation) and 117, 137-140 (commentary). Here the scale is from 1 to 12.

54 DP 38.

55 Thus *ruppa-vanamālikā* after DP 32; *kanaka-vanamālikā* after DP 37.

56 DP 36-37.

57 DP 31-32.

Ā'īn-i Akbarī. Here the sixth *Ā'īn* has the title *Banwārī*; this term is the phonetic modification of Sanskrit *Varṇamālikā* through Pherū's *vanamālikā.* On the measurement of the purity of gold, the *Ā'īn-i Akbarī* narrates as follows:[58]

> "The highest degree of purity is called in Persia *dahdahī,* but they do not know above ten degrees of fineness; whilst in India it is called *bārahbānī,* as they have twelve degrees. …
>
> "Although in this country clever ṣayrāfīs are able from experience to tell the degree of fineness by the colour and brightness of the metal, the following admirable rule has been introduced for the satisfaction of others.
>
> "To the ends of a few long needles, made of brass or such like metal, small pieces of gold are affixed, having their degree of fineness written on them. When the workmen wish to assay a new piece of gold, they first draw with it a few lines on the touchstone, and some other lines with the needles. By comparing both sets of lines, they discover the degree of fineness of gold. It is, however, that the lines be drawn in the same manner, and with the same force, so as to avoid deception."

Interestingly, there are two foreign accounts of the use of the test sticks, together with illustrations, belonging roughly to the same period, by the German Georgius Agricola (1494-1555) and by the French jeweller Jean-Baptiste Tavernier (1605-1689). Agricola's path-breaking book on minerals in Latin was published in 1556, in the same year as Akbar ascended the throne. Tavernier was born in 1605, in the same year when Akbar died; he visited India for the first time during 1638-1643. The accounts of these two Europeans of how the test sticks were made and used are not of immediate interest to us, what is of interest are the drawings of the series of test sticks provided by them, because it is quite likely that also at Pherū's time in the first quarter of the fourteenth century and at the Mughal mint in the second half of the sixteenth century, the series of test sticks were numbered and strung together in a similar manner in a chain. First, we may look at Agricola's account of the use of the touchstone:[59]

---

58 *Āīn-i Akbarī*, pp. 18-19.

59 Agricola, Book VII, pp, 252-253.

> "It remains to speak of the touchstone with which gold and silver are tested, and which was also used by the Ancients. For although the assay made by fire is more certain, still, since we often have no furnace, nor muffle, nor crucibles, or some delay must be occasioned in using them, we can always rub gold or silver on the touchstone, which we can have in readiness. Further, when gold coins are assayed in fire, of what use are they afterward?
>
> "A touchstone must be selected which is thoroughly black and free of sulphur, for the blacker it is and more devoid of sulphur, the better it generally is; I have written elsewhere of its nature. First the gold is rubbed on the touchstone, whether it contains silver or whether it is obtained from mines or whether from smelting; silver is also rubbed in the same way. Then one of the needles, that we judge by its colour to be of similar composition is rubbed on the touchstone; if this proves too pale, another needle which has a stronger colour is rubbed on the touchstone; and if this proves too deep in colour a third which has a little paler colour is used. For this will show us how great a proportion of silver or copper, or silver and copper together, is in the gold, or else how great a proportion of copper is in silver.
>
> "These needles are of four kinds. The first kind are made of gold and silver, the second of gold and copper, the third of gold, silver and copper, and the fourth of silver and copper. The first three kinds of needles are used principally for testing gold, and the fourth for silver. Needles of this kind are prepared in the following ways."

Jean-Baptiste Tavernier (1605-1689), the French jeweller, made six voyages to Turkey, Persia, India, and Java and published detailed account of his journeys in French in 1670. The book was translated soon into English in 1678 by a certain J. Phillips. During his second journey which lasted from 1638 to 1643, Tavernier visited India, in particular Agra and Golconda, and reported about the trade in precious stones and gold and silver. In this connection, he narrates that the money changers in India use thirteen assay needles for testing the degree of fineness of silver, and provided a drawing of these thirteen test sticks.[60]

---

60 Tavernier, "First book of Indian Travels", p. 25.

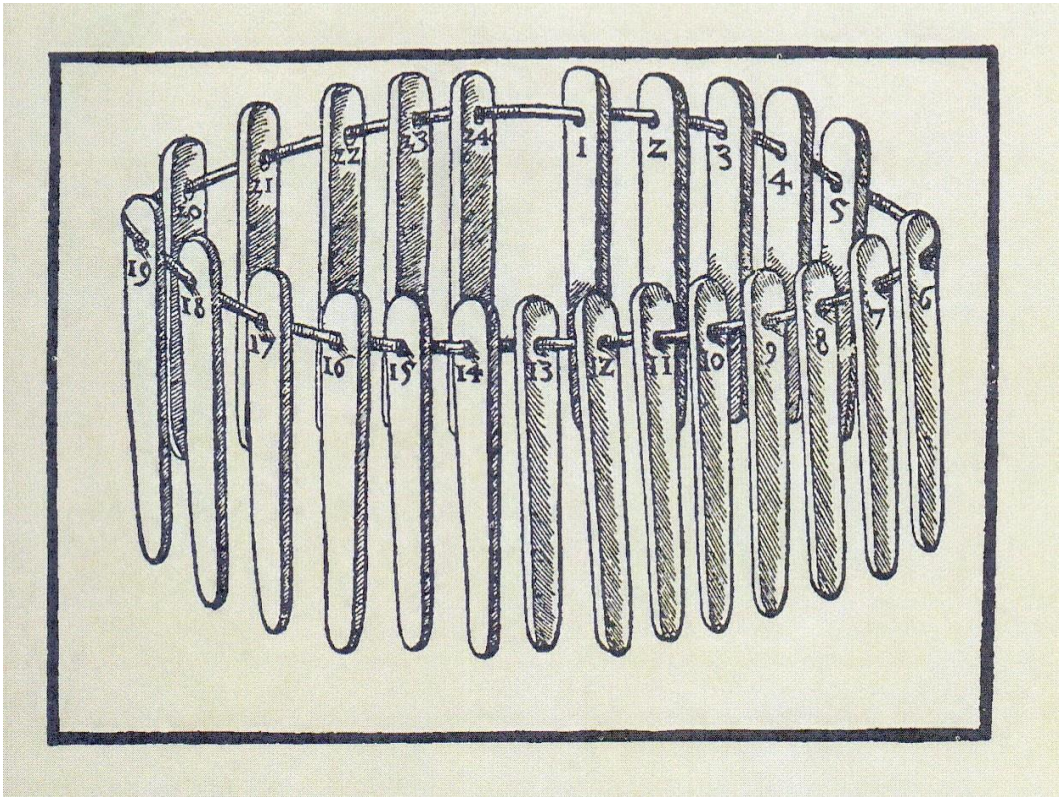


Figure 4: Assay Needles from Agricola (Book VII, p. 255)

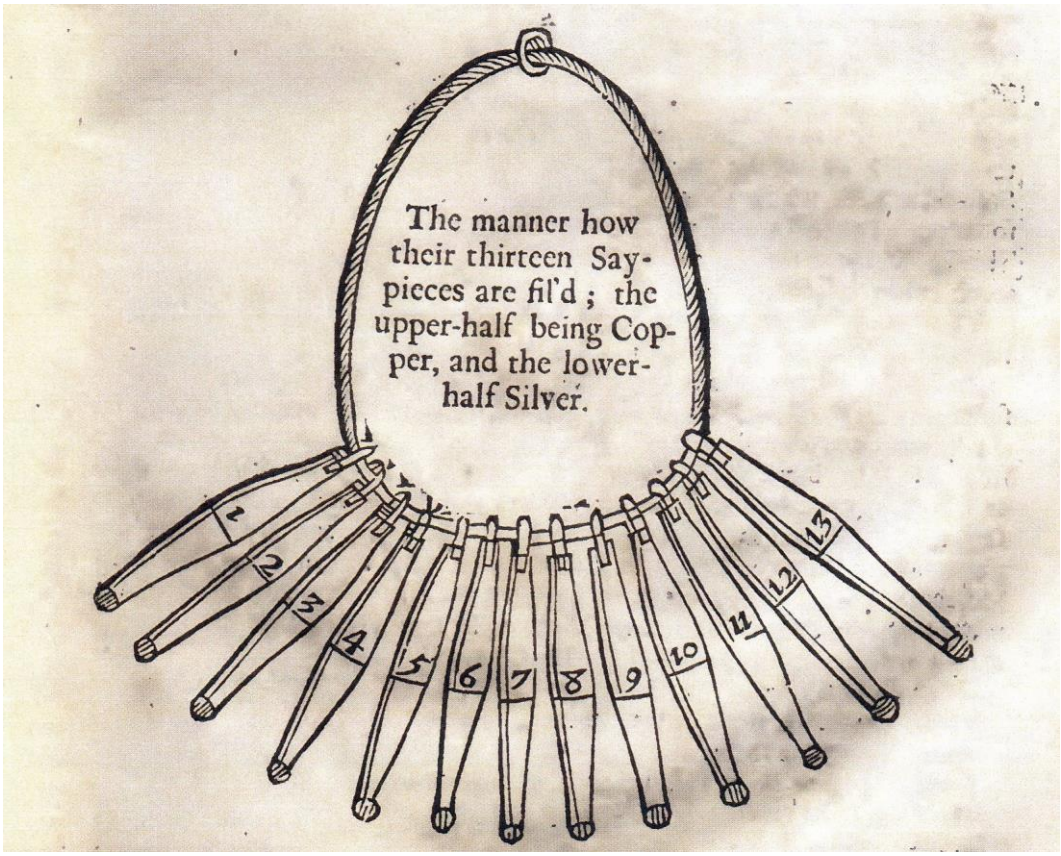


Figure 5: Assay Needles from Tavernier (here “Say pieces” means “Assay pieces”)

1.1.2 Assay by Fire (*cāsaṇiya*)

The second method of assaying the purity of gold or silver is by melting it by fire. This is also known as the loss of weight method. One takes a sample of the gold or silver, weighs it, melts it at a high temperature to remove the impurities, and then weighs again. Pherū calls this process of assay by melting *cāsaṇiya* or *cāsanikā.* The word is from the Persian *chāshnī*. One who performs this task is called *chāshnīgīr.*[61]

The process is based on the principle that precious metals do not oxidize or react chemically and that they remain separate while the others form slags or other compounds. The metal to be melted is placed in a small cone-like vessel, which is surrounded by charcoal and heated. The vessel is called "cupel" (Sanskrit *mūṣā*) and the whole process is also known as cupellation.[62] According to Pherū, the cupel is made by moistening bone ashes and moulding the moist substance into the desired shape. This is done so that the impurities in the metal to be melted are absorbed by the ashes.[63] Pherū's prescriptions for this are as follows:

> "Take one part each of dry *Palāśa* (*Butea frondosa*) wood, wild cow's dung and goat's bones and burn them together. Strain the ashes. With one and a quarter *sers* (= 275.075 g) [of these ashes] form a cup (*gaha*) [in which place the metal to be melted]. Blowing gently with a blowpipe (*vaṃkanālī*), melt it with one and a quarter *maṇ* (= 11kg 3 g) of charcoals of the *Dhava* tree (*Grislea tomentosa* or *Anogeissus latifolia*)."[64]

This basic procedure of assay is followed in the DP by more elaborate processes of the purification of gold and silver and of extracting silver from lead. These are similar to the basic assay but performed on a larger scale. The metal to be refined is melted with an excess of lead, which becomes oxidized and forms litharge and dissolves any base

---

61 Steingass, s.v., explains *chāshnī* as "taste, taste by way of a sample, proof, trial, … assay" and *chāshnīgīr* as "a taster to a prince, a cup bearer, a carver." In India, however, both the words were associated with the assay of gold and silver in the mint, and they were used in this sense in the *Ā'īn-i Akbarī* (p. 23).

62 In Sanskrit there is an extensive literature on the process of cupellation, which has been competently studied by Deshpande 1996.

63 According to Agricola, pp. 228-229, the best material is the ashes obtained from the burnt horns of a deer.

64 DP 5-6.

metals present, thus separating them from the silver or gold. The litharge soaks into the lining but the precious metal is left on the surface. The more one repeats the process, the purer the metal becomes.[65] Thus in order to achieve 100% pure gold, one has to melt the gold several times.[66]

The coins of various types which were in circulation were brought to the royal mint where they were melted and cast as pure gold or silver ingots. These ingots were either preserved as such in the treasury or used for minting new coinage. Therefore, the knowledge of these processes is essential for officers of the treasury. Pherū's account is the earliest to be found in India. Three hundred years later, Abū al-Faḍl gives a more detailed account in his *Ā'īn-i Akbarī* in connection with the description of the imperial mint.[67]

1.2 Catalogue of Coins

The second part of the DP (*vv.* 51-149) constitutes a kind of catalogue of coins. Here Pherū provides the name (*nāma*), provenance (*ṭhāma*), weight (*tullu*), metal content (*davvo*), and the exchange value in terms of the Khaljī currency (*mullu*), of some 260 types of coins issued by various kingdoms of northern and western India in the twelfth, thirteenth and early fourteenth centuries.

1.2.1 Monetary and Weight Units

Before discussing the coins described by Pherū, it is necessary to briefly explain the monitory and weight units prevalent at Delhi at the time the DP was composed. The standard coin of this period is the silver *Ṭaṃkā* with a weight of one *tolā*. This silver

---

65 Wulff 1966, p. 13: "The cupellation process that separates the precious from the base metals with the aid of lead added to the melt and subsequent oxidization of both lead and base metals must have been known for a long time, since most gold and silver objects of antiquity show a high degree of purity."

66 Abū al-Faḍl boasts that at Akbar's mint the process of refining gold was so advanced that ᶜAlā' al-Dīn's *Dīnār* type of coin which was supposed to be purest gold at 12 *vannī,* turned out to be just 10 ½ *vannī* when tested by the advanced methods at Akbar's mint; cf. *Ā'īn-i Akbarī,* p. 12.

67 *Ā'īn-i Akbarī,* pp. 18-38. The most detailed description of the processes of assay and purification of not just gold and silver, but a range of other minerals is given by Agricola (Books VII-XI); he treats the subject not as treasury official, but as a mining engineer, with elaborate woodcut illustrations.

Ṭaṃkā was equal in value to 60 *dammas* (Skt. *dramma*). The *damma,* popularly known as *gānī,*[68] was a coin made of billon, i.e. an alloy of silver and copper, and weighed 1 *māṣā* (1/12 *tolā*). There were eight different denominations of *damma* or *gānī* coins, viz. of 1, 2, 4, 6, 8, 12, 24 and 48 *gānīs,* which were designated respectively *iggānī, dugānī, caügānī, chagānī, aṭhagānī, bārahagānī, caübīsagānī, aḍtālīsagānī.* In *v.* 136, Pherū states that "in the treasury and in public transactions everywhere, the basis of accounting was *iggānī* or 1 *gānī.*"[69] The lowest denomination is *visuvā* (Skt. *viṃśopaka*) which has the value of one-twentieth of a *damma.* It is a copper coin, weighing 1 *māṣā* (0.917 g).

Besides these, there is one more monetary unit, which is mentioned a few times in the DP. It is *Jaithala* (written also as *jital*). 48 of these are equal to the Khalji *Ṭaṃka.*

The DP (*vv.* 137, 141, 143) informs us that the standard silver and gold *Ṭaṃkas* issued by ᶜAlā' al-Dīn and Quṭb al-Dīn Mubārak weighed one *tola* each. On the basis of extant coins, numismatists have estimated that the Khaljī *tola* was approximately equal 11.003 grams.[70] Accordingly, the scheme of weights in the DP and their equivalents in the metric system (corrected to three decimal places) are as follows:

1 *visuva*		(= 0.003 g)
20 *visuvas*	= 1 *java*	(= 0.057 g)
16 *javas*	= 1 *māṣa*	(= 0.917 g)
4 *māṣas*	= 1 *ṭaṃka*	(= 3.668 g)
3 *ṭaṃkas*	= 1 *tolā*	(= 11.003 g)
20 *tolas*	= 1 *ser*	(= 220.06 g)
40 *sers*	= 1 *maṇ*	(= 8802.4 g = 8 kg 802 g)

---

68 The origin of this term *gāni* or *kāni* is not known. But before the metric system was introduced in the independent India, the colonial British coinage had 1 Rupee = 16 *Anna.* A quarter *Anna* was called *Kāṇi* in Telugu. The coin itself bore the English name Quarter Anna or Pice.

69 Cf. Wright 1974, pp. 105-107; cf. Gupta 1969, p. 88: "All the billon coins were known by the name of *kani* or *gani* and carried a number of denominations — *eggani* (one), *dugani* (two), *chaugani* (four), *chchagani* (six), *atthgani* (eight), *barahagani* (twelve), *chaubisagani* (twenty-four), *adtalisagani* (fort-eight). Above them was the silver *tankas* which was valued at 60 *ganis.* … The *gani* coins, irrespective of their weight up to eight *ganis*, were of the uniform weight of 56.7 grains, the difference of value depending on the proportion in which two metals — silver and copper — mixed in them. According to information supplied by Thakkura Pheru, an *eggani* (one *kani*) coin contained 95 per cent of copper and 5 per cent of silver; *dugani* contained 7.5 per cent silver; a *chagani* had 16.4 per cent of the white metal."

70 Deyell 1999, p. 261; Gupta 1957, p. 40.

There is one more unit of weight which occurs a few times in the DP (*vv.* 70, 72). It is the *guṃjā* or *rattī,* based on the red and black seed of the creeper *Arbus precatorius.* Sixty of these *guṃjas* are equal to one *tolā*; its equivalence in grams would be roughly 0.184.

Here the weight unit *ṭaṃka* (approximately 3.668 g) needs to be distinguished from the monetary unit *Ṭaṃka,* which weighs 1 *tola* or 11.003 g. Likewise, *visuva* is employed as a unit of weight as well as the degree of fineness of silver; and *java* occurs as a unit of weight and also as one-sixteenth part of *vannī* (Skt. *varṇa*) in denoting the fineness of gold.[71]

As mentioned above, this coin catalogue of the DP seeks to provide the name, provenance, weight of the coin as well as the weights of the different metals contained in that coin, and the exchange value of that coin.

The coins described are of five types: gold, silver, gold-silver-copper alloy (*tri-dhātu-miśrita-mudrā*), silver-copper alloy or billon (*dvi-dhātu-mudrā*) and copper. The metal content of each coin type is expressed as follows. In the case of gold and silver coins, the degree of fineness is given in the scale of 1 to 12 for gold and of 1 to 20 for silver. For coins made of alloy, the weight of each metal per 100 specimens is listed. For example, the parameters of a coin named *Paüma* (Sanskrit: *Padmā*) minted at Varanasi, presumably under the reign of the Gahaḍavāla kings, are given as follows:[72]

> "The coin from Varanasi called *Paüma* is [made] of three metals. One hundred coins weigh thirty-seven *tolas,* and contain forty-one *ṭaṃkas* of gold with a purity of eleven *vannī* and eleven *java*; thirty-six *ṭaṃkas* of pure silver and thirty-four *ṭaṃkas* of copper.
>
> "In each *Paüma,* there are silver, gold and copper one *māṣa* each plus seven, ten and five *javas* and zero, four and fifteen *visuvas* respectively.
>
> "The weight of a single *Paüma* is one *ṭaṃka,* seven *javas,* sixteen *visuvaṃsas.* Know that its price is fifty-nine or sixty *jaithalas.*"

---

71 DP 34: *solahi javehi vannī.*

72 DP 62-65. For the extant specimens with the image of *Paümā* (Skt. Padmā, i.e., Lakṣmī), see Deyell 2017, pp. 115, 19.

That is to say, each coin weighs 1 *ṭaṃka,* 7 *javas* and 16 *visuvas* and consists of 1 *māṣā,* 10 *javas* and 4 *visuvas* of gold; 1 *māṣā,* 7 *javas* of silver; and 1 *māṣā,* 5 *javas* and 15 *visuavas* of copper. The touch of the gold is 11 *vannī* 11 *java,* where *java* is one-sixteenth part of *vannī;* this translates to 23 3/8 carats.

1.2.2 Tables and Notation

Much of the data given for each coin, such as the weight and price, is numerical. Needless to say that in the metrical text these numbers are represented by words. For example, this is the data given for a gold coin named *Paümā*: *tulleṇa ṭaṃku ikko satta javā sola visuvaṃsā* (*v.* 58)*,* which translates to "the weight is 1 *ṭaṃka,* 7 *javas* and 16 *visuvas.*" For the sake of metre, the proper names of the coins are modified and sometimes the numerical terms themselves are given in diverse variations. The Sanskrit word *eka* (one), for instance, undergoes many variations here like *iga, igo, ikki, ikku, ikko, egi* and so on.

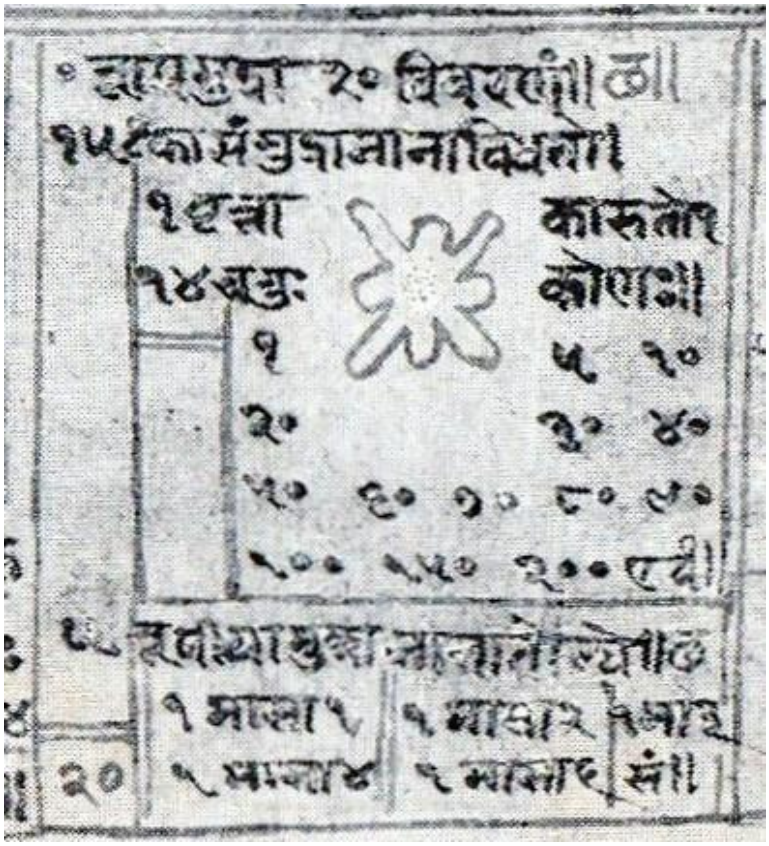


Figure 6: a table from the manuscript of the *Dravyaparīkṣā*

Pherū adds after each block of verses a table where the same numerical material is presented in digits.[73] These tables are preceded occasionally (e.g. after DP 77) by the prose line: *vivaraṃ jantreṇāha,* "the details are told by means of a table." This facilitates our understanding of the numeral data more easily. There are 29 such tables. Fortunately, some of these tables can be seen in the two available photographs of the last two pages of the manuscript of DP (Figures 1 and 2).

A specimen of such a table can be seen in Figure 6 above. This table is printed in the SGS almost in the same manner. The editors of the SGS, added serial numbers to these tables from 1 to 29.[74] In the translation which follows, I shall include first the table as it is given in the SGS (changing, however, the Devanagari fonts into the Roman script) and then the same table once again, but in English translation and with the weights in the current metric system; here the coin types will be numbered serially in the first column and the number of the corresponding verse will be shown in the second column. In the first instance, the table will carry the heading, e.g. "Table 1a" and in the second the heading "Table 1b".

While these tables help in the understanding of the numerical data to a large extent, sometimes the tables themselves throw up some problems. In the text, sometimes the weights are mentioned in *ṭaṃkas,* while the table shows the same weight in *tolās, māṣas* and *javas.* On a few occasions, the reverse is also the case.

The second problem is the notation adopted in the tables for fractions. The vertical or straight line | stands for ¼, two lines ‖ for ½ and three lines ||| for ¾. The vigesimal scale of fineness of silver in *visuvas* is indicated by ***S***, the *avagraha* sign in Devanāgarī script.[75] For example, verse 78 states that in a coin named *Abadullī* the silver content is 2 *javas* and 4 *visuvas*. Table 14 shows this as *java 2* ***S*** *4.*

In Table 7, the symbol ***S*** denotes 1 silver *Ṭaṃka* of Khaljī currency. Thus ***S*** *2*||| ***S*** *2*‖ ***S*** *2*| and so on stand for 2¾, 2½, 2¼ silver Tankas.

---

73 Similar tables can be seen in RP, JS and VS also. In these texts, the tables are variously called *yantra, koṣṭhaka,* or *cakra.*

74 In Nahata 1976, these numbers vary slightly.

75 The bold italic form ***S*** is used for this symbol so that it is not confused for an ordinary S.

However, in some other tables (1, 2, 5, 27, 29) this symbol is employed to denote certain fractions, the logic of which use I am unable to comprehend. I shall explain the problems under each table concerned.

1.2.3 Nomenclature of Coins

An interesting feature of the catalogue is the plethora of names of the coins. Today a coin is generally known by its denomination, but in Pherū's time, the nomenclature was formed in several ways, often after the names of ruling monarchs. In the DP, the coinage is generally classified according to kingdoms, and under each kingdom, the coins issued by different kings are arranged in a chronological order. Thus for Gujarat, Pherū lists the billon coins which were issued by the kings of the like name in the following order.

1. *Kumara / Kumarapurī* (issued by Kumārapāla Caulukya, r. 1144-1173)
2. *Ajayapurī* (Ajayapāla Caulukya, r. 1173-1175)
3. *Bhīmapurī* (Bhīma II Caulukya, r. 1178-1241)
4. *Lūṇavasā / Lavaṇasapurī* (Lāvaṇyaprasāda Vāghela, r. 1242-1243)
5. *Vīsalapuri* (Vīsaladeva Vāghela, r. 1244-1262)
6. *Ajjanapurī / Arjunapurī* (Arjunadeva Vāghela, r. 1264-1273).

Because of the metrical constraints, Pherū sometimes gives only an abbreviated form of a name in the verse, but the full form in the table. Thus what he calls *kumara* is only a short form of the coin named *kumarapurī,* which was issued by the king Kumārapāla Cālukya who ruled from Anhilvad Patan from 1144 to 1173. But what does suffix ˚*purī* mean? From the Sanskrit texts and inscriptions we learn that such coins were known as *Kumāra-priya, Bhīma-priya* and so on[76] which became *Kumarapurī, Bhīmapurī* etc. in Apabhraṃśa. Such method of naming the coins seems to have prevailed in Gujrarat and Malwa.

In Punjab and Delhi, however, there prevailed another system before the advent of the Muslim rule. Among the coins from Jalandhar are mentioned *Jaïtacaṃdāhe, Rūpacaṃdāhe* and *Tiloyacaṃdāhe* (DP 109-110). These were presumably issued by

---

[76] Strauch 2002, pp. 313-314 where several other occurrences are cited.

kings named Jaitracandra, Rūpacandra and Trailokyacandra. Likewise, the coinage issued by the Tomar Rajput king Anaṅgapāla was known as *Aṇagapalāhe*, by Madanapāla as *Mayaṇapalāhe*, by Pṛthvīpāla as *Piṭhaüpalāhe* and so on (DP 111 and the table that follows). I do not know the significance of the prefix *-he* added to these names.

Similarly coins issued by Muslim rulers are also designated after their names. Thus *Kuvāicī* or *Kuvācīya* (DP 116) are the coins issued by Nāṣir al-Dīn Qubācha of Sind (r. 1203-1228) who was appointed Governor of Ūcch by Muḥammad bin Sām in 1203 and who assumed independence after the latter's death in 1206. *Samasī* (DP 118) and *Tittimīsī* (DP 120) are the coins of Shams al-Dīn Īltutmish (r. 1210-1235). Some of his coins bear also the Nāgarī legend *samasadīna* or *samasadi.*

Besides these designations based on the names of rulers, there are some which are purely descriptive. Pherū mentions gold coins bearing the figures of Sītā and Rāma (DP 56). He calls these *Sīyārāma* and adds that they are of two types, *saṃyogī* (Sītā and Rāma together?) and *viyogī* (Sītā and Rāma separately?). It is not known who issued these coins before the time of Pherū. According to Parameshwari Lal Gupta, Akbar also issued a coin with the figures of Rāma and Sītā and with the Nāgarī legend *siyarāma.*[77] Pherū designates a gold coin (DP 58) and a trimetallic coin (DP 62) *Paümā* or *Padamā* (Skt. *Padmā*), which bore a stylized figure of Lakṣmī.[78]

Another group of coins bear names in which certain numbers are incorporated such as *Bārahottarī, Panarahottarī, Solahottarī, Terahasaī.* The significance of these numbers *bāraha* (12), *panaraha* (15), *solaha* (16) and *teraha* (13) remains unknown.

Furthermore, there are several designations which are either nicknames or trade names for certain coins, such as *Karāriya, Khaṭṭalāga* (DP 55), *Vilāīkora* (DP 67), *Bhaṃbhaï, Egaṭipi* (DP 75) and so on. Further research is needed to interpret these names properly.

---

77 Gupta 1969, p. 119 and pl. xxvi, no. 281; see also Mitchiner 2000.

78 Deyell 2017, p. 119, for the image of a gold coin issued by Govinda-candra-deva with an image of seated Lakṣmī on the obverse.

1.2.4 Coinage of the Turkish Sulṭāns

The lion's share of the catalogue goes to the coins issued by the various kings at Delhi, starting from the Tomar king Anaṅgapāla to Pherū's employer, Quṭb al-Dīn Mubārak Shāh of the Khaljī dynasty (*ḍhillikā-satka-mudrā*). Before the advent of the Khaljīs, Delhi was ruled by various Sulṭāns from Mu'iz al-Dīn Muḥammad ibn Sām (r. 1193-1206) to Mu'iz al-Dīn Kaiqubād (r. 1287-1290). Of these Sulṭāns, Pherū mentions only their billon coins (DP 112-131), although they are known to have issued silver coins as well.

For example, about Raḍīyya Sulṭānā (r. 1236-1240), the only female ruler of this dynasty who ruled under the name of Jalālat al-Dīn Raḍiyya, Pherū states as follows (DP 122):

> "Shams al-Dīn's (*samasadi*) daughter Raḍīyya (*radīyā*). Her *Radī* is twofold: [minted at] Delhi and Badaun. [These contain respectively] sixteen and a half, and twelve and three quarters *ṭaṃkas* [of silver in one hundred pieces]. [Their prices are] nineteen and thirty-one [pieces per *Ṭaṃka*]."

But according to Stan Goron and J. P. Goenka, there survive also a gold *Ṭaṃkā* of Raḍīyya minted at Lakhnautī in Bengal and silver *Ṭāṃkas* minted at Delhi, in addition to the billon *jītals* minted at Delhi and Badaun.[79] This is the only occasion when Pherū mentions the names of different mints.

Likewise, of the first rulers of the Khaljī dynasty, viz. Jalāl al-Dīn Fīrūz II Khaljī (r. 1290-1296) and his son Rukn al-Dīn Ibrahīm (r. 1296), Pherū's information is partial and mentions only the billon coins, because they were still in circulation (*vaṭṭaṃti vivahāre*, DP 132).

---

[79] Goron & Goenka 2001, pp. 26-27, where all the extant coins of Raḍīyyā are illustrated and excellently catalogued.

1.2.5 Coinage of ᶜAlā' al-Dīn Muḥammad Khaljī

When Pherū was composing the DP in 1318, the coinage of ᶜAlā' al-Dīn and Quṭb al-Dīn was legal tender (*saṃpaï pavaṭṭamāṇā*) and therefore his account of this coinage is naturally very detailed and comprehensive.[80]

ᶜAlā' al-Dīn Muḥammad Khaljī (r. 1296-1316) overthrew his uncle Jalāl al-Dīn Fīrūz and ascended the throne. He amassed huge quantities of gold and jewels during his campaigns and those by his generals.[81] This wealth reflected in the large variety of coins issued during his reign of two decades. Pherū informs that ᶜAlā' al-Dīn issued two varieties of *dugānī,* two varieties of *chagānī,* one variety of *igānī,* gold *Ṭaṃkās* of five denominations and weights, one silver *Ṭaṃkā* of 1 *tolā* weight, and 1 gold *Dīnār.* The five kinds of gold *Taṃkas* weighed 1, 5, 10, 50 and 100 *tolās.* The 100 *tolā* coin would weigh almost 1.1 kg. Such huge pieces naturally were not used for monitory transactions but as royal gifts to foreign ambassadors or as tokens of royal favour. This custom continued into the Mughal times.[82]

Besides these gold, silver and billon coins, there survive also several varieties of copper coins issued by ᶜAlā' al-Dīn which are not mentioned by Pherū.[83] He refers to ᶜAlā' al-Dīn as *Aśvapati Mahānarendra Pātisāhi Alāvadī,*[84] but does not mention his

---

80 DP 134-148; cf. also Gupta 1957, pp. 35-47; Moin 1999.

81 Cf. Habib 1931.

82 Cf. Gupta 1957, pp. 37-38 (Gigantic coins); Gupta 1969, pp. 87-88: "The third [Khalji] ruler, Alauddin Mahummad Shah (1296-1316 a.d.), who had enriched his treasury by conquests in South India, issued plentiful coins. He and his successor, Qutbuddin Mubarak Shah, issued not only gold and silver *tankah* but also coins of heavy weights. Alauddin had issued gold coins weighing 5, 10, 50 and 100 tolas; his son Qutbuddin Mubarak issued gigantic coins of both gold and silver in no less than fourteen denominations in two shapes — round and square — weighing 5, 10, 20, 30, 40, 60, 70, 80, 90, 100, 150 and 200 tolas. But no specimens of these coins have so far been found. It is only Thakkur Pheru, the mint-master of Delhi mint, who had referred to them in his accounts of the working of the mint, of which he was in charge, during the reign of these rulers. This might not be a myth, as such coins were issued later by the Mughal rulers. Scholars regard these gigantic issues to be merely massive ingots of artistically stamped bullion which were hoarded as stores of value and were occasionally given to ambassadors, diplomatic agents and other distinguished persons as complimentary gifts or souvenirs of imperial favour and munificence. They do not believe them to be coins of higher denominations. But we have no reason to disbelieve Thakkur Pheru when he calls these pieces gold and silver coins."
See also Hasan 1998, for an account of a gold coin issued by the Mughal Emperor Jahāngīr. It weighed a little short of 12 kg with a diameter of 20.3 cm (i.e. almost the width of A-4 size paper). In 1987 it was estimated to be worth ten million US dollars.

83 Goron & Goenka 2001, pp. 37-39.

84 Prose passage after DP 138.

Arabic titles which were incorporated on coins. Nor does he inform about the different mints, the names of which were generally available on the coins.

1.2.6 Coinage of Shihāb al-Dīn ᶜUmar

When ᶜAlā' al-Dīn Khaljī died in 1316 after a long reign, his powerful general Mālik Kafur installed ᶜAlā' al-Dīn's six years old son Shihāb al-Dīn ᶜUmar as the Sulṭān and proclaimed himself as the Regent. This poor child ruled just for two months, during which time the royal mint carried on its work as usual and issued coins under the ruler's name. Pherū lists gold and silver *Ṭaṃkās* of 1 *tolā* each and five types of *gānī* coins. Pherū mentions their weights, silver content and so on, but, unlike modern numismatists, he does not mention the inscriptions on the coins. The long Arabic titles of the Sulṭāns would not have fitted in his Apabhraṃśa metres in any case. Modern numismatic catalogues record these inscriptions also and inform that on his gold coins the child king was referred to as the "Second Alexander" (*sikandar al-thānī*).[85]

1.2.7 Coinage of Quṭb al-Dīn Mubārak Shāh

Within two months of his coronation, Shihāb al-Dīn was killed by his elder brother Quṭb al-Dīn Mubārak Shāh who escaped from the prison and ascended the throne. Pherū refers to him as *rāyabandichoḍa,* "he who released himself from the prison and became king" or "he who freed the prisoners on becoming the king" (DP 139). His short rule of four years has nothing to record but his dissolute life. The only achievement was the wide range of coinage produced by the royal mints at Delhi and in Quṭbābad (Devagiri). This Sulṭān abandoned the prevailing moulds of Chauhan coinage and introduced a completely new fabric in which he issued as many as sixty-three different types of coins: 32 varieties of gold, 20 types of silver coins, 7 kinds of *dammas* and 4 varieties of copper pieces (DP 140). In the first two years, the gold and silver *Ṭaṃkās* were of circular shape. These were changed to square shape in 1318, just before Pherū produced his manual. Pherū lists these meticulously with their weights and metal content. What he

---

85 Goron & Goenka 2001, pp. 39-40.

does not include are Quṭb al-Dīn's grandiloquent titles, which are mentioned in the modern numismatic catalogues.

Apart from the large number, the quality of Quṭb al-Dīn's coinage is said to be far superior to that of his predecessors. The numismatist Nelson Wright remarks: [86]

> "The coinage of Qutbuddin Mubarak stands out for its boldness of design and variety of its inscriptions. … There is perhaps no finer coin in the whole pre-Mughal series than the broad square gold tankah of high relief struck at Qutbabad Fort."

In this radical process of reforms, Pherū must have played a significant role. Important for posterity is the fact that he left a comprehensive catalogue to the coinage of Quṭb al-Dīn Mubārak in his *Dravyaparikṣā*.

1.2.8 Accuracy of Pherū's Assays

An important element in Pherū's data are the results of his assays. Today these can be compared with the modern assays to ascertain their accuracy. The first major study of the coins of the Delhi Sultanate was undertaken by H. Nelson Wright in his classic work *The Coinage and Metrology of the Sultans of Delhi* in 1936. Here he included also the results of the matellographic analyses of the coinage which were done by the assayers of the British Museum and of the Royal Mint. After the *Dravyaparīkṣā* was published, numismatists compared Pherū's statements with the modern assay results published by Nelson Wright and found excellent agreement between them.

In particular, John S. Deyell compared the silver content in a series of *gānī* coins according to the analysis of the British Museum and of the Royal mint on the one hand and according Pherū's assay on the other and found that the percentage of agreement between the two assays ranges between 96.56 and 101.36 and that the percentage of variance between the two lies between -3.44 and 1.36.[87] It is indeed remarkable that there is a near-perfect agreement between Pherū's assays made in the medieval mint of Delhi and the modern analyses of the British Museum.

---

86 Wright 1974, pp. 107-108.

87 Deyell 1999, p. 255.

Of course, this degree of accuracy pertains specially to the coinage of ᶜAlā' al-Dīn and his successors Shihāb al-Dīn and Quṭb al-Dīn, the coinage which Pherū directly dealt with. In the case of the coinage of other Sulṭāns and other kingdoms, the accuracy varies, depending on the number of specimens which were available to him for examination. Some parts of the data may also have been derived by Pherū from old mint records or other trade sources and not by direct examination. Even so, preserving all these records — his own and of others — for posterity in the form of the *Dravyaparīkṣā* was indeed a remarkable achievement.

DRAVYAPARĪKṢĀ, TEXT, TRANSLATION & COMMENTARY

PART ONE: ASSAY AND REFINING

0.1 Preamble

oṃ namo kamalavāsiṇī devī |
kamalāsaṇa kamalakarā chaṇasasivayaṇā sukamaladalanayaṇā |
saṃjuttanavanihāṇā namivi mahālacchi riddhikarā ‖ 1 ‖
je nāṇā muddhāiṃ siri ḍhilliya ṭaṃkasāla kajjaṭhiye |
aṇubhūya karivi pattiu vanhi-muhe jaha payāu ghiyaṃ ‖ 2 ‖
taṃ bhaṇaï kalasanaṃdaṇa caṃdasuo phira 'ṇubhāya taṇayatthe |
tiha mullu tullu davvo nāmaṃ ṭhāmaṃ muṇaṃti jahā ‖ 3 ‖
paḍhamaṃ ciya cāsaṇiyaṃ vīyaï kaṇagāi ruppa sohaṇiyaṃ |
taïe bhaṇāmi mullaṃ caütthae savva muṃdāiṃ ‖ 4 ‖ *dāraṃ*[88] ‖

Om. Salutation to the Goddess residing in the lotus.

1. Having bowed to Mahālakṣmī, who is seated on the lotus, who holds a lotus in her hand, whose face resembles the autumnal moon, whose eyes are like beautiful lotus petals, who is accompanied by the nine treasures and who causes prosperity,

2. [Pherū] who is employed (*kajjaṭhiye*) in the mint (*ṭaṃkasālā*) at the glorious Delhi and thus has direct experience of various types of coins (*muddā*), just as clarified butter [is obtained] after melting [the butter] on the fire, even so after having [melted the coins and] understood (*karivi pattitu*) [their metal content],

3. Pherū, son of Canda, son of Kalasa, describes them (i.e. the coins) for the sake of his brother and his son so that they know the price (*mullu*), weight (*tullu*), metal content (*davvo*[89]), name (*nāma*) and the place of issue (*ṭhāma*) [of each coin type].

---

88 The term *dāraṃ* occurs at the end of *vv.* 4 and 140. It is not explained in any dictionary, nor in the *Prākṛtapaiṅgala* on prosody. At the end of *v.* 4, it may be akin to Skt. *kulaka,* which denotes a cluster of stanzas that form a single syntactical sentence. It is difficult to say what the significance of the second occurrence is.

89 The primary meaning of the word *davvo* (Skt. *Dravya*) here is "metal"; hence the title of the work *Dravyaparīkṣā* is "Examination of metal content", that is, "assay". However, below in *vv.* 96-98,

4. First [will be discussed] the assay (*cāsaṇiya*), second the manner of refining (*sohaṇiya*) gold, silver etc., third, I shall state the price, and fourth [the individual description of] all coins.

1.0 Assay in General

cāsaṇiyaṃ jahā —
sukkaṃ palāsakaṭṭhaṃ gomaya ārannagā ajā atthiṃ |
kami tiya ige gi bhāyaṃ egaṭṭhaṃ dahiya taṃ rakkhaṃ ‖ 5 ‖
chāṇiya sera savāyaṃ vaṃdhi gahaṃ vaṃkanāli dhami maṃdaṃ |
dhava aṃgāra savā maṇi sohiya uttaraï cāsaṇiyaṃ ‖ 6 ‖
taṃ puṇaravi sohijjaï paṇa tolā rakkha vaṃdhiūṇa gahaṃ |
tā havaï sahaṃ kūraṃ aï nimmala cāsaṇiya ruppaṃ ‖ 7 ‖
‖ iti sarva cāsanikā mūlasodhanavidhiḥ ‖

The method of assaying (*cāsaṇiya*) is as follows:

5. Take one part each of dry *Palāśa* (*Butea frondosa*) wood, cow-dung from the forest and goat's bones, and burn them together. The ashes

6. should be strained (*chāṇiya*). With one and a quarter *ser* (= 275.075 g) [of these ashes] form a crucible (*gaha*) [in which place the coins]. Blowing gently with a blowpipe (*vaṃkanālī*), melt it with one and a quarter *maṇ* (= 11 kg 3 g) of charcoals of the *Dhava* tree (*Grislea mentosa* or *Anogeissus latifolia*). Then the melted metal (*cāsaṇiya*) runs down.

7. This should be further refined by making a crucible (*gaha*) with five *tolas* (= 55.015 g) of the ashes. Then it becomes fine particles (*sahaṃ kūraṃ* ?) of very pure *cāsaniya* silver.

Thus the assay of all metals (*savva-cāsanikā*) and the basic method of refining (*mūlasodhanavidhi*).

102, 106, 134, 136, *davvo* or *davvu* is employed in the sense of "silver" or the "amount of silver in a coin".

gaha, H. *gahī;* the manner of melting precious metals where ashes are moistened and formed into the shape of a crucible. The precious metal is placed in this crucible and the whole thing is surrounded by charcoals and heated by blowing air through a pair of bellows or blowpipe. This is analogous to the method of refining silver as described in the *Ā'īn-i Akbarī* (p. 23):

"They dig a hole, and having sprinkled in it a small quantity of wild cow dung, they fill it with the ashes of *mughlīlān* wood (it is called *babul* in Hindi); then they moisten it, and work it up into the shape of a dish; into this they put adulterated silver, together with a proportionate quantity of lead. First they put a fourth part of the lead on the top of silver, and having surrounded the whole with coals, blow the fire with a pair of bellows, till the metals are melted, which operation is generally repeated four times. The proofs of the metal being pure are a lightning-like brightness, and its beginning to harden at the sides. As soon as it is hardened in the middle, they sprinkle with water, … It then forms itself into a disc and is perfectly refined. … The ashes of the disc, which are mixed with silver and lead, form a kind of litharge, called in Hindi *kharal.*"

cāsaṇiya (Hyper-Sanskrit *casanikā*), H. *cāsnī,* from Persian *chāshnī,* "specimen for assaying". It is obvious that this is not essentially different from the method of refining. Cf. *Ā'īn-i Akbarī* (p. 24):

"The *Chashnīgīr* examines the refined gold and silver, and fixes its purity as follows:-- Having made two tolas of refined gold into eight plates, he applies layers of mixture as above described [namely, saltpeter and brick dust], and sets fire to it, keeping out, however, all draught; he then washes the plates and melts them ; if they have not lost anything by this process, the gold is pure. The assay-master then tries it upon the touchstone to satisfy himself and others. …

"In the case of silver, he takes one tola with a like quantity of lead, which he puts together into a bone crucible, and keeps it on fire till the lead is all burnt. Having then sprinkled the silver with water, he hammers it till it has lost all smell of the lead; and having melted it in a new crucible, he weighs it; and if it has lost in weight three *birinj* (rice grains), it is sufficiently pure; otherwise he melts it again, till it comes to that degree."

1.1 Extracting Silver from Lead (*Nāgacāsaṇikā*)

sīsassa amala pattaṃ karevi lahu khaṃḍa tulivi sohijjā |
nīsaraï ruppa sayalaṃ sīsaṃ gaccheï kharaḍi mahe ‖ 8 ‖
saya tolāmajjheṇaṃ bāraha java sīsae havaï ruppaṃ |
pacchā puṇa puṇa sohiya tahāvi nakaṇaṃ na kaïyāvi ‖ 9 ‖
‖ *iti nāgacāsanikā* ‖

8. Make sheets of pure lead (*sīsa*), weigh small pieces and melt. All the silver comes out and the lead goes into the *kharaḍi*.

9. In one hundred *tolas* (= 1100.03 g) of lead, there are twelve *javas* (= 0.684 g) of silver. After this, even by repeated melting, [the lead] will never be without [some] grains of [silver].

Thus the *Cāsanika* of lead (*nāga*).

kharaḍi, ashes mixed with lead and silver.
DP 9 = DU 27. Cf. DU 26 in which Pherū states:
"Now I shall state the amount of precious metals occurring in the base metals. In one hundred *tolas* (= 1100.03 g) of tin (*raṃga*) there are 34 *javas* (= 1.938 g) of gold."

1.2 Assay of Silver (*ruppacāsanikā*)

ruppassa vīsa māsā chaṭaṃka nāgaṃ ca deï sohijjā |
jaṃ jāyaï te visuvā evaṃ hui ruppa cāsaṇiyaṃ ‖ 10 ‖
‖ *iti ruppacāsanikā* ‖

10. Melt twenty *māṣas* (= 18.34 g) of silver together with six *ṭaṃkas* (= 22.008 g) of lead (*nāga*). What results is the *visuvā* (i.e. silver of 20 *visuvā* purity). In this manner is done the assay (*cāsaṇiya*) of [unwrought] silver (*ruppa*).

Thus the assay of silver.

visuvā (from Skt. *viṃśopaka,* lit. one-twentieth part) denotes the degree of fineness of silver, 20 *visuvas* being the purest silver. The *Ā'īn-i Akbarī* (p. 22) calls the highest degree of fineness of silver *bist biswa.* In addition to silver, brass (DU 7),

sandal wood (DU 49), musk (DU 52) and saffron (DU 55) are graded into twenty *visuvas.* For the method refining silver, see *vv.* 24-25 below.

1.3 Assay of Wrought Silver (*Dravyacāsanikā*)

nāṇaya ḍahakka harajaya rīṇī cakkaliya ṭaṃka dasa gahiuṃ |
panaraha guṇa sīseṇaṃ sohiya nīsaraï jaṃ ruppaṃ ‖ 11 ‖
tassāo pāḍijjaï ruppaṃ sīsassa jaṃ rahaï sesaṃ |
taṃ cāsaṇiya sarūvaṃ annaṃ jaṃ kharaḍi majjhi have ‖ 12 ‖
nīcucca nāṇayāo kameṇa caü du java kiṃci hīṇahiyā |
saṃgahaï kharaḍi ruppaṃ avassa cāsaṇiya samayaṃmi ‖ 13 ‖
harajaya cāsaṇiya dugaṃ daha daha ṭaṃkassa meli gahi addhaṃ |
paüṇa du javaṃtaresu ha du javaṃtari vāhuḍaï nūṇaṃ ‖ 14 ‖
‖ *iti dravyacāsanikā* ‖

11. *Nāṇaya, Ḍahakka, Harajaya, Rīṇī* and *Cakkaliya.* Take ten *taṃkas* (= 36.676 g) [of these] and melt them together with fifteen times lead (i.e. 2 ½ *ser* = 550.14 g). Whatever silver emerges,

12. with that silver blocks are cast (*pāḍijjaï ruppaṃ*). Whatever lead remains, that will be in the form of *cāsaṇiya.* The rest goes into the *kharaḍi.*

13. From small and big [silver] coins (*nāṇayo*), four or two *javas* (0.228 or 0.114 g) or slightly less or more *kharaḍi* silver should be collected respectively at the time of *cāsaṇiya.*

14. *Harajaya* [silver] and *cāsaṇiya* [silver]. Mix ten *ṭaṃkas* (= 36.676 g) of each and melt in the *gaha.* Then [silver] is obtained which differs [from the original weight] by one and three-fourths to two *javas* (= 0.1 to 0.114 g).

Thus the *cāsanikā* of *dravya*.

Here *dravya* apparently denotes minted or wrought silver, the five terms in *v.* 11 bring different varieties such silver. *nāṇaka* is clearly minted silver. *rīnī* is mentioned in *vv.* 42, 52, 55; it may be the name of a coin type or of an alloy. *harajaya* occurs in *v.* 42, but its connotation is uncertain, so also the connotation of *Ḍahakka* and *Cakkaliya.*

1.4 The Method of *Sallāhikā*

cāsaṇiya java dahagguṇa ji ṭaṃka māsā havaṃti tassuvare |
aggissa bhutti dīyaï ṭaṃkappaï je javā hoṃti ‖ 15 ‖
taṃ saya majjhe ruppaṃ tahacchamāṇassa pūraṇe jaṃtaṃ |
taṃva ahiyassa puṇa juya sallāhī sā bhaṇijjei ‖ 16 ‖
‖ *iti sallāhikāvidhiḥ* ‖

15-16. Not understood.

It has not been possible to extract even a literal meaning out of the two verses. Apparently the two processes named *Dravya-cāsaṇika* above and *Sallāhika* here deal with the extraction of pure silver from small quantities of wrought silver.

2.1 Refining and Assay of Gold

sāmanneṇa suvanno vārahi vannīya bhitti kaṇao ya |
paṃca java hīṇa cippaṃ piṃjari vannī ya paṃca tule ‖ 17 ‖
siya khaḍiya lūṇa kallara sama missiya cunna sā saloṇīyaṃ |
melagaya kaṇaya cippaya karevi teṇa saha païyavvaṃ ‖ 18 ‖
tihu aggikka saloṇī satti saloṇīhi sujjhae cippaṃ |
ikkārasīya vannī ikkārasa java bhave sukasaṃ ‖ 19 ‖
saya tola kaṇaya païe jaṃ gaṭṭaï sā saloṇiyaṃ cippe |
cippe dahaggi pakke jaṃ ghaṭṭaï taṃ ca kāyariyaṃ ‖ 20 ‖
cippassa tinni māsā patta karivi bhitti kaṇaya saha païe |
sa tihāu jao gaṭṭaï bhittīo paḍhama cāsaṇiyaṃ ‖ 21 ‖
pacchā ti aggi pakke puno vi tiya māsa bhitti saha païe |
teraha visuva javassa ya iya aṃtaru vīya cāsaṇie ‖ 22 ‖
parapunna dahaggi pa[ï]e bhitti samaṃ havaï taïya cāsaṇiyaṃ |
ṭaṃkāṇa cakkalīyaṃ gahijjaï ya kaṇaya cāsaṇiyaṃ ‖ 23 ‖
‖ *iti suvarṇaśodhanā cāsanikā ca* ‖

17. Generally gold of twelve *vannī* is pure gold (*bhitti kaṇao*). Five *javas* less (i.e. 11 *vannī* 11 *java*) is *cippa. Piṃjarī* is of five *vannīs.*

Vannī, S. *varṇa,* is the degree of fineness of gold, 12 *vannīs* denoting pure gold. Pure gold is called *bhitti kaṇao* (*vv.* 17, 21-24), *bhitti suvanna* (39), *dhura kaṇaya* (37), or *mahākaṇao* (38).[90]

It is not clear if *cippa* (H. *cīp*) is a specific name for the gold of 11 *vannīs* and 11 *javas* (i.e. 97.396% pure) or a general name for adulterated for gold of any degree. The latter seems to be the case in *vv.* 18-34 below. *Piṃjari,* however, is the name for the gold of 5 *vannīs* purity (i.e. 41.667% purity). The *Ā'īn-i Akbarī* (p. 26) states that the gold extracted from the ashes is called *pinjar* in Delhi and *kail* in Punjab. *Piṃjari,* S. *piñjara,* reddish yellow or tawny may denote the colour of this gold alloy which is reddish because of the high copper content.

18. Mix equal parts of gypsum (*siya khaḍiya*), salt (*lūṇa*) and saline earth (*kallara*) and pound them. This powder is called *saloṇī.* Mix this with adulterated gold (*kaṇaya cippaya*) and melt.

19. Firing thrice means one *salūṇī.* The adulterated gold (*cippa*) is refined through seven *salūṇīs,* and becomes gold of good touch (*su-kasa*) of 11 *vannīs* and 11 *javas.*

Su-kasa, cf. Skt. *karṣa,* touchstone.

20. By melting 100 *tolas* (= 1100.3 g) of gold, whatever diminishes, that much adulterated gold (*cippa*) goes into the *salūṇī.* Again by melting the adulterated gold (*cippa*), whatever diminishes, that is *kāyariya.*

Cf. *Ā'īn-i Akbarī* (pp. 20-21): "*The platemaker*. He makes adulterated gold into plates of six or seven máshas each, six fingers in length and breadth; … When the above-mentioned plates have been stamped, the owner of the gold, for the weight of every jalálí goldmuhrs, must furnish 4 sérs of saltpeter, and 4 sérs of brick dust of raw bricks. The plates, after having been washed in clean water, are stratified with the above mixture (of saltpeter and brick dust), and put one above the other, the whole being covered with cow dung, which in Hindí is called upla. It is the dry dung of the wild cow. Then they set fire to it and let it gently burn, till the dung is reduced to ashes, when they leave it to cool; then these ashes, being removed from

---

90 On the fineness of gold, cf. Sarma 1983.

the sides, are preserved. They are called in Persian *khāk-i khāliṣ,* and in Hindí *saloní.* By a process, to be mentioned hereafter, they recover silver from it. The plates, and the ashes below them, are left as they are. The process of setting fire to the dung, and removing the ashes at the sides, is twice repeated. When three fires have been applied, they call the plates *sitáí.* They are then again washed in clean water, and stratified three times with the above mixture, the ashes of the sides being removed.

"The operation must be repeated till six mixtures and eighteen fires have been applied, when the plates are again washed. Then the assay master breaks one of them; and there comes out a soft and mild sound, it is a sign of its being sufficiently pure; but if the sound is harsh, the plates must undergo three more fires. Then from each of the plates one másha is taken away, of which aggregate a plate is made. This is tried on the touchstone; if it is not sufficiently fine, the gold has to pass through one or two fires. In most cases, however, the desired effect is obtained by three or four fires."

21. Having made thin plates of three *māṣās* (= 2.751 g) each of the adulterated gold (*cippa*), melt it together with pure gold. When one and one-third *javas* (= 0.076 g) diminish from the pure gold it is the first *cāsaṇiya.*

22. Again by melting this together with three *māṣās* of pure gold, thirteen *visuvas* of a *java* (i.e. 13 / 20 *java* = 0.037 g) [will diminish]. This is the difference in the second *cāsaṇiya.*

23. In the third *casaṇiya,* by burning this completely in fire, it will become equal [in weight] to pure gold. In the *cāsaṇiya* of gold, one takes round pieces (*cakkaliya*) of one *taṃka* (= 3.668 g) each (?).

Thus the manner of refining gold and also the assay (*svarṇaśodhana cāsaṇikā ca*).

Verses 21-23 teach the method of assaying gold by melting (*cāsaṇiya*). Assay can be made by melting or upon a touchstone. The former is denoted by the term *cāsaṇiya.* In assay the gold can be of any degree of purity. Hence *cippa* here must mean merely adulterated gold. If so, how can there be a fixed quantity of loss? In *v.* 21, the weight of pure gold is not stated; presumably it is also 3 *māṣās.*

Cf. *Ā'īn-i Akbarī* (p. 22): "The following method of assaying is also used. They take two *tolas* of pure gold, and two *tolas* of gold which has passed through fire, and make twenty plates of each, of equal weight. They then spread the above mixture [of saltpeter and brick dust], apply the fire, wash them, and weigh them with an exact balance. If both kinds are found to be equal in weight, it is proof of their pureness."

2.2 Refining Silver

melagaï ruppa visuvā daha teraha sola ṭhāra uṇavīsā |
paṃca uṇa caüṇa tiuṇaṃ viuṇaṃ sama sīsayaṃ dijjā ‖ 24 ‖
sayala kudavvaṃ gacchaï kharaḍiṃtari rahaï sesa ruppavaraṃ |
taṃ puṇa divaḍḍha sīsaï sohiya hui visa visuva dhuvaṃ ‖ 25 ‖
‖ *iti ruppasodhanā* ‖

24. To the adulterated silver (*melagaï ruppa*) of the grades 10, 13, 16, 18, and 19 *visuvas* add respectively 5, 4, 3, 2 times the amount of lead [and melt].

25. All the impurities (*ku-davvaṃ*) go into *kharaḍi,* and pure silver (*ruppa-vara*) remains. By melting this again together with one and a half times lead, it becomes without doubt [pure silver of] twenty *visuvas* (*vīsavisuvam*).

Thus the method of refining silver (*ruppa-sodhanā*).

2.3 Refining *Miśradala*

tuliya salūṇīyāo aḍḍhāi guṇīya kharaḍi ruppassa |
vaṭṭevi meli piṃḍiya karijja komaṃsa cunna sahā ‖ 26 ‖
tatto karevi kuṭṭiya dhamijja ghaṭṭei taīya aṃsumalaṃ |
havaï dubhā missa dalaṃ tassāo aḍḍayaṃ kujjā ‖ 27 ‖
nīsaraï sayala ruppaṃ sīsaṃ taṃbaṃ ca jāi kharaḍi mahe |
sā kharaḍi puṇa dhamijjaï pihu pihu nīsarahi dunnevi ‖ 28 ‖
kāiriya puṇo evaṃ kīraï tassāu taṃba saha kaṇayaṃ |
nīsaraï tassa cippaṃ hui sīsaṃ kharaḍi majjhāo ‖ 29 ‖
‖ *iti miśradala śodhanā* ‖

26. Having weighed the *salūṇīya,* add two and a half times the *kharaḍi* of silver, mix it with *komaṃsa* powder, and make this into balls (*piṃḍaya karijjā*).

27. Grind these [balls] and burn in a low fire. The impurity (*aṃsumalaṃ*) is reduced. Then it becomes the *missadala* of two (i.e. mixture of silver slag and gold slag?). This should be melted in [a vessel] *aḍḍaya.*

28. All silver comes out; lead and copper go into the *kharaḍi.* That *kharaḍi* should be melted again. The two (lead and copper) emerge separately.

29. One should treat the *kāiriya* also in a like manner. Then copper and gold come out together. Their *cippa* is formed and lead [goes] into the *kharaḍi.*

Thus the process of refining the *missadala.*

Missadala is obscure. *Komaṃsa* powder is mentioned at DU 14, where it is employed in extracting tin from the ore, but it not explained either here or in DU what exactly this substance is. *Aḍḍaya* is probably an oven-like vessel with a hole at the bottom; it is filled with charcoals and placed in a pit. The metal is deposited at the top of the coal and fired. Silver goes down through the bottom hole into the pit (cf. *Ā'īn-i Akbarī,* p. 25).

2.4 Refining *Kaṇacunna*

kajjaliya mūsi thūriya topāla niyārayassa suhama kaṇaṃ |
sohagga phakka sajjiya dasaṃsa juya kaḍhiya havaï dalaṃ ‖ 30 ‖

30. In a black / blackened crucible (*kajjaliya mūsi*) place the fine particles (*suhama kaṇa*) of *thūriya, topāla* and the sweepings from the mint (*niyāra*) and add one-tenth amount of powdered (*phakka*) borax (*sohaga*) and *sajjiya* and melt. The impure gold (*dala*) emerges.

Thus the refining of particles (*kaṇa*) and powder (*cūrṇa*).

It is not clear exactly what sort of waste products are meant by the words *thūriya* and *topāla. Niyāra* (H. *niyār*) is the rubbish collected and sold at the goldsmith's shop, from which *niyāriyā / nyāriyā,* one who extracts precious metals from such refuse. Akin to this word is *nehar,* from which *neharwala* one who collects the sweepings and extracts precious metal (cf. Rây 1956, p. 222).

See also *Ā'īn-i Akbarī,* p. 27: 'The Khak-shoy. When the owners of the metals get their gold and silver in various ways which have now been described, the khak-shoy sweeps the mint, takes the sweepings to his own house, washes them and gains profit.'

Sajjiya, H. *sajjī,* alkali saltpeter, potash. *Ā'īn-i Akbarī,* p. 25, n. 1: 'Hind. *Sijjií,* impure carbonate of soda.'

For more detailed description of the processes for extracting gold and silver from the dross and other wastages, see *Ā'īn-i Akbarī,* pp. 24-27; Rây 1956, 218-224.

3.1 Degrees of Fineness of Silver (*ruppa-vanamālikā*)

caü bhāya amala taṃbaya vara pittala sola bhāya saha kaḍhiyaṃ |
iya rīsaṃ kāyavvaṃ ruppassa visova karaṇatthe ‖ 31 ‖
visa visovā ruppaṃ māsā vīsāvu jaṃ ji kaḍḍhijjā |
tittiya māsā rīsaṃ dijja havaï te visova kasaṃ ‖ 32 ‖
‖ *iti ruppavanamālikā* ‖

31. Four parts pure copper and sixteen parts pure brass (*tittila*) should be melted together. This should be treated as the *rīsa* for preparing silver of [different] grades [of fineness].

32. Take twenty *māṣās* (= 18.34 g) of silver with the fineness of twenty *visuvas.* As much silver as is to be melted, [twenty *māṣās* diminished by] so much *rīsā* should be added to it [and melted], and this gives the fineness (*kaṣa*) of so many *visuvas.*

Thus the *vanamālikā* of silver.

Vanamālikā, S. varṇamālikā, lit. series of different degrees of fineness, denotes the method of preparing a series of silver parcels with descending degree of fineness. For making silver of *x visuvas,* take *x māṣas* of pure silver and 20-*x māṣas* of *rīsa,* which is a mixture of copper and brass in the ratio of 1:4.

3.2 Degrees of Fineness of Gold (*kanaka-vanamālikā*)

aï cukkha ruppa taṃbaya kami panaraha saḍḍha saḍḍha caü rise |
iya bhāya vaṃniyatthe solasa caü kaṇaya ghaḍaṇatthe ‖ 33 ‖
jārisa vannī kīraï tittiya du javahiya bhitti kaṇao ya |

sesa du javūṇa rīsaṃ evaṃ tolikku havaï paraṃ ‖ 34 ‖
rīsa sama kaṇaya paḍhamaṃ gālivi puṇa thova kaṇaya saha kaḍhiyaṃ |
puṇa sesa sahā vaṭṭiya tā havaï jahiccha vannābhaṃ ‖ 35 ‖
athavā
rāma kara bhāya sulabhaṃ tāraṃ muṇi satta bhāya saha kaḍhiyaṃ |
eyaṃ sayaṃsa rīsaṃ suvanna vannassa haraṇa varaṃ ‖ 36 ‖
seyālīsa vibhāyaṃ dhura kaṇaya karavi ega egūṇaṃ |
tattulli dijja rīsaṃ kameṇa pāūṇa huī vannaṃ ‖ 37 ‖
‖ *iti kanaka vanamālikā* ‖

33. Very pure silver and copper, fifteen and a half and four and a half [parts] respectively, for [preparing] the *rīsa.* These parts are for the *vannī* (i.e. for making gold of different *vannīs*). Sixteen and four [parts respectively of silver and copper] for welding gold (*kaṇaya gaḍaṇatthe*).

34. Whichever *vannī* is to be prepared, [take] so many *māṣas* increased by two *javas* of pure gold. And the rest (i.e. 12 - *x māṣas*) diminished by two *javas* [is the amount of] *rīsa.* This is the first [ratio of] weights. The other (*paraṃ*) [will be discussed in 36-37].

Let *x* be the desired *vannī.*
Pure gold: *x māṣas* + 2 *javas* = (16 *x* + 2) *javas.*
Rīsa: (12 - *x*) *māṣas* - 2 *javas* = (11 - *x*) *māṣas,* 14 *javas* = (190 - *x*) *javas.*

35. Having melted first [all] the *rīsa* and an equal amount of gold, one should add again a little (*thova,* Skt. *stoka*) [more] gold, then all the rest. This becomes the shining [gold] of the desired *vannī.*

Alternatively,

36. Twenty-three parts copper (*sulabha,* Skt. *śulva*) should be melted with seventy-seven parts silver (*tāra*). These one hundred parts of *rīsa* are the best for [preparing the different] grades of gold (*suvanna vannassa*).

37. Having divided the pure gold (*dhura kaṇaya*) into forty-seven parts, take out one [part] each time and add equal amount of *rīsa,* and it becomes [the gold having a] *vannī* each time less by one quarter.

Thus the *vanamālikā* of gold.

Take any amount of pure gold and divide it into 47 equal parts. As you take out 1 part each time, add the same amount of *rīsa* to make 48 parts in total. Thus

47 gold + 1 *rīsa* = 47 / 4 = 11 ¾ *vannī* gold.

46 gold + 2 *rīsa* = 46 / 4 = 11 ½ *vannī* gold.

45 gold + 3 *rīsa* = 45 / 4 = 11 ¼ *vannī* gold, and so on.

But the formula is not framed correctly. It should read: take 48 parts of pure gold; take out 1 part and add 1 part *rīsa*; take out 2 parts and add 2 parts *rīsa*; and so on successively. The computations with gold in 38-41 below and also in the GSK 3.15-25 are based on this second ratio only where the amount of gold is in direct proportion to the degree of fineness. In the first ratio given in *v.* 34 above, there is always slightly more gold.[91]

Interestingly, Pherū employs word numerals (*bhūta-saṃkhyā*) for the first time in *v.* 36, *rāma-kara* for 23 and *muṇi-satta* for 77.[92]

4.0 Mathematics of Gold (*svarṇa vivahāra*)

javi solasehi māsaü cahu māsihi ṭāṃku tolao tiuṇo
solahi javehi vannī vārahi vannī mahākaṇao ‖ 38 ‖[93]
vannī tulleṇa hayaṃ bhitti suvannassa aggha saha guṇiyaṃ |
vārasa bhāge pattaṃ jahicchamāṇassa taṃ mullaṃ ‖ 39 ‖
nāṇā vannī kaṇao nāṇā tulleṇa jāma gālijjā |
kerisa vannī jāyaï aha erisa vanni kiṃ tullo ‖ 40 ‖
jasu vannī jaṃ tullo so tassariso guṇevi kari piṃḍaṃ |
tulli vihatte vannaṃ icchā vannī hare tullaṃ ‖ 41 ‖
‖ *iti svarṇa vivahāraṃ* ‖

---

91 These two ratios are discussed in Sarma 1983.

92 For the word numerals in GSK, see SaKHYa, p. xxxvi.

93 GSK 1.10 has slightly different reading of the first half:
javi solasehi māsaü tehivi cahu ṭaṃku tolao tiuṇo |

38. Sixteen *javas* make one *māṣa*; four *māṣas* make one *ṭaṃka*; three times this is a *tolā.* Sixteen *javas* make one *vannī,* and that which is of 12 *vannīs* is pure gold (*mahākaṇao*).

39. [The number of] *vannī,* multiplied (*haya*) by the weight [of a given gold piece] and [further] multiplied by (*guṇiya*) by the price of pure gold and divided into twelve parts, gives the price of the desired [piece of gold].

Thus if 1 *tolā* of pure gold (i.e. of 12 *vannīs*) costs 24 *drammas*.
2 *tolas* of gold of 8 *vannīs* cost 8 x 2 x 24 ÷ 12 = 32 *drammas*.

40. Gold [pieces] of various *vannīs* and different weights, when melted together, what will be the *vannī* of the resulting gold, or what is the weight of [the gold having] such *vannī*?

41. Multiply the *vannī* with the weight [of each piece of gold severally] and take their sum (*piṃḍa*). By dividing it with the aggregate weight, the [resulting] *vannī* [is obtained]; by dividing [the sum] with the desired *vannī,* the weight [is obtained].

Thus mathematics of gold.

Verse 38 provides the units of weight prevalent at Pherū's time and used by him in his works, esp. RP, GSK and DP. These are tabulated below with metric equivalents.

1 *tolā* = 3 *ṭaṃka* = 12 *māṣa* = 192 *java* = 3840 *visuva* [11.003 g]
1 *ṭaṃka* = 4 *māṣa* = 64 *java* = 1280 *visuva* [3.668 g]
1 *māṣa* = 16 *java* = 320 *visuva* [0.917 g]
1 *java* = 20 *visuva* [0.057 g]
1 *visuva* [0.003 g]

Verse 41 anticipates the following situation: there are *n* pieces of gold of different weights and different degrees of fineness. When these are melted together into one large piece, what is its degree of fineness? Answer is to multiply the *vannī* and weight of each piece severally and to add the sum. This when divided by the aggregate weight of the *n* pieces gives the *vannī* of the large piece. There is no need to calculate the weight of the large piece which is the same as the aggregate weight of the *n* pieces. Therefore, the last part of the verse 41 is redundant. GSK

3.15 has the same proposition with a slightly different wording. But the example that follows asks, correctly, for the *vannī* and not for the weight. Cf. GSK 3.16:

nava dasa aṭṭhikkārasa vannī tolāya tiya cha paṇa juyalaṃ |
egattha gāliyaṃ taṃ kerisa vannī havaï kaṇayaṃ ||

"[Four pieces of gold having fineness of] 9, 10, 8, 11 *vannīs* [and] weighing 3, 6, 5, 2 *tolās* [respectively] are melted together. Of what *vannī* will be the [resulting] gold?" There is no need to ask for the weight of the resulting piece; it would obviously be 16 (3+6+5+2) *tolās.*

5.0 Loss of Gold in Manufacture (*hrāsya*)

ugghāḍa mūsi duga saü paḍiya sao ḍhakka mūsi uddeso |
āvaṭṭa khae gacchaï harajaï taha rīṇa vaṭṭe ya || 42 ||
cheyaṇi ghaḍaṇujjālaṇi sahassi tolehi ruppu caü māsā |
kaṇao savāu māsaü ṭaṃkaṭṭha sahassi dammehiṃ || 43 ||
|| *iti hrāsyaṃ* ||

42. In an open crucible (*ugghāḍa mūsi*) of two hundred (i.e. with a capacity of two hundred units?), melt one hundred [units of] *harajaya* and likewise *rīṇī* and cover the opening of the crucible (*ḍhakka mūsi uddeśo*). When the drying up [process] is complete (*āvaṭṭha khae*?), the impurities will disappear.

43. In cutting (*cheyaṇi,* Skt. *chedana*), joining (*ghaḍaṇa*) and burnishing (*ujjālaṇa*), four *māṣas* of silver and one and a quarter *māṣa* of gold [are lost] in one thousand *tolas.* In [minting] one thousand *drammas,* eight *taṃkas* [of copper are lost].

Thus the loss.

Loss of silver: 4 *māṣas* in 1000 *tolas* (= 12000 *maṣas*): the loss is 0.033%.
Loss of gold: 1¼ *māṣas* in 1000 *tolas* (= 12000 *maṣas*); the loss is 0.014%.
The last line is not clear. *Dramma* is not a weight but the name of a coin, or rather a monetary unit in Pherū's times. From *v.* 136 below, we learn that the *iggāṇī* coin was the *dramma*-equivalent in Pherū's time, that all transactions are done in terms of this coin, that it weighed 1 *ṭaṃka* (= 3.668 g) and that 100 coins contain 950 *taṃkas* copper and 50 *ṭaṃkas* silver. Does our verse mean that when 1000 coins are melted or minted, 8 *ṭaṃkas* of the 950 *ṭaṃkas* of copper are lost?

6.0 Prices of Metals (*maulya*)

cahu saya ṭhuttari kaṇao cahu saya vattīsa kaṇaya ṭaṃko ya |
tevanni saḍḍha ruppaü saṭṭhi ṭakaü nāṇaü tivanne ‖ 44 ‖
tolikkassa salūṇī dammihi vattīsi caü hu kāyariyaṃ |
ruppassa kharaḍi sīsasya pamāṇi chaha ṭaṃka dammikke ‖ 45 ‖
sīsassa malī sīsassa addhaye taha ya ḍaüla kharaḍi puṇo |
lohaddhi loha kakkara iya agghaṃ tera vāsaṭṭhe ‖ 46 ‖
ruppaya kaṇaya tidhāuya iya tiya muddāṇa mulla dammehiṃ |
vanniya tulla pamāṇe sesa du dhāūya ṭaṃkeṇa ‖ 47 ‖
nāṇā muddāṇa kae jārisu ṭaṃko pamāṇio hoi |
ṭaṃkeṇa teṇa mullaṃ gaṇiyavvaṃ sayala muddāṇaṃ ‖ 48 ‖
bhaṇisu hava nāṇavaṭṭaṃ dammittihi jāma ittiyaṃ muddaṃ |
iya aggha pamāṇeṇaṃ ittiya muddāṇa kaïṃ mullaṃ ‖ 49 ‖
rāsiṃ tigāi guṇiyaṃ majjhima hariūṇa bhāu jaṃ laddhaṃ |
taṃ tāṇa muṃda mullaṃ na saṃsayaṃ bhaṇaï pheru tti ‖ 50 ‖
‖ *iti maulyaṃ* ‖

44. [One *tolā* of unwrought] gold [costs] 478 [*drammas*]; [one] gold *Ṭaṃka* [which also weighs 1 *tolā*] 432 [*drammas*]; [one *tolā* of unwrought] silver 53 ½ [*drammas*]; and 60 *ṭaṃkas* of *nāṇā* [silver] 53 [*drammas*].

45. One *tolā* of *salūṇī* [costs] 32 *drammas,* and [one *tolā* of] *kāyariya* 4 [*drammas*]. The *kharaḍi* of silver, on the basis of the lead content (*sīsassa pamāṇi*), [costs] 6 *ṭaṃkas* (= 2 *tolas*) per *dramma.*

46. The *malī* of lead [fetches] half [the price] of lead, so also the *ḍaüla karaḍi* (?). *Lohakakkara* (?) [fetches] half the price of iron. Their prices are 13 and 62 (Does this mean that lead is 13 *tolas* per *dramma* and iron 62 *tolas* per *dramma*?)

1 *tolā* of unwrought gold	478 *drammas*
1 gold *Ṭaṃka* (i.e. 1 *tolā* of minted gold)	432 *drammas*
1 *tolā* of unwrought silver	53.5 *drammas*
This implies a gold silver ratio of 8.94 : 1.	
60 *ṭaṃkas* (= 20 *tolās*) of *nāṇā*	
(minted silver?)	53 *drammas*

1 *tolā* of *salūṇī*	32 *drammas*
1 *tolā* of *kāyariya*	4 *drammas*
1 *tolā* of *kharaḍi*	0.5 *drammas*

47. Silver, gold and the alloy of three metals. The prices of these types of coins [will be given] in *drammas,* according to the touch (*vannī*) and weight. [The prices of] the remaining [coins] made of two metals [will be given] in [silver] *ṭaṃkas.*

In *vv.* 62-67 the prices of the triple alloy coins are given in *Jaithal* and once in *Ṭaṃkas.* It will be shown under *v.* 72 that 60 *drammas* = 48 *jaithalas* = 1 silver *Ṭaṃka.*

48. Having converted [a part of] the coins into *nāṇā* silver, whatever *ṭaṃka* becomes the standard (?), with that *ṭaṃka* the price of all the coins should be calculated.

6.1 Money Exchange

49. Now I shall explain the principles of money exchange (*nāṇavaṭṭa*). If for so many *drammas* so many coins [can be bought], by this standard rate (*aggha-pamāṇeṇaṃ*), what will be the price of so many coins?

Cf. GSK 1.65: "Now I shall explain *nāṇavaṭṭa.* nine coins fetch twenty-five *Drammas.* By this standard rate, what is the price of sixteen coins?"

Nāṇavaṭṭa, exchange of coins, from which the modern surname *nāṇāvaṭī.*

50. Multiply the given price (*rāsi*) by the third term (*tigāi,* Skt. *tṛtīyena* or *trikena*) [the number of coins whose price is mentioned] and divide by the middle term (*majjhima*) [the given number of coins]; the quotient obtained by this division (*bhāujaṃ,* Skt. *bhāgajam*) is the price of these coins, without doubt, says Pherū.

Thus the prices.

a Drammas fetch *b* coins

c coins cost *n Drammas.*

$n = a \times c \div b$ or *rāsi* x *tiga* ÷ *majjhima.*

But correctly speaking, *b* is the first term (argument) and *a* the middle term (fruit) of the rule of three (*trairāśika*). But in *v.* 49, Pherū reverses their order when he states "if for so many *drammas* so many coins can be bought" instead of saying "if

so many coins cost so many *Drammas*". Hence the confusion. The proposition is correctly stated in GSK 1.63 (rule) and 65 (example). 1.63:

āi aṃtekajāī ṭhavijjae annajāi majjheṇa |
aṃtena majjhi guṇiyaṃ āimabhāgaṃ tirāsiyagam ‖

"The first and the last terms are of like denomination. The middle term is of a different denomination. Multiply the last with the middle term and divide by the first term. This is the Rule of Three."

PART TWO: COIN CATALOGUE

atha mudrā yathā —

Now the [description of individual] coins.

7.0 Silver Coins (*rūpyamudrā*)

savā igavanna dammihiṃ puttaliyā khīmalīya caütīse |
tolā ikku kajāniya vāvani ādaniya igavanne ‖ 51 ‖
rīṇī je muddā laga sa tihā guṇacāsi tolao tevi |
saḍḍhaḍayāla ruvāī khurājamī saḍḍha paṃcāse ‖ 52 ‖
vāliṭṭha pāu ovama ruppamayā tinni hoṃti tihu tulle |
saṭṭhu saü asī cattā tolā ikko ya vāvanno ‖ 53 ‖
siri devagiriu vanno siṃghaṇu tulleṇa māsao ikko |
sataraha visuvā saḍḍhā ruppaü tārāya māsaddho ‖ 54 ‖
annaṃ jaṃ ji karāriya khaṭṭālaga narahaḍāï rīṇīya |
tahaṃ sayala diṭṭhi mullu ahavā cāsaṇiya aggimuhe ‖ 55 ‖[94]
‖ *iti rūpyamudrā* ‖

51. [The price of] *Puttaliyā / Pūtalī* is fifty-one and a quarter *Drammas*; of *Khīmalīya / Khīmalī* thiry-four [*Drammas*]. *Kajāniya / Kajanī* is one *tolā* [in weight and fetches] fifty-two [*Drammas*], and *Ādaniya / Ādanī* fifty-one [*Drammas*].

52. *Rīṇī* coins are of three types. They also weigh 1 *tolā* each. *Rīṇī* [fetches] forty-nine [*Drammas*], *Rūvāī / Ruvāī* forty-eight and a half [*Drammas*], and *Khurājamjī* fifty and a half [*Drammas*].

53. *Vāliṭṭha / Vāliṣṭa* coins are made of silver in three weights, namely quarter, half and 1 *tolā* [respectively and are priced at] one hundred and sixty, eighty, and forty [pieces] for fifty-two [*Drammas*].

---

[94] There is some variation in the coin names as they occur in the verses and in the tables. Perhaps those in the tables are the correct forms, those in the verses being slightly modified to suit the metre. In the translation of the verses, both the forms will be given, first from the verses and then from the tables. In the commentary, we shall use the forms from the tables.

It is difficult to construe this verse with its confusing syntax. The translation is based on the table. If the coins weighing 1 *tolā* each are priced at 40 pieces for 52 *dr*, a single coin would be valued at 1.3 *dr*. Since the standard silver costs 53 *dr* per 1 *tolā* (cf. 44 above), these coins should contain merely about 2.45% silver and should have been included in the bimetallic coins (73 ff. below).

54. *Siṃghaṇu / Sīghaṇa* from the glorious Devagiri is one *māṣa* in weight. [The fineness of] silver is seventeen and a half *visuvas. Tārā* is half a *māṣa* in weight.

55. Other *Rīṇī* coins like *Karāriya / Karārī, Khaṭṭālaga / Khaṭiyālaga, Narahaḍa* etc. should be priced according to their appearance or by melting a sample.

Thus the silver coins.

Ādanī must be a coin from Aden and *Khurajamī* a coin from Khwarizm. *Sīghaṇa* is probably a coin issued by Siṅghaṇa Yādava of Devagiri who ruled between *ca.* 1200-1247. For his gold coins, see *vv.* 59-61 below. Other coin names are obscure. The word *Rīṇī* occurs in *vv.* 11, 42, 52, 55, but it is not certain whether it is the name of a certain type of coins or of a grade of silver.

Table 1a

pūtali	*to◦*	*51*|
khīmalī	◦	*34*
kajānī	◦	*52*
ādanī	◦	*51*
rīṇī mudrā	◦	*49*
ruvāī	◦	*48*‖
khurājamī	◦	*50*‖
vāliṣṭa	*ji 3*	
prati	*52*	
160	*vā. 1*	
80	*vā. 1*	
40	*vā. 1*	
sīghaṇamudrā	***S** 04*	
tārā mā◦ ‖	***S** 02*	
rīṇī khaṭiyā laga narahaḍādi		
karārī ete dṛṣṭi athavā		
casanī pramāṇe mūlyaṃ |		

Verse 54 does not mention the price of *Sīghaṇī* but only the weight and the degree of fineness at 17 ½ *visuvas*; this value is represented in the table as ***S*** 04. The weight of *Tārā* is mention as ½ *māṣa* which is represented in the table as *mā◦* ‖ ***S*** 02. I do not understand the use of the symbol ***S*** here.

Table 1b (Silver Coins)

S.no.	Verse no.	Coin name	Silver grade in *visuvas*	Wt *to, ṭ, m*	Wt grams	Price in *Drammas*
1	51	*Pūtalī*	-	-		51.25
2	51	*Khīmalī*	-	-	-	34
3	51	*Kajānī*	-	1 *to*	11.003	52
4	51	*Ādanī*	-	-	-	51
5	52	*Rīṇī*	-	1 *to*	11.003	49
6	52	*Ruvāī*	-	1 *to*	11.003	48.5
7	52	*Khurājamī*	-	1 *to*	11.003	50.5
8	53	*Vāliṣṭa* 1	-	0.25 *to*	2.751	52/160
9	53	*Vāliṣṭa* 2	-	0.5 *to*	5.502	52/80
10	53	*Vāliṣṭa* 3	-	1 *to*	11.003	52/40
11	54	*Sīghaṇa*	17.5	1 *m*	0.917	4
12	54	*Tārā*	17.5	0.5 *m*	0.458	2
13	55	*Rīṇī Karārī*	-	-	-	-
14	55	*Rīṇī Khaṭiyālaga*	-	-	-	-
15	55	*Rīṇī Narahaḍa*	-	-	-	-

8.0 Gold Coins (*svarṇamudrā*)

kaṇaya maya sīyarāmaṃ duvihaṃ saṃjoya taha vioyaṃ ca |
daha vannī dasa māsā abhannaṇīyā sapūyavarā ‖ 56 ‖
caükaḍiya taha sirohiya aṭṭhī vannī savā caü mmāsā |
tulle kumaru puṇevaṃ aṭṭhī vannī dhuvaṃ jāṇa ‖ 57 ‖
paümābhihāṇa muddā vāraha vannī ya tassa kaṇao ya |
tulleṇa ṭaṃku ikko satta javā sola visuvaṃsā ‖ 58 ‖
devagirī hemacchū savādasī siṃghaṇī mahādevī |
ṭhāṇakara lohakuṃḍī aṭṭhī vāṇakara paüna dasī ‖ 59 ‖
khaggadhara cukkharāmā saḍḍhanavī kesarī ya chaha saḍḍhā |
satta java dasī vannī kaülādevī viyāṇāhi ‖ 60 ‖

je anni acchu vahuviha tharehi taha mullu tullu najjeï |
caümāsā dīnāro jahiccha vannī ṇusāri phalo ‖ 61 ‖
‖ *iti svarṇamudrā* ‖

56. *Sīyarāma / Sītārāma* coins made of gold are of two types. *Saṃjoya / Saṃyogī* and *Vioga / Viyogī.* [The fineness is] ten *vannī* [and weight] ten *māṣas.* These [coins] should not be melted but worshipped.

Coins bearing the figures of Rāma and Sītā together (*saṃyogī*?) or separately (*viyogī*?) were probably issued by several kings at various times (likewise also coins bearing the figure of Padmā., i.e. Lakṣmī, see 58 below). It is not known who issued the coins referred to here. But it does suggest that Rāma worship is popular at this period. Akbar also issued a coin with the figures of Rāma and Sītā and the Nāgarī legend *siyarāma.*[95]

57. *Caükaḍiya / Caükaḍiyā* and *Sirohiya / Sirohiyā* are of eight *vannī* gold and weigh four and a quarter *māṣas* each. *Kumaru / Kumaru Tihuvaṇagiri* has the same weight and is of eight *vannī* gold.

58. The coin called *Paüma / Padamā* is of twelve *vannī* gold. Its weight is 1 *ṭaṃka,* 7 *javas,* 16 *visuvaṃsas.*

See 62 below for *Paüma* made of tri-metallic alloy issued from Varanasi.

59. Of the *Acchū / Āchū* gold coins of Devagiri, *Siṃghaṇī / Siṃghaṇa* and *Mahādevī* contain ten and a quarter *vannī* gold; *Ṭhanakara / Ṭhāṇakara* and *Lohakuṃḍī* have

60. eight *vannī* gold; and *Vāṇakara / Rāmabāṇa* ten less by a quarter *vannī* gold. *Khaggadhara Cukkharāma / Khaḍgadhara Cokhīrāma* has nine and a half *vannī* gold; *Kesarī* six and half *vannī* gold, and *Kaülādevī / Kauladevī,* you know, seven *java* and ten *vannī.*

61. Other *Acchū* coins with various degrees of fineness (*bahuviha tharehi*), whose value and weight are not known (*najjei*?), should be priced according to the fineness of

---

95 Cf. Gupta 1969, p. 119; pl. xxvi, no. 280; Mitchiner 2000.

gold, [by comparing the with] the [gold] *Dīnāra* weighing four *māṣas* [of ‘Ala’u-d-dīn Khaljī, see 137 below].

Thus the gold coins.

Caükaḍiya means a square coin, but issued by whom? For, *Kumaru* the table has *Kumaru Tihuvaṇagiri*, i.e. issued by Kumārapāla of Tribhuvanagiri. According to Jinapāla, pp. 19-20, Jinadatta Sūri preached to Kumārapāla at Tribuvanagiri some time before the former’s death in VS 1211= AD 1154, and at that time Tribhuvanagiri was a centre of Jainism. This town has been identified with modern Tahangarh, 24 miles north of Karauli.[96]

Āchū / Acchū seems to be a generic name for a certain type of coins.

Siṃghana of Devagiri ruled *ca.* 1200-1247 and his grandson Mahādeva from 1261 to 1270/71 (Majumdar 1975, pp. 193-96). *Siṃghaṇī* and *Mahādevī* were issued by these two kings respectively. Mahādeva was succeeded by his nephew Rāmacandra whose last known date is 1311. ᶜAla’ al-Dīn Khaljī invaded Devagiri in 1294. Perhaps the coin called *Vāṇakara / Rāmabāṇa* (representing Rāma with a bow and arrows) and Khaggadhara Cukkharāma (Rāma with a sword) were issued by this Rāmacandra. See Gupta 1969, pl. xix, no. 203, for his gold coin with the legend ‘*śrīrāma*’. *Cukkha / cokkha* occur often in the RP in the sense of ‘pure’.

On Kaüladevī (Skt. Kamalādevī), see Majumdar 1975, p. 81: “Sāraṅgadeva … was succeeded by his nephew Karṇa, son of Rāma, in A.D. 1296. In A.D. 1299 Ulugh Khān and Nusrat Khān, two generals of ‘Alā-ud-dīn Khalji, wrested the whole of Gujarat from Karṇa and captured the queen Kowladevi (Kamaladevī) who was subsequently admitted into the harem of ‘Alā-ud-dīn.” Karṇa ultimately found refuse in Devagiri. Is this coin somehow connected with this queen?

It may be noted that the majority of the non-Sultanate gold coins in circulation are from Devagiri, or those carrying divine figures and used for worship.

---

96 Cf. Majumdar 1957, p. 56: “Tāj-ul-Ma’āsīr states that in AD 1196 Mu’izz-ud-dīn Muhamad Ghūrī defeated Kunwarpāla, the Rai of Thangarh (Tahangarh), and handed the fort over to Bahā-ud-dīn Tughril.”

Table 2a

vā◦ 10 sītārāma māsā 10
1. saṃyogī 1 viyogī
vānī 8 caükaḍiyā 4|
vā◦ 8 sirohiyā 4|
vā◦ 8 kumaru Tihuṇagiri māsā 4|
*vā◦ 12 padamā ṭaṃ◦ 1 java 7 **S** o|||o*

In this table 2, *vā°* stands for *vānī,* the degree of fineness of gold. According to *v.* 58, the coin *Paümā* has a fineness of 12 *vānī* and weight of 1 *ṭaṃka*, 7 *javas* and 16 *visuvaṃśas.* In the table "16 *visuvaṃśas*" are represented by ***S*** o\|\|\|o. I am unable to understand the use of the symbol ***S*** here.

Table 3a

āchū devagirī mudrā svarṇamaya
vānī thiurāpramāṇe (?)
10| siṃghaṇa
10| mahādevī
8 ṭhāṇakara
8 lohakuṃḍī
9||| rāmabāṇa
9|| khaḍgadhara. coṣīrāma
6|| kesarī
10 ja 7 kauladevī
◦ dīnāru mā. 4

Tables 2 - 3 b (Gold Coins)

S.no.	Verse no.	Coin name	Grade in *vannī*	Wt. *to* etc	Wt. in grams	King who issued the coin
16	56	*Sītārāma Saṃyogī*	10	10 *m*	9.169	
17	56	*Sītārāma Viyogī*	10	10 *m*	9.169	
18	57	*Caükaḍiyā*	8	4.5 *m*	4.126	
19	57	*Sirohiyā*	8	4.5 *m*	4.126	
20	57	*Kumaru*	8	4.5 *m*	4.126	Kumārapāla of Tahangarh
21	58	*Padamā*	12	1*t*,7*j*,16*v*	4.113	
22	59	*Siṃghaṇa*	10.25	-	-	Siṅghana of Devagiri

23	59	*Mahādevī*	10.25	-	-	Mahādeva of Devagiri
24	59	*Ṭhāṇākara*	8	-		
25	59	*Lohakuṃḍī*	8	-		
26	59	*Rāmabāṇa*	9.75	-		Rāmacandra of Devagiri
27	60	*Khaḍgadhara Chokhīrāma*	9.5	-		Rāmacandra of Devagiri
28	60	*Kesarī*	6.5	-		
29	60	*Kaüladevī*	10 7/16	-		

9.1 Trimetallic Coins

vāṇārasīya muddā paüimā nāmeṇa ikki saya majjhe |
tinneva dhāu tulle tolā saïtīsa jāṇeha ‖ 62 ‖
paṃca java hīṇa vāraha vannī kaṇao ya ṭaṃka igayālā |
chattīsa amala ruppaṃ taṃbaṃ caütīsa ṭaṃkevaṃ ‖ 63 ‖
ikki paümassa majjhe ruppa kaṇaya taṃba māsaokikko |
satta daha paṃca java kami sunna caü panara visuvahiyā ‖ 64 ‖
iya egi paüma tullo muṇi 7 java visuvaṃsa sola ṭaṃku igo |
jāṇeha tassa mullo jaïthala uṇasaṭṭhi aha saṭṭhī ‖ 65 ‖

62. The coin from Varanasi called *Paüma / Padama* is [made] of three metals. One hundred coins weigh thirty-seven *tolas,*

63. and contain forty-one *ṭaṃkas* of gold of fineness eleven *vannī* eleven *java*; thirty-six *ṭaṃkas* of pure silver and thirty-four *ṭaṃkas* of copper.

64. In each *Paüma,* there are silver, gold and copper one *māṣa* each plus seven, ten and five *javas,* and zero, four and fifteen *visuvas* respectively.

65. The weight of a single *Paüma* is one *ṭaṃka,* seven *javas,* sixteen *visuvaṃsas.* Know that its price is fifty-nine or sixty *Jaithalas.* [97]

---

[97] For a trimetallic coin with the image of *Lakṣmī* on the obverse, issued by Govinda-candra (ca. 1114-1154), the Gahadavala ruler of Varanasi, see Deyell 2017, p. 118.

Table 4a

◦ padamā 100 madhye dhatu 3 ṭaṃka 111
ṭaṃ 41 sonā vānī 11 java 11 cīpā
ṭaṃ 36 rūpā coṣā navātī viśvā 20
ṭaṃ 34 tāṃbā coṣā amala pradhāna

Table 4b

100 Padmā coins contain 3 metals
[weigh] 111 *ṭaṃkas* = 37 *tolas* = 407.111 g
41 *ṭaṃkas* (150.388 g) of gold with a purity 11 *vannī 11 java*
36 *ṭaṃkas* (132.048 g) of pure (*cokhā,* coṣā) of purity 20 *visuvas*
34 *ṭaṃkas* (124.712 g) of copper, pure (*coṣa),* faultless (*amala*)

The significance of the three terms *cīpā, navatī* and *pradhāna,* in connection with gold, silver and copper respectively, metals eludes me.

Table 5a

◦ padamā 1 saṃtolye ṭaṃ 1 java 7 ***S*** *o‖‖1*
māsā 1 ja 7 ***S*** *o‖‖ rūpā cokhā‖*
māsā 1 ja 10 ***S*** *4‖‖ 1 kanaka cokhāḥ‖*
māsā 1 ja 5‖‖ o ***S*** *4 tāṃbā nirmala*

While Table 4 gives the weights in 100 specimens, Table 5 shows the weight of a single coin and those of gold, silver and copper in 1 coin. In this table, 16 *visuvas* is shown as ***S*** *o‖‖1,* 4 *visuvas* as ***S*** *4‖‖ 1* and 5 *javas* 15 *visuvas* as *ja 5* ***S*** *‖‖ o* ***S*** *4.* I am unable to understand the use of the symbol ***S*** in all these three cases.

Table 5b

		Grams
Wt. of the coin	4 *māṣa* 7 *Java* 16 *visuva*	4.115 g
Gold	1 *māṣa* 10 *java* 4 *visuva*	1.499 g
Silver	1 *māṣa* 7 *java* 0 *visuva*	1.316 g
Copper	1 *māṣa* 5 *java* 15 *visuva*	1.247 g
Total of three	4 *māṣa* 6 *java* 19 *visuva*	4.062 g

It may be noted that the sum of the three components is slightly less than the actual weight of the single coin.

bhagavā tidhāu saṃbhava paüimā sama tulla vivihamullā ya |
bhagavaṃ dasaṇiya nāme kāriya jiyasatta rāyassa ‖ 66 ‖

66. *Bhagavā* [coins] made of three metals are of the same weight as the *Paüimā* but are of different values. These good-looking (*dasaṇiya*) [coins] are issued by King Jiyasatta (Skt. Jitaśatru) in the name of Bhagavā (deity).

The second line seems to suggest that these coins carry the image of some deity and therefore are to be seen (*dasaṇiya,* Skt. *darśanīya*), that is to to say, that these are to be worshipped and not melted.

Table 6a

bhagavā nānāvidha maulya mudrā 11 tolye māsā 4 java 7 bhagavaṃta nāme jitasatra nṛpa kāritaṃ ‖

Table 6b

Bhagavā coins are of 11 [types] with different values. Weight 4.067 grams. In the name of deity, caused to be made by King Jitasatra.

According to the table, there are 11 types of coins in this series. The weight is the same as that of the *Paüimā.* Verse 65 states that a single *paüimā* weighs 1 *ṭaṃka,* 7 *javas* and 16 *visuvas.* But the weight of *Bhagavā,* according to the table, is only 4 *māṣas* (= 1 *ṭaṃka*) and 7 *javas.* Neither the text, nor the table, gives the price of these Bhagavā coins or their gold content.

mudda vilāīkoraṃ māsā nava tulli tinni dhāū ya |
taṃbaṃ divaḍḍha māsaṃ sesa kaṇaya ruppa addhaddhaṃ ‖ 67 ‖
paüṇa ti ṭaṃkā mullaṃ imassa sesāṇa kamiṇa pāūṇaṃ |
jā pāya ṭaṃkao hui ikkārasa mudda tulli samā ‖ 68 ‖

67. *Vilāīkora* coin is nine *māṣas* in weight and is made of three metals. [There are eleven coin types in this series and the first one contains] one and a half *māṣas* copper, the rest is gold and silver in equal parts.

68. Its price is three [silver] *Ṭaṃkas,* less by a quarter; [the prices] of the rest [are obtained by] diminishing [the first price] by a quarter [*Taṃka*] each time successively up to one quarter *Taṃka.* These eleven coins are of equal weight.

Table 7a

vilāī kora mudrā 11 tolye
māsā 9 mūlye ṭaṃkā ***S*** *2‖‖* ***S*** *2‖* ***S*** *2|* ***S*** *2*
S *1‖‖* ***S*** *1‖* ***S*** *1|* ***S*** *1* ***S*** *o‖‖* ***S*** *o‖* ***S*** *o|*

In this table the symbol ***S*** is employed to denote 1 silver *Ṭaṃka.*

Table 7b

Vilāīkora coins, 11 types
Weight of each 9 *māṣas.*
Respective prices 2¾, 2½, 2¼, 2, 1¾, 1½, 1¼, 1, ¾, ½, ¼ silver *Ṭaṃkas.*

The name *vilāīkora* and the provenanvce of this series remains obscure. All the 11 types in this series weigh 9 *māṣas* each (= 8.253 g) but contain different proportions of the three metals. Thus the first in the series contains gold 3¾ *māṣas* (= 3.439 g), silver 3¾ *māṣas* (= 3.439 g) and copper 1½ *māṣas* (1.376 g). Its price is 2¾ silver *Ṭaṃkas*. The other ten types of the series contain gradually diminishing amounts of gold and silver, their prices going down from from 2½ to ¼ silver *Ṭaṃkas.*

9.2 Coins of Mahoba

māhovayassa muddā tullo ikkassa saḍḍha caü māsā |
saṃjoya tinni dhāū pihu pihu nāmehi taṃ bhaṇimo ‖ 69 *‖*
ruva kaṇaya guṃja caü caü taṃbaü guṇavīsa vīravaṃbho ya |
mullu caüvīsa jaïthala hīrāvaṃbhassa vāvīsaṃ ‖ 70 *‖*
taṃbu aḍhāi māsā ruppu suvanno ya ikku ikko ya |
tiyaloyavaṃbha mullaṃ chattīsaṃ viviha bhojassa ‖ 71 *‖*

69. The Coins of Mahoba (*mahovaya*) weigh four and a half *māṣas* (= 4.127 g) each and are made of three metals. We shall describe them by their separate names.

70. *Vīravaṃbha / Vīraviramu* contains four *guṃjas* each of gold and silver and nineteen *guṃjas* copper. Its price is twenty-four *Jaithalas.* The price of *Hīravaṃbha / Hīravaramu* twenty-two *Jaithalas.*

71. *Tiyaloyavaṃbha / Trilokavaramu* contains two and a half *māṣas* of copper, one *māṣa* each of silver and gold. Its price is thirty-six [*Jaithalas*]. Bhoja's [coins are of] various [weights and prices].

Table 8a

24 vīravaramu		*māsā 4‖*	*tṛdhātu*
◦ sonaü		*◦ rūpaü*	*trāṃbā*
◦ rātī	*4*	*◦ rātī 4*	*rā. 19*

Vīravaramu: gold 4 *guṃjas* (= *ratti*), silver 4 *guṃjas,* copper 19 *guṃjas,* total weight 27 *guṃjas* or 4½ *māṣas.* Price 24 *Jaithal.*

Table 9a

22	*hīravaramu*	*māsā 4‖*	*tṛdhātu*	
◦	*◦ sonaü*	*rūpaü*		*tāṃbā*
◦	*◦ rā. 3‖‖*	*rā. 3‖‖*	*19‖*	

Hīravaramu: the text does not give the metal content, but the table does: gold 3 ¾ *guṃjas,* silver 3 ¾ *guṃjas,* copper 19 ½ *guṃjas.* Total weight 27 *guṃjas.* Price 22 *Jaithal.*

Table 10a

36	*trilokavaramu*	*1*	*māsā*	*4‖*	*mā.*
◦	*mā 1 sona mā 1 rūpau mā 2‖*				*tāṃbā*

Trilokavaramu: gold and silver 1 *māṣa* each, copper 2 ½ *māṣas.* Total weight 4 ½ *māṣas,* or 27 *guṃjas.* Price 36 *Jaithal.*

Table 11a

◦ bhoja nānā taulya vividha mūlya
◦ tṛdhātu saṃbhava

Trailokyamalla Caṇḍela, son of Paramārdī, ruled Kālañjara from *ca.* 1205 to 1241 and was succeeded by his son Vīravarman who ruled between *ca.* 1254 and 1285

or 1288. He was succeeded by Bhojavarman, probably his son, who reigned for a short time. His brother Hammīravarman succeeded him in 1289 and ruled at least up to 1308. The coins *Trilokavaramu and Vīravaramu* refer to Trailokyavarman and his son Vīravarman. Bhoja mentioned in 71 must be Bhojavarman. Does *Hīravaramu* refer to Hamīravarman? There does not seem to be a king named Hīravarman in this line. Surprisingly Pherū does not list these coins chronologically, which he otherwise does. He refers to these coins as the coins of Mahoba. The town Mahobā belonged to the kingdom of Kālañjara. Was it a mint town?

vallaha tiya kami dhāū ruppa kaṇaya guṃja aṭṭha paṇa ahuṭṭhaṃ |
taṃbu bhava 11 satara 17 vīsaṃ 20 mulle cālīsa tīsa vīsa dhuvaṃ || 72 ||
|| *iti tridhātumiśritamudrāḥ* ||[98]

72. There are three *Vallaha / Vālambha* coins, containing respectively eight, five, and three and a half *guṃjas* of both gold and silver, and eleven, seventeen and twenty *guṃjas* of copper. Their prices are forty, thirty and 20 [*Jaithals* respectively].

Thus the coins of three metals.

Table 12a

Vālambha		*māsā*	*sonā*	*rūpā*	*tāṃbā*
40	*1*	*4*‖	*rā. 8*	*rā. 8*	*rā. 11*
30	*1*	*4*‖	*rā. 5*	*rā. 5*	*rā. 17*
20	*1*	*4*‖	*rā. 3*‖	*rā. 3*‖	*rā. 20*

The name *Vallaha / Vālambha* is obscure. It is interesting that in these tri-metallic coins, the proportion of gold and silver is generally the same. All the three coin types in this series weigh 27 *guṃjas* each, but with declining proportion of gold and silver and consequently the price. The weight unit *guṃja* (or *rattī*) is not mentioned elsewhere, but only in verses 70, 72 and 142 and in tables 8, 9, 12 and 142. Here the total weight of a coin is 4 ½ *māṣas* = 27 *gunjas.* Therefore 12 *maṣas* = 1 *tolā* = 12 x 27 x 9/2 = 60 *guṃjas*.

---

98 Cf. Deyell 2018.

Although *v.* 47 states that the price of the gold coins, silver coins and tri-metallic coins will be stated in *Drammas*, here the prices of the triple-alloy coins are given in *Jaithalas,* and once in *Ṭaṃkas.*

Tables 4 - 12b (Trimetallic coins)

S.no.	Verse no.	Coin name	Wt. in Grams	Proportion gold: silver: copper	Price
30	62-65	*Padamā*	4.071	1 : 0.873 : 0.829	59 or 60 *Jaithal*
31	66	*Bhagavā*	4.071		
32	67-68	*Vilāīkora*	8.252	1 : 1 : 0.4	2.75 *Ṭaṃkas*
33	70	*Vīravaramu*	4.127	1 : 1 : 4.75	24 *Jaithal*
34	70	*Hīravaramu*	4.127	1 : 1 : 5.2	22 *Jaithal*
35	71	*Trilokavaramu*	4.127	1 : 1 : 2.5	36 *Jaithal*
36	71	*Vālambha* 1	4.127	1 : 1 : 1.375	40 *Jaithal*
37	71	*Vālambha* 2	4.127	1 : 1 : 3.4	30 *Jaithal*
38	71	*Vālambha* 3	4.127	1 : 1 : 5.714	20 *Jaithal*

10.0 Billon Coins

atha dvidhātu-mudrāḥ —
je tolā je māsā ji ṭaṃka ullaviya sayala muddehiṃ |
taṃ sayamajjhe ruppaü jāṇijjahu sesa taṃbo ya ‖ 73 ‖

Now the billon (silver + copper) coins

73. Whatever *tolās,* whatever *māṣas* or whatever *ṭaṃkas* are mentioned for all the coins [below], these should be understood as the weight of the silver in one hundred [specimens], the rest being copper.

10.1 Coins of Khorasan

khurasāṇa desa saṃbhava cinhakkhara pārasīya turukīya |
taṃbaya ruppa du dhāū imehi namehi jāṇeha ‖ 74 ‖
bhaṃbhaï ya egaṭippī sikaṃdarī kurulukī palāhaürī |
sammosīya lagāmī peri jamālī masūdīyā ‖ 75 ‖
saya mudda majjhi ruppaü ti caü ti du igega du du iga du tolā |
suna 0 ti 3 suna 0 cha 6 du 2 savāpaṇa 5| cha 6 du 2 saḍhanava 9‖

paüṇa dui 1||| māsā ‖ 76 ‖
caütīsaṃ tevīsaṃ caütīsigayāla asī saṭṭhi kame |
igayāla sattayālaṃ paṇapanna 'ḍayāla ṭaṃkikke ‖ 77 ‖
‖ *iti khurasāṇī-mudrāḥ* ‖ *vivaraṃ jantreṇāha* —

74. The coins from Khorasan bear Persian or Turkish symbols (*cihna*) and letters (*akkhara*) on them and are made of silver and copper alloy. Know these by [the following] names:

75. *Bhaṃbhaï / Bhāmbhaï, Egaṭippi / Igaṭippī, Saikandarī, Kurulukī, Palahaürī / Palāhaürī, Sammosīya / Samosī, Lagāmī, Peri / Perī, Jamālī, and Masūdīya / Masūdī Karārī.*

76. In one hundred coins [the weight of] silver is three, four, three, two, one, one, two, two, one, two *tolās*; and zero, three, zero, six, two, five and a quarter, six, two, nine and a half, and one and three quarters *māṣas* [respectively].

77. [Their prices are] thirty-four, twenty-three, thirty-four, forty-one, eighty, sixty, forty-one, forty-seven, fifty-five and forty-eight coins per one *Ṭaṃka.*

Thus the coins of Khorasan. The details (*vivaraṃ*) are shown in the table (*jaṃtra*).

Some of the coin names refers to rulers Sikandar, Jamāl and Masūd. *Kurulukī* may refer to Qarlagh, viz., Saifu-d-dīn al-Ḥasan Qarlagh (1239-1249) and his son Nāṣiru-d-dīn Muḥammad Qarlagh 1249. According to Wright 1907, pp. 183-186, the silver coin issued by the former weighs 170 grains and the billon coin 55-53 grains. These coins were apparently struck in India; the copper coins issued by the father carry the legend in Nāgarī *śrī hasaṇa karalaka* and the billon coins issued by the son *śrī mahamada karaluka.* Weights of single coins are not mentioned.

Table 13a

34	*Bhāṃbhaï mudrā*	*100 madhye rūpā*	*to 3*	*mā. 0*
23	*Igaṭīpī*	*100 madhye rūpā*	*to 4*	*mā. 3*
34	*Sikaṃdarī*	*100 madhye rūpā*	*3*	*mā. 0*
41	*Kurulukī*	*100 madhye rūpā*	*2*	*mā. 6*
80	*Palāhaurī*	*100 madhye rūpā*	*1*	*mā. 2*
60	*Samosī*	*100 madhye rūpā*	*1*	*mā. 5*|
41	*Lagāmī*	*100 madhye rūpā*	*2*	*mā. 6*
47	*Perī*	*100 madhye rūpā*	*2*	*mā. 2*
55	*Jamālī*	*100 madhye rūpā*	*1*	*mā. 9* ‖
48	*Masūdī Karārī*	*100 madhye rūpā*	*2*	*mā. 1* ‖‖

Table 13b

S.no.	Verse no.	Coin name	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
39	75-77	*Bhāṃbhaï*	33.009 g	34
40	75-77	*Igaṭīpī*	46.763 g	23
41	75-77	*Sikaṃdarī*	33.009 g	34
42	75-77	*Kurulukī*	27.508 g	41
43	75-77	*Palāhaurī*	12.837 g	80
44	75-77	*Sammosī*	15.817 g	60
45	75-77	*Lagāmī*	27.508 g	41
46	75-77	*Perī*	23.84 g	47
47	75-77	*Jamālī*	19.485 g	55
48	75-77	*Masūdī Karārī*	23.611 g	48

10.2 Aṭhanārī Coins

avadallī taha kutulī tulli savā paṇa du māsiyā mulle |
saṭṭhi asī taha ruppaṃ du du java caü sola vivakamme ‖ 78 ‖

78. *Avadullī / Abadullī* and *Kutulī* weigh five and a quarter and two *māṣas* [respectively and their] prices are sixty and eighty [per *Ṭaṃka*]. The silver [content] is two and two *javas,* and four and sixteen *visuvas* respectively.

Thus the *Aṭhanārī* coins.

The name *Aṭhanārī* may refer to some region which cannot be identified; likewise *Avadullī* may refer to a ruler Abdulla who too cannot ber identied.

Table 14a

◦ *abadullī*	*1 māsā 5*|	*madhye rūpā*	*java 2* ***S*** *4*	*pra◦ 60*
◦ *kutulī*	*1 māsā 2*	*madhye rūpā*	*java 2*|||	*pra◦ 80*

The first line states that of the coin *Abadllī,* 1 [coin weighs] 5 ¼ *māṣas*; the amount of silver (*rūpā*) in the coin is 2 *javas* and 4 *visuvas*; here the symbol ***S*** indicates *visuva.* Thereafter, the price of the coin is shown as *pra◦ 60*; here *pra°* means *prati* (each). The purport of the expression is that "the price is 60 pieces per *Ṭaṃka.*" In the second line of the verse, the passage *du du java caü sola vivakamme,* should be corrected as *du du java caü sola visuva kame.* The silver content in the coin *Kutulī* is 2 *javas* and 16 *visuvas,* i.e. 2 16/20 = 2 4/5. In the table, this is shown incorrectly as 2||| = 2 ¾ .

There is also an error in the prices. The content of silver in each *Kutulī* coin is 2 *javas* and 16 *visuvas*, whereas in *Abdullī* it is 2 *javas* and 4 *visuvas*. Thus *Kutulī* has a more silver in each coin. On the basis of the silver content, it should be more expensive than *Abdullī.* Therefore, the figures in the last column should be interchanged so that the price of *Kutulī* is 60 per *Ṭaṃka* and *Abdullī* 80 per *Ṭaṃka*.

%%Table 14b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
49	78	*Abadullī*	4.814 g	0.125 g	60
50	78	*Kutulī*	1.834 g	0.16 g	80

10.3 Coins of Vikramārka

vikkama nariṃda bhaṇimo gojiggā aüṇatīsa tola ruvā |
daürāhā paṇavīsaṃ savā rume ahuṭha caü mulle ‖ 79 ‖
bhīmāhā chavvīsaṃ tolā māsaddhu cāri ṭaṃkikke |
corīmorī tolā paṇavīsaṃ mulli cāri savā ‖ 80 ‖
karaḍa taha kuṃmmarūvī kālākaccari ya chakka kari mulle |
saya majjhi aṭṭhamāsā sataraha tolā ya khalu ruppaṃ ‖ 81 ‖

79. Now we shall discuss [the coins of] King Vikrama. *Gojiggā / Gojigā* has thirty less by a quarter *tolās* silver (*ruva*) [in 100 specimens] and *Daürāhā* twenty-five and a quarter *tolās* silver (*rume*?). The price is three and a half and four [per *Ṭaṃka* respectively].

80. *Bhīmāhā* has twenty-six *tolās* and half a *māṣa* silver [in one hundred specimens and its price is] four per *Ṭaṃka. Corīmorī* has twenty-five *tolās* [silver in one hundred specimens and is priced at] four and a quarter per *Ṭaṃka.*

81. *Karaḍa, Kummaruva / Kūrmarūpī,* and *Kālākaccarī / Kālākacārī* are priced at six [per *Taṃka*]. They contain seventeen *tolās* and eight *māṣas* of silver in one hundred [coins].

Thus the coins of Vikramārka.

Vikramārka was a legendary king of Malwa; coins of Vikramārka probabkly means coins of Malwa. But some of these seem to be from Gujarat, e.g. *Daürāhā* of Durlabharāja (AD 1010-1012) and *Bhīmāha* of Bhīma I. Does the suffix *-hā* mean "belonging to?"

Table 15a

◦ *gojigā*	*100*	*madhye rūpā tolā*	*29*	*māṣa*	*9*	*prati*	*3*|
◦ *daürāhā*	*100*	*madhye rūpā tolā*	*25*	*māṣa*	*3*	*prati*	*4*
◦ *bhīmarāhā*	*100*	*madhye rūpā tolā*	*26*	*māṣa*	*0*‖	*prati*	*4*
◦ *corī morī*	*100*	*madhye rūpā tolā*	*25*	*māṣa*	*0*	*prati*	*4*|
◦ *karaḍa*	*100*	*madhye rūpā tolā*	*17*	*māṣa*	*8*	*prati*	*6*
◦ *kūrmmarūpī*	*100*	*madhye rūpā tolā*	*17*	*māṣa*	*8*	*prati*	*6*
◦ *kālākacarī*	*100*	*madhye rūpā tolā*	*17*	*māṣa*	*8*	*prati*	*6*

Table 15b

S.no.	Verse no.	Coin name	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
51	79	*Gojiggā*	327.34 g	3.5
52	79	*Daürāhā*	277.826 g	4
53	80	*Bhīmāhā*	286.537 g	4
54	80	*Corīmorī*	275.075 g	4.5
55	81	*Karaḍa*	194.387 g	6
56	81	*Kūrmarūpī*	194.387 g	6
57	81	*Kākacarī*	194.387 g	6

10.4 Coins of Gujarat

gujjaravaï rāyāṇaṃ bahuviha muddāi viviha nāmāiṃ |
tāṇaṃ ciya bhaṇimohaṃ tullaṃ mullaṃ nisāmeha ‖ 82 ‖
kumara ajaya bhīmapurī lūṇavasā ruppu ṭaṃka paṇavannā |
paṃca nava visuva mullo tulle caümāsa tera javā ‖ 83 ‖
vīsalapurīya chaha kari kuṃḍe gugguliya ṭaṃka pannāsaṃ |
ḍullahara panara tolā ahuṭṭha māsā cha saḍḍha kare ‖ 84 ‖
ajjuṇapurīya tolā vāraha saḍḍhāya mulli aṭṭha kare |
kaṭṭāriyā caüddasa tolā māsā ti satteva ‖ 85 ‖
nava kari asapālapurīgārasa tolā aḍḍhāiya māsā |
sāraṃgadeva naravaï tassa imaṃ saṃpavakkhāmi ‖ 86 ‖
soḍhalapurī cha tolā māsā aṭṭheva mullu pannarasā |
paṇa māsā daha tolā dasa kari lākhāpurī jāṇa ‖ 87 ‖

82. Of the kings of Gujarat, there are several types of coins with different names. I shall smention their weight and price. Listen now.

83. *Kumara / Kumarapurī, Ajaya / Ajayapurī, Bhīmapurī* and *Lūṇavasā / Lāvaṇasapurī* contain fifty-five *ṭaṃkas* of silver [in one hundred specimens]. Their price is five and nine-twentieths [per *Ṭaṃka*] and the weight [of a single coin] four *māṣas* and thirteen *javas*.

84. *Vīsalapurīya / vīsalapurī* coins, [namely,] *Kuṃḍe* and *Gugguliya / Gūgale,* are [priced] at the rate of (*kari*) six [per *Ṭaṃka.* One hundred specimens] contain 50 *ṭaṃkas*

of silver. *Ḍullahara / Ḍolahara* contains fifteen *tolas,* three and a half *māṣas* of silver [in one hundred coins] and its price is at the rate of (*kare*) six and a half [per *Ṭaṃka*].

85. *Ajjuṇapurīya / Arjunapurī* has twelve and a half *tolās* of [silver in one hundred pieces and its] price is eight [per *Ṭaṃka*]. *Kaṭṭāriya / Kaṭāriya* has fourteen *tolās* and three *māṣas* [silver in one hundred specimens and is priced at] seven [per *Ṭaṃka*].

86. *Asapālapurī* [is priced] at nine [per *Ṭaṃka*] and has eleven *tolās* and two and a half *māṣas* [of silver in one hundred coins]. Of King Sāraṅgadeva, I state now [his coins].

87. *Soḍhalapurī* has six *tolās* and eight *māṣas* [of silver in one hundred coins] and its price is fifteen [per *Ṭaṃka*]. *Lākhāpurī* has ten *tolās* and five *māṣas* [of silver in one hundred coins and its price is] ten [per *Ṭaṃka*], you know.

Table 16a

5|4	*Kumarapurī*	*100*	*madhye*	*tolā*	*18*	*mā◦*	*4*
5|4	*Ajayapurī*	*100*	*madhye*	*tolā*	*18*	*mā◦*	*4*
5|4	*Bhīmapurī*	*100*	*madhye*	*tolā*	*18*	*mā◦*	*4*
5|4	*Lāvaṇasāpurī*	*100*	*madhye*	*tolā*	*18*	*mā◦*	*4*
8	*Arjunapurī*	*100*	*madhye*	*tolā*	*12*	*mā◦*	*6*
6	*Vīsalapurī*	*100*	*madhye*	*tolā*	*16*	*mā◦*	*8*
	1 kuṃḍe 1 gūgale						
6‖	*Ḍolahara*	*100*	*madhye*	*tolā*	*15*	*mā◦*	*3‖*
7	*Katāriyā*	*100*	*madhye*	*tolā*	*14*	*mā◦*	*3*
9	*Āsapālapu*	*100*	*madhye*	*tolā*	*11*	*mā◦*	*2‖*
15	*Soḍhalapurī*	*100*	*madhye*	*tolā*	*6*	*mā◦*	*8*
10	*Lākhāpurī*	*100*	*madhye*	*tolā*	*10*	*mā◦*	*5*

In this table, the coins are not mentioned in the same sequence as in the text. In some cases, the text mentions the weight of silver in *ṭaṃkas,* which is converted into *tolās* and *māṣas* in the table. The weight of a single coin is 4 *māṣas* and 13 *javas* (= 4.409 g), but this is not shown in the table. The price of each of the first four coins is stated to be *paṃca nava visuva*, "five and nine-twentieths". In the table this is represented as 5|4 in the first column, where the vertical line denotes ¼ and the 4 thereafter 4 *visuvas,* i.e., 4/20. The three units together add up to 5 + ¼ + 4/20 = 5 + 9/20. It is rather a clumsy way; this could have been expressed more simply as 5 ***S*** 9.

Table 16b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
58	83	*Kumarapurī*	4.409 g	55.015 g	5.45
59	83	*Ajayapurī*	4.409 g	55.015 g	5.45
60	83	*Bhīmapurī*	4.409 g	55.015 g	5.45
61	83	*Lāvasapurī*	4.409 g	55.015 g	5.45
62	84	*Vīsalpurī Kuṃḍe*		55.015 g	6
63	84	*Vīsalapurī Gūgale*		55.015 g	6
64	84	*Ḍolahara*		167.255 g	6.5
65	85	*Arjunapurī*		137.538 g	8
66	85	*Kaṭariya*		156.793 g	7
67	86	*Asapālapurī*		123.326 g	9
68	87	*Soḍhalapurī*	4.585 g	73.36 g	15
69	87	*Lākhāpurī*	4.585 g	114.615 g	10

The coin names refer to the successive rulers of Gujarat, namely

Kumara of Kumārapāla Caulukya of Anhilvad (r. 1144-1173).

Ajaya of Ajayapāla (r. 1173-1175).

Bhīmapurī of Bhīma II (r. 1178-1241).[99]

Lūṇavasā of Lāvaṇyaprasāda Vāghela, feudatory of Bhīma II and for some time the virtual ruler of Gujarat.[100]

Arjunapurī of Arjunadeva Vāghela (r. 1264-1273).

Sāraṅgadeva Vāghela (r. 1274-1293).

Soḍhalapurī of Soḍhala?

Lākhāpurī ?

Asapālapurī of Aśvapāla?

---

99 *Bhīmapuri* (from S. *Bhīmapriya*) *drammas* are mentioned *Purātanaprabandhasaṃgraha*, pp. 33, 34, 65 (see Nahata 1976, p. 33n).

100 *Lūṇasapurīya drammas* are mentioned in Rājaśekhara's *Prabandhakośa,* p. 105 (Nahata 1976, p. 34n).

gavikā ya paṃca tolā ruppaü sayamajjhi vīsa kari mulle |
paḍiyā rajjapalāhā solaha kari cha tola ahuṭṭha māsā[101] ‖ 88 ‖
vevalaya saḍḍha solasa ruppu cha tolā ya māsao paüṇo |
iya ittiyāṇa tullo māsā paṃceva ikkikko ‖ 89 ‖
aṭṭha karivi saṭṭhasayā tolā saḍhavāra tulli māsahuṭhā |
dasa tola satta māsā varāha nava saḍḍha ṭaṃkīṇa ‖ 90 ‖
vāraha saḍḍha kareviṇu tolaṭṭha ruvā vināikā caṃdī |
kanhaḍapurī ca saḍḍhā kaṇu panaraha tola ahuṭha masā ‖ 91 ‖
vāṇa igavīsa tolā adhamāsaü ruppu paṃca igi ṭaṃke |
machavāha cha kari solaha tolā māsaṭṭha ruppu sae ‖ 92 ‖
caütīsā païtīsā chattīsā taha ya sattatīsā ya |
mālavapuri chārīyā cāsaṇie mullu eyāṇaṃ ‖ 93 ‖

88. *Gavikā* has five *tolās* of silver in one hundred [coins] and its price is twenty [per *Ṭaṃka*]. *Paḍiyā* and *Rajjapalaha / Rajapalāhā* are sixteen [per *Ṭaṃka*] and contain six *tolās* and three and a half *māṣas* of silver [in one hundred coins].

89. *Vevalaya / Vevalā* [is priced] at sixteen and a half [per *Ṭaṃka*] and contains six *tolās* and three quarters of a *māṣa* of silver [in one hundred specimens]. The weight of these many (*ittiyāṇa*) coins [namely from *Gavikā* downwards] is just five *māṣas* each.

90. *Saṭṭhasayā / Sāṭhasayā* [is priced] at eight [per *Ṭaṃka*] and contains twelve and a half *tolās* of silver [in one hundred coins]. [Each coin] weighs three and a half *māṣas. Varāha* has ten *tolās* and seven *māṣas* [of silver in one hundred coins]. [Its price is] nine and a half per *Ṭaṃka.*

91. *Vināikā Caṃḍī / Vināyakā* [is priced] at the rate of (*kareviṇu*) twelve and a half [per *Ṭaṃka*]; it has eight *tolās* of silver [in one hundred coins]. *Kanhaḍapurī / Kāhṇaḍapurī* is six and a half [per *Ṭaṃka*] and contains fifteen *tolās* and three and a half *māṣas* [of silver in one hundred coins].

---

101 SGS reads *ahuṭha māsā;* this is corrected as *ahuṭṭha māsā* in Nahata 1976. But the text has both forms *ahuṭa* and *ahuṭṭha,* which according to Nahata translates to “three and a half”. I fail to understand the derivation of this expression.

92. *Vāṇa* contains twenty-one *tolās* and half a *māṣa* of silver [in one hundred coins]. [Its price is] five per *Ṭaṃka*. *Machavāha / Machavāhā* is [priced] at six [per *Ṭaṃka*] and contains 16 *tolās* and eight *māṣas* of silver in one hundred [coins].

93. *Caütīsā, Païtīsā, Chattīsā* and also *Sattatīsā;* and *Chāriyā* of Malavapurī (Ujjain?). The prices of these [should be determined] by melting a sample (*cāsaṇiye*).

Thus the coins of Gujarat (*gurjarīmudrā*).

Table 17a

20	*Gavikāḥ*	*100*	*madhye*	*tolā*	*5*	*māsā*	*0*
16	*Paḍiyā*	*100*	*madhye*	*tolā*	*6*	*māsā*	*3‖*
16	*Rajapalāhā*	*100*	*madhye*	*tolā*	*6*	*māsā*	*3‖*
16‖	*Vevalā*	*100*	*madhye*	*tolā*	*6*	*māsā*	*0‖‖*
8	*Sāṭhasayā*	*100*	*madhye*	*tolā*	*12‖*	*māsā*	*3‖*
9 ‖	*Varāha muṃda*	*100*	*madhye*	*tolā*	*10*	*māsā*	*7*
12‖	*Vināyakā*	*100*	*madhye*	*tolā*	*8*	*māsā*	*0*
6 ‖	*Kāhnaḍapurī*	*100*	*madhye*	*tolā*	*15*	*māsā*	*3‖*
5	*Vāṇamudrā*	*100*	*madhye*	*tolā*	*21*	*māsā*	*‖*
6	*Machavāhā*	*100*	*madhye*	*tolā*	*16*	*māsā*	*8*

The coin names in the above verses 88-93 are difficult to interpret, in particular the numerical designations in verse 93, viz., *Caütīsā* (34), *Païtīsā* (35), *Chattīsā* (36) and *Sattatīsā* (37). Should not *Chariyā* of Mālavapurī be included in the next group? Verse 89 states that the weights of the single coins from *Gavikā* to *Vevalā* are 5 *māṣas,* but this is not shown in the table, nor is the weight of a single *Saṭhasayā* (3.5 *māṣās*), which is mentioned in *v.* 90. The weights of the other coins from *Varāha* to *Machavāhā* are not mentioned in the text. The names *Varāha, Vināyaka, Kānhaḍapurī* suggest that these conis may have carried the images of the gods Varāha (i.e. *Varāha* incarnation of Viṣṇu), Vināyaka (Gaṇeśa) and Kṛṣṇa.

Table 17 b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
70	88	*Gavika*	4.585 g	55.015 g	20
71	88	*Paḍiyā*	4.585 g	69.228 g	16
72	88	*Rajapalāhā*	4.585 g	69.228 g	16
73	89	*Vevalā*	4.585 g	66.706 g	16.5
74	90	*Sāṭhasayā*	3.21 g	137.538 g	8
75	90	*Varāha*		117.449 g	9.5
76	91	*Vināyakā*		88.024 g	12.5
77	91	*Kanhaḍapurī*		168.255 g	6.5
78	92	*Vāṇa*		231.522 g	5
79	92	*Machavāhā*		183.384	6
80	93	*Caütīsā*			
81	93	*Païtīsā*			
82	93	*Chattīsā*			
83	93	*Sattatīsā*			
84	93	*Chāriyā of Mālavapurī*			

10.5 Coins of Malwa

mālaviya caükkaḍiyā tolā aṭṭhāya saḍḍha vāri kare |
diupālapurī panaraha tolā paṇa māsa chaha saḍḍhā ‖ 94 ‖
kuṃḍaliyā chaha tolā paüṇa cha māsā ya mulli pannarasā |
māsaṭṭha paṃca tolā vāraha java kaüliyā sataraṃ ‖ 95 ‖
vāvīsa ṭaṃka davvo teraha saḍḍhā chaḍulliyā hoṃti |
selakkī tuṃgaḍa paṇa tolā tiya māsa caüvīsaṃ (uṇavīsaṃ?)[102] ‖ 96 ‖
iya ittiyāṇa tullaṃ caümāsā daha javā havaṃti dhuvaṃ |
jānīyā cittaüḍī vīsaṃ davvo ya paṇa tolā ‖ 97 ‖

---

[102] The text has 24 (*caüvīsa*) and the table 19; therefore, the editors seem to have added *uṇavīsaṃ* in brackets.

94. *Caükkaḍiyā / Caukaḍiyā* of Malwa [contains] eight *tolās* [of silver in one hundred coins]. [It is priced] at twelve and a half [pieces per *Ṭaṃka*]. *Diupālapurī* contains fifteen *tolās* and five *māṣas* [of silver in one hundred pieces]. [Its price is] six and a half [pieces per *Ṭaṃka*].

95. *Kuṃḍaliya* contains six *tolās* and six less by a quarter *māṣas* [of silver in one hundred coins] and the price is fifteen [pieces per *Ṭaṃka*]. *Kaüliya* contains five *tolās,* eight *māṣas* and twelve *javas* [of silver in one hundred coins]. [Its price is] seventeen [pieces per *Ṭaṃka*].

96. *Chaḍḍulliyā / Chaḍuliya* contains twenty-two *ṭaṃkas* of silver (*davvo*) [in one hundred coins]. [It is valued at] thirteen and a half [pieces per *Ṭaṃka*]. *Selakkī Tuṃgaḍa / Selakī Tuṃgaḍa* contains five *tolās* and three *māṣas* [of silver in one hundred coins]. [Its price is] nineteen [pieces per *Ṭaṃka*].

97. The weight of these many [coins, i.e. all the coins from *Caükaḍiyā* downwards is] four *māṣas* and ten *javas,* for sure. *Jānīyā* of Chittor is twenty [pieces per *Ṭaṃka*] and its silver content (*davvaṃ*) is five *tolās* [in one hundred specimens].

Table 18a

prati	*nāma 100 ma rūpā*	*to◦*	*mā◦ taulye*	*ṭaṃ*	*java*
12‖	*Caukaḍiyā*	*8*	*0*	*1*	*10*
6 ‖	*Diupālapurī*	*15*	*5*	*1*	*10*
15	*Kuṃḍaliyāḥ*	*6*	*5‖‖*	*1*	*10*
17	*Kaüliyā Mudra*	*5*	*8 ‖‖*	*1*	*10*
13 ‖	*Chaḍuliyā*	*7*	*4*	*1*	*10*
19	*Selakī Togaḍa*	*5*	*3*	*1*	*10*
20	*Jānīyā Citauḍī*	*5*	*0*	*0*	*0*

The weight of the coins is mentioned in the text as *4 māṣas* and 10 *javas.* In the table is given as 1 *ṭāṃka* and 10 *javas.*

Table 18b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
85	94	*Caükaḍiyā*	3.668 g	88.024 g	12.5
86	94	*Diupālapurī*	3.668 g	169.63 g	6.5
87	95	*Kuṃḍaliyā*	3.668 g	71.291 g	15
88	95	*Kaüliyā*	3.668 g	63.035 g	17
89	96	*Chaḍuliā*	3.668 g	242.066 g	13.5
90	96	*Selākī Togaḍa*	3.668 g	57.766 g	19
91	97	*Jānīyā* of Chittor		55.015 g	20

jakkariyā galahuliyā vāvīsaṃ tīsa mullu taha davvo |
kami cāri tinni tolā cha java caümmāsa caümāsā ‖ 98 ‖
māsaṭṭha ikku tolaü ruppo ya ravālagā ya chappannā |
sivagaṇaya paṃcahattari mulli savā tolao ruppo ‖ 99 ‖
caüdasa savā caüdasī tolā vapaḍāya malita satta kare |
siha coramāra maluvā teraha tolā ya satta satta savā ‖ 100 ‖
‖ *iti Mālavī-mudrāḥ* ‖

98. *Jakkariyā / Jakārīyā* and *Galahuliyā* [are priced respectively at] twenty and thirty [pieces per *Ṭaṃka*]. The silver content (*davva*) [in one hundred coinsis] is four *tolās,* four *māṣas* and six *javas,* and three *tolās* and four *māṣas* [respectively].

99. *Ravālagā* has one *tolā* and eight *māṣas* of silver [in one hundred coins]. [Its price is] fifty-six [pieces per *Ṭaṃka*]. The price of *Sivagaṇaya / Sivagaṇā* is seventy-five [pieces per *Ṭaṃka*]. The silver content is one and a quarter *tolā* [in one hundred coins].

100. *Vapaḍāya / Vāpaḍā* and *Malita / Malīta* [contain respectively] fourteen and fourteen and a quarter *tolās* [of silver in one hundred coins, and both are priced at] seven [pieces per *Ṭaṃka*]. *Sīha / Śīhamāra* and *Coramāra* of Malwa [contain] thirteen *tolās* [of silver in one hundred coins and are priced respectively at] seven and seven and a quarter [pieces per *Ṭaṃka*].

Thus the coins of Malwa.

Table 19a

prati	*nāmāni 100 madhye*	*rūpā to◦*	*mā◦*	*tolye*	*ṭaṃ*
22	*Jakāriyā nāma 100 madhye*	*4*	*4‖*	*0*	*0*
30	*Galahuliyā “ “*	*3*	*4*	*0*	*0*
56	*Ravālagā mudrā śata 1 madhye*	*1*	*8*	*0*	*0*
75	*Sivagaṇā śata 1 madhye*	*1*	*3*	*0*	*0*
7	*Vāpaḍā nāma mudrā madhye*	*14*	*0*	*0*	*0*
17	*Malītā nāma mudrā madhye*	*14*	*3*	*1*	*0*
7	*Sīhamāra nāma mudrā ma◦*	*13*	*0*	*1*	*0*
7	*Coramāra nāma 100 ma◦*	*13*	*0*	*1*	*0*

Was the argument in the first line added by the editors? Under weight there are two columns, which should be designated as *ṭaṃ◦* and *java* as in the previous table. The table has 17 for *Malitā* which is clearly wrong. The price of both *Sīhamāra* and *Coramāra* is given as 7 per *Ṭaṃka* in the table. The table also states that the weight of the last three coins is 1 *Ṭaṃka.*

Table 19b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
92	98	*Jakarīyā*		47.022 g	22
93	98	*Galahuliā*		36.677 g	30
94	99	*Khālagā*		18.339 g	56
95	99	*Sivagaṇā*		13.754 g	75
96	100	*Vāpaḍā*		154.042 g	7
97	100	*Malīta*	3.668 g	156,792 g	7
98	100	*Sīhamāra*	3.668 g	143.039 g	7
99	100	*Coramāra*	3.888 g	143.039 g	7.25

10.6 Coins of Narwar (*Nalapura*)

cāhaṃḍī tinni kamaso duüttarī aṃkakī purāṇī ya |
ti ti du tola daha ti daha māsa 'ḍavīsa vatīsa paṇatīsaṃ ‖ 101 ‖
āsaliya satarahuttari du tola chammāsa davvu cālīsaṃ |
āsallī ṭhegā mahi cha ṭaṃka kaṇu mulli pannāsaṃ ‖ 102 ‖
āsaliya naviya tulle sataraha tolā savāya igi ṭaṃke |
ṭaṃka aḍhāī ruppaü saya majjhe vīsa māsāya ‖ 103 ‖
‖ *iti nalapura-mudrāḥ* ‖

101. *Cāhaṃḍī* [coins are of] three [types]: *Duüttarī / Duottarī, Aṃkakī / Āṃkakī* and *Purāṇīya / Purāṇī.* [The silver content in one hundred coins is] three, three, two *tolās* and ten, three, ten *māṣas* [respectively]. [The prices respectively are] twenty-eight, thirty-two, and thirty-five [pieces per *Ṭaṃka*].

102. *Āsaliya Satarahuttarī / Āsalī Satarahottarī* has two *tolās* and six *māṣas* of silver (*davvu*) [in one hundred coins]. [It is priced at] forty [pieces per *Ṭaṃka*]. *Āsallī Ṭhegā / Āsalī Theṃgā* has six *ṭaṃkas* of silver (*kaṇu*?) [in one hundred specimens]. [Its price is] fifty [pieces per *Ṭaṃka*].

103. A single coin (*igi ṭaṃka*) *Āsaliya Naviya / Āsalī Navī Ṭhekā* weighs seventeen and a quarter *tolās.* The silver [content] is two and a half *ṭaṃkas* and twenty *māṣas* in one hundred [coins].

Thus the coins of Narwar.

Cāhaṃḍī of Cāhaḍadeva of Narwar (r. 1237-1254).
Āsaliyā of Cahaḍadeva's grandson Āsalladeva (r. 1254-1279).
The significance of *duottarī* (having 2 extra) and *satarahuttarī* (having 17 extra) remains obscure.

Table 20a

pra◦	*28*	*Cāhaṃḍī Duottarī*	*100 madhye*	*to◦*	*3*	*mā◦*	*10*
pra◦	*32*	*Cāhaṃḍī Āṃkakī*	*100 madhye*	*to◦*	*3*	*mā◦*	*3*
pra◦	*35*	*Cāhaṃḍī Purāṇī*	*100 madhye*	*to◦*	*2*	*mā◦*	*10*
pra◦	*40*	*Āsalī Satarahottarī*	*madhye*	*to◦*	*2*	*mā◦*	*6*
pra◦	*50*	*Āsalī Ṭheṃgā*	*100 madhye*	*to◦*	*2*	*mā◦*	
pra◦	*17*	*Āsalī Navī Ṭhekā 1 prati tulita tolā 17| madhye rūpā tolā 2|| sata 1 madhye rūpā to 5 (?)*					

The data about the coin named *Āsalī Navī Ṭhekā* in verse 103 and in the table above is confusing. Both state that a single coin weighs 17¼ *tolās* (189.8 grams); this is very heavy. The verse does not mention its price; the table states 17 pieces for 1 silver *Ṭaṃka*. The last line of the table gives two values for the amount of silver in 100 coins: 2 ½ *tolās* or 5 *tolās.* The sign of interrogation must have been added by the editors.

Table 20b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
100	101	*Cāhaṃḍī Duottarī*		42.179 g	28
101	101	*Cāhaṃḍī Aṃkākī*		35.76 9	32
102	101	*Cāhaṃḍī Purāṇī*		31.176 g	35
103	102	*Āsalī Satarahottarī*		27.508 g	40
104	102	*Āsalī Theṃgā*		22.006 g	50
105	103	*Āsalī Navī Thekā*	189.8 g !	?	17

10.7 Coins of Chanderi

caṃderiyassa muddā mulle kolhāpurīya chaha saḍḍhā |
panaraha tolā satihā tulle caü visuva ṭaṃku igo ‖ 104 ‖
saḍḍhaṭṭha saḍḍha vāraha tolā jīrīya hīriyā sayage |
vāraṭṭha karivi su kame ṭaṃkaï ikke viyāṇeha ‖ 105 ‖
davvu aḍhāī tolā akuḍā saya majjhi mullu cālīsā |
jaïta aḍa māsa nava java davvo mulleṇa divaḍha sayaṃ ‖ 106 ‖
saṭṭhu saü vīra ṭaṃkaï java teraha satta māsa saya majjhe |
lakkhaṇa savā cha māsā ruppu sae mullu asī sayaṃ ‖ 107 ‖
rāma du java caü māsā dunni sayā mulli ṭaṃkae ikke |
vavvāvarā masīṇā khasaraṃ ca sayaṃ navaï ahiyaṃ ‖ 108 ‖
‖ *iti caṃderikāpura-satka-mudrāḥ* ‖

104. The coins of Chanderī (*Caṃderiya*) [are as foillows]. The price of *Kolhāpurīya / Kohlāpurī* is six and a half [pieces per *Ṭaṃka*]. [The silver content in one hundred specimens is] fifteen and one-third *tolās.* Its weight is one *ṭaṃka* and four *visuvas* (3.68 grams).

105. *Jīrīya / Jīriyā* and *Hīriyā* [contain] eight and a half, and twelve and a half *tolās,* [respectively of silver] in one hundred [specimens]. Their prices, you should know, are twelve and eight [pieces] for one *Ṭaṃka*.

106. *Akuḍā* has two and half *tolās* of silver (*davvu*) in one hundred [coins]. Its price is forty [pieces per *Ṭaṃka*]. *Jaïta* [contains] eight *māṣas* and nine *javas* of silver (*davvo*) [in one hundred coins]. Its price is one hundred and fifty [pieces per *Ṭaṃka*].

107. *Vīra / Vīramuṃda* [is priced at] one hundred and sixty [pieces] per *Ṭaṃka.* It [contains] seven *māṣas* and thirteen *javas* [of silver] in one hundred [coins]. *Lakkhaṇa / Lakṣmaṇī* [contains] six and a quarter *māṣas* of silver in one hundred [coins]. Its price is one hundred and eighty [pieces per *Ṭaṃka*].

108. *Rāma* has four *māṣas* and two *javas* [of silver in one hundred coins]. Its price is two hundred [pieces] per one *Ṭaṃka*. *Vavvāvarā, Masīṇā* and *Khasaraṃ / Khasara* [are priced at] one hundred and ninety [pieces per *Ṭaṃka*].

Thus the coins existing (*satka?*) in the city of Chanderī (*Caṃderikāpura*).

Table 21a

pra◦	*6*‖	*Kolhāpurī*	*100 madhye*	*to◦*	*15mā◦*	*4*	*java*	*0*
pra◦	*12*	*Jīriyā*	*100 madhye*	*to◦*	*8 mā◦*	*6*	*java*	*0*
pra◦	*8*	*Hīrīyā*	*100 madhye*	*to◦*	*12mā◦*	*6*	*java*	*0*
pra◦	*40*	*Akuḍā*	*100 madhye*	*to◦*	*2 mā◦*	*6*	*java*	*0*
pra◦	*150*	*Jaïta*	*100 madhye*	*to◦*	*0 mā◦*	*8*	*java*	*9*
pra◦	*160*	*Vīramuṃda*	*100 madhye*	*to◦*	*0 mā◦*	*7*	*java*	*13*
pra◦	*180*	*Lakṣmaṇī*	*100 madhye*	*to◦*	*0 mā◦*	*6*	*java*	*4*
pra◦	*200*	*Rāma*	*100 madhye*	*to◦*	*0 mā◦*	*4*	*java*	*2*
pra◦	*190*	*Vavvavarā*	*100 madhye*	*to◦*	*0 mā◦*	*5*	*java*	*8*
pra◦	*190*	*Masīṇā*	*100 madhye*	*to◦*	*0 mā◦*	*5*	*java*	*8*
pra◦	*190*	*Khasara*	*100 madhye*	*to◦*	*0 mā◦*	*5*	*java*	*8*
		‖ *iti canderikāpura-mudrāḥ* ‖						

For *Kolhāpurī* the text mentions the weight, but the table does not.

For the last three, the text does not mention the silver in 100, but the table does.

Table 21b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
106	104	*Kolhāpurī*	3.68 g	165.713 g	6.5
107	105	*Jīriyā*		93.526 g	12
108	105	*Hīriyā*		137.538 g	8
109	106	*Akuḍa*		27.508 g	40
110	106	*Jaïta*		7.849 g	150
111	107	*Vīra*		7.26 g	160
112	107	*Lakṣmaṇī*		5.73 g	180
113	108	*Rāma*		3.782 g	200
114	108	*Vavvāvarā*	11.015 g	5.044 g	190
115	108	*Masīṇā*	11.015 g	5.044 g	190
116	108	*Khasara*	11.015 g	5.044 g	190

10.8 Coins of Jalandhar

jālaṃdharī vaḍohiya jaïtacaṃdāhe ya rūpacaṃdāhe |
ruppa caü tinni māsā divaḍha sayaṃ du saya ṭaṃkikke ‖ 109 ‖
tinni saya ikki ṭaṃke sīsaḍiyā hui tiloyacaṃdāhe |
saṃtiurīsāhe puṇa cāri sayā ikki ṭaṃkeṇaṃ ‖ 110 ‖
‖ *iti jālaṃdharī-mudraḥ* ‖

109. The *Vaḍohiya* [coins] of Jalandhar, namely *Jaitacaṃdāhe* and *Rūpacaṃdāhe* [contain respectively] four and three *māṣas* of silver [in one hundred specimens]. [They are priced at] one hundred and fifty and two hundred [pieces per *Ṭaṃka*].

110. *Sīsaḍiyā* coins, namely *Tiloycaṃdāhe / Trilokacaṃdāhe* [are priced at] three hundred [pieces per *Ṭaṃka*]. *Saṃtiurīsāhe / Sāṃtiurīsāhe* are four hundred per *Ṭaṃka.*

Thus the coins of Jālandhara.

Vaḍohiya and *Sīsaḍya* appear to be the names of dynasties.

Jaitacaṃdāhe of Jaitracandra; *Rūpcaṃdāhe* of Rūpacandra; *Tiloyacaṃdāhe* of Triloka- or Trailokacandra. *Sāṃtiurīsāhe,* of Śāntipurī Shah?

Table 22a

pra◦	*150*	*Jaïtacaṃdāhe*	*100 madhye*	*rūpa to◦ 0*	*mā◦ 4*
pra◦	*200*	*Rūpacaṃdāhe*	*100 madhye*	*“* *0*	*3*
pra◦	*300*	*Trilokacaṃdāhe*	*100 madhye*	*“* *0*	*0*
pra◦	*400*	*Sāṃtiurī sāhe*	*‖ madhye*	*“* *0*	*0*

Table 22b

S.no.	Verse no.	Coin name	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
117	109	*Jaitacaṃdāhe*	3.668 g	150
118	109	*Rūpacaṃdāhe*	2.751 g	200
119	110	*Tiloyacaṃdāhe*	-	300
120	110	*Sāṃtiurisāhe*	-	400

11.0 Coins of Delhi

11.1 Coins of Tomar Rajputs

atha ḍhillikā-satka-mudrā yathā —
aṇaga mayaṇappalāhe pithaüpalāhe ya cāhaḍapalāhe |
saya majjhi ṭaṃka solaha ruppaü uṇavīsa kari mullo ‖ 111 ‖
‖ *etā mudrā rājaputra-tomarasya* ‖

Now the coins existing / current (*satka*) in Delhi are as follows:

111. *Aṇaga/Aṇagapalāhe, Mayaṇappalāhe / Madanapalāhe, Piṭhaüpalāhe* and *Cāhaḍapalāhe* [contain] sixteen *ṭaṃkas* of silver in one hundred [coins]. [Their price is] nineteen [pieces per *Ṭaṃka*].

These coins are of Tomar Rajputs.
But these are of different dynasties.
Aṇagapalāhe of Anaṅgapāla of Tomar dynasty (1049-1099)
Mayaṇapalāhe of Madanapāla of Gahadavāla dynasty (1080-1115)
Piṭhaüpalāhe, of Pṛthvīrāja of Chauhan dynasty (1166-1192)
Cāhaḍapalāhe, of Cāhaḍadeva (1235-1254)[103]

Table 23a

prati	*nāmāni mudrānāṃ*	*śata 1 madhye*	*rūpya*	*tolā*	*māsā*
19	*Aṇagapalāhe*	*sata 1*	*“*	*5*	*4*
19	*Madanapalāhe*	*sata 1*	*“*	*5*	*4*
19	*Pithaüpalāhe*	*sata 1*	*“*	*5*	*4*
19	*Cāhaḍa palāhe*	*sata 1*	*“*	*5*	*4*

The text mentions the weight of silver in 100 specimens as 16 *ṭaṃkas,* which is shown as 5 *tolas* 4 *māṣas* in the table. Both amount to 58.665 grams.

---

[103] Cf. Gupta 1969, p. 69; see also Deyell 2017, n.7: “Foremost amongst these is Thakkura Pheru’s *Dravyapariksha* of 1318 CE, which mentions the Delhi coins of Ananga Pala, Madana Pala, Pithau (Prithvi) Pala and Chahada Pala, in that order (*gatha* 111 and table 23).”

Table 23b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
121	111	*Anagapalāhe*	58.665 g	19
122	111	*Madanapalāhe*	58.665 g	19
123	111	*Pithaüpalāhe*	58.665 g	19
124	111	*Cāhaḍapalāhe*	58.665 g	19

11.2 Coins of the Delhi Sulṭāns

sūjā sahāvadīṇī taheva mahamūdasāhi caükaḍiyā |
ṭaṃka caüddasa ruppaü saya majjhe mullu igavīsaṃ ‖ 112 ‖
kaḍagā saravā makhiyā savā cha tolā ya ruppu sola kare |
kuṃḍaliyā paṇa tolā cha māsa aṭṭhāra igi ṭaṃke ‖ 113 ‖
churiyā jagaḍapalāhā caü tola du māsa ruppu paṇavīsaṃ |
dukaḍī ṭṭhegā ahiyā igi māsaï ruppi tevīsaṃ ‖ 114 ‖
kavvāicī jajīrī taha ya pharīdīya parasiyā majjhe |
dasa māsā tiya tolā mulle ṭaṃkikki chavvīsā ‖ 115 ‖
caüka kuvācīya vaphā savā ti tolā ya mulli igatīsā |
satihāya tinni tolā khakāriyā tīsa kari jāṇa ‖ 116 ‖
uṇatīsa niṃvadevī mulle tolā tu saḍḍhacaü māsā |
dhamaḍāha jakārīyā ahuṭṭha tolā 'ḍavīsa kare ‖ 117 ‖
paḍhamā alavadīṇī sayagā samasīya cāri ṭaṃka savā |
igasaṭṭhi ikki ṭaṃkaï sattari caü ṭaṃka momiṇiyā ‖ 118 ‖
duka selā paṃca ravā tolā tiya divaḍhu māsao ruppo |
battīsa karivi mulle ṭaṃkaï ikke viyāṇijjā ‖ 119 ‖
titimīsi kuvvakhāṇī khalīphatī adhacaṃdā sikaṃdarīyā |
nava ṭaṃka ruppu mulle caütīsa karevi iya samasī ‖ 120 ‖
samasaddīṇa suyāṇaṃ rukuṇī perojasāhi paṇatīsaṃ |
taha vārasuttarī puṇa iga māsā hīṇa tiya tolā ‖ 121 ‖
samasadi suyā radīyā tassa radī dunni ḍhilliya vudaüvā |
saḍha sola paüṇa terahā ṭaṃkaka uṇavīsa igatīsā ‖ 122 ‖
navagā paṇagā maüjī māsā nava saḍḍha tolao ikko |
paṇapanna solahuttarī dui tolā mulli paṃcāsaṃ ‖ 123 ‖

uṇacāsa panarahutarī dui tolā ikku māsao ruppo |
chakā du tola du māsā saïṃtāla maüjjiyā evaṃ ‖ 124 ‖
perojasāhi naṃdaṇa alāvadīṇassa eva muddāiṃ |
valavāṇīya ikaṃgī aḍḍhā tiya ṭaṃka mulli asī ‖ 125 ‖
valavāṇi vāmadevī tissūliya caükaḍīya sagavannā |
mulle divaḍḍhu tolaü saya majjhe davvu nāyavvo ‖ 126 ‖
terahasaī maruṭṭī navaï karivi ikku tolao ruppo |
uccaï mūlatthāṇī nava māsā ruppu tīsa sayaṃ ‖ 127 ‖
marakuṭṭīya sukārī vāraha navanavaï 1299 aṃkitassa mahe |
tolikku addha māsaü sattāsī mulli jāṇeha ‖ 128 ‖
sīrājī dui tolā chammāsā ruppu mulli igayālā |
caüpanna mukkhatalaphī māsā dasa tolao ikko ‖ 129 ‖
kālhāṇī taha nasīrī dakkārī satta cha paṇa 7|6|5 ṭaṃka kaṇo |
sagayālīsa pacāsaṃ paṇapannā kameṇa ṭaṃkikke ‖ 130 ‖
sattāvīsa gayāsī du ti hiya sayamajjhi 102|103 ṭaṃka dasa ruppaṃ |
maüjjī saï paṇa tolā samasī huya ruppa ṭaṃkāya ‖ 131 ‖
jallālī taha rukuṇī saḍḍhā paṇa ṭaṃka ruppu saya majjhe |
mullaṃ savāu daṃmaṃ lahaṃti vaṭṭaṃti vivahāre ‖ 132 ‖
annaṃna desasaṃbhava amuṇiyanāmāiṃ jaṃ ji muddāiṃ |
te panaraha guṇa sīsaï sohivi kaṇu mullu najjei ‖ 133 ‖
‖ *iti śrī ḍhilyāṃ rājye varttamāna-mudrāḥ* ‖

112. *Sūjā, Sahāvadānī, Mahamūda Sāhī* and *Caükaḍiyā* [contain] fourteen *taṃkas* of silver in one hundred [specimens]. [Their] price is twenty-one [pieces per *Ṭaṃka*].

Mahamūda Sāhī was issued by Mu'iz al-Dīn Mohammad I ibn Sām (1193-1206). Some of his coins bear the Nāgarī legend *srī mahamada sāmī* (Wright 1936, nos. 10-13).

113. *Kaḍagā / Kaṭakā, Saravā* and *Makhiyā* [contain] six and a quarter *tolās* of silver [in one hundred coins]. [Their price is] sixteen [pieces per *Ṭaṃka*]. *Kuṃḍaliya* [contains] five *tolās* and six *māṣas* [of silver in one hundred coins]. [Its price is] eighteen per *Ṭaṃka.*

114. *Churiya* and *Jagaḍapalāhā / Jagatapalāhā* [contain] four *tolās* and two *māṣas* of silver [in one hundred coins]. [Their price is] twenty-five [pieces per *Ṭaṃka*]. *Dukaḍī Ṭhegā / Dukaḍiyā Ṭhegā* [contains] one *māṣa* more silver [than the previous, i.e., four *tolās* and three *māṣas*]. [Its price is] twenty-three [pieces per *Ṭaṃka*].

Ṭhegā occurs sometimes. Is it a vernacular form of *Ṭaṃkā ?*

115. *Kuvvāicī Jajīrī / Kuvāicī Jajīrī, Pharīdīyā / Pharīdī and Parasiyā* [contain] three *tolās* and ten *māṣas* [of silver in one hundred specimens]. Their price is twenty-six [pieces] per one *Ṭaṃka*.

116. *Caüka Kuvācīya / Caükā* and *Vaphā* [contain] three and a quarter *tolās* [of silver in one hundred coins]. Their price is thirty-one [pieces per *Ṭaṃka*]. *Khakāriyā* [contains] three and one-third *tolās* [of silver in one hundred coins]. [Its price is] thirty [pieces per *Ṭaṃka*].

Kuvāicī, Kuvācīya, of Nāṣir al-Dīn Qubācha of Sind (1203-1228) who was appointed Governor of Ūcch by Muḥammad bin Sām in AD 1203 and assumed independence after the latter's death in 1206. His coinage consisted mainly of small billon pieces; some carry the legend *śrī kubāca suritāṇa* in Nagari (Wright 1907, p. 183).

117. *Niṃbādevī / Nīṃvādevī* is twenty-nine [pieces per *Ṭaṃka*] in price, and [contains] three *tolās* and four and a half *māṣas* [of silver in one hundred pieces]. *Dhamaḍāha / Dhamaḍāhā* and *Jakarīyā* [contain] three and a half *tolās* [of silver in one hundred coins]. [Their price is] twenty-eight [pieces per *Ṭaṃka*].

118. *Paḍhamā Alāvadīṇī / Alāvadīnī* and *Sayagā Samasīya / Satakā Samasī* [contain] four and a quarter *ṭaṃkas* [of silver in one hundred coins]. [Their price is] sixty-one [pieces per *Ṭaṃka*]. *Momiṇyā / Mominī Alāī* [is priced at] seventy [pieces per *Ṭaṃka* and contains] four *ṭaṃkas* [of silver in one hundred specimens].

Paḍhamā Alāvadīnī, of ᶜAlā' al-Dīn the First?

Samasī refers to Shams al-Dīn Īltutmish (1210-1235). Some of his coins bear Nāgarī legend *samasadīna* or *samasadi.*

For *Mominī,* see Wright 1936, p. 26, coin nos. 68-72 of Īltutmish with the Nāgarī legend *mustaṃsiri amīra li maumināṃ*.

119. *Dukaselā Paṃcaravā / Selā Samasī* [contains] three *tolās* and one and a quarter *māṣas* of silver [in one hundred coins]. The price should be known as thirty-two per *Ṭaṃka.*

120. *Tittimīsi / Titimīsī, Kuvvakhānī, Khalīphatī, Adhacaṃdā* and *Sikaṃdarīyā* [contain] nine *ṭaṃkas* [silver in one hundred coins]. [Their price is] thirty-four [pieces per *Ṭaṃka*]. These are *Samasī* coins (i.e. issued by Shams al-Dīn Īltutmish).

Tittimīsī, of Īltutmish.
Khalīphatī, cf. the legend *srī ṣalīphaḥ* on nos. 73-77 in Wright 1936, p. 26.
Adhacaṃdā, a half-moon (or crescent) on the coin? Wright 1936, p. 415, lists such an ornament but only on Sher Shāh's coinage.

121. [Now the coins issued by] Shams al-Dīn's offspring (*samasaddīna suyāṇam*): *Rukunī, Perojasāhī* and *Bārasuttarī / Barahottarī* [of Rukn al-Dīn Fīrūz 1235-36] are [priced at] thirty-five [pieces] per *Ṭaṃka* [and contain] three *tolās* less by one *māṣa* [of silver in one hundred specimens].

122. Shams al-Dīn's daughter Raẓīya (*Radīya*). Her *Radī* is twofold: [minted at] Delhi and at Badaun. [These contain respectively] sixteen and a half, and twelve and three quarters *ṭaṃkas* [of silver in one hundred pieces]. [Their prices are] nineteen and thirty-one [pieces per *Ṭaṃka*].

Radī, of Jalālat al-Dīn Raẓīyya (r. 1236-1240). The text and table expressly mention her two mints at Delhi and Badaun.
The *Radī* from the Delhi mint contains, in 100 specimens, silver of 16½ *ṭaṃkas.* This is equal to 5 *tolās* and 6 *māṣas* as shown in the table = 60.517 grams. The *Radī* from the Badaun mint contains, in 100 specimens, silver of 12¾ *ṭaṃkas.* This is equal to 4 *tolas* and 3 *māṣas* as shown in the table = 46.763 grams.
On her coinage, see Wright 1936, pp. 40-43, nos.161-171.

123. *Navagā Maüjī / Vārā Navakā Maüjī* and *Paṇagā Maūjī* [contain] one *tolā* and nine and a half *māṣas* [of silver in one hundred coins]. [Their price is] fifty-five [pieces per *Ṭaṃka*]. *Solahuttarī / Solasottarī* [contains] two *tolās* [of silver in one hundred coins]. Its price is fifty [pieces per *Ṭaṃka*].

124. *Paranarahuttarī / Panarahottarī* [is priced at] forty-nine [pieces per *Taṃka* and contains] two *tolās* and one *māṣa* of silver [in one hundred coins]. *Chakā* [contains] two *tolās* and two *māṣas* [of silver in one hundred specimens]. [Its price is] forty-seven [pieces per *Ṭaṃka*]. Thus the *maüjjiyā* coinage.

Maüjī, maujjiyā, coins issued by Mu'iz al-Dīn Bahram Shāh (1240-1242).
On his coinage, see Wright 1936, pp. 43-46, nos. 172-187.

125. These are the coins of ᶜAlā' al-Dīn Mas'ūd [1242-46], son of Rukn al-Dīn Fīrūz (*perojasāhi naṃdana alāvadīṇassa*). *Valavāṇī Ikaṃgī / Balavāṇi Ikāṃgī* [contains] three and a half *ṭaṃkas* [of silver in one hundred coins]. [Its] price is eighty [pieces per *Ṭaṃka*].

But the coin name *Balavānī* suggests Ghiyāth al-Dīn Balban (1266-1287). However, his own coin is styled *Gayāsī* in verse 131 below.

126. *Balavāṇī Vāmadevī* and *Tissuliya Caükaḍīya / Caukaḍha* [are priced at] fifty-seven [pieces per *Ṭaṃka*] and the silver content (*davvu*) in one hundred [specimens] should be known as one and a half *tolās.*

Tissuliya Caükaḍīya suggest a square coin with a trident on it. Trident is listed by Wright 1936, p. 413, as one of the ornaments on the coinage of Īltutmish and Fīrūz Shāh, but not on the coinage of ᶜAlā' al-Dīn Mas'ūd.

127. *Terahasaī Maruṭṭī / Terahasaī Maroṭī* [is priced at] ninety [pieces per *Ṭaṃka* and contains] one *tolā* of silver [in one hundred coins]. *Uccaï Mālatthāṇī / Uccaī Mulathānī* (of Multan) [contains] nine *māṣas* of silver [in one hundred specimens]. [Its price is] one hundred and thirty [pieces per *Ṭaṃka*].

128. *Marakuṭṭīya* / *Maroṭī Igānī* and *Sukārī* have [the numerals] twelve ninety-nine marked on their face. [They contain] one *tolā* and half a *māsa* [of silver in one hundred coins]. [Their price], you should know, is eighty-seven [pieces per *Ṭaṃka*], .

Maruṭṭī, Maroṭī, Marakuṭṭīya refer to modern Maroṭ (Marukoṭṭṭa) near Jodhpur; *Mūlatthāṇī* to Multan (S. Mūlasthāna). Were these mint towns? For the year (VS) 1299, see Wright 1936, p. 48, no. 190A, a billon coin of ᶜAlā' al-Dīn Mas'ūd with 1299 in Nāgarī. Its weight is 53 grains. This is the only instance where Pherū records the year of issue.

129. *Sīrājī* [contains] two *tolās* and six *māṣas* of silver [in one hundred coins]. Its price is forty-one [pieces per *Ṭaṃka*]. *Mukkhtalaphī / Mukhtalaphī* [is priced at] fifty-four [pieces per *Ṭaṃka* and contains] one *tolā* and ten *māṣas* [of silver in one hundred pieces].

130. *Kālhāṇī, Nasīrī,* and *Dakkārī / Dakārī* [contain] seven, six and five *ṭaṃkas* of silver (*kaṇo*) [in one hundred coins]. [Their prices are] forty-seven, fifty and fifty-five [pieces respectively per *Ṭaṃka*].

Nasīrī, of Nāṣir al-Dīn Maḥmūd I (1246-1266). The table states that the coin *nasīrī ḍhilyāṃ ṭaṃkasālāhata,* "struck (*hata*) at the Delhi mint."

According to the text, the amount of silver in the coin *Dakārī* is 5 *ṭaṃkas* = 1 *tolā* 2 *ṭaṃkas* = 1 *tolā* 8 *māṣas.* But the table has 1 *tola* and 8½ *māṣas.*

131. *Gayāsī / Gayāsī Dugāṇī* [is priced at] twenty-seven [pieces per *Ṭaṃka,* and contains] ten *tolās* of silver in 102 or 103 [coins]. *Maüjī / Maüjī Tigānī* [contains] five *tolās* of silver in one hundred [coins]. [Its price is], like that of *samasī,* twenty (*huya?*) per *Ṭaṃka.*

Gayāsī, of Ghiyāth al-Dīn Balban (1266-1287).

Maüjī, of Mu'iz al-Dīn Kaiqubād (1287-90).

Samasī, of Shams al-Dīn Kayūmas (1290).

The table does not list *Samasī.*

11.3 Coins of the *Khaljīs*

132. *Jallālī / Jalālī* and *Rukunī* [contain] five and a half *ṭaṃkas* of silver in one hundred [coins]. They fetch the price of one and a quarter *dramma* [each] and are in circulation.

Jalālī, of Jalāl al-Dīn Fīrūz II Khaljī (1290-96) and *Rukunī,* of his son Rukn al-Dīn Ibrahīm I (1296). These, along with the coinage of ᶜAlā' al-Dīn Muḥammad II, were still legal tender in 1318 when the DP was composed. According to this text, their price is 1¼ *Drammas* for a single coin; according to the table, 48 pieces per *Ṭaṃka.* This clearly shows that 60 *Drammas* make 1 silver *Ṭaṃka.* Secondly, *Jalālī* and *Rukunī,* being valued at 48 pieces per *Ṭaṃka,* are equal to 1 *Jaithal.*

133. All other coins from different countries and with unknown names should be melted together with fifteen times their weight of lead, and the value of the silver [thus extracted] (*kaṇu*) should be estimated.

Thus the coins existing in the kingdom of Delhi.

Table 24a

prati	*nāmāni*	*śata 1*	*madhye*	*rūpya*	*tolā*	*māsā*
21	*Sūjā nāma mudrā*	*sata 1*	"	"	*4*	*8*
21	*Sahāvadīnī mudrā*	*sata 1*	"	"	*4*	*8*
21	*Mahamūdasāhī mudrā*	*sata 1*	"	"	*4*	*8*
21	*Caükaḍīyā mudrā*	*sata 1*	"	"	*4*	*8*
16	*Kaṭakā nāma mudrā*	*sata 1*	"	"	*6*	*3*
16	*Saravā nāma mudrā*	*sata 1*	"	"	*6*	*3*
16	*Makhiyā muṃda*	"	"	"	*6*	*3*
18	*Kuṃḍaliyā muṃda*	"	"	"	*5*	*6*
25	*Churiyā muṃda*	"	"	"	*4*	*2*
25	*Jagaṭapalāhā nāma*	"	"	"	*4*	*2*
23	*Dukaḍīyā Ṭhegā*	"	"	"	*4*	*3*
26	*Kuvāicī Jajīrī mudrā*	"	"	"	*3*	*10*
26	*Pharīdī nāma mudrā*	"	"	"	*3*	*10*
26	*Parasiyā mudrā*	"	"	"	*3*	*10*
31	*Caüka nāma mudrā*	*sata 1*	"	"	*3*	*3*
31	*Vaphā nāma mudrā darvu*	"	"	"	*3*	*3*
30	*Khakāriyā nāma mudrā*	"	"	"	*3*	*4*
29	*Nīṃvadevī nāma mudrā*	"	"	"	*3*	*4‖*
28	*Dhamaḍāhā nāma mudrā*	"	"	"	*3*	*6*
28	*Jakārīyā nāma mudrā*	"	"	"	*3*	*6*
61	*Alāvadīnī mudrā*	"	"	"	*1*	*5*
61	*Satakā Samasī mudrā*	"	"	"	*1*	*5*
70	*Mominī Alāī mudrā*	"	"	"	*1*	*4*
32	*Selā Samasī*	"	"	"	*3*	*1‖*
34	*Titimīsī nāma mudrā*	"	"	"	*3*	*0*
34	*Kuvvakhānī*	"	"	"	*3*	*0*
34	*Khalīphatī*	"	"	"	*3*	*0*
34	*Adhacaṃdā*	"	"	"	*3*	*0*
34	*Sikaṃdarī nāma mudrā*	"	"	"	*3*	*0*
35	*Rukunī nāma mudrā*	"	"	"	*2*	*11*
35	*Peroja sāhī " "*	"	"	"	*2*	*11*
35	*Bārahottarī " "*	"	"	"	*2*	*11*
19	*Radī Ḍhillikā Ṭaṃkasālāsaṃ madhye*	"	"	"	*5*	*6*
31	*Radī Vudauvāṃ Ṭaṃkasāla Vudāū*	"	"	"	*4*	*3*
55	*Vāra◦ Navakā Maüjī*	"	"	"	*1*	*9‖*
55	*Panakā Maüjī nāma mudrā*	"	"	"	*1*	*9‖*

55	*Solahottarī mudrā sata 1 madhye*	“	“	“	*2*	*0*
49	*Panarahottarī mudrā sata 1 madhye*	“	“	“	*2*	*1*
46	*Chakā nāma mudrā sata 1 madhye*	“	“	“	*2*	*2*
80	*Balavāṇī Ikāṃgī sata 1 madhye*	“	“	“	*1*	*2*
57	*Balavāṇī Vāmadevī sata 1 madhye*	“	“	“	*1*	*6*
57	*Caükaḍīyā*	“	“	“	*1*	*6*
90	*Terahasaī maroṭī sata 1 madhye*	“	“	“	*1*	*0*
130	*Uccaī Mulathāṇī sata 1 madhye*	“	“	“	*0*	*9*
87	*Maroṭī Igānī mudrā sata 1 madhye*	“	“	“	*1*	*0*‖
87	*Sukārī nāma mudrā sata 1 madhye*	“	“	“	*1*	*0*‖
41	*Sīrājī nāma mudrā sata 1 madhye*	“	“	“	*2*	*6*
54	*Mukhtalaphī mudrāḥ sata 1 madhye*	“	“	“	*1*	*10*
47	*Kālhaṇī nāma mudrā sata 1 madhye*	“	“	“	*2*	*4*
50	*Nasīrī Ḍhilyāṃ Ṭaṃkasāla-hatā*	“	“	“	*2*	*0*
55	*Dakārī nāma mudrā sata 1 madhye*	“	“	“	*1*	*8*‖
27	*Gayāsī Dugāṇī nāma mudrā*	“	“	“	*3*	*4*
20	*Maüjī nāma mudrā tigāṇī sata 1*	“	“	“	*5*	*0*
48	*Jalālī nāma mudrā vartamānā*	“	“	“	*1*	*10*
48	*Rukunī nāma mudrā pravartamānā*	“	“	“	*1*	*10*
	‖ *iti śrī Ḍhilyāṃ rājye vartamānamudrāḥ* ‖					

The scribe intends to write in each line *x nāma mudrā śata madhye* but makes a change in every line!

Table 24b

S.no.	Verse no.	Coin name	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
11.2 Coinage of the Delhi Sulṭāns				
125	112	*Sūjā*	154.042 g	21
126	112	*Sahāvadīnī*	154.042 g	21
Muʿizz al-Dīn Muḥammad ibn Sam (1193-1206)				
127	112	*Mahamūdasāhī*	154.042 g	21
128	112	*Caükaḍiyā*	154.042 g	21
129	113	*Kaṭaka*	68.769 g	16
130	113	*Saravā*	68.769 g	16
131	113	*Makhiyā*	68.769 g	16
132	113	*Kuṃḍaliyā*	60.517 g	18
133	114	*Churiyā*	45.846 g	25
134	114	*Jagatapalāhe*	45.846 g	25
135	114	*Dukaḍiyā Ṭhegā*	46.763 g	23
136	115	*Kuvāicī Jajīrī*	42.179 g	26
137	115	*Pharīdī*	42.179 g	26
138	115	*Parasiyā*	42.179 g	26
139	116	*Caükā Kuvāīcī*	35.76 g	31
140	116	*Vaphā*	35.76 g	31
141	116	*Khakariyā*	36.64 g	30
142	117	*Nīṃvādevī*	37.136 g	29
143	117	*Dhamaḍāhā*	38.511 g	28
144	117	*Jakāriyā*	38.511 g	28
145	118	*Paḍamā Alāvadīnī*	49.514 g	61
Shams al-Dīn Īltutmish (1210-1235)				
146	118	*Satakā Samasī*	49.514 g	61
147	118	*Momanī Alāī*	44.012 g	70
148	119	*Selā Samasī*	34.155 g	32
149	120	*Titimīsī*	99.027 g	34
150	120	*Kuvvakhānī*	99.027 g	34
151	120	*Khalīphatī*	99.027 g	34
152	120	*Adhacaṃdā*	99.027 g	34
153	120	*Sikaṃdariyā*	99.027 g	34

S.no.	Verse no.	Coin name	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
Rukn al-Dīn Fīrūz (1235-1236)				
154	121	*Rukunī*	32.093 g	35
155	121	*Perohasāhī*	32.093 g	35
156	121	*Bārahottarī*	32.093 g	35
Jalālat al-Dīn Raḍīyya (1236-1240)				
157	122	*Radī* of Delhi	181.55 g	55
158	122	*Radī* of Badaun	140.288 g	31
Muʿiz al-Dīn Bahram (1240-1242)				
159	123	*Navakā Maüjī*	19.715 g	55
160	124	*Panakā Maüjī*	19.715 g	55
161	123	*Solahottarī*	22.006 g	50/55(table)
162	124	*Panarahottarī*	22.923 g	49
163	124	*Chakā*	23.34 g	47
ʿAlā' al-Dīn Masūd (1242-1246)				
164	125	*Balavāṇī Ikaṃgī*	38.511 g	80
165	126	*Balavāṇī Vāmadevī*	16.505 g	57
166	126	*Tissuliya Caükaḍiyā*	16.5.5 g	57
167	127	*Terahasaī Maruṭṭī*	11.003 g	90
168	127	*Uccaï Mulathāṇī*	8.253 g	130
169	128	*Maroṭī Igānī*	11.462 g	87 of VS 1299= AD 1243, cf. Wright 190A
170	128	*Sukārī*	11.462 g	87
171	129	*Sīrājī*	27.508 g	41
172	129	*Mukhtaliphī*	20.173 g	54
173	130	*Kalhāṇī*	77.027 g	47
Naṣīr al-Dīn Maḥmūd I (1246-1266)				
174	131	*Nasīrī* of Delhi mint	66.018 g	50
175	130	*Dakarī*	55.015 g	55
Ghiyāth al-Dīn Balban (1266-1287)				
176	131	*Gayāsī*	110.03 g	27

S.no.	Verse no.	Coin name	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
Muʿiz al-Dīn Kaiqubād (1287-1290)				
177	131	*Maüjī Tigānī*	55.015 g	20
Shams al-Dīn Kayamars (1290)				
178	131	*Samasī*	?	?
Jalāl al-Dīn Fīrūz II Khaljī (1290-1296)				
179	132	*Jalālī*	60.517 g	48
Rukn al-Dīn Ibrahīm II (1296)				
180	132	*Rukunī*	60.517 g	48

12.0 Coinage of ʿAlā' al-Dīn Muḥammad Khaljī (r. 1296-1316)

12.1 Billon Coins

saṃpaï pavaṭṭamāṇā muddā allāvadīṇa rāyassa |
duviha dugāṇī davvo paüṇā dasa aṭṭha ṭaṃka sae ‖ 134 ‖
chaggāṇī puṇa duvihā saḍḍhā paṇavīsa paüṇa paṇavīsā |
ṭaṃka saya majjhi ruppaü saḍḍhā caü du java nava visuvā ‖ 135 ‖
iggāṇī saya majjhe taṃbaü paṇa navaï ṭaṃka paṇa davvo |
rāyahare vivahāre gaṇijja iggāṇiyā sayalaṃ ‖ 136 ‖
iga paṇa daha pannāsaṃ saya tolā tulli hema ṭaṃkāiṃ |
caü māsā dīnāro ruppaya ṭaṃko ya tolīṇo ‖ 137 ‖
‖ *iti aśvapati mahānarendra pātisāhi alāvadī mudrāḥ* ‖

134. The coins now current are those of King ʿAlā' al-Dīn. *Dugāṇī* is of two types, [containing] ten less by a quarter, and eight *ṭaṃkas* of silver in one hundred [coins respectively.

135. *Chaggāṇī / Chagānī* is again of two types, [containing] in one hundred coins twenty-five and a half *ṭaṃkas* and four and a half *javas* of silver [in the first type] and twenty-five less by a quarter *ṭaṃkas,* two *javas* and two *visuvas* of silver [in the second type].

136. *Iggāṇī / Igānī* [contains] in one hundred [coins] ninety-five *ṭaṃkas* of copper and five *ṭaṃkas* of silver (*davvo*). At the royal court (*rāyahara*) and in all transactions (*vivahāra*), the calculations are done in terms of *Iggāṇī.*[104]

Thus the coinage of ᶜAlā' al-Dīn, the lord of cavalry (*aśvapati* ?), the great king and Bādshāh.

Table 25[105]

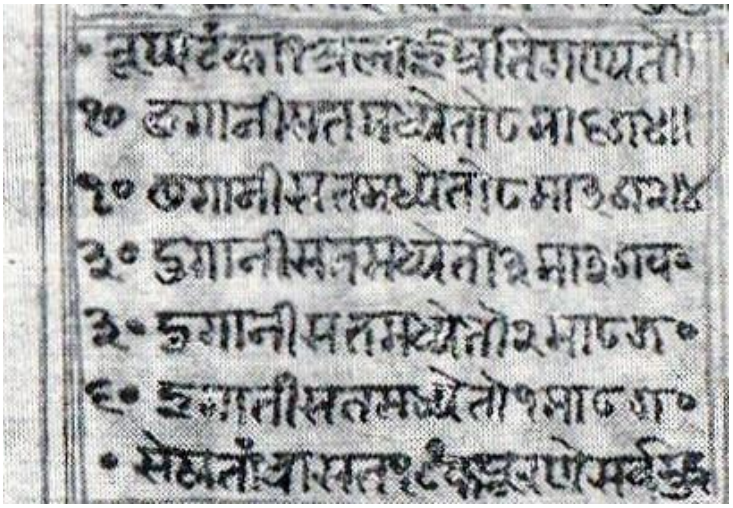


Table 25a

° *rūpya ṭāṃkā 1 alāī prati gaṇyate* ‖					
10	*Chagāṇī*	*sata madhye*	*to 8*	*mā 6*	*ja 4*‖
10	*Chagāṇī*	*sata madhye*	*to 8*	*mā 3*	*ja 2|4*
30	*Dugāṇī*	*sata madhye*	*to 3*	*mā 3*	*ja 0*
30	*Dugāṇī*	*sata madhye*	*to 2*	*mā 8*	*ja 0*
60	*Igānī*	*sata madhye*	*to 1*	*mā 8*	*ja 0*
° *śeṣa tāṃbā sata 1 ṭāṃka pūraṇe sarva mudra*					

The text has *ṭaṃkas*; these are converted into *tolas, māṣas* and *javas* in table 25 above. In the case of the second type of *Chagāṇī,* the table represents 2 *javas* and 2 *visuvas* as *ja 2|4* which is inexplicable.

---

104 Cf. Wright 1936, pp. 105-107; Gupta 1969, pp. 87-89.

105 Detail from Figure 2.

Table 25b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Price (no. of coins per 1 *Ṭaṃka)*
181	136	*Igānī*	3.668 g	18.34 g	60
182	134	*Dugānī* 1		34.846 g	30
183	134	*Dugānī* 2		29.344 g	30
184	135	*Chagānī* 1		95.791 g	10
185	135	*Chagānī* 2		90.903 g	10

12.2 Gold and Silver Coins

137. The weights of [different] gold *Ṭaṃkas* are one, five, ten, fifty and hundred *tolās* [repectively]. [Gold] *Dīnāra* is four *māṣas* [in weight] and silver *Ṭaṃka* is one *tolā* [in weight].

Table 26[106]

106 Detail from Figure 2.

Table 26a

hema Ṭaṃkā nānā taulye
° *ika toliyā 1*
° *paṃca toliyā 1*
° *dasa toliyā 1*
° *paṃcāśa toliyā 1*
° *sayatoliyā ṭaṃkā 1*
Hema Dīnāru māsā 4
Rupya Ṭaṃkā sarvepi ika toliyāḥ

These coins are designated in the table as *Ikatoliyā Ṭaṃkā, Pāṃcatoliyā-, Dasatoliyā-, Paṃcāsatoliyā-,* and *Sayatoliyā-*. The larger coins were never used in monetary transactions, but only as ceremonial gifts.[107]

Table 26b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)
186	137	*Ikatoliyā* Gold *Ṭamka*	11.003 g
187	137	*Paṃcatoliyā*	55.015 g
188	137	*Dasatoliyā*	110.03 g
189	137	*Paṃcāsatoliyā*	550.15 g
190	137	*Sayatoliyā*	1100.3 g
191	137	*Dīnāra*	3.668 g
192	137	Silver *Ṭaṃka*	11.003 g

12.3 Coinage of Shihāb al-Dīn ᶜUmar (r. 1316)

caü māsa jāva ghaḍiyaṃ sahāvadīṇassa tuccha muddāiṃ |
damma chagāṇī ṭaṃkā ruppa suvannassa tolīṇā ‖ 138 ‖

138. Shihāb al-Dīn ᶜUmar's (*sahāvadīna*) inferior coins are made of [weights ranging] up to four *māṣas. Dramma* and *Chagānī,* silver and gold *Ṭaṃkas* weigh 1 *tolā* each.

---

107 See introduction, p. 36.

4 *māṣas* = 1 *ṭaṃka* = 3.668 g is, of course, the standard weight of smaller coinage fixed by ᶜAlā' al-Dīn. Shihāb al-Dīn probably issued also lighter coins.

Table X[108]

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)
193	138	Copper coins	
194	138	*Dramma*	11.003 g
195	138	*Chagāṇī*	11.003 g
196	138	Silver *Ṭaṃka*	11.003 g
197	138	Gold *Ṭaṃka*	11.003 g

13.0 Coinage of Quṭb al-Dīn Mubārak Shāh I (r. 1316-1320)

itto bhaṇāmi saṃpaï kutubuddī rāyavaṃdichoḍassa |
caüraṃsa vaṭṭa muddā nāṇāviha tulla mullo ya ‖ 139 ‖
battīsaṃ kaṇayamayā ruppamayā vīsa damma sattavihā |
caüviha taṃbaya sāhā muddā savvevi tesaṭṭhī ‖ 140 ‖ *dāraṃ* ‖
iga paṇa daha tolāiṃ dasa hiya jā saü divaḍḍha saü du sayaṃ |
iya vaṭṭa hema ṭaṃkā caüraṃsa puṇovi emeva ‖ 141 ‖
teraha māsā satihā suvanna ṭaṃko ya soniyā tivihā |
iga māsiyā dumāsiya caüguṃjā eya battīsaṃ ‖ 142 ‖
‖ *iti svarṇa-mudrāḥ* ‖

139. Now I shall tell the weight and price of the various types of the current coins, square and circular, of Quṭb al-Dīn, the king who was released from the prison and became the king or the king who released prisoners when he ascended the throne (*rāyabandicoḍa*).

140. There are thirty-two [types of] gold coins, twenty of silver coins, and seven types of *Dammas* (i.e. billon coins) and four types of copper Sāhā (?) coins — altogether sixty-three [types].

---

108 In the SGS, there is no table listing the coins issued by ᶜUmar.

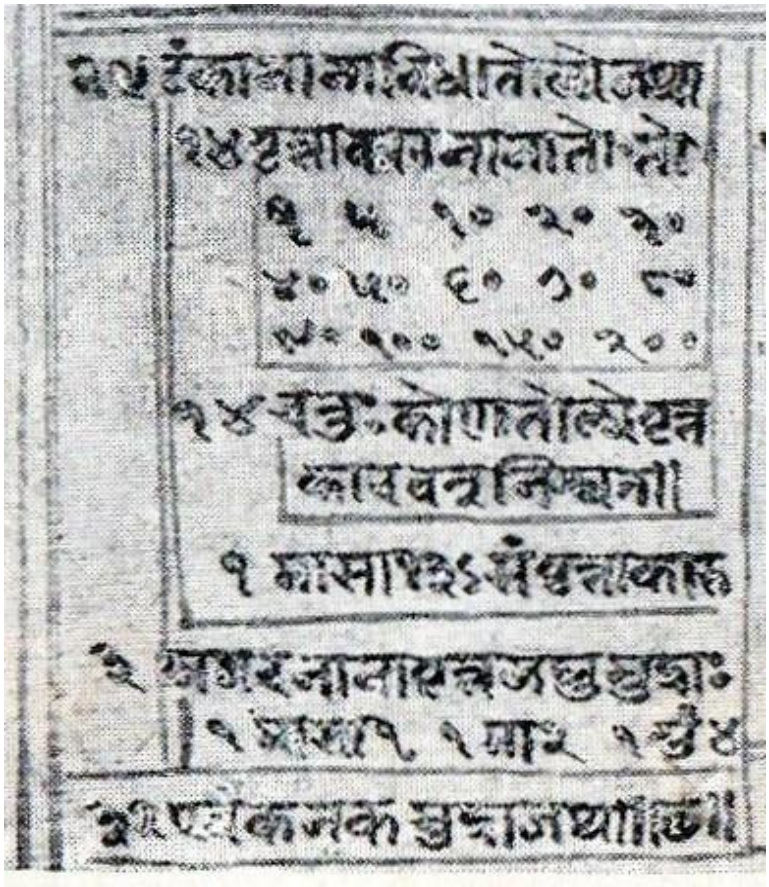
13.1 Gold Coins

141. One, five, ten *tolās,* further increased each time by ten up to one hundred, then one hundred and fifty and two hundred [*tolās*]; these are [the respective weights of] the circular (*vaṭṭa*) gold *Ṭaṃkas.* The same are also [the respective weights of] the square (*caüraṃsa*) [gold *Ṭaṃkas*].

142. There is one more gold *Ṭaṃka* of thirteen and one-third *māṣas. Soniyā* is of three types, weighing one *māṣa,* two *māṣas,* and four *guṃjas* [respectively]. Thus there are thirty-two [types of gold coins].

Thus [the 32 types of] gold coins.

Table 27[109]



109 Detail from Figure 2.

Table 27a

kanaka mudrā 32 yathā —
29. ṭaṃkā nānāvidhā tolo yathā
14. vṛttākāra nānā to◦ to
1 5 10 20 30
40 50 60 70 80
90 100 150 200
14. catuḥkoṇa tolye vṛttākāra vat niścita |
*1. māsā 13 **S** saṃvṛttākāru*
3. apara nānā vṛtta laghumudrāḥ
1 māsā 1 | 1 mā◦ 2 | 1 guṃ◦ 4

32.

In this table, the symbol ***S*** is used to denote the fraction 1/3 which is rather strange.

Table 27b

S.no.	Verse no.	Coin name	Wt. of a single coin	Wt. in Metric system
198-211	141	Round gold *Ṭaṃka*	14 types from 1 to 200 *tolas*	from 11.003 g to 2.2 kg
212-225	141	Square gold *Ṭaṃka*	14 types from 1 to 200 *tolas*	from 11.003 g to 2.2 kg
226	142	Round gold *Taṃka*	13 1/3 *māṣa*	12.228 g
227	142	Round *Soniyā* 1	1 *māṣa*	0.917 g
228	142	Round *Soniyā* 2	2 *māṣas*	1.834 g
229	142	Round *Soniyā* 3	4 *guṃjas*	

Table 27 states that the gold *Ṭaṃka* of 13 1/3 *māsas* (= 12.227 g) is of circular shape. Wright 1936, p. 96 f. lists three square types (nos. 368, 369, 370) and one circular type (no. 370A), all weighing about 169 grains, i.e. roughly 1 *tolā.* No. 370B (Pl. XX) is a square coin with a weight of 55.7 grains, i.e. 4 *māṣas.* Pherū does not mention any such coin! Perhaps it was introduced after the DP was written in 1318. According to Wright (p. 107 f), the square coin was brought into vogue in 1317 or 1318.

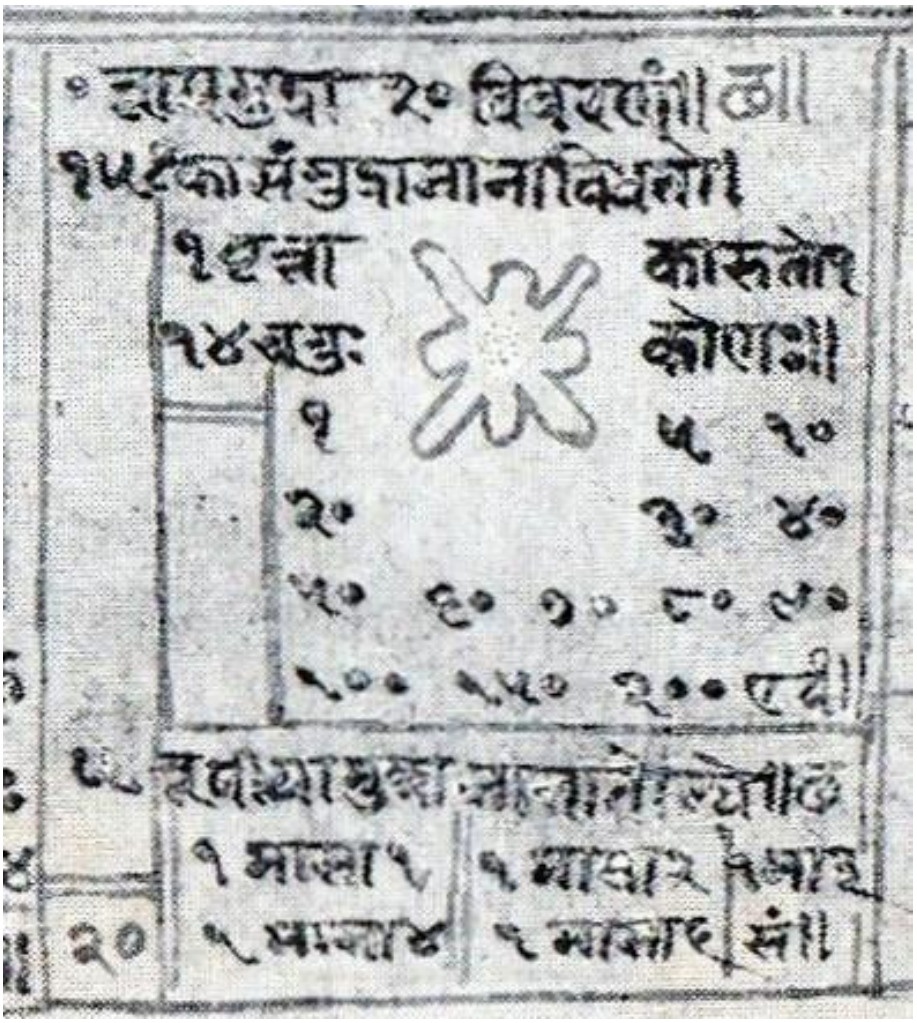
13.2 Silver Coins

ruppiga tolī vaṭṭā caüdasa caüraṃsa hema sama tullā |
paṃca vihā ruppaïyā iga du ti caümāsi addha tulā ‖ 143 ‖
‖ *iti rupya-mudrāḥ* ‖

143. There is a circular silver coin of one *tolā,* and fourteen [types of] square [silver coins] having the same weights as the gold coins. There are five types of *Ruppaiyā / Rupīyā* weighing one, two, three and four *māṣas* and half a *tolā* [respectively].

Thus [the 20 types of] silver coins.

Table 28[110]



110 Detail from Figure 2.

Table 28a

rūpyamudrā 20 vivaraṇam |
15. ṭaṃkā mudrā nānā vidha to◦ |
1. saṃvṛttākāra to◦ 1
14. catuḥkoṇaḥ | tolo yathā —
1 5 10 20 30 40 50
60 70 80 90 100 150 200
evaṃ
5. rupīyā mudrā nānā tolo |
1 māsā 1 | 1 māsā 2 | 1 mā◦ 3
1 māsā 4 | 1 māsā 6 | saṃvṛttā◦
20.

According to the table, the *Rupīyās* are circular. Wright 1936, p. 97 f. lists 5 circular coins (nos. 371, 371A, 372, 374, 374A) and 2 square types, (371B, 373) each weighing about 169 grains, or 1 *tolā.* No. 375 of 84.6 grains corresponds to the *Rupīya* of 6 *māsas,* and no. 375A of 26 grains to the *Rupīya* of 2 *māṣas.*

Table 28b

S.no.	Verse no.	Coin name	Wt. of a Single coin	Wt. of a single coin (in grams)
230	143	Round silver *Ṭaṃka*	1 *tolā*	11.003 g
231-244	143	Square silver *Ṭaṃkas* 14 types as in gold		
245	143	*Rupiyā* 1	1 *māṣa*	0.917 g
246	143	*Rupiyā* 2	2 *māṣas*	1.834 g
247	143	*Rupiyā* 3	3 *māṣas*	2.751 g
248	143	*Rupiyā* 4	4 *māṣas*	3.668 g
249	143	*Rupiyā* 5	5 *māṣas*	4.585 g

13.3 Billon Coins

duggāṇī ya chagāṇī tulle mulle ya ruppa taṃbe ya |
allāī sama jāṇaha anne anne vi hī bhaṇimo ‖ 144 ‖
caügāṇī vaṭṭa sae sola savā taṃka nava javā ruppaṃ |
caümāsā tulleṇaṃ na saṃsayaṃ ittha nāyavvaṃ ‖ 145 ‖
caüvīsa vārasaṭṭha ya aḍayālīsāṇa mudda caüraṃsā |
tulle ya ruppa taṃbaya saṃkhā kami aṭṭhagāṇīo ‖ 146 ‖
tittīsa ṭaṃka nava java caü visuvā ruppu sesa taṃbo ya |
saya aṭṭhagāṇiehiṃ igegi tullo ya caümāsā ‖ 147 ‖
‖ *iti draṃma mudrāḥ* ‖

144. *Dugānī* and *Chagānī* are like the *Alāī* [coins, i.e. *Dugānī* and *Chagānī* of ᶜAla' al-Dīn] in weight, price, and silver and copper [content]. Now I shall speak about others.

However, in Table 29, the amount of silver and copper in 100 *Dugānī* coins are given as 8 and 92 *ṭaṃkas* respectively. But these values do not correspond to either of the two types ᶜAlā' al-Dīn's *Dugānīs* (see Table 25). The same is the case with *Chagānī*.

145. In one hundred circular *Caügānī* [coins] there are sixteen and a quarter *ṭaṃkas* and nine *javas* of silver. The weight [of a single *Caügāṇī* coin] is four *māṣas*; there is no doubt about it.

146. *Caüvīsa / Caübīsagānī, Varasa / Bārahagānī, Aṭṭha / Aṭṭhagānī* and *Aḍiyālīsa / Aḍatālīsagānī* coins are square [in shape]. The weights of silver and copper [in these coins] should be calculated on the basis of *Aṭṭhagānī.*

147. In one hundred *Aṭṭhagānīs,* there are thirty-three *ṭaṃkas,* nine *javas* and four *visuvas* of silver. The weight of each coin is four *māṣas.*

Thus the [the 7 types of] *Dramma* coins.

13.4 Copper Coins

visuvā savāya visuvā adhavā païkā ya taṃba caüraṃsā |
tulleṇa kami caḍaṃtā māsāo jāma paṇa māsā ‖ 148 ‖
‖ *iti sāhe mudrāḥ* ‖

148. Square copper coins: *Visuvā, Savāya Visuvā, Adhavā* and *Païkā* weigh from one *māṣa* gradually increasing up to five *māṣas.*

Thus the imperial (*sāhe* ?) coinage.

On these copper coins, Gupta 1969, p. 89, remarks as follows: “The copper coins of these early Sultans of Delhi were smaller in value than the billon *gani.* They were *visuva* (one-twentieth of a *gani*), *sava-visuva* (one-sixteenth of a *gani*), *adhava* (one-eighth of a *gani*) and *paika* (five *visuvas* or one-fourth of a *gani*). They, according to Thakkura Pheru, weighed 14.2, 19.7, 35.8 and 71.6 grains respectively.”

Table 29a

drammā mudrā sapta 7 nānāvidha tolo mūlo |
vṛttākāra mudrā 3 tolye ṭaṃ 1
1. Dugāṇī 100 madhye dhātu 2
ṭaṃ. 8 navātī rūpya| ṭaṃ. 92 tāṃra
1. Caügānī 100 madhye dhātu 2
ṭaṃ. 16 mā◦ 1 java 9 rūpya
ṭaṃ. 83 mā◦ 2 java 7 trāṃbā
1. Chagānī 100 madhye dhātu 2
ṭaṃ. 24 mā◦ 3 java 1‖ rūpya
ṭaṃ. 75 mā◦ java 14‖ tāṃra
caturasra mudrāḥ 4
1. Aṭhagānī 100 madhye
*ṭaṃ. 33 mā◦ java 9 **S** 4 rū◦*
ṭaṃ. 66 mā◦ 3 ja◦ 6 |||. 1 tāṃ◦
1. Vārahagānī 100 ṭaṃ◦ 150
*mā◦ 1 ja◦ 15|||. 1| 2 **S** 4 rū◦*
*mā◦ 4 ja◦ **S** 3‖. 2|||. 1 tāṃ◦*
1. Caüvīsagānī to ṭaṃ◦ 3 (300?)
mā◦ 3 ja◦ 15‖. 2‖. 4|. 3 rū◦
*mā◦ 8 ja◦ | 2 **S** 0 | **S** 0 ‖ tāṃ◦*
4. Aḍatālīsagānī ṭaṃ◦ 6 (600?) caüvsagāṇīto dviguṇaṃ dravyaṃ |
tāmra mudrā 4 sāha saṃ |
*°**S** 1 māsā 1*
*°**S** 1| māsā 1|*
*°**S** 2‖ māsā 2‖ ° **S** 5 māsā 5*

Verse 147 states that in one hundred specimens of *Aṭhgānī*, the silver content is 33 *ṭaṃkas,* 9 *javas* and 4 *visuvas.* In table 29 above "9 *javas* and 4 *visuvas*" is represented as 9 ***S*** 4, employing the special symbol ***S*** for *visuva.* Since each coin weighs 1 *ṭaṃka,* one hundred of these weigh 100 *taṃkas.* The amount of copper in these 100, would be 66 *ṭaṃkas,* 3 *māṣas,* 6 *javas* and 16 *visuvas.* In the table "6 *javas* and 16 *visuvas*" is represented as 6 |||. 1; here 6||| denote 6 ¾ *javas,* i.e, 6 *javas* 15 *visuva.* The 16 *visuva* is represented by the final digit 1.

The text does not mention weights of a single coin of *Bārahganī* and *Caubīsaganī.* But it can be assumed that like the other *Dramma* coins these too weigh 4 *māṣas* (3.668 g).

The text does not give the weights of silver and copper in *Bārahganī* and *Caubīsaganī*, but the table does. However, the notation is totally incomprehensible.

The notation concerning the four copper coins is equally confusing. The text states that the first copper coin has a weight of 1 *visuvā,* which is shown in the table as ***S*** *1 māsā 1.* One would think that here ***S*** *1* is adequate; then what is the significance of "*māsā 1*". The same the problem with the next three coins.

Table 29b

S.no.	Verse no.	Coin name	Wt. of a single coin (in grams)	Wt. of silver in 100 coins (in grams)	Wt. of copper in 100 coins (in grams)	Face value
249		*Dugāṇī* (circular)	3.668 g	29.344 g	337.456 g	2 *Drammas*
250		*Caügānī* (circular)	3,668 g	60.118 g	306.677 g	4 *Drammas*
251		*Chagānī* (circular)	3.668 g	84.869 g	275.927 g	6 *Dramma*
252		*Aṭhagānī* (square)	3.668 g	121.569 g	245.229 g	8 *Drammas*
253		*Bārahagānī* (square)	3.668 g			12 *Drammas*
254		*Caübīsagānī* (square)	3.668 g			24 *Drammas*
255		*Aḍatālīsagānī* (square)	3.688 g			*48 Drammas*
256	148	*Visuvā*	0.003 g			1/20 *dr*
257	148	*Savāya Visuvā*	0.00375 g			1/16 *dr*
258	148	*Adhavā*	0.0075 g			1.8 *dr*
259	148	*Paikā*	0.015 g			¼ *dr*

14.0 Conclusion

evaṃ davvaparikkhaṃ disimittaṃ caṃdataṇaya phereṇa |
bhaṇiya suya-baṃdhavatthe teraha paṇahattare varise ‖ 149 ‖
iti śrīcandrāṃgaja ṭhakkura pherū viracitā
dravyaparīkṣā samāptā |

149. Thus the *Davvaparikkhaṃ* has been expounded briefly by Pherū, son of Canda, in the year 1375 (= AD 1318) for the sake of his brother and son.

[Here] ends the *Dravyaparīkṣā* composed by Ṭhakkura Pherū, son of the the illustrious Candra.

BIBLIOGRAPHY

Ā'īn-i Akbarī | H. Blochmann, (tr). The *Ā'īn-i Akbarī by Abu'l-Fazl 'Allāmī*, vol. 1, Calcutta 1873.

Agrawala 1951-52 | Vasudeva Sharan Agrawala, "Dhātūtpatti" (text, Hindi translation by Bhanwar Lal Nahata and Sanskrit *chāyā* by Narottarm Dās Svāmī), *The Journal of the Uttar Pradesh Historical Society,* 24-25 (1951-52) 321-335.

Agrawala 1954 | V. S. Agrawala, "The Highest Purity of Gold in India (Solahbānī and Bārahbānī Systems)," *Journal of the Numismatic Society of India,* 16.2 (1954) 270-274.

Agrawala 1964-65 | V. S. Agrawala, "Ṭhakkura Pherū viracitā Prākṛtabhāṣābaddhā Dravyaparīkṣā," *Indian Numismatic Chronicle,* 4.1 (1964-65), pp. 75-94.

Agrawala 1966 | V. S. Agrawala, "A Unique Treatise on Medieval Indian Coins" in: *Studies in Indian Cultutre: Dr. Ghulam Yazdani Commemoration Volume,* Hyderabad 1966, pp. 81-101 (English translation of *gāthās* 51-149). Reprinted as Agrawala 1969.

Agrawala 1969 | "Dravyaparīkṣā of Ṭhakkura Pherū: Translated by V. S. Agarwal," *Indian Numismatic Chronicle,* vol. VII, parts 1-2 (1969) pp. 110-114.

Agricola | Georgius Agricola, *De Re Metallica,* translated from the first Latin edition of 1556, … by Herbert Clark Hoover & Lou Henry Hoover, London 1912; reprinted often in Dover Paperbacks.

Arthaśāstra | *The Kauṭilīya Arthaśāstra,* ed. R. P. Kangle, part 1 (text), second edition, Bombay University 1969; part II (translation), second edition, Bombay University 1972.

Cunningham 1891 | A. Cunningham, *Coins of Medieval India from seventh century to Mohammaden Times*, London 1891.

Deshpande 1966 | Vijaya Jayant Deshpande, "Muṣāvijñāna or the Science of the Crucibles," *Indian Journal of History of Science,* 30.4 (1996) 359-373.

Deyell 1999 | John S. Deyell, *Living without Silver: The Monetary History of Early Medieval North India,* OUP, Delhi 1990, Oxford India Paperbacks, 1999.

Deyell 2017 | John S. Deyell, "A Fresh Look at Dehliwalas and Related Coinages of the Twelfth Century," *Numismatic Digest*, Mumbai, 41 (2017) 97-127.

Deyell 2018 | John S. Deyell, "*Iti tridhātumiśritamudrāh*: The Rajput 'seated-Lakshmi' coins and the revival of gold in North India," *Numismatic Digest*, Mumbai, 42, (2018) 98-114.

Goron & Goenka 2001 | Stan Goron & J. P. Goenka. *The Coins of the Indian Sultanates: Covering the Area of Present Day India, Pakistan and Bangladesh*, New Delhi 2001.

Gupta 1957 | Parameshwari Lal Gupta, "The Coinage of the Khilji Sultans of Delhi," *The Journal of the Numismatic Society of India,* 29 (1957) 35-47.

Gupta 1969 | Parameshwari Lal Gupta, *Coins,* National Book Trust, New Delhi 1969.

Habib 1931 | Muhammad Habib (tr), *The Campaigns of 'Alā'u'd-Dīn Khilji being the Khazā'inul Fuṭūḥ (Treasures of Victory) by Hazrat Amir Khusrau of Delhi*, Madras 1931.

Habib 982 | Irfan Habib, "Agrarian Economy," in: Tapan Roychaudhury & Irfan Habib (ed), *The Cambridge Economic History of India,* Volume I: *c.* 1200- *c.* 1700, Cambridge 1982, p. 50 ff.

Hasan 1998 | Najm-Ul-Hasan, "Making Big Money," *Hindustan Times,* 1 May 1998.

Hayashi 2014 | Takao Hayashi, "Magic Squares in India" in: Helaine Selin (ed), *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures,* Dordrecht 2014.

Jacobi 1892 | Hermann Jacobi, "The Computation of Hindu Dates in Inscriptions, &c.," *Epigraphia Indica,* 1 (1892) 403-460.

Jain 1950 | Banarsi Das Jain, "The Persian of Jain Hymns" in: Vishva Bandhu (ed), *Siddhabhāratī, or the Rosary of Indology,* Part One, Hoshiarpur 1950, pp. 47-49.

Jinapāla | Jinapālopādhyāya, *Kharatara-gacchālaṃkāra-yugapradhānācārya-gurvāvalī,* included in: Jina Vijaya Muni (ed), *Kharatagagaccha-bṛhad-gurvāvalī,* Singhi Jain Series 42, Bombay 1956, pp. 1-88.

Kapadiya 1934 | Hiralal R. Kapadiya, "A note on Jaina hymns and magic squares," *Indian Historical Quarterly,* 10 (1934)148-153.

Koch 2004 | Ebba Koch, "The 'Moghuleries' in the Millionenzimmer, Schönbrunn Palace, Vienna" in Rosemary Criller et a (ed), *Arts of the Mughal India: Studies in Honour of Robert Skelton,* Mapin Publishing, Ahmedabad 2004, pp. 153-167.

Kulkarni 1987 | R. P. Kulkarni (tr), *Vastusara-Prakaranam: A Prakrit Treatise of Vastushastra*, Pune 1987.

Mahendra Sūri | Mahendra Sūri, *Yantrarājaḥ, Mahendraguru-viracitaḥ, Malayendu-sūri-viracita-ṭīkā-sahitaḥ,* ed. Kṛṣṇaśaṃkara Keśavarāma Raikva, Mumbai 1936.

Majumdar 1956 | Asok Kumar Majumdar, *Chaulukyas of Gujarat: A Survey of the History and Culture from the Middle of the Tenth to the End of the Thirteenth Century*, Bharatiya Vidya Bhavan, Bombay 1956.

Majumdar 1957 | Ramesh Chandra Majumdar (ed), *The Struggle for Empire,* Bharatiya Vidya Bhavan, Bombay 1957.

McHugh 2012 | James Andrew McHugh, *Sandalwood and Carrion: Smell in Indian Religion and Culture*, Oxford 2012.

Mehta 1991 | Makrand Mehta, *Indian Merchants and Entrepreneurs in Historical Perspective*, Delhi 1991.

Mitchiner 2000 | Michael Michiner, *Ramatankas, Hindu Religious Tokens illustrating Themes from Ramayana*, Nasik 2000.

Moin 1999 | Danish Moin, *Coins of the Delhi Sultanate,* Indian Institute of Research in Numismatic Studies, Nasik 1999.

Nahata & Nahata | Agarchand Nahata & Bhanwar Lal Nahata, *Ratnaparīkṣā, Calcutta,* n.d. (text with Hindi translation).

Nahata 1976 | Bhanwar Lal Nahata, *Ṭhakkura Pherū viracitā Dravyaparīkṣā aur Dhātūtpatti* (texts with Hindi translation and notes), Vaishali 1976.

Nahata Festschrift 1976 | *Śrī Agarchand Nāhaṭā Abhinandan Granth,* ed. Hazarimal Banthia, Bikaner 1976.

Nahata Festschrift 1986 | *Śrī Bhanwar Lal Nāhaṭa Abhinandan Granth*, Calcutta 1986.

Rây 1956 | P. Rây, *History of Chemistry in Ancient and Medieval India,* Indian Chemical Society, Calcutta 1956.

SaKHYa 2009 | Sreeramula Rajeswara Sarma, Takanori Kusuba, Takao Hayashi & Michio Yano, *Gaṇitasārakaumudī, the Moonlight of the Essence of Mathematics, by Ṭhakkura Pherū,* edited with Introduction, Translation and Mathematical Commentary, New Delhi 2009.

Sarma 1983 | Sreeramula Rajeswara Sarma, "*Varṇamālikā* System of Determining the Fineness of Gold in Ancient and Medieval India" in *Aruṇa-Bhāratī: Professor A. N. Jani Felicitation Volume,* Baroda, 1983, pp. 369-389.

Sarma 1984 | Sreeramula Rajeswara Sarma, *Ṭhakkura Pherū's Rayaṇaparikkhā*, *A Medieval Prakrit Text on Gemmology,* with an Introduction, Sanskrit *chāyā*, Translation into English and Commentary Aligarh 1984.

Sarma 1986 | Sreeramula Rajeswara Sarma, "Thakkura Pheru and the Popularisation of Science in India in the Fourteenth Century" in: *Sri Bhanwar Lal Nahata Abhinandana Grantha*, Calcutta 1986, pt 4, pp. 63-72; reprinted as Sarma 1987 and Sarma 1991.

Sarma 1987 | Sreeramula Rajeswara Sarma, "Thakkura Pheru and the Popularisation of Science in India in the Fourteenth Century," *Jain Journal*, 21.3 (January 1987) 86-95.

Sarma 1990 | S. R. Sarma, "Islamic Calendar and Indian Eras" in: G. Kuppuram & J. Kumudamani (ed), *History of Science and Technology in India,* Delhi 1990, vol. II, pp. 433-441.

Sarma 1991 | Sreeramula Rajeswara Sarma, "Thakkura Pheru and the Popularisation of Science in India in the Fourteenth Century" in: Ganesh Lalwani (ed), *Jainanthology: An Anthology of Articles selected from Jain Journal of last 25 Years,* Jain Bhavan, Calcutta1991, pp. 146-156.

Sarma 1996 | Sreeramula Rajeswara Sarma, "Sanskrit Manuals for Learning Persian" in: Azarmi Dukht Safavi (ed), *Adab Shenasi,* Aligarh 1996, pp. 1-12.

Sarma 1999 | Sreeramula Rajeswara Sarma, "Yantrarāja: The Astrolabe in Sanskrit," *Indian Journal of History of Science,* 34 (1999) 145-158.

Sarma 2000 | Sreeramula Rajeswara Sarma, "Sultān, Sūri and the Astrolabe," *Indian Journal of History of Science*, 35.2 (2000) 129-147.

Sarma 2002 | Sreeramula Rajeswara Sarma, "From Yāvanī to Saṃskṛtam: Sanskrit Writings inspired by Persian Works," *Studies in the History of Indian Thought,* Kyoto, 14 (November 2002) 71-88.

Sarma 2009 | Sreeramula Rajeswara Sarma, "Persian-Sanskrit Lexica and the Dissemination of Islamic Astronomy and Astrology in India" in: Gherardo Gnoli & Antonio Panaino (ed), *KAYD: Studies in History of Mathematics, Astronomy and Astrology in Memory of David Pingree* (Serie Orientale Roma, CII), Rome 2009, pp. 129-150.

Sarma 2012 | Sreeramula Rajeswara Sarma, "A Jain Assayer at the Sulṭān's Mint" in: Jayandra Soni (ed), *Jaina Studies: Proceedings of the DOT 2010 Panel in Marburg, Germany,* Aditya Prakashan, Delhi 2012, pp. 7-32.

Sarma 2021 | Sreeramula Rajeswara Sarma, *A Descriptive Catalogue of Indian Astronomical Instruments* - third revised edition; accessible online at https://srsarma.in/catalogue.php and at CrossAsia-Repository https://crossasia-repository.ub.uni-heidelberg.de.

Sarma & Sahai 1995| Sreeramula Rajeswara Sarma & Yaduendra Sahai, "Gushing Mercury, Fleeing Maiden: A Raśaśāstra Motif in Mughal Painting," *Journal of the European Āyurvedic Society,* 4 (1995) 149-162.

Schröder 2015 | Johannes Schröder, "A Wooden Jain House Temple from the Berlin Museum of Asian Art and its Tradition," *Südasien-Chronik - South Asia Chronicle,* 5 (2015) 347-368. https://edoc.hu-berlin.de/bitstream/handle/18452/9156/43.pdf?sequence= 1 [also bit.ly/3mPbTqQ, last accessed in January 2021]

Sewell & Dikshit 1896 | Robert Sewell & Sankara Balakrishna Dikshit, *The Indian Calendar, with Tables for the Conversion of Hindu amd Muhammadan into A. D. Dates, and vice versa,* London 1896.
https://ia800909.us.archive.org/35/items/IndianCalendarSewelDikshit/Indian%20calendar-Sewel-Dikshit.pdf
[also bit.ly/3rs3iy0, last accessed in January 2021]

SGS | *Ṭhakkura-Pherū-viracita-Ratnaparīkṣādi-sapta-grantha-saṃgraha,* ed. Agarchand Nahata & Bhanwar Lal Nahata, Rajasthan Oriental Series 60, Jodhpur, 1961.

Shah 1972 | Umākānta P. Shah, "Śabda-vilāsa or Pārasānāmamālā of Mantrī Salakṣa of Gujarat," *Vimarśa: A Half Yearly Bulletin of Rashtriya Sanskrit Samsthan*, Tirupati, Vol. I, No. 1 (1972); English section, pp. 31-36.

Sharma | Dashrath Sharma, *Early Chauhan Dynasties,* 1975.

Steingass 1892 | F. Steingass, *A Comprehensive Persian-English Dictionary,* London 1892 (many reprints).

Strauch 2002 | Ingo Strauch, *Die Lekhapaddhati-Lekhapañcāsikā: Briefe und Urkunden im Mittelalterlichen Gujara*t, Berlin 2002.

Subbarayappa & KVSarma 1985 | B. V. Subbarayappa & K. V. Sarma (ed), *Indian Astronomy : A Source-Book,* Nehru Centre, Bombay 1985.

Tavernier | John Baptista Tavernier, *The Six Voyages of John Baptista Tavernier, a Noble Man of France now living, through Turkey into Persia, and the East-Indies, finished in the Year 1670, giving an account of the state of those countries : illustrated with divers sculptures ; together with a new relation of the present Grand Seignor's seraglio, by the same author / made English by J. P[hillips]*, …, London 1678.
https://ia800204.us.archive.org/31/items/sixvoyagesJohnB00Tave/sixvoyagesJohnB00Tave.pdf
[also bit.ly/3pma7PJ, last accessed in January 2021]

Thomas 1891 | Edward Thomas, *Chronicles of the Pathan Kings of Delhi,* London 1891.

Truschke 2020 | Audrey Truschke, "Jains and Muslims", *Brill's Encyclopedia of Jainism*, 2020, pp. 330-341.

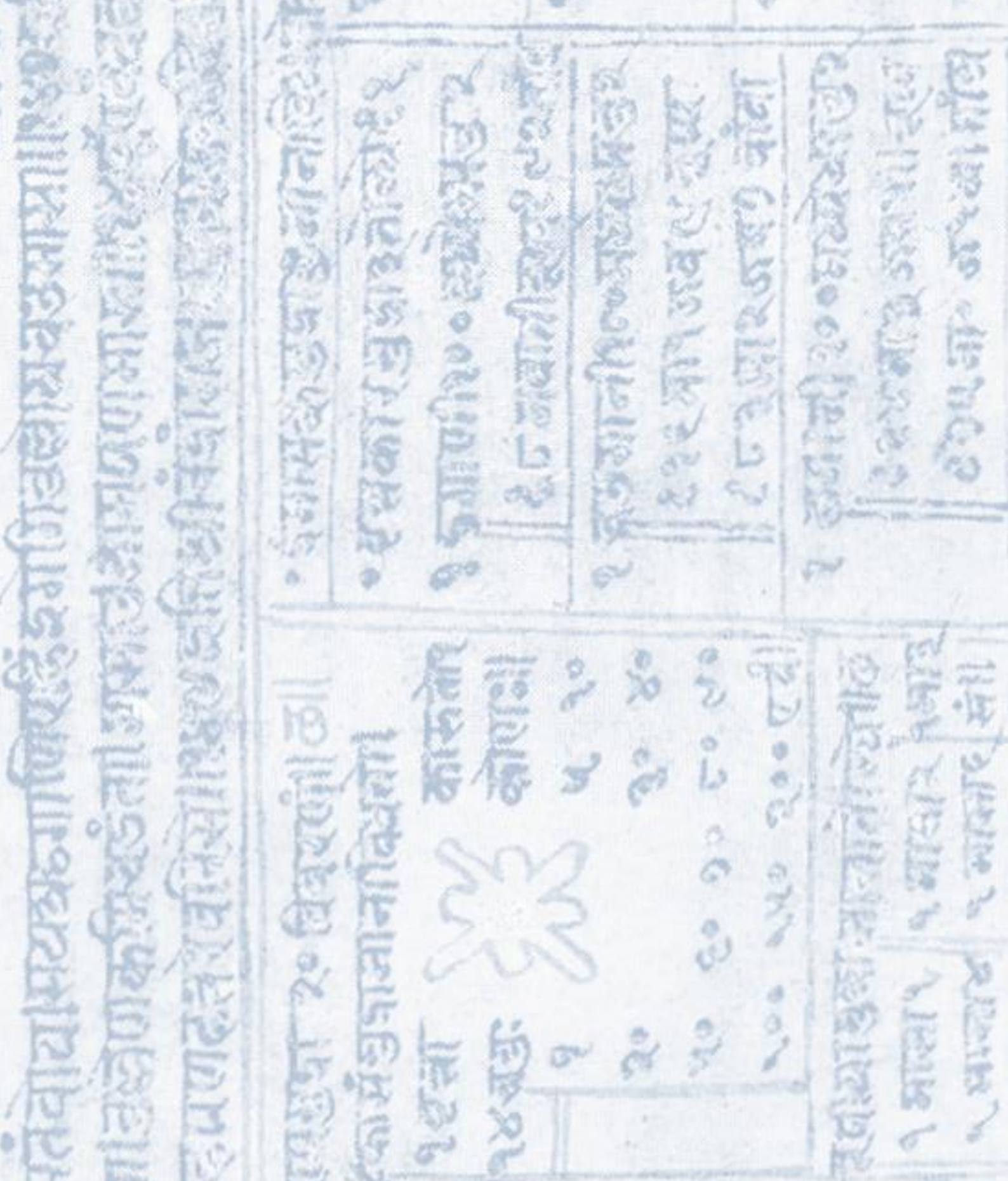
Velankar 1944 | Hari Damodar Velankar (ed), *Jinaratnakośa: An Alphabetical Register of Jain Works and Authors,* vol. I: Works, Bhandarkar Oriental Research Institute, Poona 1944.
https://ia801602.us.archive.org/12/items/in.ernet.dli.2015.341473/2015.341473.Jinaratnakosa-An.pdf
[also bit.ly/2KTqVi6, last accessed in January 2021]

Wilson 1855 | H. H. Wilson, *A Glossary of Judicial and Revenue Terms* …, London 1855.

Wright 1907 | H. Nelson Wright, *Catalogue of the Coins in the Indian Museum Calcutta, including the Cabinet of the Asiatic Society of Bengal,* volume II, Oxford 1907. https://ia800307.us.archive.org/2/items/catalogueofcoins02indi/catalogueofcoins02indi.pdf
[also bit.ly/34HLlS6, last accessed in January 2021]

Wright 1936 | H. Nelson Wright, *The Coinage and Metrology of the Sultāns of Delhī, incorporating a Catalogue of the Coins in the Author's Cabinet now in the Delhī Museum*, Oxford University Press, New Delhi 1936, reprint: New Delhi 1974.

Wulff 1966 | Hans, E. Wulff, *The Traditional Crafts of Persia: Their Development, Technology, and Influence on Eastern and Western Civilizations*, The M.I.T. Press, Cambridge, Mass. & London 1966.



THE DRAVYAPARĪKṢĀ OF ṬHAKKURA PHERŪ

An Assayer's Manual from the Khaljī Court of Delhi

Duesseldorf, Germany