

Du corps humain, au carrefour de plusieurs savoirs en Inde.
Mélanges offerts à Arion Roşu à l'occasion de son 80^e anniversaire

BROKEN STRING – SCATTERED PEARLS A MOTIF IN SANSKRIT POETRY AND MATHEMATICS

Sreeramula Rajeswara SARMA

Aligarh Muslim University, Aligarh - University of British Columbia, Vancouver

0.1 To Bhaṭṭa Tauta, the guru of the celebrated Abhinavagupta, is attributed the saying that the inborn poetic genius consists in the ability to invent ever new or original modes of expression¹. The originality most cherished in Sanskrit *kāvya*, however, is not so much an originality in themes, images, comparisons or motifs, but rather the originality in inventing new variations or twists to what are already stock motifs. It should, therefore, be interesting to trace how poets at different times play upon the variations of a single motif. It is these variations that show the imagination, the creativity, and the innovation of a poet². The poet or, for that matter, any artist in Indian classical tradition, though working within strictly laid down parameters, has the freedom to be innovative in inventing original variations to the stock motif.

0.2 In this paper, I propose to study a poetic conceit³ connected with the pearl necklace, the string of which keeps breaking at every

¹ *Prajñā navanavollekhaśālinī pratibhā matā*, quoted by Śrīdhara in his commentary *Kāvyaṅkāśaviveka* on Mammaṭa's *Kāvyaṅkāśa*, ed. Sivaprasada BHATTACHARYA, Part 1, Calcutta 1959, p. 6.

² Cf. Siegfried LIENHARD, "Beobachtungen zu einem wenig bekannten Kāvya-Motiv", *WZKS* 22 (1978), p. 57-65, esp. 65: "Es ist grundlegend für unser Verständnis der Entwicklung des *kāvya*, dass Motive ihre poetische Aussagekraft gerade dadurch bewahren, dass sie in stets neuen und überraschenden Wendungen angewandt werden". Cf. also Alex PREMINGER (ed.), *Encyclopedia of Poetry and Poetics*, Princeton, New Jersey, 1965, s.v. *Originality*, p. 595: "Eliot argues that a poet, under most circumstances, is successful only when writing within a tradition and that therefore his search for originality should be confined to producing 'finer variations within a form'".

³ On poetic conceits in general, see Wilhelm RAU, "Poetical Conventions in Indian *Kāvya* Literature", *The Adyar Library Bulletin* 50 (1986), p. 191-197.

slender excuse, scattering the pearls all around. Pearls were used in ancient India to decorate various objects like thrones, canopies, elephant trappings and so on; they were also employed in various kinds of ornaments for men and women. Poets often describe these ornaments made of pearls⁴. More often they employ pearls as metaphors: to compare the droplets of perspiration⁵, the hot drops of tears⁶, or, as the incomparable Kālidāsa does, to compare the lustre on the smiling lips of Pārvaī with the luminosity on the pearl⁷.

0.3 The main function of the pearl in Sanskrit *kāvya*, however, is to decorate a woman's bosom in the form of a necklace or *hāra*⁸. It looks as though the breasts and pearl strings are inseparable in the poet's imagination. Whether in joy or in distress, whether walking or making love, a woman is never without her pearl string in Sanskrit poetry. Even when she is shedding tears in great distress, the tear drops themselves adorn her breasts like a pearl necklace⁹.

⁴ On the use of pearls in Sanskrit poetry, see Sreeramula Rajeswara SARMA, "Gajamuktika: Poetic Convention and Reality", *BEI* 9 (1991), p. 195-202; Minoru HARA, "The Pearl in Sanskrit Literature", *Memoirs of the Research Department of the Toyo Bunko*, No. 57, 1999, p. 156-174; Rani MAJUMDAR, "Kādambarī men Muktaṅghaḥ" in Radhavallabh TRIPATHI (ed.), *Vāṇmayī: Panorama of Indological Researches: Dr. Krishna Kant Chaturvedi Felicitation Volume*, Delhi, 1999, p. 180-186; IDEM, "Kālidās ki Kṛtiyon men Muktaṅghaḥ", *Pañcāla*, Kanpur, vol. 12, 1999, p. 106-113.

⁵ See e.g. Bāṇa, *Kādambarī* (with the *Ṭīkā* by Bhānucandra and Siddhicandra, reprint: Delhi 1985), p. 31: *narapatih ... vyāyāmbhūmim ayāsīt | sa tasyām ... kṛtamadhuravyāyāmah ... nirdayaśrama-cchinna-hāravigalita-muktā-prakarānu-kāribhiḥ ... svedakaṅkāsantatibhir alaṅkriyamāṅgamūrtih ...*

⁶ Kālidāsa, *Vikramorvaṣya* 5.15:

*kiṃ sundari praruditāsi mamopanīte
vaṣṣasthiter adhigamān mahati pramode |
pīnastanopari nipātibhir ānayanti
muktāvaliviracanāṃ punaruktim asraiḥ ||*

see also Kālidāsa, *Raghuvamśa* 6.28:

*anena paryāsayatāśrubindūn muktāphalasthūlatamān staneṣu |
pratyaṅgīṭāḥ śatruvilāsiniṅam unmucya sūtreṇa vinaiva hārāḥ ||*

⁷ Kālidāsa, *Kumārasambhava* 1.44:

*puṣpaṃ pravālopaḥitaṃ yadi syān muktāphalaṃ vā sphuṭavidrumastham |
tato 'nukuryād viśadasya tasyās tāmroṣṭhaparyastarucaḥ smītasya ||*

⁸ In Sanskrit *hāra* always means a pearl string; cf. *Amarakośa*: *hāro muktāvalī*; *Medinī*: *hāro muktāvalau yudhi*; Mallinātha on *Kumārasambhava* 5.8: *hāraṃ muktāvalīm*.

⁹ See *Vikramorvaṣya* 5.15; *Raghuvamśa* 6.8 cited in note 6 above.

Indeed, as Kālidāsa observes, it is difficult to decide whether pearls enhance the beauty of breasts or whether the latter make pearls shine all the more:

*kañṭhasya tasyāḥ stanabandhurasya muktākalāpasya ca nistalasya |
anyonyaśobhājananād babhūva sādharmaṇo bhūṣaṇabhūṣyabhāvaḥ ||¹⁰*
Her neck, pretty with the swelling breasts,
and the string of well rounded pearls
make each other mutually beautiful.
The relationship of the adornment and the adorned
thus became mutual between the two.

0.4 The picture of the pearl necklace swinging on the plump breasts of a lovely woman is delineated with great economy with a few verbal brush strokes in the following Prakrit verse:

*sundari gujjari ṇāri loaṇa dīha visāri |
piṇapaoharabhāra lolai mottiyahāra ||¹¹*
Pretty Gujjarī wench,
eyes long and wide;
[on] plump, heavy breasts
dangles the string of pearls.

0.5 In Sanskrit, the pearl is called *muktā* (f), and the term *mukta* (m) denotes a liberated soul. Poets are fond of playing upon this double meaning. Thus Amaru:

*hāro 'yam hariṇākṣiṇām luṭhati stanamaṇḍale |
muktānām apy avastheyam ke vayam smarakiṅkarāḥ ||¹²*
This pearl string lingers
on the breast-globes of the deer-eyed beauties.
If this is the case of the liberated souls / pearls,
what to say about us, Kāma's slaves ?

Another variation based on double meaning occurs in the following verse of uncertain authorship, generally attributed to Amaru:

*asadvṛtto nāyam na ca khalu guṇair eṣa rahitaḥ
priyo muktāhāras tava caraṇamūle nipatitaḥ |
grhāṇemaṇ mugdhe vrajatu nijakañṭhapraṇayitām*

¹⁰ Kālidāsa, *Kumārasaṃbhava* 1.42.

¹¹ *Prākṛtapaiṅgala*, edited and translated into Hindi by Bhola Shankar VYAS, Varanasi 1959, l. 178; see also 2.185.

¹² *Amaruśataka*, with the *Rasikasañjīvanī* commentary by Arjunavarmadeva, NSP, third edition, Bombay 1954, appendix 3, no. 138, p. 80.

upāyo nāsty anyas tava hṛdayasantāpaśamane ||¹³

He is not a bad character	It's not that it is not fully round,
nor is he without merits.	nor is it without qualities ¹⁴ .
The lover gave up his food,	This dear pearl necklace
and is falling at your feet.	fell on your feet.
Do take him, dear,	Do pick it up, dear,
and let him enjoy your embrace.	and let it adorn your neck.
There is no other way	There is no other way
to remove the burning in your heart.	to cool your burning heart.

1.1. As with many other motifs which became stock motifs later on through repeated imitation, this motif of the "broken string and scattered pearls" was also employed for the first time by Kālidāsa:

*gatyutkampād alakapatitair yatra mandārapuṣpaiḥ
patracchedaiḥ kanakakamalaiḥ karṇavibhramśibhiś ca |
muktājālaiḥ stanaparicitaiḥ chinnaśūtrais ca hārair
naiśo mārgaḥ savitur udaye sūcyate kāmīnīnām* ||¹⁵

In the blessed city of Alakā, the nocturnal wanderings of the lovely ladies can be discerned the next morning from the various items that they unknowingly scattered on the path owing to the agitation in their gait: *mandāra* flowers from their hair, decorative paint on their cheeks, golden lotuses with which they had decked their ears, and above all, strings of pearls that once rested on their breasts, as they hurried in darkness towards the lover; or, more appropriately, when they returned from him.

1.2 Kālidāsa himself offers a variation on this motif, a variation that finds echo in all the subsequent poets. The pearl necklace breaks also during a tempestuous love play, and the scattered pearls tell what naughty events took place there. But then just to say that pearls are scattered on the ground and that these suggest that somebody was making love at this

¹³ Cited in the *Subhāṣitāvalī* as by Amaru, but not commented upon by any. See *Amaruśataka*, with the *Rasikasāñjivani* commentary by Arjunavarmadeva, NSP, third edition, Bombay 1954, appendix 4, p. 81, no. 140.

¹⁴ According to Ratnaśāstra, a pearl is valued on the basis of six qualities (*guṇas*): it should be white (*śīta*), perfectly round (*vr̥tta*), heavy (*guru*), smooth (*snigdha*), sparkling (*tāra*) and clear (*nirmala*). Thus Buddhahatṭa says in his *Ratnaparikṣā* 95:

*sitaṃ vr̥ttaṃ guru snigdhaṃ sutāraṃ nirmalaṃ tathā |
śadbhir guṇaiḥ samāyuktaṃ mauktikaṃ guṇavat smṛtam ||*

Cf. Louis FINOT, *Les lapidaires indiens*, Paris 1896, p. 22. See also Sreeramula Rajeswara SARMA, *Thakkura Pherū's Rayanaparikkhā*, Aligarh 1984, p. 28, 57.

¹⁵ Kālidāsa, *Meghadūta* 70 (=II.11).

place in the previous night is not great poetry. The poet adds other images to this motif. On the mountain Kailāsa, Siddhas live in houses made of rock crystal. The stars reflecting in these crystal palaces look as though they are the pearls, spilled from the necklaces that broke during lovemaking:

*niśāsu yatra pratibimbītāni tārākulāni sphaṭikālayeṣu |
dṛṣṭvā ratāntacyutatārahāramuktābhramaṇ bibhrati siddhavadhvaḥ ||¹⁶*
At night, the mass of stars,
reflecting on the floors of the crystal palaces,
make the Siddha ladies think
that these are indeed those sparkling pearls
scattered from the strings
that broke in their lovemaking.

1.3 Quite often, the broken pearl string is a marker to indicate the places where young persons indulge in uninhibited love play. The well-being of a habitat is judged not only by the spiritual eminence of the Brahmins, not only by the material wealth displayed in the palaces and at the market place, but also by the fortunate circumstances that allow its youth the opportunity to make love: the capital city of an exemplary king caters not only to *dharma* and *artha* but to *kāma* as well. Padmagupta Parimala uses this motif in his *Navasāhasāṅkacarita* to describe the opulence of Ujjayinī ruled by the legendary Vikramāditya (and to allude indirectly to the rule of his patron Muñja Paramāra who was styled Navasāhasāṅka, a title that means as much as a second Vikramāditya):

Sindhurāja

*na pakṣapātena vadāmi satyam uṣassu yasyāṇ bhavanāṅgaṇebhyaḥ |
sammārjanībhiḥ parataḥ kriyante visūtritaikāvalimauktikāni ||¹⁷*
No, I am not saying this out of partiality.
It is absolutely true.
In that city, they sweep away every morning
with brooms all the pearls
from the broken necklaces
that lie scattered in the palace yards.

It is not stated expressly why the strings of the pearl necklaces broke (nor is it necessary for readers familiar with the conventions of Sanskrit *kāvya*), but the implication is clear: namely, that young couples were indulging in what they are expected to indulge in at night.

¹⁶ Kālidāsa, *Kumārasambhava* 9.43.

¹⁷ *The Navasāhasāṅkacarita of Padmagupta alias Parimala*, ed. Pandit Vāmana Shāstrī Islāmpurkar, Bombay 1895, 1.27, part 1, p. 6.

Sindhurājā 1.4 Muñja was succeeded by Bhoja, who was a yet greater patron of poets. One of his protégés elaborates on the motif by heaping further images. He does not describe Bhoja's opulence directly but suggests it through the description of his court poets on whom Bhoja conferred immense wealth. In their palaces too, heaps of pearls get strewn about from necklaces broken in course of love sports (*kelivisūtra*). And these too are swept with brooms into the courtyards "in the morning after". Not only that; coming into contact with the lac dye on the feet of women who go about there, the pearls are tinged with red. Looking at these red pearls, the pet parrots of the palace think they are pomegranate seeds and try to bite into them.

*muktāḥ kelivisūtrahāragalitāḥ sammārjanibhir hṛtāḥ
prātaḥ prāṅgaṇasimni mantharacalābalāṅghrilākṣāruṇāḥ |
dūrād dāḍimabijaṣaṅkitadhiyaḥ karṣanti kelīśukāḥ
yad vidvadbhavaṇeṣu bhojanṛpateṣ tat tyāgalilāyitam ||¹⁸*
Pearls that get loose
from strings which broke in the love play [at night],
are swept with brooms into the yard in the morning.
From the lac dye on the moving maids' feet,
they are then tinged red.
Pet parrots nibble at them,
hoping these to be pomegranate seeds.
It is indeed the effect of King Bhoja's munificence
that this [happens] in the mansions of his poets.

This verse is quoted by Mammaṭa in his *Kāvyaṣprakāśa* as an illustration of the figure of speech called *Udāta*, which consists in an exalted description of a thing or of a person.

1.5 Bhoja's younger contemporary Bilhaṇa introduces yet another twist to the motif of scattered pearls. In Bilhaṇa's native Kashmir, pleasure palaces line up on both banks of the river Vitastā. In the balconies of these palaces, couples engage in uninhibited amorous sports with the usual consequence that the pearl strings break. The pearls then roll down into the river, and the river shines with these floating pearls like the Milky Way with the twinkling stars:

*tīradvandvapaṇayibhavanavrātavātāyanastha-
svairakṛiḍācchalitamithunacchinnaḥārāvākīrṇā |
yasyotsaṅge kulasarid asau nilakaṅṭhaprasūtā
dhatte tārītilakitanabhāṣaṅgigaṅgānukāram ||¹⁹*

¹⁸ Mammaṭa, *Kāvyaṣprakāśa*, tenth Ullāsa, illustration 505.

¹⁹ Bilhaṇa, *Vikramāṅkadevacarita* 18.9.

2.1 In his *Naiṣadhīyacarita*, Śrīharṣa avers that pearl necklaces look pretty only on a woman's bosom²⁰, but examples of men wearing pearl necklaces are not wanting in Sanskrit *kāvya*²¹. A pearl necklace shines on the chest of a man too; indeed its lustre can be augmented by the brightness of his teeth²².

2.2 Pearl strings worn by men also break, not in love sports, but only in the tumult of crowds. Thus in Bāṇa's *Kādambarī*, when crown prince Candrāpīḍa rises from his throne to embark on an expedition, thousands of vassal kings rise from their seats to follow him; the pressure of the crowd is so great that their pearl necklaces break, scattering the pearls on the floor of the royal assembly, and these pearls look as if they were grains of parched rice, thrown up for bringing good luck:

[*Candrāpīḍaḥ*] *samantāt sasambhramotthitaiś ca parasparasamghaṭṭa-vighaṭṭita-hāra-sūtra-vigalitān anavaratam āśāvijaya-prasthāna-maṅgala-līlā-lājān iva muktīāphalaprakarān kṣaradbhiḥ ... anugamyamāno nara-patisahasrair āsthā-namaṇḍapān niragāt*²³.

This description finds an echo in the *Navasāhasāṅkacarita*:

*anyonyasaṁśleṣaviśīrṇahāracyutena sevāvasare nṛpāṅām |
kīrṇāsu muktānikareṇa yasya kaksyāsu vārapramadāḥ skhalanti* ||²⁴
“In his palace halls, the courtesans falter [as they step on] the heaps of pearls that get loose from the broken necklaces of the vassal kings, as they jostle with each other, while paying their respects to him”.

2.3 But the idea of a man's pearl string breaking did not appeal to the poets so much as that of a woman. It is true that the idea of a woman's pearl string breaking during the sexual act contributes to the erotic sentiment. But even in the case of lovemaking, a man's pearl necklace never breaks; it is always the woman's that does so.

3.1 Coming back to the women's pearl strings, we have seen the poets using the motif to describe the opulence of a town or that of a household. Characteristically enough, for Bhartṛhari the scattered pearls

²⁰ *Naiṣadhīyacarita* 2.44: *taruṇīstana eva śobhate maṅghārāvalirāmaṅṅyakaṁ*.

²¹ In real life too, men wore pearl strings, as is evident from the contemporary official portraits of Shah Jahan or Sawai Jai Singh.

²² Cf. Kālidāsa, *Raghuvamśa* 5.52: *daśanaprabhābhiḥ saṁvardhitorahasthala-tāra-hāraḥ*; see also 6.16, 60.

²³ *Kādambarī*, p. 241.

²⁴ *Navasāhasāṅkacarita* 1.69, p. 15.

suggest the dispersal of worldly wealth when the effect of past good deeds is exhausted:

*śubhram sadma savibhramā yuvatayaḥ śvetātapatrojvalā
lakṣmī ity anubhūyate sthiram iva sphīte śubhe karmaṇi |
vicchinne nitarām anaṅgakahakriḍātruṭtantukam
muktājālam iva prayāti jhaṭiti bhraśyad diśo drśyatām ||²⁵*
Marvellous house,
vivacious women,
Goddess of wealth,
radiant with white parasol,
[reigns there, as it were].
One thinks this lasts for ever,
when past good deeds are abundant.
But as soon as these are exhausted,
wealth scatters in all directions
in front of your very eyes,
like the rows of pearls
when the string is broken in love quarrel.

3.2 Note the expression *anaṅga-kalaha-kriḍā*. Lovemaking can certainly be a sport or play (*kriḍā*), but how can it be a *kalaha*, “strife” or “quarrel”? The *Kāmasūtra* provides the answer. It avers that “the sexual union itself is a kind of quarrel (*kalaha*), because lovemaking is a kind of contest (*vivāda*) and pitiless in nature”²⁶. As the commentary *Jayamaṅgala* explains, it is a contest because the man and the woman try to overpower each other; pitiless because it involves biting with teeth, scratching with nails and so on²⁷.

But the contest par excellence is the *Puruṣāyita* (“acting like a man”) or *Viparītarati* (“lovemaking in reverse”) when she does unto him what he had done to her before, in revenge, as it were²⁸. This explains why the love play becomes tempestuous and why the woman’s pearl string breaks.

²⁵ D. D. KOSAMBI (ed), *The Epigrams attributed to Bhartrhari, including the Three Centuries*, Bombay 1948, no. 7, p. 3-4.

²⁶ *Kāmasūtra* 2.7.1: *kalaharūpaṃ suratam ācakṣate | vivādātmarkatvād vāmaśīla-
tvāc ca kāmasya |*

²⁷ The *Jayamaṅgalā* cites Bhāravi, *Kirātārjuniya*, 9.49:

*ādr̥tā nakhapadaīḥ parirambhāś cumbitāni ghanadantanipātaiḥ |
saukumāryaguṇasambhṛtakīrtir vāma eva surateṣv api kāmaḥ ||*

²⁸ *Kāmasūtra* 2.8.6: *sā prakīryamāṅga-keśakusumā śvāsaviçchinnahāsinī vaktra-
saṃsargārthaṃ stanābhyām uraḥ pīḍayantī punaḥ punaḥ śiro nāmayantī yās
ceṣṭāḥ pūrvam asau darśitavāṃś tā eva pratikurvīta |*

3.3 The *Subhāṣitāvali*, compiled by Vallabhadeva²⁹, has a section on *Viparitarati*. We cite two verses from this section. One is from Māgha's *Śiśupālavadhā*:

āhataṃ kucataṣṭena taruṇyāḥ sādhu soḍham amuneti papāta |
*truṭiyataḥ priyatamorasi hārāt puṣpavṛṣṭir iva mauktikavṛṣṭiḥ ||*³⁰
'Bravo, he bore well the attack
from the firm breasts of the beloved!'
As if to proclaim this,
there fell on the lover's chest
[celestial] shower of flowers,
the pearls from the breaking string.

The other is attributed to Bhaṭṭa Bāṇa:

patatu tavorasi satataṃ dayitādhammillamallikāprakaraḥ |
*ratiraṇarabhasakacagrahalulitālakavallarīpatitaḥ ||*³¹
The heaps of the *Mallikā* flowers
from the beloved's coiffeur,
dislodged when her hair was pulled
in the heat of the battle of love,
may always fall on your chest.

Thus expressions like *anaṅgakalaha*, *ratiraṇa*, *suratakalaha*³², *ratikalaha*³³ were clearly understood by connoisseurs (*sahydayas*) as *Viparitarati*³⁴. The motif of the broken string pertains primarily to this mode of lovemaking, whether this is expressly stated or not.

4.1 This motif of the "broken string and scattered pearls" gave rise to mathematical problems as well. When the pearl necklace breaks, all the pearls do not fall at one place. Some roll down under the bed, some reach the corner, some are behind the door and so on. Interesting problems of the type known as *iṣṭakarman* can be formulated from such a

²⁹ *The Subhāṣitāvali of Vallabhadeva*, ed. Peter PETERSON & Pandit DURGAPRASADA (1886), second edition by R. D. KARMARKAR, Bombay Sanskrit and Prakrit Series, No. 3, Poona 1961.

³⁰ No. 2124 = *Śiśupālavadhā* 10.74; see also 10.87:

subhruvām adhi payodharapīṭhaṃ pīdanais truṭitavaty api patyuh |
muktamauktikalaghur guṇaśeṣā hārayaṣṭir abhavad gurur eva ||

³¹ *Ibid.*, No. 2120.

³² See 4.1 below.

³³ See 5.1 below.

³⁴ Mahāvīra (see 4.2 below) employs *praṇayakalaha* in this sense, but this expression is generally understood to mean "lovers' tiff". Indeed the *Kāmasūtra* devotes a section to this topic; see 2.10.27-33.

situation. The eighth century mathematician Śrīdhara does so in his *Trīṣatikā*:

*kāminyā hāravatyāḥ suratakalahato mauktikānām truṭitvā
bhūmau yātas tribhāgaḥ śayanatalagataḥ pañcamāṃśaś ca dr̥ṣṭaḥ |
ātaḥ ṣaṣṭaḥ sukeśyā gaṇaka daśamakaḥ saṃgr̥hītaḥ priyeṇa
dr̥ṣṭam ṣaṭkaṃ ca sūtre kathaya katipayair mauktikair eṣa hāraḥ ||*³⁵

In love quarrel the lady's pearl string broke.

One third of the pearls fell on the floor,

one fifth was found on the bed.

The lady grabbed one sixth

and the lover gathered one tenth.

Six pearls were seen still on the string.

Tell, mathematician,

how many pearls were there in the necklace ?

4.2 Śrīdhara explains the method of solving the problem thus:

*stambhāṃśaikyaṃ tyaktvā rūpāc cheṣeṇa sambhajer dr̥śyam ||*³⁶

³⁵ *Trīṣatikā* by Śrīdharācārya, ed. Sudhākara Dvivedī, Benares 1899, example 26, p. 14. This verse was very popular. It is often cited, and with several variant readings. Kripa Shankar SHUKLA, in the introduction to his edition of Śrīdhara's *Pāṭiganīta* (*The Patiganita of Sridharacarya, with an Ancient Sanskrit Commentary*, ed. & tr. Kripa Shankara SHUKLA, Lucknow, 1959, p. xxi.) quotes it but reads, instead of *hāravatyāḥ*, *hāravallyāḥ* which is perhaps the correct reading. Śaṅkara, in his commentary *Kriyākramakarī* on the *Lilāvati* (*Lilāvati of Bhāskarā-cārya, with Kriyākramakarī of Śaṅkara and Nārāyaṇa*, ed. K.V. SARMA, Hoshiarpur 1975, p. 103.), quotes it (without attribution) in the following manner:

*kāminyā hāravallyā suratakalahato mauktikānām truṭitvā
bhūmau jātas tribhāgaḥ śayanatalagataḥ pañcamāṃśaś ca dr̥ṣṭaḥ |
ātpāḥ ṣaṣṭaḥ sukeśyā gaṇaka daśamakaḥ saṃgr̥hītaḥ kamitrā
dr̥ṣṭam ṣaṭkaṃ ca sūtre kathayatu katibhir mauktikair eṣa hāraḥ ||*

Rāmakṣṇadeva also cites it in his commentary *Manorañjanī* on the *Lilāvati* (cf. Bibhuti Bhusan DATTA, "On the Relation of Mahāvīra to Śrīdhara", *Isis* 17 [1932], p. 25-33, esp. 31). It is not surprising that at a subsequent stage of text transmission, the verse moved from the commentaries to the main text of the *Lilāvati* itself. Thus the version of the *Lilāvati*, as printed by N.H. PHADKE in his *Lilāvati-punardarśana* (Bombay, 1971, p. 34, No. 53; see also the pretty modern illustration on the facing page) contains the verse with a considerable better reading:

*hāras tāras taruṇyā nithuvanakalahe mauktikānām viśīrṇaḥ
bhūmau yātas tribhāgaḥ śayanatalagataḥ pañcamāṃśo 'sya dr̥ṣṭaḥ |
prāptaḥ ṣaṣṭaḥ sukeśyā ...*

Therefore many modern writers attribute the verses to Bhāskara rather than to Śrīdhara.

“Subtract the sum of the fractions [which have been arranged vertically] in a column from unity (*rūpa*), and with the remainder divide what has been seen (*drśya*).”

$$\begin{aligned} \text{Thus } 1/3 + 1/5 + 1/6 + 1/10 &= 24/30. \\ 1 - 24/30 &= 6/30. \\ 6 \div 6/30 \text{ or } 6 \times 30/6 &= 30. \end{aligned}$$

4.3 The Jaina mathematician Mahāvīra (c. 950 AD) elaborates upon the hint given by Śrīdhara, devoting as many as six verses to this problem³⁷. This section of his mathematical treatise *Gaṇitasāra-saṃgraha* can be treated as an independent minor poem (*khaṇḍakāvya*) on the mathematics of the scattered pearls. Here Mahāvīra draws a vivid word picture to create the right ambience for the love play which results in scattered pearls, which in their turn give occasion to the mathematical problem³⁸:

kācid vasantamāse prasūnaphalagucchabhāranamrodyāne |
kusumāsavarasarañjitaśukakokilamadhupamadhuranisvananicite ||17||
himakaradhavale prthule saudhatale sāndrarundra(?)myḍūtalpe |
phaṇiḥphaṇanitambabimbā kanadamalābharaṇaśobhitāṅgī ||18||
pāṭhinajaṭharanayanā kaṭhinastanahāranamratanumadhyā |
saha nijapatinā yuvatī rātrau prītyānuramamāñā ||19||
praṇayakalahe samutthe muktāmayaakaṇṭhikā tadabalāyāḥ |
chinnāvanau nipatitā tattryaṇśaś ceṭikāṃ prāpat ||20||
śadbhāgaḥ śayyāyām anantarānantarārdhamitibhāgāḥ |
śaśamkhyānās tasyāḥ sarve sarvatra sampatitāḥ ||21||
ekāgraśaṣṭīśatayutasahasramuktāphalāni dr̥ṣṭāni |
tanmauktikapramāṇaṃ prakirṇakaṃ vetsi cet kathaya ||22||

[It was the] month of spring.

In a garden full of trees bent with the weight of flowers and fruit;
pervaded by the sweet sounds of parrots and koels,
who were delighted with the juice of floral nectar;
on a wide terrace, white like the moon,
on a thick, full (*rundra* ?) and soft couch,

³⁶ *Trīṣatikā* by Śrīdharaṅcārya, rule 27, p. 13.

³⁷ Shukla argues that this verse is a condensation of Mahāvīra’s verses (“Note how successfully has Śrīdharaṅcārya condensed the matter of six verses into one single verse.”) and that therefore Śrīdhara is posterior to Mahāvīra. But the fact is that the verses of Mahāvīra are an elaboration of Śrīdhara’s verse. Cf. Bibhuti Bhusan DATTA, *op. cit.*

³⁸ *The Gaṇita-Sāra-Saṅgraha of Mahāvīraṅcārya*, with English translation and notes by M. Raṅgācārya, Madras 1912, *Prakirṇakavyavahāra*, verses 17-22, p. 49.

a young woman
 with the orbs of hips like the hoods of the lord of the serpents,
 limbs adorned with shining pure ornaments,
 eyes like the interior of a *Pāṭhina* flower,
 slender waist bent by the [weight of] hard breasts and pearl string,
 made love to her husband joyfully at night.
 When their lovemaking turned into a battle,
 the lady's pearl necklace
 broke and fell on the floor.
 One third [of those pearls] reached the maid.
 A sixth part [fell] on the bed.
 a half of that, and a half that,
 and so on for six times successively,
 scattered all over.
 But one-thousand-one-hundred-and-sixty-one pearls
 were found [still on the string].
 Tell the total number of pearls in the string,
 if you know [how to solve problems of] the *Prakīrṇaka*.

4.4 The pearls scattered at different places are

$1/3 + 1/6 + 1/12 + 1/24 + 1/48 + 1/96 + 1/192 + 1/384 = 255/384$
 The remaining pearls or *drśya* = $1 - 255/384 = 129/384 = 1161$.
 Therefore, the total number of pearls would be $1161 \div 129/384$
 $= 1161 \times 384/129 = 3456$.

4.5 This is also the solution given by M. Raṅgācārya³⁹ in his edition and translation of the *Gaṇitasārasaṅgraha*. However, this solution does not match with his translation of this passage. The mathematical part of the problem is rendered by Raṅgācārya thus: "One-third of that necklace of pearls reached the maid-servant there; 1/6 fell on the bed; then ½ of what remained (and one-half of what remained thereafter and again ½ of what remained thereafter) and so on, counting six times (in all), fell all of them everywhere; and there were found to remain (unscattered) 1,161 pearls"⁴⁰. According to him, the third term is half of what remained in the necklace after one-third and one sixth of the pearls have slipped off the string. The next five times are likewise halves of what remained after each group of pearls slipped out. The text *ṣaḍbhāgaḥ śayyāyām anantarānantarārdhamitibhāgāḥ | ṣaṣṭsamkhyānās tasyāḥ sarve sarvatra sampatitāḥ* does not quite support this

³⁹ *The Gaṇita-Sāra-Saṅgraha of Mahāvīrācārya*, with English translation and notes by M. Raṅgācārya, Madras 1912, p. 310.

⁴⁰ *Ibid.*, p. 73.

interpretation. The mathematical implications of Raṅgācārya's translation are the following.

Let the total number of pearls be x .

- (i) one-third $x/3$
- (ii) one-sixth $x/6$; what remained thereafter $x - x/3 - x/6 = x/2$
- (iii) half of what remained $x/4$; what remained thereafter $x/2 - x/4 = x/4$
- (iv) half of what remained $x/8$; what remained thereafter $x/4 - x/8 = x/8$
- (v) half of what remained $x/16$; what remained thereafter $x/8 - x/16 = x/16$
- (vi) half of what remained $x/32$; what remained thereafter $x/16 - x/32 = x/32$
- (vii) half of what remained $x/64$; what remained thereafter $x/32 - x/64 = x/64$
- (viii) half of what remained $x/124$; what remained thereafter $x/64 - x/124 = x/124$

Thus the number of pearls that finally remained in the string is $x/124 = 1161$.
Therefore $x = 1161 \times 124 = 148608$ ⁴¹.

5.1 It is but appropriate that an article for a felicitation volume should conclude with a benediction, to the one felicitated and also to those who felicitate. For this purpose, we select a charming poem from the *Bhojaprabandha* of Ballālasena:

*cyutām indor lekhāṃ ratikalābhagnāṃ ca valayaṃ
dvayaṃ cakrikṛtya prahasitamukhī śailatanayā |
avocad yaṃ paśyety avatu sa śivāḥ sā ca girijā
sa ca kṛīḍācandro daśanakiraṇāpūritatanuḥ ||⁴²*
The half moon that slipped [from Śiva's head]
and the bangle that broke in love quarrel;
she put these two together to form a ring.
With a smiling face, the Mountain's daughter
said to Śiva, 'Look'.

⁴¹ Following Raṅgācārya, Lakshmi Chandra JAIN also in his Hindi translation of the *Gaṇitasārasaṅgraha*, (Sholapur 1963, p. 71) translates as “1/6 śayyā par gire, tab śeṣ ke 1/2, aur punaḥ agrim śeṣ ke 1/2 aur phir agrim śeṣ ke 1/2, is tarah kul 6 bār...” We have seen the consequences of taking the remainder in each step, viz. the number of total pearls in the string will be the huge figure of 148608. Yet Jain also mentions the result as 3456 (Appendix, p. 29)!

⁴² See M.B. EMENEAU, “Signed Verses by Sanskrit Poets” in: B. A. van Nooten (ed), *Sanskrit Studies of M. B. Emeneau: Selected Papers*, Berkeley 1988, p. 59-66, esp. 63 where this verse is discussed. Emeneau adds that this verse was included in three other collections: in Śrīdharadāsa's *Saduktikarṇāmṛta* (1.11.5), in the *Śārṅgadharapaddhati* (no. 96), and in Vallabhadeva's *Subhāṣitāvali* (no. 66).

May that Śiva, may that Girijā,
may also that moon who was formed in play,
as the ring was filled
with the rays from their teeth,
protect [us]⁴³.

⁴³ The crescent moon and the broken piece of bangle were joined to form a ring, and the interior of the ring was filled with the white rays from the teeth of the smiling Pārvatī and Śiva. Thus Pārvatī playfully created a full moon (*krīḍācandra*).