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Mathematics and Iconography in *Lilāvati*  
263

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## Mathematics and Iconography in *Līlāvati* 263

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1.1 In the section on permutations of his *Līlāvati*<sup>1</sup>, Bhāskaraṅcārya poses a playful problem. In a particular iconic form, Śiva holds ten different weapons or emblems (*āyudha*) in his ten hands. Supposing these ten emblems are mutually exchanged in these ten hands, how many variations will there be? If this is difficult to visualize, Bhāskara gives another example. Hari, that is Viṣṇu, holds four different emblems in his four hands. If these are interchanged, how many variations will there be?

*pāsāṅkuśāhiḍamarūkakaḥkapāśūlaiḥ  
khaṭvāṅgaśaktiśaracāpayutair bhavanti /  
anyonyahastakalitaiḥ kati mūrtibhedāḥ  
sambhor harer iva gadārisarojaśaṅkhaiḥ ||263||<sup>2</sup>*

“How many permutations will there be of the iconic forms (*mūrtibhedāḥ*) of god Śambhu, by the exchange of his ten emblems, namely, the *pāśa* (noose), the *anikuśa* (elephant’s hook), the *ahi* (serpent), the *ḍamarūka* (tabor or small hand drum), the *kapāla* (skull), the *śūla* (trident), the *khaṭvāṅga* (staff with a skull at the top), the *śakti* (spear), the *śara* (arrow) and the *cāpa* (bow) in his different hands, like those of Hari by the exchange of the *gadā* (club), the *cakra* (discus), the *saroja* (lotus) and the *śaṅkha* (conch)?”

1.2 The mathematical answer is simple. Interchanging the four emblems in the four hands means extracting the number of possible permutations of four things taken four at a time. According to verse 261 of the *Līlāvati*<sup>3</sup> the answer is  $1 \times 2 \times 3 \times 4 = 24$  forms. Likewise, in the case of Śambhu = Śiva, the permutations will be  $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 = 3,628,800$ .

2.1 But then the following question arises. Is this a mere whim of the mathematician Bhāskara, or can such variations really be conceived of? Do the strict canons of iconography as laid down in the *Śilpaśāstra* and in the *Āgamas* allow such variations in the placement of emblems? On this question, Gaṇeśa Daivajña remarks as follows in his commentary *Buddhivilāsinī* (1545 CE) on the *Līlāvati*:

*yathā gadādibhir āyudhair anyonyam caturṣu hasteṣu kalitair hareḥ  
keśavādayo mūrtibhedā drśyante tadvat pāsādidaśabhir āyudhair  
anyonyam kalitaiḥ sambhoḥ kati bheda bhavanti arthaḥ / yathā harer*

*mūrtibhedā loke prasiddhāstathā śambhor neti kṛtvā harer nidarśanam /*

“Just as by the mutual exchange of the club and other emblems in the four hands, there arise variations in Hari’s iconic forms, starting with Keśava, in the same manner how many forms will there be of Śambhu by the mutual exchange of the *pāśa* and other weapons: this is the purport of the verse. Hari’s example was given because the variations of Śambhu’s form are not so well known in the world as those of Hari.”

Thus from Gaṇeśa we learn that each one of the twenty-four variations arising out of the mutual exchange of the four weapons or emblems has a separate name and that these names and the corresponding iconic forms are well known. Colebrooke mentions that these names and forms are discussed in the Purāṇas.<sup>5</sup>

2.2 Indeed, certain Purāṇas enumerate the twenty-four names and mention how the four emblems are arranged in each corresponding form.<sup>6</sup> Thus the *Padmapurāṇa*<sup>7</sup> and *Agnipurāṇa*<sup>8</sup> describe these twenty-four forms and their names under the heading *Caturvimśati-mūrtayah*. These are also described in certain late texts like Hemādri’s *Caturvargacintāmaṇi* (thirteenth century)<sup>9</sup> and In Sūtradhāra Maṇḍana’s *Rūpamaṇḍana* (sixteenth century).<sup>10</sup> However, the relevant passages in all sources, with the exception of the last mentioned one, are highly corrupt. Because of the monotonous nature of the description,<sup>11</sup> the specifications for different forms have often got mixed up and even the sequence of the twenty-four forms has not always been correctly maintained.

3.1 There is yet another source which has not been noticed in this connection so far. It deserves our attention because it is contemporaneous to Bhāskara and because its mode of enumeration of these twenty-four forms is unusual. This source is the encyclopaedic treatise by name *Mānasollāsa*<sup>12</sup> which was composed by the Western Cālukyan monarch Someśvara III. The epoch of this work is Friday, *Caitra śuddha* 1, Śaka 1051, Jovian Year (southern style) *Saumya* (corresponding to Friday, 22 March 1129).<sup>13</sup>

3.2 The first chapter (*adhyāya*) of the third book (*vimśati*) of the *Mānasollāsa* enumerates the twenty-four names of Viṣṇu together with the corresponding placement of the four emblems in his four hands. We reproduce the relevant passage below, after improving the spelling of certain code words according to the principles laid out in the passage itself.<sup>14</sup>

*āyudhānām viparyāsāc catursv api ca bāhuṣu /*

*jagannāthasya vakṣyante caturvimśati mūrtayah ||688||*

*prādakṣiṇyena boddhavyā caturvimśati mūrtayah /*

*athohastakrameṇādau yathaiṅvākṣarasamjñayā ||689||*

*avaśiṣṭam adbhobāhoś caturtham nāmavācakam /*  
*prādhānyam vyañjaneṣv eva dīrghānusvārayor bahih ||690||*  
*chandasaḥ pūraṇārthāya kvacid ādyam pralupyate /*  
*paśacāmke śapaṁgānā gācaśamā cagāpago ||691||*  
*gopaśamvi caśampāma pāgacatri śacāgavā /*  
*paṁcāṁgaśrī gacaṁpāhr śapacāpa paśāgadā ||692||*  
*gaśāpāsam<sup>15</sup> gaśācāmivā caśagāpra cagāśani /*  
*capāśampu pagāśādho<sup>16</sup> capāṁgonṛ gapācacyu<sup>17</sup> ||693||*  
*pācaśamja śagācope śocapāha śagāpakṛ /*  
*caturbāhuyutāḥ sarvāḥ mūrtayaḥ parikīrtitāḥ ||694||*  
*iti keśavādicaturvīmśatimūrtibhedāḥ /*

### 3.3 Translation

688: "Now will be enumerated the twenty-four iconic forms (*mūrtayah*) of Jagannātha, which arise from interchanging (*viparyāya*) the emblems (*āyudha*) in his four hands."

689: "The twenty-four forms are to be understood (i.e. the emblems in the four hands will be enumerated) in clockwise sequence (*prādakṣiṇya*), starting from the lower hand [on the right]; the enumeration will be made in syllabic code (*akṣara-samjñā*)."

690: "The remaining one (*avaśiṣṭa*) (i.e. the fourth emblem which is not mentioned, but which can be inferred from the other three) belongs to the [left] lower hand. And the fourth syllable denotes the name [of the corresponding iconic form] (*nāmavācaka*). [In the syllabic code which now follows], what are pertinent are the consonants. The lengthening [or shortening] of vowels and [the addition or deletion of] *anusvāra* are merely external (i.e. not pertinent; they are done for the sake of metre)."

691ab: "For the sake of the metre too, occasionally the first syllable [of the relevant designation] is omitted."...

694cd: "All the images are said to be with four arms."

"Thus the twenty-four different iconic forms, starting from Keśava."

In 691cd-694, the placement of the four emblems and the corresponding names or designations are given by code words of four syllables (*akṣara-samjñā*)

each. The first three are the initial syllables of the names of the emblems. The fourth syllable is the initial syllable of the name of the form. The sequence of the enumeration of the emblems starts with the right lower hand and proceeds clockwise, i.e. right lower hand, right upper hand, left upper hand and left lower hand. The names of the emblems placed in the right lower hand, in the right upper hand and in the left lower hand are indicated by the first three syllables of the code word. When the names of three emblems are mentioned, the name of the fourth emblem in the lower left hand can automatically be inferred. The fourth syllable of the code word, being the initial syllable of the name of the form, will provide the name of the form.

In all the four syllables of the code words, it is the consonants that are important. For metrical reasons, occasionally the vowels are lengthened or shortened and *anusvāras* are added or deleted.

This will become clear from the following example. The first code word is *paśa-cam-ke*. Here *pa* stands for *padma* in the lower right hand; *śa* means *śarikha* in the upper right hand; *cam* suggests *cakra* in the upper left hand. We can now infer that the remaining emblem, namely *gadā* is in the lower left hand. Finally the fourth syllable *ke* indicates that the form with the above-mentioned placement of emblems has the designation-Keśava.

Someśvara adds that in some cases the first syllable of the designation is omitted. This happens when the designation begins with a vowel. If this vowel is included in the code word as the fourth syllable, it will not remain as an independent entity but will merge with the vowel of the third syllable, through the grammatical process known as *sandhi*. Therefore in such cases, instead of the initial vowel, the second syllable that contains a consonant is given. Take the example of no. 16 in the table below. Here the name of the form is Aniruddha and code word is *ca-gā-śa-ni*. Here if the initial syllable of Aniruddha is included, the code word would read *ca-gā-śa-a*. But through *sandhi*, the fourth syllable will merge with the third and the result will be *ca-gā-śā*. Therefore, instead of the initial syllable *a*, the second syllable *ni* was included in the code word. This is the case with nos. 18, 20 and 22 as well.

3.4 The placement of the emblems in the twenty-four forms and the corresponding designations are shown in the following table:

	code word	lower right hand	upper right hand	upper left hand	lower left hand	Designation
1.	<i>pa-śa-caṁ-ke</i>	<i>padma</i>	<i>śaṅkha</i>	<i>cakra</i>	<i>gadā</i>	<b>Keśava</b>
2.	<i>śa-paṁ-gā-nā</i>	<i>śaṅkha</i>	<i>padma</i>	<i>gadā</i>	<i>cakra</i>	<b>Nārāyaṇa</b>
3.	<i>gā-ca-śaṁ-mā</i>	<i>gadā</i>	<i>cakra</i>	<i>śaṅkha</i>	<i>padma</i>	<b>Mādhava</b>
4.	<i>ca-gā-pa-go</i>	<i>cakra</i>	<i>gadā</i>	<i>padma</i>	<i>śaṅkha</i>	<b>Govinda</b>
5.	<i>ga-pa-śaṁ-vi</i>	<i>gadā</i>	<i>padma</i>	<i>śaṅkha</i>	<i>cakra</i>	<b>Viṣṇu</b>
6.	<i>ca-śaṁ-pā-ma</i>	<i>cakra</i>	<i>śaṅkha</i>	<i>padma</i>	<i>gadā</i>	<b>Madhusūdana</b>
7.	<i>pā-ga-ca-tri</i>	<i>padma</i>	<i>gadā</i>	<i>cakra</i>	<i>śaṅkha</i>	<b>Trivikrama</b>
8.	<i>śa-cā-ga-vā</i>	<i>śaṅkha</i>	<i>cakra</i>	<i>gadā</i>	<i>padma</i>	<b>Vāmana</b>
9.	<i>paṁ-cāṁ-ga-śrī</i>	<i>padma</i>	<i>cakra</i>	<i>gadā</i>	<i>śaṅkha</i>	<b>Śrīdhara</b>
10.	<i>ga-caṁ-pā-hṛ</i>	<i>gadā</i>	<i>cakra</i>	<i>padma</i>	<i>śaṅkha</i>	<b>Hṛṣīkeśa</b>
11.	<i>śa-pa-cā-pa</i>	<i>śaṅkha</i>	<i>padma</i>	<i>cakra</i>	<i>gadā</i>	<b>Padmanābha</b>
12.	<i>pa-śā-ga-dā</i>	<i>padma</i>	<i>śaṅkha</i>	<i>gadā</i>	<i>cakra</i>	<b>Dāmodara</b>
13.	<i>ga-śā-pā-saṁ</i>	<i>gadā</i>	<i>śaṅkha</i>	<i>padma</i>	<i>cakra</i>	<b>Samkarṣaṇa</b>
14.	<i>ga-śa-caṁ-vā</i>	<i>gadā</i>	<i>śaṅkha</i>	<i>cakra</i>	<i>padma</i>	<b>Vāsudeva</b>
15.	<i>ca-śa-gā-pa</i>	<i>cakra</i>	<i>śaṅkha</i>	<i>gadā</i>	<i>padma</i>	<b>Pradyumna</b>
16.	<i>ca-gā-śa-ni</i>	<i>cakra</i>	<i>gadā</i>	<i>śaṅkha</i>	<i>padma</i>	<b>Aniruddha</b>
17.	<i>ca-pā-śaṁ-pu</i>	<i>cakra</i>	<i>padma</i>	<i>śaṅkha</i>	<i>gadā</i>	<b>Puruṣottama</b>
18.	<i>pa-gā-śā-dho</i>	<i>padma</i>	<i>gadā</i>	<i>śaṅkha</i>	<i>cakra</i>	<b>Adhokṣaja</b>
19.	<i>ca-pāṁ-go-nṛ</i>	<i>cakra</i>	<i>padma</i>	<i>gadā</i>	<i>śaṅkha</i>	<b>Nṛsimha</b>
20.	<i>ga-pā-ca-cyu</i>	<i>gadā</i>	<i>padma</i>	<i>cakra</i>	<i>śaṅkha</i>	<b>Acyuta</b>
21.	<i>pā-ca-śaṁ-ja</i>	<i>padma</i>	<i>cakra</i>	<i>śaṅkha</i>	<i>gadā</i>	<b>Janārdana</b>
22.	<i>śa-gā-co-pe</i>	<i>śaṅkha</i>	<i>gadā</i>	<i>cakra</i>	<i>padma</i>	<b>Upendra</b>
23.	<i>śo-ca-pā-ha</i>	<i>śaṅkha</i>	<i>cakra</i>	<i>padma</i>	<i>gadā</i>	<b>Hari</b>
24.	<i>śa-gā-pa-ḥṛ</i>	<i>śaṅkha</i>	<i>gadā</i>	<i>padma</i>	<i>cakra</i>	<b>Kṛṣṇa</b>

Now it becomes obvious that these twenty-four names are indeed well known. Even today *Smārta* Brahmins daily recite these names in this very sequence in a rite known as *Ācamana* (sipping water as a means of internal purification).<sup>18</sup> The names and forms prescribed in the *Mānasollāsa* are exactly those which are enumerated in the *Rūpamaṇḍana* to which mention has been made above. That the twenty-four names and their sequence in these two texts are identical with the same as recited in the daily ritual<sup>19</sup> shows that the sequence given in these two texts is the correct one. It is likely that the placement of emblems is also the correct one because, this being a case of complete set of permutations, any variation in one form will automatically make it cease to be a distinct form separate from the other twenty-three. Therefore, variations found in other texts are merely due to corruption of texts in transmission, rather than to separate iconographic traditions.

4.1 Have these twenty-four forms, each with a distinct placement of the emblems, been ever represented in sculpture or painting? T. A. Gopinatha Rao discusses this issue in his invaluable *Elements of Hindu Iconography*.<sup>20</sup> According to him six of the twenty-four forms are represented in sculpture in the Chennakeśavasvāmin temple at Belūr in Karnataka. "They are of Keśava, Mādhava, Govinda, Madhusūdana, Hari and Śrīkrṣṇa respectively. Of these, the first image, that of Keśava is among the best specimens of the Hoyasaḷa school of sculpture, and is in an excellent state of preservation. It was set up by Śāntalādevī, the chief queen of Viṣṇuvardhana of the Hoyasaḷa dynasty, in the Kappe-Chennigarāya shrine in the Chennakeśavasvāmin temple. [...] The other five images are found sculptured on the walls of the central shrine of the Chennakeśavasvāmin in the same temple. [...] All the images are well executed, and bear evidence of trained workmanship."<sup>21</sup>

4.2. Such variations in the placement of emblems in Viṣṇu's hands are seen in sculpture elsewhere too, but nowhere in such preponderance as at Belūr. In her fine study of the *Iconography of Viṣṇu*, Kalpana Desai gives a large list of such images in north India and adds: "This survey of the *caturvīṃśati mūrtis* makes it clear that in the whole of northern India only selected forms of Viṣṇu have been worshipped by the people. Numerically, the Trivikrama image tops the list of Viṣṇu images right from the early times. The other prevalent forms are - Puruṣottama, Keśava, Śrīdhara, Govinda, Adhokṣaja and Acyuta."<sup>22</sup> But, like Belūr in south India, there is one place in the north where several forms are depicted together. To quote Kalpana Desai once again: "An interesting record of these images is still present in a temple at Valam in Gujarat, where most of the varieties of standing four-handed images of Viṣṇu are not only carved together but are also identified by the inscriptions on their pedestals. Only seventeen of these have survived, from which the iconography of Keśava, Nārāyaṇa, Saṃkarṣaṇa, Govinda, Viṣṇu, Madhusūdana, Kṛṣṇa, Trivikrama, Hṛṣīkeśa, Padmanābha and Dāmodara tally

exactly with the description given in the *Rūpamaṇḍana*.<sup>23</sup> Unfortunately Desai does not attempt to date these sculptures.<sup>24</sup>

4.3 However, the standard mode of representation of the four emblems seems to be the one where Viṣṇu holds the *cakra* in his upper right hand and the *śaṅkha* in the upper left hand; the *padma* in the lower right hand and the *gadā* in the lower left hand. This is the twenty-first iconic form called Janārdana and it is this form which is most frequently represented in stone and bronze sculpture.

4.4 Much more popular than this is another form where only two emblems, namely the *cakra* and the *śaṅkha*,<sup>25</sup> are shown in the upper right and left hands. The two lower hands are empty of emblems but display significant *mudrās*; the right hand in *abhaya-mudrā* (gesture of protection and reassurance) and the left in *varada-mudrā* (gesture of conferring his grace). In fact this is the most popular form of representation of Viṣṇu, the benevolent lord who offers his protection and grace to his devotees. It is in this form that Venkateśvara in the famous temple on the Tirupati Hills is depicted.

5.1. Viṣṇu has one thousand names, which were enumerated as early as the *Mahābhārata*.<sup>36</sup> Of these, twenty-four names became important in the cult. Scholars trace these twenty-four names to the Pañcarātra concept of the four *Vyūhas*, namely Vāsudeva, Saṁkarṣaṇa, Pradyumna and Aniruddha. Jitendra Nath Banerjea opines that the concept of the four *Vyūhas* was first formulated in the second century and was increased to twenty-four in the Gupta period.<sup>27</sup> Gradually distinct iconic forms were assigned to each of the twenty-four names, the distinction being just a difference in the placement of the emblems. It is difficult to determine when this happened, but the earliest text where the *Caturvīṁśati-mūrtis* are described is the *Agnipurāṇa* of uncertain date. The available sculptures in north India depicting these variations are rather late; they are datable to seventh to tenth centuries.<sup>28</sup>

5.2. But is there any intrinsic connection between a particular form with a certain arrangement of the emblems and the corresponding designation? Why must a form holding the *śaṅkha* and the *cakra* in the upper hands and the *padma* and the *gadā* in the lower hands be designated as Keśava, and not Mādhava? Or what is the connection between the concept of Trivikrama who covered the entire cosmos with three strides (*tri-vikrama*) and the arrangement in which the *gadā* and the *cakra* are held in the upper hands and the *padma* and the *śaṅkha* in the lower hands?

Indeed, the connection between the twenty-four names and the twenty-four forms based on the permutations of the placement of the four emblems seems to be without any mythological or philosophical basis. It must be the brain-child of some mathematician rather than a theologian—a mathematician who resorted



to the permutations of the four emblems in order to provide separately identifiable iconic forms to the twenty-four names. In other words, mathematics of permutations played a role in the iconography of Viṣṇu's twenty-four forms.

In an earlier section of the *Līlāvati*<sup>29</sup> Bhāskara himself remarks that the mathematics of permutations and combinations has its application in several areas: "to compute the variations of metre in prosody,<sup>30</sup> the variations of the placement of windows and other architectural elements (*mūśāvahanabhedādī*) [In architecture], the variations of the *tālas* [in music],<sup>31</sup> the variations [of diverse kinds] in sculpture and other crafts (*śilpaka*), and the combinations of different medicinal substances in medicine, for those persons who are knowledgeable in the respective subjects."

5.3 In the case of the mathematician Bhāskara who alludes to these *Caturvīṃśatimūrtis*, the following facts are rather striking. He was born in 1114 and lived at Vijjalaviḍa in the Sahyādris in present-day Maharashtra. It is not known when he composed the *Līlāvati*, but it must be before 1150 when he completed the *Siddhāntaśiromaṇi*. The *Mānasollāsa*, which describes the twenty-four forms and names in a syllabic code, was composed around 1129 by King Someśvara III who ruled parts of present-day Maharashtra and Karnataka from 1126 to 1138. The sculptures which represent as many as six of these twenty-four forms at the Beḷūr Channakeśava Temple also belong to this period. The main image of Keśava was commissioned by Śītalādevī, chief queen of Viṣṇuvardhana of Hoyasaḷa dynasty who ruled ca. 1110-1152. The other five sculptures too belong to this period. Therefore the proximity of these three sources in time and space may be taken as an indication that in the first half of the twelfth century the cult of the *Caturvīṃśati-mūrtis* was prevalent in the Maharashtra-Karnataka region.

6.1 Now there remains the question of the 3,628,800 forms of Śiva arising out of the permutations of the ten emblems. Like Viṣṇu, Śiva is also invested with one thousand names in the *Mahābhārata*,<sup>32</sup> but nowhere with three million names nor with so many forms. This part is purely Bhāskara's fancy. But the ten emblems enumerated by him are not fanciful, and these must have had a basis in the *Śilpasāstra*. In plastic sculpture Śiva is represented with two, four, eight, ten or more arms. The forms with many arms and weapons are usually *sarṁhāra-mūrtis* when the god is set to vanquish an enemy. According to an anonymous text cited by Gopinatha Rao, the ten-armed form is prescribed for the *Gajāsura-sarṁhāra-mūrti*, when Śiva vanquished a demon in the form of an elephant. For this form the text prescribes the ten emblems as follows: *akṣamālā* (rosary), *asi* (sword), *śakti* (spear), *daṇḍa* (staff) and *sūlā* (trident) in the five hands on the right; *khaṭvāṅga* (staff with a skull at the top), *bhujaga* (serpent), *kapāla* (skull), *khetaka* (shield), and *harina* (deer) in the five hands on the left.<sup>33</sup> The ten emblems in Bhāskara's

list, we may recall, are *pāśa* (noose), *aṅkuśa* (elephant's goad), *ahi* (serpent), *ḍamaru* (small hand drum), *kapāla*, *śūla*, *khaṭvāṅga*, *śakti*, *śara* (arrow) and *cāpa* (bow).<sup>34</sup> Only five are common in these two lists, viz. *ahi*, *kapāla*, *śūla*, *khaṭvāṅga* and *śakti*. The remaining five, viz. *pāśa*, *aṅkuśa*, *ḍamaru*, *śara* and *cāpa* are also wielded by Śiva, but in other iconic forms.

For the moment then Bhāskara's exact source for Śiva's ten emblems eludes us.

## Notes and References

1. On combinations and permutations in the *Līlāvātī*, see Sreeramula Rajeswara Sarma and Suresh Chandra Sarbhai, "Bhāskarācārya kī Līlāvātī men Saṁcaya-Kramacaya Ganita," *Prācyā-Prajñā*, 15 (1984), pp. 1-15.
2. Bhāskara, *Buddhivilāsinī-Līlāvātīvivaraṇākhya-ṭīkādvyayopetā śrīmad-Bhāskarācāryaviracitā Līlāvātī*, ed. Dattatreya Vishnu Apte, Anandasrama Press, Poona, 1937, (Ānandāśrama Sanskrit Series 107), verse 263, pp. 277-278.
3. *Ibid.*, verse 261 ab, p. 275:  
*sthānāntam ekādicayāṅkaghātaḥ saṁkhyāvibhedā niyataiḥ syur aṅkaiḥ /*  
"The product of multiplication of the arithmetical series, beginning from one and increased by one, and going up to the given number, is the number of variations with specific figures."
4. *Ibid.*, p. 278. The passage reads erroneously *pāśādir daśabhir*, which is emended here to *pāśādi-daśabhir*.
5. Henry Thomas Colebrooke, *Līlāvātī, translated by Colebrooke*, with notes by Haran Chandra Banerji, Kitab Mahal, Allahabad 1969, p. 168, fn. 1. "The twenty-four different representations of *Viṣṇu*, arising from diversity in the manner of placing the weapons in his hands, are distinguished by as many discriminative titles of the god allotted to those figures in the theogonies or *Purāṇas*."
6. For a discussion on these twenty-four names and their forms (*Caturvīṁśati-mūrtis*), see Tārānātha Tarkavācaspati, *Vācaspatyam*, (Calcutta 1873-1888), reprint: Varanasi 1969, Vol. IV, pp. 2878-79, s. v. *Caturvīṁśatimūrti*; T. A. Gopinatha Rao, *Elements of Hindu Iconography*, (Madras 1914-16), second edition: Delhi 1968, Vol. I, part 1, pp. 227-244: *Chaturvīṁśati-Mūrtayah*; part 2, Appendix C, pp. 62-64; Jitendra Nath Banerjea, *The Development of Hindu Iconography*, University of Calcutta, Calcutta, (first edition 1941), second edition (revised and enlarged), 1957, pp. 386-88, 407-412; Kalpana Desai, *Iconography of Viṣṇu (In Northern India, upto the Medieval Period)*, Abhinav Publications, New Delhi, 1973, pp. 7-14, figs. 1-10. T. S. Maxwell, *The Gods of Asia: Image, Text and Meaning*, Oxford University Press, Delhi, 1998, pp. 80-86.
7. *Padma-Mahā-Purāṇa*, (Venkateswara Steam Press, Bombay), reprint: Nag Publishers, Delhi, 1996, Vol. II, p. 96 verse: *Pātāla Khaṇḍa*, 98. 16cd-27cd. This passage is reproduced in T.A. Gopinatha Rao, *op.cit.*, I. 2, Appendix C, pp. 62-63. There are slight variations in the two versions. The passage begins as follows:

*śaṅkhacakraḡadāpadmī Keśavākhyo ḡadādharah /*  
*Nārāyaṅah padmagadācakraśaṅkhāyudhaiḡ kramāt //*  
*Mādhavaś cakraśaṅkhābhyām padmena ḡadayā bhavet /*  
*ḡadābjaśaṅkhacakrī ca Govindākhyo ḡadādharah //*

8. *Agnipurāṅa*, Poona 1957, (Ānandāśrama Sanskrit Series 41), Ch. 48 (pp. 70-71).  
 The chapter begins thus:

*omrūpaḡ Keśavaḡ padmaśaṅkhacakraḡadādharah /*  
*Nārāyaṅah śaṅkhapadmagadācakrī pradakṡiṅam //1//*  
*tato ḡadī Mādhavo 'riśaṅkhapadmī namāmi tam /*  
*cakrakaumodakīpadmaśaṅkhī Govinda ūrjitaḡ //2//*

This chapter is reproduced in *Vācaspatyam*, Vol. 4, pp. 2878-9.

9. *Caturvargacintāmaṅi of Śrī Hemādri*, ed. Bharatacandra Śiromaṅi, (Calcutta, 1883-1895), reprint: Varanasi, 1985, Vol. II: *Vratakhāṅḡa*, part 1, pp. 114-115. Here the passage is said to be extracted from the *Siddhāntasārasamhitā*. This passage is reproduced also in *Vācaspatyam*, Vol. 4, pp. 2878-79.
10. The relevant passage is reproduced in T. A. Gopinatha Rao, *op. cit.*, I. 2, Appendix C, pp. 63-64 and discussed in 1.1, pp. 229-230. The *Rūpamaṅḡana* together with the *Devatāmūrtiprakaraṅa* were edited by V. M. Sāṅkhyatīrtha and published in Calcutta Series in 1936. I have not been able to see this publication.
11. See the extracts cited in footnotes 7 and 8. Kalpana Desai, *op. cit.*, p. 151, shows in a neat table the placement of emblems for each form as prescribed in *Padmapurāṅa* (4.79), *Rūpamaṅḡana* (ch. 5), *Pārameśvara-samhitā*, *Kriyākhaṅḡa* (23.72-78) and *Ahīrbudhnya-samhitā* (26.33-46). The last two texts give only the first twelve forms. Both Banerjea (*op. cit.*) and Desai (*op. cit.*), while following the prescriptions given in the *Rūpamaṅḡana*, do not seem to recognize that the deviations found in other texts are purely due to errors in transmission. Banerjea (*op. cit.*, p. 411) reports that "B. B. Bidyabinod [*Memoirs of the Archaeological Survey of India*, No. 2, pp. 23-33, pls. VII-VIII] made a comparative study of some of these passages from the *Caturvargacintāmaṅi*, *Agni* and *Padmapurāṅas*, pointed out the differences in a few of these descriptions and rightly observed that 'a decisive identification is not always possible in the present state of our documents.'"
12. *Mānasollāsa of King Bhūlokamalla Someśvara*, ed. G. K. Srigondekar, Oriental Institute, Baroda, 1925 Vol. I (Gaekwad's Oriental Series, No. 28), 1925, reprint 1967; Vol. II (GOS 84), 1939; Vol. III (GOS 138), 1961.
13. *Ibid*, I, p. 34: 2.2.61-64.
14. *Ibid*, II, p. 60, 3.688-694; see also the editor's comments in the Introduction, p. 11.
15. Text; *ḡaśāpāśam (sam)*
16. Text; *ḡagācā (śā) dho*

17. Text: *gapācatuḥ* (cu)
18. See *Vācaspatyaṃ*, s. v. *Ācamana* (vol. 1, p. 629). Strangely enough, none of the recent authors who wrote on the twenty-four names and forms (see n.5 above) noticed this fact that the twenty-four names are still recited in the daily ritual in this very sequence.
19. Occasionally Nṛsimha is replaced by Narasimha or Nārasimha.
20. T. A. Gopinatha Rao, *op.cit.*, I.1, pp. 227-244: Chaturvīmśati-Mūrtayah; see also I. 2, Appendix C, pp. 62-64 where relevant passages from the *Padmapurāṇa* and *Rūpamaṇḍana* are reproduced.
21. *Ibid.*, I.1, pp. 243-44. The six images are reproduced in Plates LXIX (Keśava), LXX (Madhusūdana, Mādhava and Govinda) and LXXI (Hari and Kṛṣṇa).
22. Kalpana Desai, *op.cit.*, pp. 10-12.
23. *Ibid*, pp. 12-13.
24. It has not been possible for me to check whether subsequent to Desai's writing in 1973, she or anybody else has studied these images in detail. Recently, I came across the information that all the 24 forms can be seen today in Mumbai in the Sri Venkatesh Devasthanana at 80/84, Fanaswadi, (Girgaum area), which was constructed in 1910 under the personal supervision of Jagadguru Gadi Prathivadi Bhayankaram Srimad Ananthacharya Swamiji Maharaj of Kanchi. The forms are carved on the outer wall of the first Prākāra.
25. It must also be noted that of the four emblems, the *cakra* and the *śaṅkha* are more important than the *gadā* and the *padma*. Not only are these two personified in mythology, they are also worshipped independently.
26. *Mahābhārata* (Critical Edition), *Anuśāsanaparvan*, 135.14-120.
27. Jitendra Nath Banerjea, *op.cit.*, pp. 387-88; see also 388, n. 1.
28. Kalpana Desai, *op.cit.*, p. 11.
29. *Līlāvātī*, verse 131 cd-132:
- chandaścityuttare chandasy upayogo 'sya tadvidām //*  
*mūṣāvahanabhedādau khaṇḍamerau ca śilpake //*  
*vaidyake rasabhedīye tan noktaṃ vistr̥ter bhayāt //*
30. On the use of permutations and combinations in Sanskrit prosody, see Ludwig Alsdorf, "Die Pratyayas. Ein Beitrag zur indischen Mathematik", *Zeitschrift für Indology und Iranistik*, 9 (1933), pp. 97-157; an English translation of the same by Sreeramula Rajeswara Sarma, "The Pratyayas: Indian Contribution to Combinatorics," *Indian Journal of History of Science*, 26.1 (1991), pp. 17-61; idem, "Śūnya in Piṅgala's Chandahsūtra" in: A. K. Bag & S. R. Sarma (ed), *The Concept of Śūnya*, New Delhi 2003, pp. 126-136.
31. On the use of permutations and combinations in music, see Ākeḷla Mallikārjuna Śarmā, *Permutative Genius in Tāla (-Prastāra) in Indian Music*, Telugu University, Hyderabad, 1992; idem, *Indian Genius in Tālaprastāra*, Sri Sannidhi Sangita

Publications, Hyderabad, 2001.

32. *Mahābhārata* (Critical Edition), *Anuśāsanaparvan*, 17.30-150.

33. Gopinatha Rao, *op.cit.*, II. I, pp. 114-15:

*akṣamālām asirī śaktirī daṇḍam śūlam ca dakṣiṇe /*  
*khaṭvāṅgam bhujagam caiva kapālam khetakam tathā //*  
*paraṇam (hariṇam ?) ca tathā haste vāmbhāge niveśayet /*  
*gajāsūravadhenaḍḍhye bāhubhir daśabhir yutaḥ //*

34. On these and other emblems and weapons, see Gopinatha Rao, *op. cit.*, I. 1, pp. 1-14, pls. I-IV; Jitendra Nath Banerjea, *op. cit.*, pp. 299-306.