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Structure, System, and Source of Vedic Eleven- and Twelve-Syllable Lines*

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In this paper, I propose a formal analysis of the eleven- and twelve-syllable lines of Vedic, with a glance at Greek lyric meter and a look at Greco-Aryan. Based on the higher incidence of word-end, as well as surface hiatus patterns and clitic placement, in certain positions of verse-final pādas, the Vedic eleven- and twelve-syllable lines can be described as an octosyllable and enneasyllable, respectively, expanded by a bacchiac or amphibrach; these subdivide into [2|3][3|3] and [2|3][3|4]. These parses are consistent with the ternary podic analysis of native metrical tradition (Piṅgala). The positions especially of medial feet permit substitutions of heavy syllables for light and vice versa, to such an extent that mismatched weights became almost de rigueur. The eight-, eleven-, and twelve-syllable lines can thus be represented by related tree structures. Greek furnishes comparable eleven- and twelve-syllable lines (glyconics and hipponacteans with internal "dactylic" expansion). The proposed representations of the major Vedic pāda types add a vertical dimension to horizontal comparison and reconstruction of the Indo-European system.

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1 Introduction

In his introduction to what remains a standard reference, Arnold (1905:2) conceded that his metrical handbook was "necessarily tentative in character and may be found to need correction in important details." I would like to suggest some.

Arnold described the Vedic eleven- and twelve syllable lines as trimeters, the triṣṭubh and the jagatī being the most commonly encountered verse forms (Arnold 1905:7). Out of all the variability, Arnold singled out iambic as the prevalent rhythm, observing this to be truer as you approach the cadence of the pāda (Arnold 1905:9). Arnold segments the trimeter with a major caesura after the fourth or fifth syllable, and one before the fourth or fifth syllable from line-end (Arnold 1905:11). This is encapsulated by Macdonell (1916:441–2: the "normal" hendecasyllable being "(a) ⏑ – ⏑ –, ⏑ ⏑ – | – ⏑ – ⏑ or (b) ⏑ – ⏑ – ⏑, ⏑ ⏑ | – ⏑ – ⏑," and the dodecasyllable "(a) ⏑ – ⏑ –, ⏑ ⏑ – | – ⏑ – ⏑ ⏑ or (b) ⏑ – ⏑ – ⏑, ⏑ ⏑ | – ⏑ – ⏑ ⏑" (cf. Mylius 1975: 200) and successors, such as Mylius (1975:198: "bei Acht- und Zwölfsilbern jambisch, bei Elfsilbern trochäisch") and West (1973:162: "(a) × ⏑ × ⏑ | ⏒ ⏒ ⏑ ⏑ ⏑ – –," "(b) × – ⏒ – ⏑ | ⏑ ⏑ ⏑ ⏑ – –," "the cadence [of the dodecasyllable] is ⏑ ⏑ – ⏑ –"). West, following Meillet 1923, projects the Vedic forms, with greater optionality, back to Proto-Indo-European.

Here, I follow up on Mercado 2025 on the Vedic octosyllable. Underlying the Vedic octosyllable was a hierarchical tree structure.[1] I had gathered verse-final octosyllables, intuiting that realization of meters become more faithful the closer you get to verse-end, which Oldenberg had observed in 1909[2] (cf. Gunkel and Ryan 2017 on "pāda cohesion" or phonology at medial pāda boundaries). The strongest preferences for where to set word-ends, where to let vowels stand in hiatus at word juncture (with or without shortening), and where enclitics should go are compactly illustrated in figure 1, where ⁝ = weaker phonological thus metrical boundary and | = stronger.

1 Cf. tree structures in Classical Sanskrit meter (Deo 2007) and Sanskrit/Prakrit āryā meter (Ollett 2012).

2 Oldenberg 1909:221: "Daneben ist dann ein erster, freilich recht geringfügiger Anfang der Differenzierung der ganzen Reihen gegen einander darin zu bemerken, daß die an sich nicht sehr häufige freiere Behandlung der zweiten Silbentetras (z. B. ⏑ ⏑ ⏑ ⏑ statt ⏑ – ⏑ ⏑) bei der Zusammenordnung der drei Reihen einer Gāyatrī an erster Stelle leichter zugelassen wird, als an zweiter oder dritter." Cf. 1888:4–5: "In der älteren Zeit erfolgt die Versbildung durchaus so, dass der selbe Pâda, wenn er innerhalb des Verses wiederkehrt, stets dieselbe Form, oder genauer ausgedrückt ununterschieden jede beliebige seiner als gleichwerthig betrachten Formen zeigt; erst am Ende der Ṛigveda-Periode entwickelt sich eine Differenzierung von Formen, welche je nach ihrer Verschiedenheit demselben Pâda an verschiedenen Stellen des Verses zukommen."

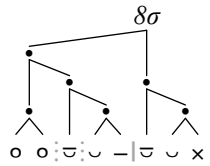


Fig. 1. Vedic octosyllable (after Mercado 2025:152)

(Let o o = {– –, ⏑ –, – ⏑, also ⏑ ⏑}, used to represent the Aeolic base in Greek lyric.) This recasting in light of contemporary theory and method[3] has the further advantage of connecting with ancient Indian metrical tradition. Such a complex octosyllable comprises feet already noticed by Piṅgala (before 10th c. CE; see Renou 104:§1553) and codified in his *Chandaḥsūtra* 1.2–3 + 5 (Weber 1863:210–1 + 216, Weber's emphasis):

> *triguruṃ viddhi* ***ma****kāram, laghvādisamanvitaṃ yakārākhyam* |
> *laghumadhyamaṃ ca* ***repha****ṃ,* ***sa****kāram ante gurunibaddham* || 2 ||
> *laghvantyaṃ hi* ***ta****kāram,* ***ja****kāram ubhayor laghuṃ vijānīyāt* |
> *ādiguruṃ ca* ***bha****kāraṃ,* ***na****kāram iha* ***Paiṅgale*** *trilaghum* || 3 ||

In diesem *Paiṅgala*-Werke wisse *m* als 3mal schwer (– – –), *y* als mit leichtem Anfang versehen (⏑ – –), *r* als leicht in der Mitte (– ⏑ –), *s* als schwer am Ende (⏑ ⏑ –): — *t* als leicht am Ende (– – ⏑), *j* als leicht zu beiden Seiten (⏑ – ⏑), *bh* als schwer im Anfang (– ⏑ ⏑), *n* als dreimal leicht (⏑ ⏑ ⏑).

> *ādimadhyāvasāneṣu* ***ya-ra-tā*** *yānti lāghavam* |
> ***bha-ja-sā*** *gauravaṃ yānti* ***ma-nau*** *tu gurulāghavam* || 5 ||

y, *r*, *t* sind je am Anfang (⏑ – –), in der Mitte (– ⏑ –), oder am Ende (– – ⏑) leicht: ebenso *bh*, *j*, *s* an denselben Stellen schwer (*bh* – ⏑ ⏑, *j* ⏑ – ⏑, *s* ⏑ ⏑ –): *m*, *n* sind je bloß schwer, resp. leicht (*m* – – –, *n* ⏑ ⏑ ⏑).

The iambs in the medial and final ternary feet can be substituted by trochees, whereby the alternation [⏒ ⏑ –, ⏒ – ⏑] was extended to include [– – –, ⏑ ⏑ ⏑]; the reanalysis also applied to the first foot, so [– –, ⏑ –, – ⏑, ⏑ ⏑].

From a fresh look at the eleven- and twelve-syllable lines in Vedic, not just to correct Arnold but also to contradict Oldenberg from 1888,[4] I argue that the

3 See Hayes 1988, Hayes and Kaun 1996, and, treating Classical Greek and Arabic meters, Prince 1989.

4 Oldenberg 1888:1 contra: "innerhalb derselben zeigt die Bemessung und Vertheilung der zu gestaltenden metrischen Materie, der langen und kurzen Sylben, nicht oder doch nicht durchweg jene scharfe und feste Ausprägung, die ein Zurückgehen auf kleinere Einheiten, auf Füsse wie in der griechischen Metrik, möglich machen würde."

hendecasyllable and dodecasyllable can be represented as hierarchical tree structures terminating in metrical feet, which can ultimately be derived from the octosyllable and compared with Greek lyric meter more directly and beyond superficial resemblances.

2 Synchronic description

We proceed from the intuition that right edges of phonological and/or syntactic phrases often coincide with the right edges of metrical constituents. Statistical testing can show whether the structures suggested by prosodic boundaries stand on rock or sand.

2.1 Hendecasyllables

In 3,845 verse-final pādas,[5] word boundaries tend to be set markedly more frequently in positions 2, 4, 5, and 8. The prevalence of prosodic word-ends are diagnostic of relatively strong pāda-internal metrical boundaries. Positions that license word-final vowels in apparent hiatus are likely constituent-final at a higher level of metrical structure. Lastly, word-final syllables followed by enclitics likely occupy relatively weaker metrical boundaries.

2.1.1 By the numbers

A way to normalize these very different counts is to calculate *z*-scores (= [count – mean] ÷ standard deviation, viz. here the number of word boundaries in one position minus the average incidence of word boundaries in all positions, divided by the standard deviation in all positions). The differences are thus measured not by the raw counts n but by z, i.e., how many standard deviations a count is above or below the mean, which is set to 0. Table 1 gives the counts, means, standard deviations, and z-scores of (a) prosodic word-ends, (b) word-final vowels in hiatus, and (c) word-ends preceding enclitics. These *z*-scores are plotted in chart 1. Positions 1 and 10, respectively being initial and penultimate, do not host word boundaries that could be perceived as metrical boundaries; similarly, position 6 being post-caesural (the caesura being "late" as per Arnold 1905:11). Both prosodic word-ends and word-final vowels in apparent hiatus are set to positions 4, 5, and 9, with 5 relatively stronger than 4 and 9.

5 By *verse*, I refer to the numbered constituent that can also be called *stanza* or *strophe*; by *pāda* I refer to the lettered constituent that constitutes a verse. NB: Arnold (1905:7 et passim) uses *verse* to mean *pāda*.

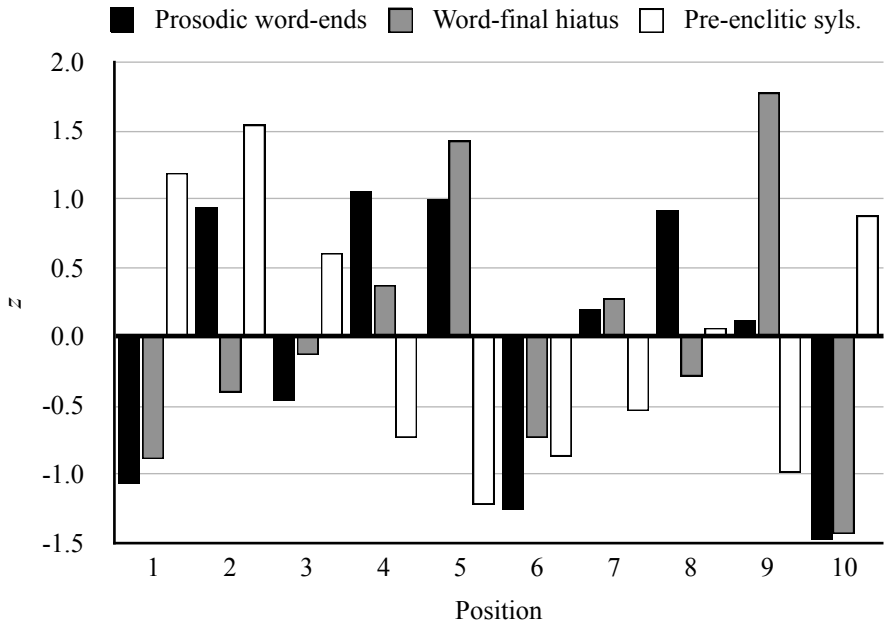
Table 1. Word boundaries in verse-final hendecasyllables

		Position									
		1	2	3	4	5	6	7	8	9	10
(a)	*n*	499	**1,891**	919	**1,973**	**1,926**	362	1,383	**1,880**	1,330	211
	z	*–1.1*	***0.9***	*–0.5*	***1.1***	***1.0***	*–1.3*	*0.2*	***0.9***	*0.1*	*–1.5*
(b)	*n*	52	96	121	166	**260**	66	157	106	**292**	2
	z	*–0.9*	*–0.4*	*–0.1*	*0.4*	***1.4***	*–0.7*	*0.3*	*–0.3*	***1.8***	*–1.4*
(c)	*n*	161	183	124	**40**	**9**	**31**	52	89	**24**	141
	z	*1.2*	*1.6*	*0.6*	***–0.7***	***–1.2***	***–0.9***	*–0.5*	*0.1*	***–1.0***	*0.9*

	Row headers	Mean	Std. dev.
(a)	Prosodic word-ends	1,237.4	695.4
(b)	Word-final vowels in apparent hiatus	131.8	90.4
(c)	Word-ends followed by enclitics	85.4	62.9

The avoidance of pre-enclitic syllables in 4, 5, 6, 7, and 9 suggests these are relatively strong metrical boundaries unlike positions 1, 2, 3, and 10.

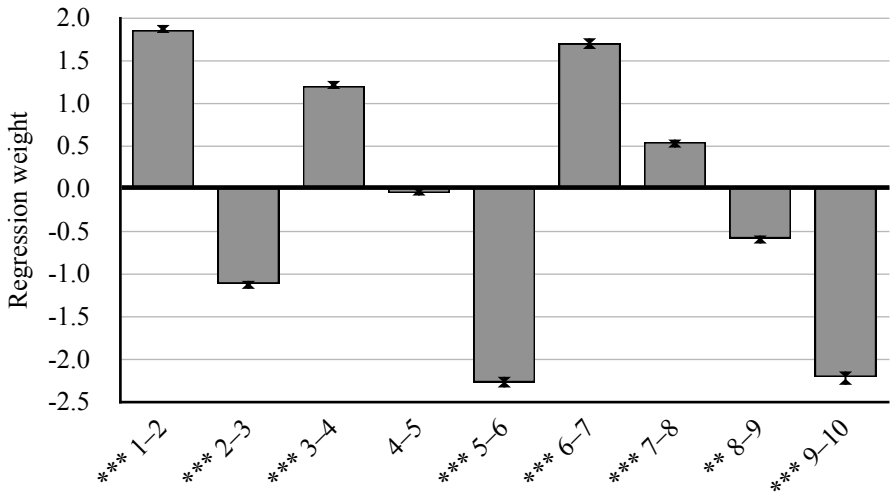
Chart 1. *z*-scores from table 1



The *z*-scores suggest the bracketing [1 2 | [3 4 | 5]] [[6 7 | 8] [9 | 10 11]] for the structure of the hendecasyllable. The preponderance of prosodic word-ends in some positions versus others does not appear accidental. We can visualize the results of a

binomial logistic regression in following chart, where the bars represent the weights of coefficients ("position to position") and the error bars the standard errors.

Chart 2. In-/decrease in expectation of word-end from position to position[6]



Positive weights denote increased expectation of prosodic word-end from one position to the next, and negative weights decreased expectation. To statistically significant degrees, expected prosodic word-ends spike in positions 2, 4, 7, and—less markedly—8.

From segmentation of the hendecasyllabic "trimeter" into 2 | 3 | 3 | 3, the question arises as to whether these syllable groupings can point to higher levels of metrical constituency. One way to assess this is to examine how well the predicted grouping pattern aligns with the observed distribution of prosodic word-ends as quantified by Pearson's correlation coefficient *r*. The foot types tallied in table 3[7] either vary together, with little mutual regard, or in opposite directions depending on where in the pāda they stand.

6 Results of a binomial logistic regression: regression weight (log-odds of prosodic word-end) = change in expectation of prosodic word-end, including apparent word-final hiatus. Three asterisks *** signal $p < 0.001$ and two ** $p < 0.01$; significance values result from a Likelihood Ratio Test using a χ^2 distribution.

7 The types in 3–4–5 and 6–7–8 were reduced to [– – ⏑, – ⏑ ⏑, ⏑ – ⏑, ⏑ ⏑ ⏑] to make comparison with 1–2 and 9–10–11 more direct and to facilitate the calculation of *r* values.

Table 2. Correlation ($r \leq 1.0$, using the frequencies in table 3)

	3–4–5	6–7–8	9–10–11
1–2	**–0.9**	0.3	–0.6
3–4–5		–0.4	**0.8**
6–7–8			–0.5

The variation between spondees ~ trochees ~ iambs ~ pyrrhics in the initial foot is very strongly negatively correlated with the alternation of foot types in the second foot. This can be taken to mean that they are not in parallel structural environments at a high enough level of constituency. By contrast, the variation in the second foot is very strongly positively correlated with the alternation in the final foot, suggesting that the crescendoing half-pādas are saliently parallel.

Table 3. Foot types

1–2			3–4–5			6–7–8		9–10–11		
– –	**1,565**	***41%***	– – –	**560**	***15%***	63	*2%*	– – ×	15	*0.4%*
			– – ⏑	**958**	***25%***	16	*0.4%*			
⏑ –	**1,679**	***44%***	⏑ – –	**725**	***19%***	**1,318**	***34%***	⏑ – ×	**3,771**	***98%***
			⏑ – ⏑	**936**	***24%***	68	*2%*			
– ⏑	320	*8%*	– ⏑ –	177	*5%*	336	*9%*	– ⏑ ×	21	*1%*
			– ⏑ ⏑	226	*6%*	27	*1%*			
⏑ ⏑	281	*7%*	⏑ ⏑ –	124	*3%*	**1,941**	***51%***	⏑ ⏑ ×	38	*1%*
			⏑ ⏑ ⏑	142	*4%*	76	*2%*			

The opening binary foot tends very strongly to be spondaic/iambic. The second foot is most frequently realized by a molossus/palimbacchiac and bacchiac/amphibrach, which responds to the bacchiac/amphibrach that overwhelmingly predominates the cadence. The weak positive correlation between 1–2 and 6–7–8 signals their structural parallelism.

Table 4. Internal word-ends in ternary feet

		3–4–5	6–7–8	9–10–11	Mean	Std. dev.
×.××	*n*	830	326	**1,317**	824.3	495.5
	z	*0.01*	*–1.0*	***1.0***		
××.×	*n*	**1,825**	**1,347**	198	1,123.3	836.2
	z	***0.8***	***0.3***	*–1.1*		

The substructure of the ternary foot in the hendecasyllable is at variance with the substructure in the octosyllable /⏓⁝⏑ –/. Table 4 shows how the medial ternary

feet strongly tend towards [× ×.×], suggesting /× ×.×/; in the cadence, the difficulty of setting a mono-syllable in final position can account for the frequency of [×.× ×].

2.1.2 Structure of the hendecasyllable

Therefore we can represent the underlying weights and subgrouping as /ο ο|⏑ –:⏒|⏑ –:⏒|⏑ –(:)×/. In the medial ternary feet, the bacchiac/amphibrach [⏑ – ⏒]—called by Piṅgala *ya-* and *ja-gaṇa*—can be realized by [– ⏑ ⏒] (*ra-*/*bha-gaṇa*) with mismatch and analogically [– – –, ⏑ ⏑ ⏑] (*ma-*/*na-gaṇa*), obscuring the underlying rhythm. The word boundary and quantitative patterns point to the tree structure in figure 2b. Such a hendecasyllable can be traced back to the octosyllable in figure 2a.

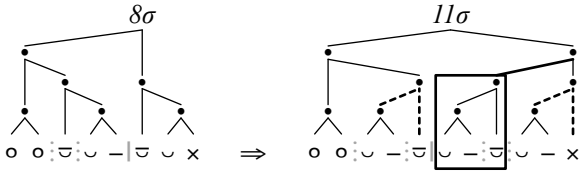


Fig. 2. Structure and derivation of the hendecasyllable

The octosyllable was lengthened by the addition of a third ternary foot, and the *indifferentes* and iambs switch places via anaclasis.

I count 531 pādas that can be scanned as [ο ο ⏑ – ⏒ ⏑ – ⏒ ⏑ – ×], i.e., without substitutions masking the proposed underlying rhythm, of which 21 are [ο ο ⏑ – ⏒|⏑ – ⏒ ⏑ – ×] with prosodic word-end at the caesura, and 3 are [ο ο:⏑ – ⏒|⏑ – ⏒:⏑ – ×] with prosodic word-ends at foot boundaries:

(1)[8]	1.61.9d	*svarír ámatro vavakṣe ráṇāya*	⏑ ⏑:⏑ – –|⏑ – –:⏑ – ×
	4.5.12d	*réku padáṃ ná nidānắ́ áganma*	– ⏑:⏑ –:⏑|⏑ – ⏑:⏑ – ×
	10.27.11d	*yá īṃ váhāte yá īṃ vā vareyắ́t*	⏑·–:⏑ – –|⏑·–·–:⏑ – ×

The vast majority of pādas—3,314—have one or more feet with mismatch (trochees for iambs) and/or analogical weights (pyrrhics/spondees for iambs). The following examples are of pādas with mismatch (shaded).

8 Text of the *RV* is quoted from van Nooten-Holland. For space considerations, I omit translations unless meaning is relevant. In the scansion, I mark prosodic word-ends with triple interpuncts ⁝ and the left edges of enclitics with midlinear dots ·.

(2)

3.54.15d	*saṃgṕbhyā na á bharā bhū́ri paśváḥ*	– – –·⏑⁝–|⏑ –⁝– ⏑⁝– ×
2.14.8d	*índrāya sómaṃ yajyavo juhota*	– – ⏑⁝– –|– ⏑ –⁝⏑ – ×
6.13.4d	*dhatté dhāníyam pátyate vasavyaìḥ*	– –⁝– ⏑ –|– ⏑ –⁝⏑ – ×
2.42.1d	*mā́ tvā kā́ cid abhibhā́ víśvyā vidat*	–·–⁝–·⏑⁝⏑|⏑ –⁝– –⁝⏑ ×
10.77.3d	*riśā́daso ná máryă abhídyavaḥ*	⏑ – ⏑ –·⏑|– ⏑⁝⏑ – ⏑ ×

2.1.3 Qualitative observations

Some qualitative support can be found in hymns as units of metrical constituency at the highest level. Consider the twenty-fourth hymn of the fifth maṇḍala. In this hymn, scanned in the traditional way, we can see how the odd pādas—octosyllables—terminate in what a Hellenist might call a hypodochmiac [– ⏑ – ⏑ ×]. The even pādas of hendecasyllables cadence in trochaic dimeters [– ⏑ – ⏑ – ⏑ ×], irrespective of the caesura.

(3) 5.24 (8σ + 11σ;[9] trans. Jamison-Brereton)

1 a *ágne tuváṃ nŏ́ántama*
b *utá trātā́ śívó bhavā varūthyàḥ*

2 a *vásur agnír vásuśravā*
b *áchā nakṣi dyumáttamaṃ rayím dāḥ*

3 a *sá no bodhi śrudhī́ hávam*
b *uruṣyā́ ṇo*[10] *aghāyatáḥ samasmāt*

4 a *táṃ tvā śociṣṭha dīdivaḥ*
b *sumnā́ya nūnám īmahe sákhibhyaḥ*

1 O Agni, be our nearest and our kind rescuer, providing (us) a shield.

2 Agni is good and famed for goods. Arrive here and give the most brilliant wealth.

3 Be attentive to us, and hear our summons. Give us freedom from anyone who wishes evil.

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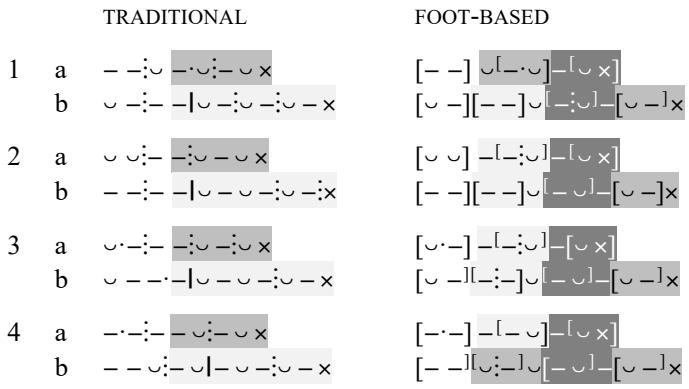
9 Arnold (1905:230) describes *RV* 5.24 as 8σ + 8σ + 3σ, with catalexis from 8σ + 8σ + 4σ (cf. Oldenberg 1888:114 with n. 1).

10 *ṇŏ (a-)* would be light from expected shortening in hiatus; however, notwithstanding *nŏ (an-)* in 1a, *ṇō (a-)* without shortening in 3b seems to be called for by the responsion pattern.

4 O strongest-blazing, shining (Agni), we now beg you for your favor for (us, your) partners.



By contrast, what looks arbitrary in the traditional description appears more structured under the proposed foot-based theory (square brackets [ ] demarcate foot boundaries, superscripted when not realized by prosodic word-end): all non-initial feet participate in a complex responsion pattern. The octosyllables cadence in a cretic, and the hendecasyllables in a cretic + bacchiac/amphibrach. The second feet of 1a and 4b are filled by amphibrachs, enclosing all other pādas with a palimbacchiac second foot.

As the patterns brought to the fore can be described in terms of feet, so can an audience appreciate irregularity and regularity better, if both they and poets can map the linear string emanating from bards' mouths onto underlying structure.[11] In this way, we can bring into sharper relief the metrical cohesion between the eight- and eleven-syllable lines of *RV* 5.28 in particular and more generally as members of a unified system.

2.2 Dodecasyllables

In 1,462 verse-final twelve-syllable pādas, prosodic word-ends are most often aligned to positions 2, 4, 5, and 8—just as in hendecasyllables—less frequently 9. Word-final vowels in apparent hiatus suggest that positions 5 (the "late" caesura) and 9 are at major metrical boundaries. This is corroborated by the avoidance of pre-enclitic word-ends in positions 4, 5, 6, 7, and 10. The relative weakness of the

11 Willett 2002:12 (Willett's italics) concerning Greek lyric but generalizable: "*A colometry that consistently enables working memory to process whole cola sequentially has a far higher likelihood of producing semantic and rhythmic coherence for both performers and hearers*."

metrical boundaries at positions 2 and 8 licenses the setting of pre-enclitic word-ends in those spots.

Table 5. Word boundaries in verse-final dodecasyllables

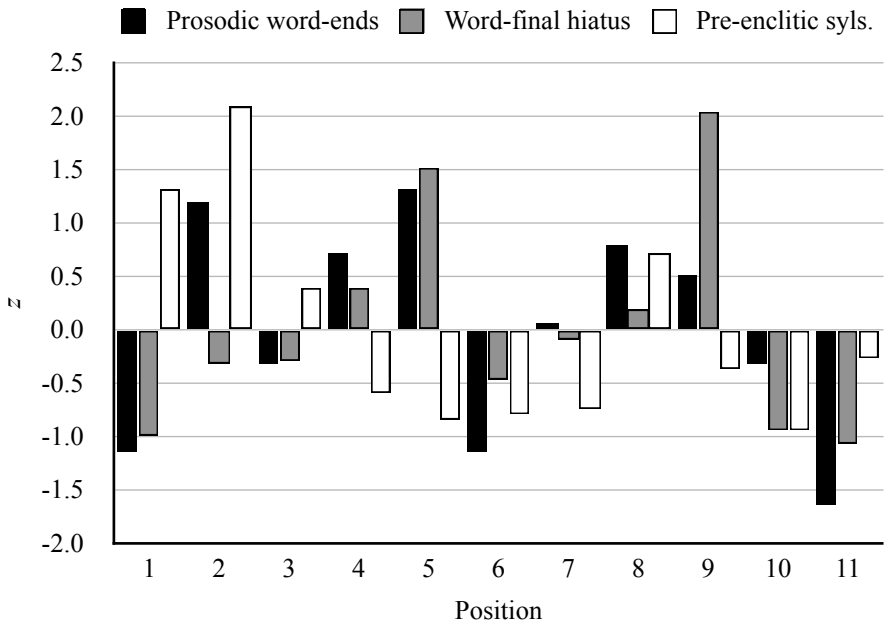
		Position										
		1	2	3	4	5	6	7	8	9	10	11
(a)	*n*	159	**776**	376	655	**809**	159	476	**671**	598	381	25
	z	*–1.1*	***1.2***	*–0.3*	*0.7*	***1.3***	*–1.1*	*0.1*	***0.8***	*0.5*	*–0.3*	*–1.6*
(b)	*n*	11	35	36	59	**99**	29	43	52	118	13	8
	z	*–1.0*	*–0.3*	*–0.3*	*0.4*	***1.5***	*–0.5*	*–0.1*	*0.2*	*2.0*	*–0.9*	*–1.1*
(c)	*n*	53	68	35	**16**	**11**	**12**	**13**	41	20	9	22
	z	*1.3*	*2.1*	*0.4*	***–0.6***	***–0.8***	***–0.8***	***–0.7***	*0.7*	*–0.4*	*–0.9*	*–0.3*

	Row headers	Mean	Std. dev.
(a)	Prosodic word-ends	462.3	265.9
(b)	Word-final vowels in apparent hiatus	45.7	35.3
(c)	Word-ends followed by enclitics	27.3	19.5

2.2.1 By the numbers

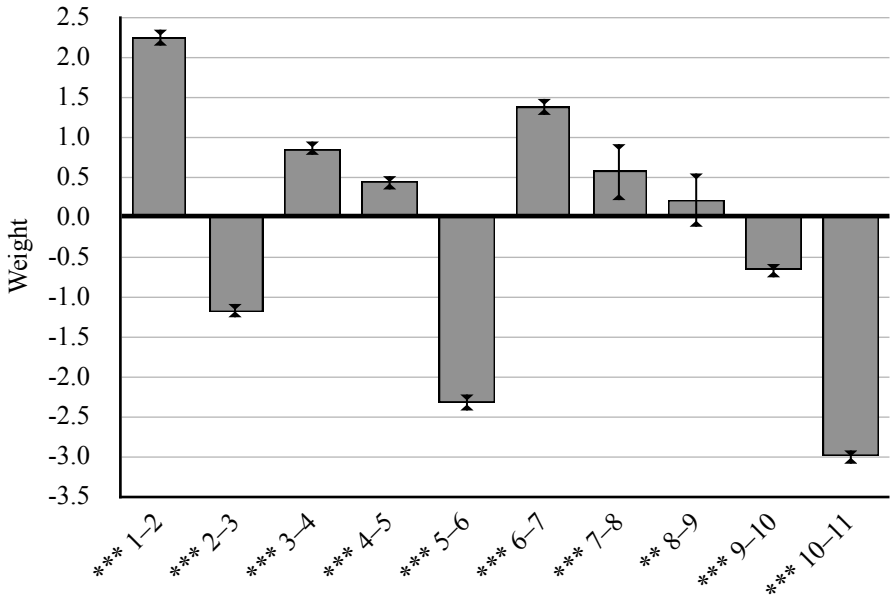
The depiction of the *z*-scores from table 5 in chart 3—

Chart 3. *z*-scores from table 5



—clarifies how the loci of word boundaries is the same in both the hendecasyllable and the dodecasyllable, namely positions 1–6 and 8–10. As in hendecasyllables (cf. chart 2 with n. 6), changing frequency of word-end across positions is not due to chance. Chart 4 graphically represents how expectation of word-end spikes in position 2, 4, 5, 7, and 8.

Chart 4. In-/decrease in expectation of word-end from position to position



The statistics support parsing the dodecasyllable as [1 2][3 4 | 5][6 7 | 8][9 10 11 12]. The favored shapes of feet are the same as in hendecasyllables (see table 3):

Table 6. Foot types

	1–2			3–4–5		6–7–8			9–10–11–12	
– –	**590**	***40%***	– – –	**210**	***14%***	20	*1%*	– – – ×	—	
			– – ⏑	**370**	***25%***	10	*1%*	– – ⏑ ×	3	*0.2%*
⏑ –	**664**	***45%***	⏑ – –	**280**	***19%***	464	*32%*	⏑ – – ×	2	*0.1%*
			⏑ – ⏑	**380**	***26%***	21	*1%*	⏑ – ⏑ ×	**1,418**	***97%***
– ⏑	120	*8%*	– ⏑ –	59	*4%*	185	*13%*	– ⏑ – ×	8	*1%*
			– ⏑ ⏑	77	*5%*	38	*3%*	– ⏑ ⏑ ×	1	*0.1%*
⏑ ⏑	88	*6%*	⏑ ⏑ –	42	*3%*	694	*47%*	⏑ ⏑ – ×	—	
			⏑ ⏑ ⏑	44	*3%*	30	*2%*	⏑ ⏑ ⏑ ×	30	*2%*

—spondee/iamb initially, molossus/palimbacchiac ~ bacchiac/amphibrach in 3–4–5, palimbacchiac/anapest (also cretic) in 6–7–8, and what looks like an iambic dipody or metron finally.

2.2.2 Structure of the dodecasyllable

The preferred quantities and segmentation point to the following tree, which corroborates Macdonell's (1916:442) opinion that the dodecasyllable was "probably an extension," i.e., a hypermetrical hendecasyllable.

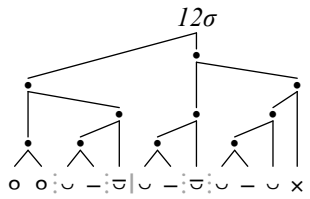


Fig. 3. Structure of the dodecasyllable

Arnold (1905:7) could only imprecisely describe the relationship of the two long lines as "varieties" of trimeter. In §3 below I outline a derivational relationship between these "varieties."

2.2.3 Qualitative observations

Just as *RV* 5.24 in §2.1.3 above, the forty-third hymn of the second maṇḍala has a complex responsion pattern that appears sensitive to the proposed structure. In the traditional scansion, the choriamb [– ⏑ ⏑ –] + iamb [⏑ – ⏑ ×] after the caesura in 1a is echoed by 3b, though the caesura here is "late." The fourth paeonic [⏑ ⏑ ⏑ –] + iamb in 1bc and 3cd respond almost perfectly, but for the catalexis in 3d; 2bc also close with this rhythm. The palimbacchiac + iamb in 1d is picked up by 3a, as well as 2a and 2de. Pādas 1abc and 1d respond chiastically to 3a and 3bcd, irrespective of the place of the caesura and the structure of the break + cadence. The foot-based analysis makes apparent a more precise and thorough responsion pattern, perception of which is facilitated by metrical substructures (I put aside 2c with its thirteen syllables). Pādas 1abcd + 2ab + 2de + 3abc all end in iambic metra; 3d ends with a bacchiac, as if a catalectic iambic metron. The anapestic third feet in 1abc + bacchiac third feet in 1d + 2a are mirrored in 2e + 3a + 3bcd. The amphibrachic second foot in 1b and the palimbacchiac/molossus in 1cd chiastically respond to 3ab + 3c. The anapestic third foot of 2b responds to the same in the second foot of 1a, binding the first verse and the beginning of the second. Binding the end of the second and

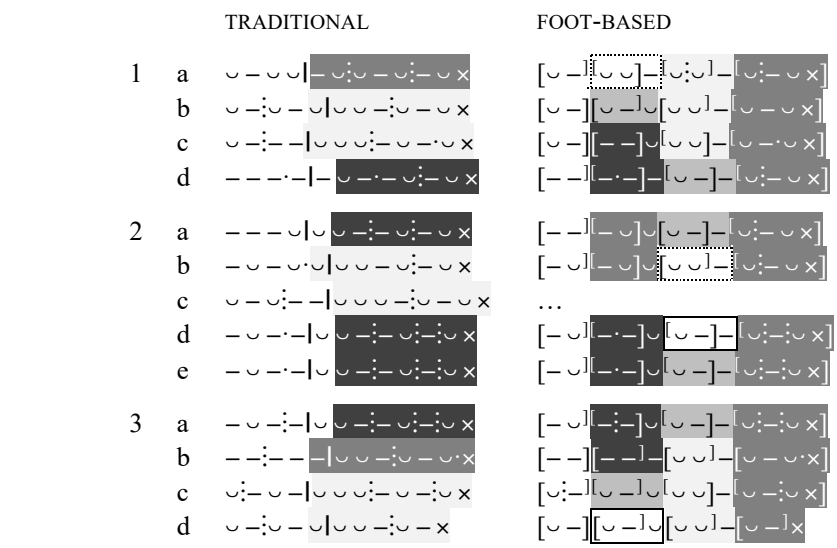
the end of the third, the bacchiac in the third foot of 2d is echoed asymmetrically by the amphibrachic second foot of 3d.

(4) 2.43 (1 and 3 in jagatī, 2 in atiśakvarī/aṣṭi; trans. Jamison-Brereton)

1 a *pradakṣiníd ambhí gṛṇanti kārávo*
b *váyo vádanta ṛtuthā́ śakúntayaḥ*
c *ubhé vā́cau vadati sāmagā́ iva*
d *gāyatrā́m ca traiṣṭubhaṃ cā́nu rājati*

2 a *udgātéva śakune sā́ma gāyasi*
b *brahmaputrá 'va sávaneṣu śaṃsasi*
c *vṛ́ṣeva vājī́ śíśumatīr apī́tiyā*
d *sarváto naḥ śakune bhadrám ā́ vada*
e *viśváto naḥ śakune púṇyam ā́ vada*

3 a *āvádaṃs tváṃ śakune bhadrám ā́ vada*
b *tūṣṇī́m ā́sīnaḥ sumatíṃ cikiddhi naḥ*
c *yád utpátan vádasi karkarír yathā*
d *bṛ́had vadema vidáthe suvī́rāḥ*



1 Turning toward the right the bards sing welcome—the birds speaking at their proper season, the birds of omen. It speaks both speeches like a sāman-singer: it regulates both gāyatrī and triṣṭubh meters.

2 Like the Udgātar, O omen-bird, you sing the sāman. Like the Son of the Sacred Formulation, you recite at the pressings. Like a bullish prize-winner

[= stallion] when he has approached (mares) with young, speak auspiciously to us in every way, omen-bird—speak pleasantly to us in all ways, omen-bird.

3 When you are speaking, omen-bird, speak auspiciously; when you are sitting silently, take note of our good thought. When, as you fly up, you speak like a lute ... —May we speak loftily at the ritual distribution, in possession of good heroes.

2.3 Metrical variability across maṇḍalas

The underlying (sub-) regularities that I advocate for might seem fatally contradicted by pyrrhics in the opening binary foot and tribrachs in ternary feet, where we also get molossi. They are not few. I suspect that these alternants are the product of a sort of analogical levelling. In the opening binary foot, the alternation of spondee, iamb, and trochee can easily be reinterpreted to include pyrrhics given the expectation of columnar correspondence. In ternary feet, tribrachs and molossi are similarly understandable from [⏑̯:⏑ –, ⏑̯:– ⏑, ⏑ –:⏑̯, – ⏑:⏑̯]. Hence, widening the spectrum of metrical well-formedness, we have the pādas *en pointe* in (5), so to speak, and more plodding ones in (6).

(5) a. 9.107.20d

śakunā́ iva paptima [⏑ ⏑]⏑[⏑ ⏑]–[⏑ ×]

b. 10.61.5d

duhitúr ā́ ánubhṛtam anarvā́ [⏑ ⏑][⏑:⏑]⏑[⏑ ⏑]⏑[⏑ – ×]

c. 5.54.3d

stanáyadamā rābhasā́ údojasaḥ [⏑ ⏑][⏑ ⏑]–[– ⏑]⏑[⏑ – ⏑ ×]

(6) a. 5.68.3c

máhi vāṃ kṣatráṃ devéṣu [⏑ ⏑]–[– –]–[– ×]

b. 5.69.2d

dhiṣánānāṃ retodhā́ ví dyumántaḥ [⏑ ⏑][– –]–[– –]–[⏑ – ×]

c. 10.106.13c

abhiárṣan stoṭ́bhyo vīrávad yáśaḥ [⏑ ⏑][– –]–[– –]–[⏑ –:⏑ ×]

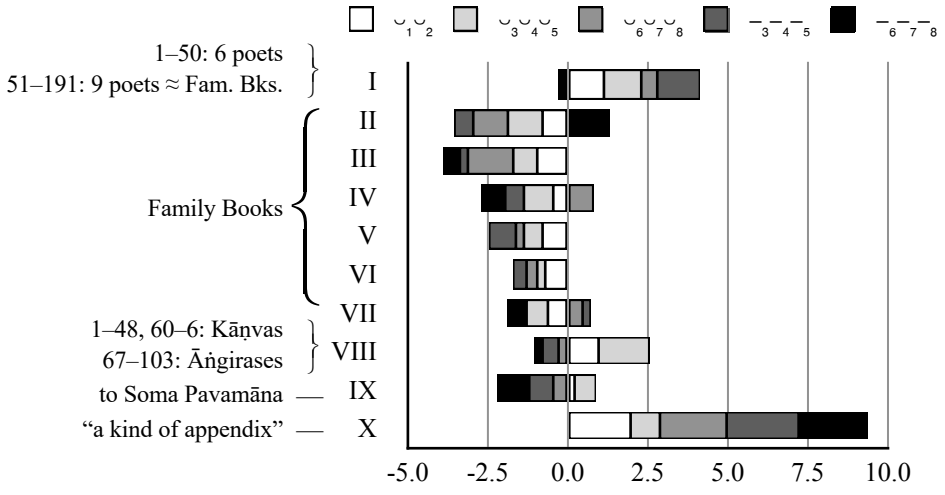
The hunch that these substituted feet *result from later* analogical levelling may be a good one. We can drill down into the aggregate figures and calculate *z*-scores by maṇḍala in table 7, graphically represented by chart 5.

Table 7. Frequency of analogical syllable weights by maṇḍala

		Maṇḍala									
		I	II	III	IV	V	VI	VII	VIII	IX	X
⏑₁⏑₂	*n*	**115**	36	20	50	36	40	42	**110**	76	**149**
	z	***1.1***	*–0.8*	*–0.9*	*–0.4*	*–0.8*	*–0.7*	*–0.6*	***1.0***	*0.2*	***1.9***
⏑₃⏑₄⏑₅	*n*	**87**	13	23	19	30	40	27	**98**	72	**79**
	z	***1.2***	*–1.1*	*–0.8*	*–0.9*	*–0.6*	*–0.3*	*–0.7*	***1.5***	*0.7*	***1.0***
⏑₆⏑₇⏑₈	*n*	13	5	3	15	9	9	13	9	8	**22**
	z	*0.4*	*–1.0*	*–1.4*	*0.8*	*–0.3*	*–0.3*	*0.4*	*–0.3*	*–0.5*	***2.1***
–₃–₄–₅	*n*	**150**	53	71	55	45	62	94	59	48	**191**
	z	***1.4***	*–0.6*	*–0.2*	*–0.6*	*–0.8*	*–0.4*	*0.2*	*–0.5*	*–0.7*	***2.2***
–₆–₇–₈	*n*	7	**14**	6	5	8	8	6	7	4	**18**
	z	*–0.3*	***1.3***	*–0.5*	*–0.8*	*–0.1*	*–0.1*	*–0.5*	*–0.3*	*–1.0*	***2.2***

	Mean	Std. dev.		Mean	Std. dev.
⏑₁⏑₂	68.4	42.0			
⏑₃⏑₄⏑₅	48.8	31.7	–₃–₄–₅	82.8	49.2
⏑₆⏑₇⏑₈	10.6	5.4	–₆–₇–₈	8.3	4.3

Chart 5. Relative frequency of analogical pyrrhics, tribrachs, and molossi per maṇḍala (Jamison-Brereton), as measured by *z*-scores (see table 7)



On the basis of features having less to do with meter, the second through seventh maṇḍalas constitute the "Family Books," which are taken to be the oldest parts of the *Rig-Veda* (Jamison-Brereton 10). The *z*-scores for pyrrhics, tribrachs, and molossi in this core are below the mean, apart from molossi in maṇḍala II and tribrachs in IV. The first, eighth, and tenth maṇḍalas, by contrast, have above-average distribution of all-light or all-heavy feet. For independent reasons, maṇḍalas I, VIII, and X are taken to be younger (Jamison-Brereton 11–2). So, the metrical flexibility or non-regularity traditionally regarded as old can only be ascribed to the venerable antiquity of Vedic, assuming a primeval syllable-counting system on its way to quantitative (sub-) regularity. I suggest that columnar correspondence later muddled archaic regularity and complex responsion.

3 Reimagining the Vedic metrical system

We can provisionally unify the eight-, eleven-, and twelve-syllable lines in a derivational relationship. Starting from the octosyllable in figure 4, we can achieve the hendecasyllable in two steps: first by transposing the cretics/anapests into bacchiacs/amphibrachs through anaclasis, then by affixing a third bacchiac/amphibrach.

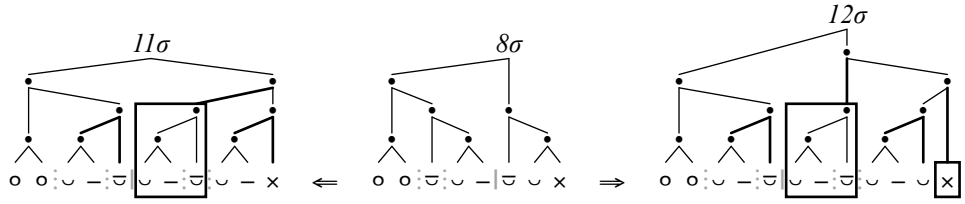


Fig. 4. Derivation of hendeca- and dodecasyllables

The relative frequency of medial bacchiacs/amphibrachs in octosyllables (1,069×, 28%; Mercado 2025:150) could have motivated the anaclasis. The bacchiac/amphibrach takes off, being found 1,661×, in 43% of second feet and 1,386×, in 36% of third feet, becoming the preferred cadence 3,771×, in 98% of verse-final hendecasyllables (see table 3). The dodecasyllable looks like the octosyllable with medial anaclasis, like the hendecasyllable, but with an extra position. The bacchiac/amphibrach emerges as a favorite: 660×, in 45% of second feet and 485×, in 33% of third feet.

4 Historical comparison

Equipped with plausible synchronic descriptions not only of the octosyllable but also of the eleven- and twelve-syllable pādas—on the one hand—and the intuition that Vedic meters are cognate with Greek—on the other hand—I offer the following account of the historical development of the Vedic lines. If Greco-Aryan metrical forms are not only cognate but also, as Greek shows, participate synchronically in a derivational system, I posit that Vedic at least preserves traces not only of inherited forms but also of the relationship among them.

4.1 The Greco-Aryan hendecasyllable

The Vedic hendecasyllable has been analyzed as the catalectic variant of the dodecasyllable (West 1973:163, 2007:48; Nagy 1974:29). Otherwise, Greek furnishes more than one hendecasyllabic meter that could be compared directly with Vedic.[12] The derivational relationship noticed for the octo- and hendecasyllable recommends comparison with the glyconic internally expanded by an anapest (gl^a 22×, gl^{2a} 25×, gl^{3a} 1×, and $\ddot{}gl^a$ 1× in my corpus,[13] in addition to internally expanded [hyper-] acephalous, hypermetrical, and [hyper-] catalectic types).

(7) gl^a ⏑ ⏑ – ⏑ ⏑ – ⟨⏑ ⏑ – ⟩ ⏑ ×

Alcm. 27.3	ὕμνωι καὶ χαρίεντα τίθη χορόν
Sapph. 94.8	μέμναισ’, οἶσθα γὰρ ὤς σε πεδήπομεν
Ibyc. 1a.27	νᾱῶν ὠ[ς Μεν]έλᾱος ἀπ’ Αὐλίδος

An octosyllable with a central trochaic metron (figure 5a; Mercado 2025:163) yields an anaclastic variant with a central iambic metron (figure 5b) by transposing the daughters of node h. Such a reconstructed octosyllable with a central iambic metron does not lie beyond the realm of possibility, as indicated by 919 verse-final octosyllables (24% of my corpus) with the hypothesized quantities and word = foot boundaries (8).

12 Meillet (1923:35 ap. Schmidt 1967:310) favored the Sapphic hendecasyllable /– ⏑ – × | – ⏑ ⏑ – ⏑ – ×/, a trochaic metron + aristophanean (= $\ddot{}gl$^), though placement of word-ends in 86 lines in my corpus suggests [– ⏑ ⁝ – ▽ – | ⏑ ⏑ – | ⏑ ⁝ – ×], a hypodochmiac + ^$\ddot{}gl$^. A much less strongly attested type is the compound *gl* | *ba* /⏑ ⏑ – ⏑ ⏑ – ⏑ – | ⏑ – ×/. Suffice it to say that comparison of Vedic with either of these lines is not economical.

13 See Mercado 2025:156–60.

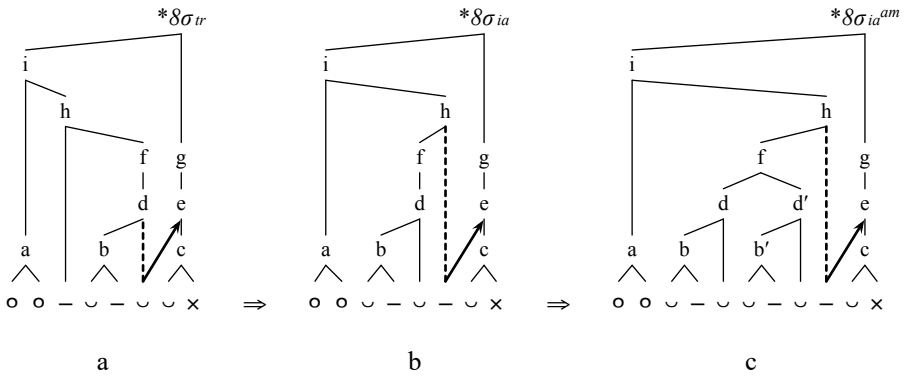


Fig. 5. Development of the Vedic hendecasyllable I

(8)	1.30.22c	*asmé rayíṃ ní dhāraya*	[– –][∪ –]∪⁝–⌈∪ ×]
	2.8.3c	*yásya vratáṃ ná mḗyate*	[– –][∪ –]∪⁝–⌈∪ ×]
	3.11.2c	*agnír dhiyā́ sám ṛṇvati*	[– –][∪ –]∪⁝–⌈∪ ×]
	5.52.3d	*diví kṣamā́ ca manmahe*	[– –][∪ –]∪⁝–⌈∪ ×]
	6.59.6d	*triṃśát padā́ ní akramīt*	[– –][∪ –]∪⁝–⌈∪ ×]
	7.66.9c	*íṣaṃ súvaś ca dhīmahi*	[∪ –][∪ –]∪⁝–⌈∪ ×]
	8.84.1c	*agníṃ ráthaṃ ná védiyam*	[– –][∪ –]∪⁝–⌈∪ ×]
	9.24.3c	*nṛ́bhir yató ví nīyase*	[∪ –][∪ –]∪⁝–⌈∪ ×]
	10.33.9c	*táthā yujā́ ví vāvṛte*	[∪ –][∪ –]∪⁝–⌈∪ ×]

The iambic octosyllable could be expanded internally by infixing, as it were, another amphibrach from node f (figure 5c). Two verse-final pādas come close to realizing the reconstructed weights and breaks.

(9)	6.15.1d	*jiyók cid atti gárbho yád ácyutam*	[∪ –][∪⁝–⌋∪[– –]∪⁝–⌈∪ ×]
	10.78.3d	*pitṝ́ṇā́ṃ ná śáṃsāḥ surātáyaḥ*	[∪ –⌋[∪ –]∪[– –]∪ –⌈∪ ×]

At a subsequent stage, the single longum hanging from node h is reassigned to node e (figure 6) through reanalysis. The new parse could have obtained for the base trochaic octosyllable and ported through the derivations, or, if the derivation was already unproductive, the change of node could have taken place in all three types.

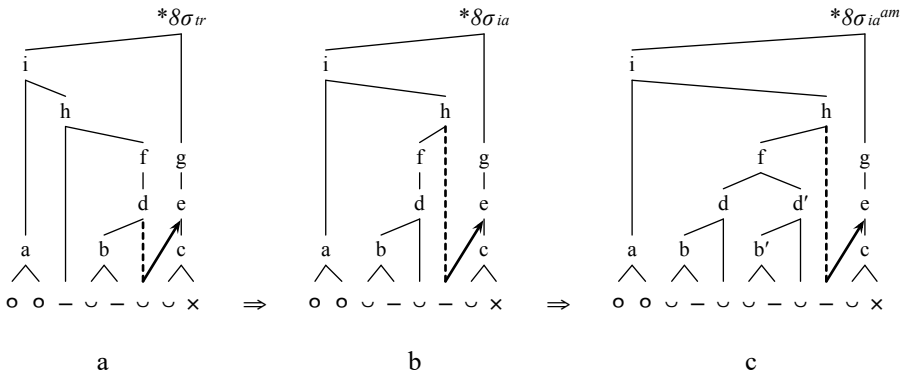


Fig. 6. Development of the Vedic hendecasyllable II

At the latest pre-Vedic—or the earliest historical Vedic—stage, positions 3 and 6 in the cretic/anapestic octosyllable become *indifferentes* (figure 7a). In the anaclastic octosyllable with bacchiacs/amphibrachs, the daughters of node e change places (figure 7b). Finally, the infixed bacchiac/amphibrach is adopted by node g (figure 7c). It is not clear whether the derivation remained operative or whether the octo- and hendecasyllables had become extra-paradigmatic, so to speak.

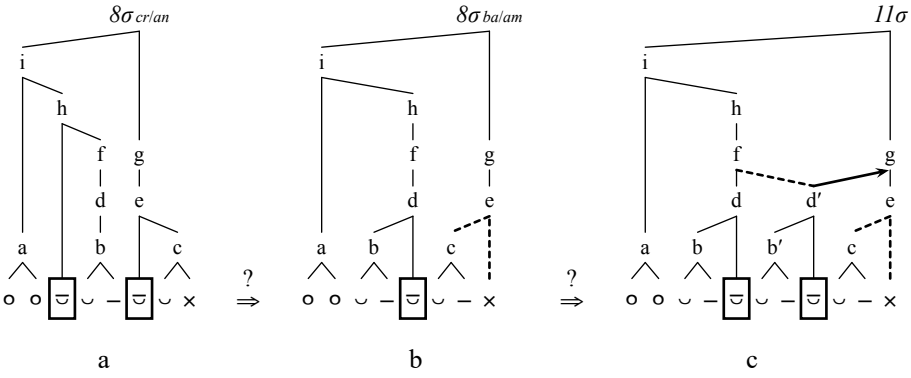


Fig. 7. Development of the Vedic hendecasyllable III

Thirty-seven pādas in my corpus are amenable to being parsed as octosyllables with bacchiac/amphibrachic feet, among which:

(10) 8.3.19d *níḥ párvatasya gắ ājaḥ* [–⁝–][⏑ –][⏑⁝–]×

10.157.1b *índraś ca víśve ca devắḥ* [– –][⏑⁝–]–[⏑⁝–]×

4.2 The Greek suffixed glyconic and the Vedic dodecasyllable

As with the hendecasyllable, the synchronic derivation of the dodecasyllable from the eight-syllable pāda calls for consideration of a Greek twelve-syllable line that can be derived from the glyconic.[14] But, first, consider the Greek hipponactean and the Vedic enneasyllable.

4.2.1 The Greek hipponactean and the Vedic enneasyllable

The hipponactean (11a) is produced by adding a position at the glyconic's right edge (Itsumi 2009:27). Its left edge and middle can be manipulated in the same ways as the glyconic: the central choriamb (8×) can be initial (3×) (11b) or near final (1×) through anaclasis (11c).

(11) a. *hi* ⏑ ⏑ – ⏑ ⏑ – ⏑ – ×

Alcm. 1.77 ἀλλ' Ἀγησιχόρᾱ με τείρει

Alc. 130.18 ἰ̓μέρρων ἀγόρᾱς ἄκουσαι

Simon. 26.1 τῶν ἐν Θερμοπύλαις θανόντων

b. *¨hi* – ⏑ ⏑ – ⏑ – ⏑ – ×

Anacr. 346.1 καί σε δοκεῖ μὲν ἐ[ν δό]μ̣ο̣ι̣σ̣ι̣[ν

c. *hi¨* ⏑ ⏑ – ⏑ – ⏑ ⏑ – ×

Alcm. 125 πῆρά τοι μαθήσιος ἀρχᾱ́

All three variants are attested with internal anapestic expansion (*hi*^{a} 2×, *hi*^{2a} 1×; *¨hi*^{a} 11×; *hi*$^{¨a}$ 1×):

(12) a. *hi*^{a} ⏑ ⏑ – ⏑ ⏑ – ⟨⏑ ⏑ –⟩ ⏑ – ×

scol. 10.2 = 12.2 ὥσπερ Ἁρμόδιος καὶ Ἀριστογείτων

b. *¨hi*^{a} – ⏑ ⏑ – ⟨⏑ ⏑ –⟩ ⏑ – ⏑ – ×

Sapph. 152 παντοδάπαισι μεμειχμένᾱ χροίαισιν

Ibyc. 34.2 μᾶλά τε καὶ ῥόδα καὶ τέρεινα δάφνα

14 Possible candidates are the compound glyconic + iambic metron /⏓ ⏓ – ⏑ ⏑ – ⏑ – | ⏑ – ⏑ ×/ and the glyconic with internal choriambic expansion /⏓ ⏓ – ⏑ ⏑ – ⟨– ⏑ ⏑ –⟩ ⏑ ×/. The iamb and choriamb being quaternary feet are not salient in Vedic and would be hard to square with more prevalent ternary feet. At present, I doubt these are viable candidates.

	Anacr. 416.2	πάνταϛ ὅσοι χθονίουϛ ἔχουσι ῥυσμούϛ
	Simon. 37.1	ἄνδρ’ ἀγαθὸν μὲν ἀλᾱθέως γενέσθαι
c.	*hi¨ᵘ*	○ ○ – ∪ – ∪ ∪ –⟨∪ ∪ –⟩× (?)
	Alcm. 1.87	γλαύξ· ἐγὼ[ν] δὲ τᾶι μὲν Ἀώτι μάλιστα

On the Vedic side, the enneasyllable appears more marginal than the hipponactean (see Arnold 1905:161, 212, 245). From fourteen tokens (only four verse-final), e.g., (13), we can tentatively draw the tree in figure 8.

(13)	1.149.5a	*ayáṃ sá hótā yó dvijánmā*	[∪ –]∪[– –]–[∪ –⌋×
	2.11.15c	*asmắn sú pŕ̥tsu á́ tarutra*	[– –]∪[– ∪]–[∪ –⌋×
	8.46.20a	*sánitaḥ súsanitar úgra*	[∪ ∪⌋–[∪ ∪⌋∪⌈∪:–⌋×
	9.67.30c	*ākhúṃ cid evá deva soma*	[– –]∪[– ∪]–⌈∪:–⌋×

(Pāda 9.67.30c is verse-final.) Word-ends in the fourteen enneasyllables are set most frequenty in position 2 (9×, $z = 1.2$), 3 (9×, $z = 1.2$), 5 (7×, $z = 0.6$), and, less frequently, in 6 (6×, $z = 0.3$)—positions 2 and 5 are foot-final in the octosyllable. In 6–7–8, the alternation of anapest (3×) and cretic (11×) point to /⏑ ∪ –/, as in the octosyllable, which can be generalized for 3–4–5.

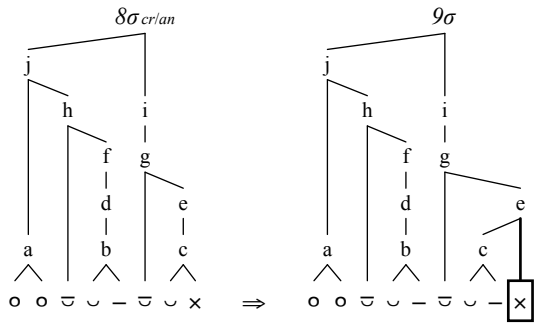


Fig. 8. Structure and derivation of the enneasyllable

The affinities of the nine-syllable pāda with the octosyllable suggest that the former is the hypermetrical derivative of the latter, not a variant shortened from longer lines.

4.2.2 Nine plus three equals twelve

The synchronic dodecasyllable could be the reflex of a prehistoric hypermetrical octosyllable with central iamb, internally expanded by an amphibrach. At the earliest, the iambic octosyllable (figure 9a) was lengthened by one position at its right edge (figure 9b), which in turn was internally expanded (figure 9c).

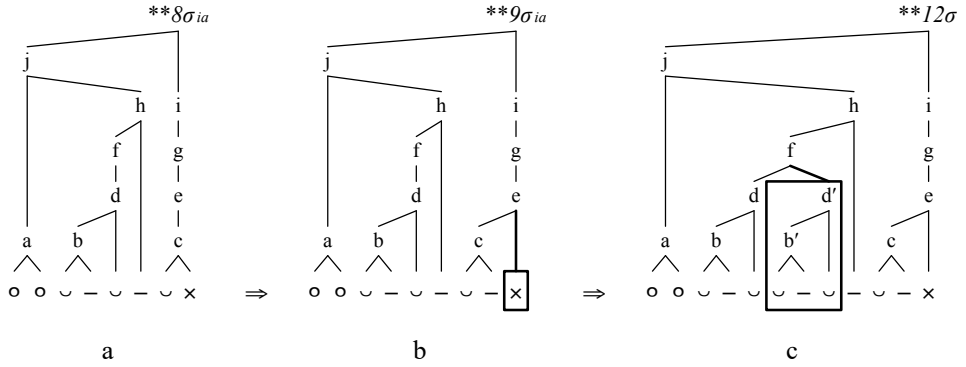


Fig. 9. Development of the Vedic dodecasyllable I

Later, the longum in position 6 is reassigned from node h to e in the octosyllable (figure 10a), to node g in the ennea- and dodecasyllable (figures 10a–b).

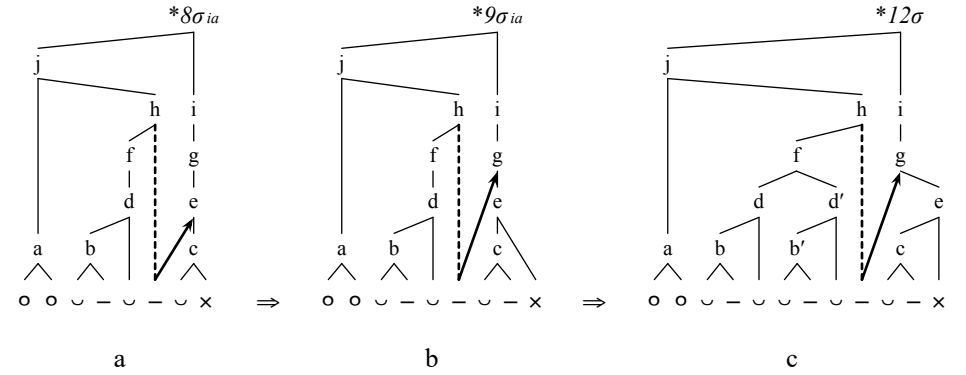


Fig. 10. Development of the Vedic dodecasyllable II

Finally, the breve under node d becomes *indifferens* (figure 11). In the enneasyllable, the amphibrach under node e and the longum hanging from node g change places (figures 11b–c). The infixed amphibrach under node d′ is delinked from node f and joins the closing tetrasyllable under i. In this latest stage of development, whether the derivational paths were still clear cannot be determined.

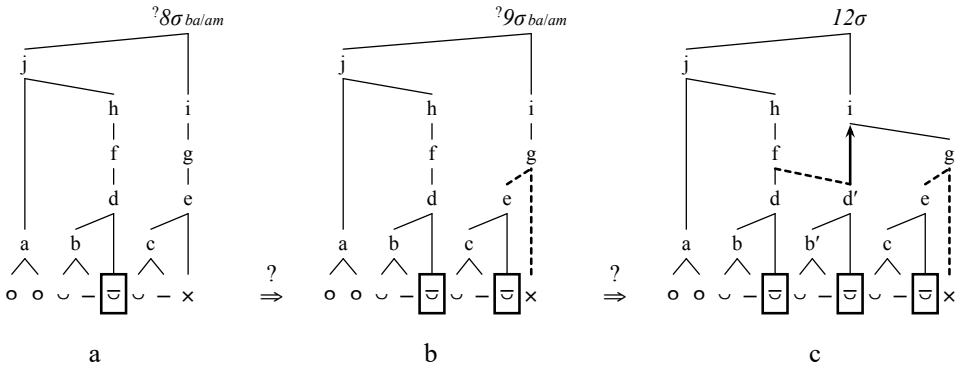


Fig. 11. Development of the Vedic dodecasyllable III

5 Conclusion

A reexamination of Vedic meter through a generativist lens lets us see Sanskrit sacral verse in three dimensions. Tree representations—typologically extraordinary ones—based on word boundary patterns allow more precise description of relationships among the eight- (nine-), eleven-, and twelve-syllable pāda forms. When considered in light of the hierarchical tree structures of archaic Greek lyric meters—even more unparalleled typologically—our comparisons can unearth not only retentions but also the modifications—anaclasis, internal expansion, reanalysis—that have obscured common descent.

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