

# Allomorph Selection in Vedic Sanskrit Perfects of the Form $C_i e: C_j$ -

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## 1 Introduction

Vedic Sanskrit (Indo-Iranian; Indo-European; ~1200–500 BCE) possesses an anterior past tense formation, referred to as the PERFECT, the most salient morphological formant of which is a prefixing reduplicant of the shape CV.<sup>1</sup> Perfect stems are built by the attachment of this reduplicant to a verbal root, and exhibit vowel alternations (*ablaut*) in the root, conditioned by the accentual properties of inflectional suffixes (cf. Steriade, 1988:94–5 and Kiparsky, 2010). Typical examples the inflection of perfects in their singular and plural active forms are given in example (1); see further Macdonell, 1916 [1993]:146–58 and Whitney, 1889 [1960]:279–96.

### (1) Vedic Sanskrit Perfect Inflection

a. /dəjç/ ‘point’		b. /dəwfi/ ‘rub’		c. /drəwfi/ ‘be hostile’	
SINGULAR	PLURAL	SINGULAR	PLURAL	SINGULAR	PLURAL
1 [di-dé:ç-ə]	[di-diç-má]	[du-dó:fi-ə]	[du-dufi-má]	[du-dró:fi-ə]	[du-druhi-má]
2 [di-dé:ç-tʰə]	[di-diç-á]	[du-dó:k-tʰə]	[du-dufi-á]	[du-dró:k-tʰə]	[du-druhi-á]
3 [di-dé:ç-úr]	[di-diç-úr]	[du-dó:fi-úr]	[du-dufi-úr]	[du-dró:fi-úr]	[du-druhi-úr]
d. /dər/ ‘pierce’		e. /dərç/ ‘see’		f. /dwəjs/ ‘hate’	
SINGULAR	PLURAL	SINGULAR	PLURAL	SINGULAR	PLURAL
1 [də-dár-ə]	[də-dṛ-má]	[də-dərç-ə]	[də-dṛç-má]	[di-dvé:ç-ə]	[di-dviç-má]
2 [də-dár-tʰə]	[də-dṛ-á]	[də-dərç-tʰə]	[də-dṛç-á]	[di-dvé:ç-tʰə]	[di-dviç-á]
3 [də-dá:r-úr]	[də-dṛ-úr]	[də-dərç-úr]	[də-dṛç-úr]	[di-dvé:ç-úr]	[di-dviç-úr]

In the following, I will refer to the form of the perfect stem seen in the singular as the STRONG stem and to the form seen in the plural as the WEAK stem. Throughout both the strong stem and weak stem, the form of the reduplicant is invariant, copying the leftmost consonant of the root and a vowel [ə], [i], or [u]; the vowel of the reduplicant corresponds to form of the root seen when a root’s underlying /ə/ is subject to deletion: for example, in (1).f., because the “reduced” form of the root is [dviç-], the reduplicant will contain an [i].<sup>2</sup> The root, meanwhile, alternates between retention of an underlying /ə/ in the strong stem (giving surface [e:], [o:], [a:], or [ə]) and deletion of a /ə/ (giving [i], [u], [r] or ∅). Example (1).d. in particular illustrates a perfect

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<sup>1</sup> For an overview of the syntactic and semantic usage of the Vedic perfect, see Kümmel, 2000:65–94.

<sup>2</sup> On the vowel of the reduplicant in Sanskrit perfects, see further Kulikov, 2005 and, especially, Steriade, 1988. Roots containing underlying /i/ or /u/, or a glide /j/ or /w/ immediately to the right of a /ə/ or /a:/ will invariably show [i] or [u], respectively, in their reduplicants. The same holds for roots that contain a glide /j/ or /w/ to the left of a /ə/ or /a:/ if that /j/ or /w/ serves as a syllable nucleus [i]/[u] when the /ə/ or /a:/ is subject to deletion: thus 3.PL.PERF [su-ṣup-úr] to /swəp-/ ‘sleep’. Otherwise, the reduplicant will contain [ə]: contrast 3.SG.PERF [u-vá:s-ə] to /wəs-/ ‘shine’ and 3.SG.PERF [və-vá:s-ə] to /wəs-/ ‘clothe’. To borrow the distinction drawn by Steriade (1988:98), /wəs-/ ‘shine’ contains a “vocalizable sonorant”, whereas /wəs-/ ‘clothe’ does not. Exactly how such a distinction should be derived or lexically encoded is an independent problem that does not bear on the issues treated in this paper.

to a biconsonantal root /C<sub>1</sub>əC<sub>j</sub>-/ that reduces to [C<sub>1</sub>C<sub>j</sub>-]; schwa deletion does not require that the root contain another segment able serve as a syllable nucleus within the morphological domain of the root.

However, many biconsonantal roots of Vedic show an inflection in their perfect weak stems unlike the pattern in (1) to which /dər-/ belongs. The examples in (2) present cases in which a root does not build a weak stem of the shape [C<sub>1</sub>ə-C<sub>1</sub>C<sub>j</sub>-] (like [də-dr-] above), but instead a weak stem of the shape [C<sub>1</sub>e:C<sub>j</sub>-]; an ill-formed weak stem of the form [C<sub>1</sub>ə-C<sub>1</sub>C<sub>j</sub>-] is given for contrast.

(2) Perfect Weak Stems of the Form [C<sub>1</sub>e:C<sub>j</sub>-]

a. /dəb <sup>h</sup> -/ ‘deceive’			b. /jəm-/ ‘stretch out’		
3.SG	3.PL	*3.PL	3.SG	3.PL	*3.PL
[də-dá:b <sup>h</sup> -ə]	[de:b <sup>h</sup> -úr]	*[dədb <sup>h</sup> -úr]	[jə-já:m-ə]	[je:m-úr]	*[jəjm-úr]
c. /çək-/ ‘create’			d. /səd-/ ‘sit’		
3.SG	3.PL	*3.SG	*3.PL	3.PL	*3.PL
[çə-çá:k-ə]	[çe:k-úr]	*[çəçk-úr]	[sə-sá:d-ə]	[se:d-úr]	*[səsd-úr]

The principal object of this paper is to account for the occurrence and distribution of perfect weak stems of the form [C<sub>1</sub>e:C<sub>j</sub>-], like those seen in (2), in competition with expected weak stems of the form [C<sub>1</sub>ə-C<sub>1</sub>C<sub>j</sub>-] that would result from the application of schwa deletion typical to perfect weak stems, as seen in (1).<sup>3</sup> Section 2 lays out the relevant data to be accounted for, and sets out the relevant phonological conditions under which [C<sub>1</sub>e:C<sub>2</sub>-] weak stems emerge, including some principled exceptions. Section 3 looks more broadly at the phonology of Vedic Sanskrit to argue that [C<sub>1</sub>e:C<sub>2</sub>-] stems constitute a case of *phonologically conditioned* allomorphy, rather than a more straightforward case of *phonologically driven* allomorphy (following the distinction drawn by Carstairs (1988)).

## 2 Where and Why Does [C<sub>1</sub>e:C<sub>1</sub>C<sub>j</sub>-] Occur?

Already in Early Vedic Sanskrit,<sup>4</sup> many roots of the shape /C<sub>1</sub>əC<sub>j</sub>-/<sup>5</sup> that build perfect weak stems attest one of the form [C<sub>1</sub>e:C<sub>j</sub>-]. The grammarian Pāṇini (~ 500 BCE; cf. von Böhtlingk, 1887 [1964]:section 6.4.120) in fact prescribes [C<sub>1</sub>e:C<sub>j</sub>-] as the perfect weak stem to /C<sub>1</sub>əC<sub>j</sub>-/ roots, though his conditions overgenerate on the distribution of [C<sub>1</sub>e:C<sub>1</sub>C<sub>j</sub>-] stems: Pāṇini states that any /C<sub>1</sub>əC<sub>j</sub>-/ root, except those that substitute the initial consonant of the root in reduplication (this typically means replacement of an underlying velar stop with a palatal stop: e.g., [cə-kr-] to /kər-/ ‘make’ or [jə-gm-] to /gəm-/ ‘come, go’), builds a perfect weak stem [C<sub>1</sub>e:C<sub>j</sub>-]. This formulation suffers mainly from overgeneration, in that it predicts that roots like /dər-/, whose perfect is show in (1).d. above, should exhibit a weak stem \*[de:r-]; this overgeneration essentially occurs where C<sub>1</sub> is [-approximant] and C<sub>2</sub> is [+approximant], as shown by the examples in Table (1).<sup>6</sup>

Instead, it appears that [C<sub>1</sub>e:C<sub>j</sub>-] stems largely emerge as an alternative to perfect weak stems of the form [C<sub>1</sub>ə-C<sub>1</sub>C<sub>j</sub>-] where the subsequence [C<sub>1</sub>C<sub>j</sub>] involves a sonority plateau or a transition from a more sonorous to a less sonorous consonant (adopting a simple version of the SONORITY HIERARCHY from Clements, 1990). Later Sanskrit examples given in Table (2) show that [C<sub>1</sub>e:C<sub>j</sub>-] stems consistently appear where C<sub>j</sub> is [-approximant], but [C<sub>1</sub>VC<sub>1</sub>C<sub>j</sub>-] stems consistent appear (or relevant data is wanting) where C<sub>j</sub> is [+approximant].

<sup>3</sup> In Early Vedic Sanskrit (EVS; see footnote 4 below) the strong stem [C<sub>1</sub>ə-C<sub>1</sub>əC<sub>j</sub>-] sometimes occurs in morphological contexts where a weak stem is expected. For reasons of space, competition between the use of the strong stem in place of the weak stem and weak stems of the form [C<sub>1</sub>e:C<sub>j</sub>-] cannot be treated here.

<sup>4</sup> By this term, I mean the Sanskrit that is assumed to be chronologically oldest, namely, a sub-part of the *Ṛgveda* referred to as the Family Books; see the Introduction of Jamison & Brereton, 2014 for further information. I will contrast EVS with Later Sanskrit (LS), which for present purposes will mean all Sanskrit outside of the Family Books of the *Ṛgveda*.

<sup>5</sup> Sanskrit lacks any biconsonantal roots containing two identical consonants, i.e., /C<sub>1</sub>əC<sub>1</sub>-/. This lexical gap is generally true in closely related languages (e.g., Ancient Greek, Latin, Gothic) as well; see further Cooper, 2009 and Sandell, 2015a.

<sup>6</sup> There is one exception to the generalization that roots of the form /[-approximant]ə[+approximant]-/ do **not** build [C<sub>1</sub>e:C<sub>j</sub>-] stems: /cər-/ ‘move’ has a 3.PL.PERF [ce:r-úr]. As discussed at 2.2 below, this case is explicable on the basis of bigram phonotactics: the sequence [cr] is dispreferred in Sanskrit.

Table (1): Overgeneration of [C<sub>i</sub>e:C<sub>j</sub>-] Predicted by Pāṇinian Rule in /Cə[+approximant]-/ Roots

	Root	Gloss	Pāṇinian Perfect Weak Stem	Actual Perfect Weak Stem (3.PL)
a.	/dər-/	‘pierce’	*[de:r-]	[də-dr-úr]
b.	/d <sup>h</sup> ər-/	‘hold’	*[d <sup>h</sup> e:r-]	[də-d <sup>h</sup> r-úr]
c.	/d <sup>h</sup> əw-/	‘shake’	*[d <sup>h</sup> e:v-]	[d <sup>h</sup> u-d <sup>h</sup> v-úr]
d.	/b <sup>h</sup> əj-/	‘fear’	*[b <sup>h</sup> e:j-]	[bə-b <sup>h</sup> j-úr]
e.	/wər-/	‘cover’	*[ve:r-]	[və-vr-úr]
f.	/çər-/	‘crush’	*[çe:r-]	[çə-çr-úr]
g.	/sər-/	‘flow’	*[se:r-]	[sə-sr-úr]

Table (2): [C<sub>i</sub>e:C<sub>j</sub>-] Occurs where C<sub>j</sub> = [-approximant]

	Stop	Fricative	Nasal	Liquid	Glide
Stop	[pe:c-]	[de:f-]	[te:n-]	([ce:r-]) [də-dr-]	[bi-bhj-]
Fricative	[se:p-]	[se:f-]	[çe:m-]	[sə-sr-]	[si-šj-]
Nasal	[me:d-]	[ne:ç-]	[me:n-]	[mə-mr-]	[mi-mj-]
Liquid	[re:b <sup>h</sup> -]	[le:š-]	[re:m-]	— <sup>a</sup>	— <sup>b</sup>
Glide	[je:t-]	[ye:š-]	[je:m-]	— <sup>c</sup>	— <sup>d</sup>

<sup>a</sup> Sanskrit lacks any biconsonantal roots in which both consonants are liquids.

<sup>b</sup> The weak stem of the root /rəw/ ‘cry’ shows syllabification of the glide [w] and epenthesis in case of vowel hiatus: 1.PL.PERF. [rurumá], 3.PL.PERF. [ruruúr].

<sup>c</sup> Only a root /jər-/ would fully satisfy this combination of segments, and no such root exists.

<sup>d</sup> The weak stem of the root /jəw/ ‘unite’ shows syllabification of the glide [w] and epenthesis in case of vowel hiatus: 1.PL.PERF. [jujumá], 3.PL.PERF. [jujuúr].

As Table (2) shows, [C<sub>i</sub>e:C<sub>j</sub>-] forms are essentially unattested where C<sub>j</sub> is [+approximant] segment. As seen in Table (1) above, sequences of stop+liquid, stop+glide, fricative+liquid, and fricative+glide are almost entirely licit. While a dispreference for falling sonority or sonority plateaus would also predict [C<sub>i</sub>e:C<sub>j</sub>-] forms where liquid+liquid, glide+glide, or glide+liquid sequences would occur, relevant data is largely missing, or exhibits a further alternative behavior (see notes b and d in Table (2)).

EVS, does, however, attest certain weak stems containing stop+stop, nasal+nasal, and stop+nasal as [C<sub>i</sub>C<sub>j</sub>] (e.g., [pə-pt-], [mə-mn-], [tə-tn-]); these forms attest [C<sub>i</sub>e:C<sub>j</sub>-] weak stems in LS ([pe:t-], [me:n-], [te:n-]). In short, it seems that the grammar of EVS sometimes permits sequences of two [-approximant] consonants in reduplicated perfects; the later language only permits a perfect weak stem [C<sub>i</sub>ə-C<sub>i</sub>C<sub>j</sub>-] if C<sub>j</sub> is [+approximant].

However, sonority sequencing alone is an insufficient motivation to consistently block [C<sub>i</sub>ə-C<sub>i</sub>C<sub>j</sub>-] perfect weak stems: Sanskrit normally permits transitions from less sonorous consonants to more sonorous consonants (e.g., [tərpá:jə] ‘make pleased.IMPERATIVE’). I therefore conclude that it is **only** in the particular configuration [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-], which typically emerges under reduplication, that the sonority transitions in [C<sub>i</sub>C<sub>j</sub>] appear to become relevant.

**2.1 [C<sub>i</sub>e:C<sub>i</sub>C<sub>j</sub>-] and POORLY-CUED REPETITION** Bans on and repairs to sequences [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] have recently been discussed by Zukoff (2014, 2015a, 2015b, Fthc.) as the driving markedness constraint behind several atypical patterns of reduplication in Indo-European languages (including Ancient Greek, Sanskrit, and Gothic). Zukoff (2015a:2–3) defines the principle in (3), which can be translated into the constraint in (4).

(3) **THE POORLY-CUED REPETITION PRINCIPLE:**

A CVC sequence containing identical consonants (C<sub>α</sub>VC<sub>α</sub> = C<sub>i</sub>VC<sub>i</sub>) is dispreferred, due to repetition blindness; it is especially dispreferred if one or both of the consonants do not bear phonetic cues which are important for the perception (in contrast to zero) in the speech signal.

(4) **POORLY-CUED REPETITION (PCR):**

Assign a violation mark \* to any C<sub>α</sub>VC<sub>α</sub> (= C<sub>i</sub>VC<sub>i</sub>) sequence where the second consonant<sup>7</sup> lacks the **requisite cues** to its presence.

<sup>7</sup> Only the second consonant is relevant in the cases under discussion; the first consonant will always be word-initial, immediately preceding a vowel, and will thus always have adequate phonetic cues to its presence.

## (5) Phonetic Cues to the Presence of a Consonant (cf. Wright, 2004)

- a. **Burst**: stop release burst  
→ present in stop-initial and nasal-initial sequences
- b. **Intensity Rise**: rise in spectral intensity between two segments  
→ present in rising-sonority sequences
- c. **CR Transitions**: spectral transitions between a consonant and a following sonorant  
→ present in consonant-sonorant sequences

The requirement that the two segments C<sub>i</sub> be completely identical in phonological make-up explains why roots with an initial velar stop (/k/ or /g/) or glide /w/ never show [C<sub>i</sub>e:C<sub>j</sub>-] forms: the former are subject to a replacement of the velar with a palatal stop in the reduplicant (e.g., [cə-kr-] to /kəɾ/ ‘do’), while the latter are subject to fortition of /w/ to [v] when not adjacent to another consonant, resulting in weak stems such as [və-ʋn-] to /wən/ ‘win’. In both cases, the identity requirement between two segments is not met.

The distribution and history of [C<sub>i</sub>e:C<sub>j</sub>-] forms in Sanskrit, combined with the fact that certain cues are treated as more crucial than others in different languages, suggests that Zukoff’s PCR constraint is in need of some closer examination in order to avoid designing *ad hoc* markedness conditions that fit the data of the language under discussion. For instance, Zukoff (*op. cit.*) concludes that while Gothic assesses PCR violations only when an intensity rise and/or CR transition is lacking, Ancient Greek requires that both burst and either an intensity rise or CR transition be present. The evidence from [C<sub>i</sub>e:C<sub>j</sub>-] perfect weak stems in Sanskrit, meanwhile, points to two diachronic phases:

- **EVS**: either **burst** or **consonant+approximant transitions** are sufficient to avoid repair.
- **LS**: only **consonant+approximant** transitions (with **intensity rise**, too; liquid+liquid and glide+glide are probably not licit) are sufficient to avoid repair.

In this respect, the later phase of Sanskrit appears at least as restrictive as Gothic. I therefore propose the following expansion and gradient scalar treatment of Zukoff’s PCR constraint:

- One point of violation is assigned for sonority plateaus between C<sub>i</sub> and C<sub>j</sub>.
- Two points of violation are assigned if C<sub>i</sub> is of greater sonority than C<sub>j</sub>.
- One point of violation is assigned for clusters lacking in consonant–sonorant transitions.
- One point of violation is assigned for clusters lacking in consonant–approximant transitions.
- One-half point of violation is assigned for clusters lacking in burst (i.e., sequences in which C<sub>i</sub> is neither a stop nor a nasal).

This system yields the set of violation patterns seen in Table (3), and thus constitutes a stringency hierarchy that makes direct predicts about the conditions under which PCR violations might emerge in a given language.<sup>8</sup>

Table (3): A Gradient Interpretation of PCR Violations

	Stop	Fricative	Nasal	Liquid	Glide
Stop	3	2	1	0	0
Fricative	4.5	3.5	1.5	0.5	0.5
Nasal	4	4	2	0	0
Liquid	4.5	4.5	3.5	1.5	0.5
Glide	4.5	4.5	3.5	2.5	1.5

The typology of languages that could exist given the values in Table (3) would then be as listed in Table (4):

<sup>8</sup> On the notion of stringency hierarchies generally, cf. Prince, 1999 and de Lacy, 2004. I find that the proposed PCR hierarchy here has an intuitive interpretation as the quantity of violations given to a globally ranked (or weighted) PCR constraint that penalizes the sequence [C<sub>i</sub>VC<sub>j</sub>].

Table (4): Typology of Licit [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] Sequences Based on Scale in Table (3)

Maximum Licit Violation Score	Licit [C <sub>i</sub> C <sub>j</sub> ] Sequences in the Configuration [C <sub>i</sub> VC <sub>i</sub> C <sub>j</sub> ]
4.5	All C <sub>i</sub> VC <sub>i</sub> C <sub>j</sub>
4	All except fricative+stop, liquid+stop, liquid+fricative glide+stop, and glide+fricative
3.5	Also excludes nasal+stop and nasal+fricative
3	Also excludes fricative+fricative, liquid+nasal, and glide+nasal
2.5	Also excludes stop+stop
2	Also excludes glide+liquid
1.5	Also excludes fricative+stop and nasal+nasal
1	Also excludes nasal+fricative and liquid+glide
0.5	Allows only stop/nasal/fricative+liquid/glide and liquid+glide
0	Allows only stop/nasal+liquid/glide

Investigation of reduplicated forms thus far in Ancient Greek and Gothic is compatible with this typology (see again the papers of Zukoff cited above for the data on Ancient Greek and Gothic):

- Gothic permits [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] where [C<sub>i</sub>C<sub>j</sub>] is a stop/fricative/nasal+liquid/glide; however, cases of nasal+liquid/glide are not attested. This type of language entails the well-formedness of liquid+glide as well, but evidence is lacking.
- Ancient Greek permits [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] where [C<sub>i</sub>C<sub>j</sub>] is a stop+nasal or stop+liquid. This type of language entails the well-formedness of fricative+liquid/glide and liquid+glide as well, but evidence is lacking.

The data from Sanskrit perfects under consideration here permits us to expand the body of evidence in support of this typology:

- EVS permits [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] where [C<sub>i</sub>C<sub>j</sub>] is a stop+stop sequence, and indeed excludes all instances where C<sub>i</sub> is not a stop, and C<sub>j</sub> is not a sonorant.
- LS appears to behave like Gothic in largely permitting [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] just where [C<sub>i</sub>C<sub>j</sub>] is stop/fricative+liquid/glide, though specific evidence in favor of allowing nasal+liquid/glide does exist in Sanskrit.

The interest in tying PCR effects to a gradient constraint grounded in a stringency hierarchy is that precise testable typological predictions are made. The scale used here is compatible with at least the evidence from patterns of reduplication in Sanskrit, Ancient Greek, and Gothic; further cross-linguistic investigation of PCR effects is necessary to determine whether this scale is essentially correct, or whether the approach of cobbling together language-specific definitions of PCR violations out of the factors of burst, intensity rise, and consonant+sonorant and/or consonant+approximant transitions yields more accurate predictions.

Further interesting is the fact that some lexicalized forms in Ancient Greek (cf. the treatment in Zukoff, forthcoming:28–34) mirror the patterns of EVS, thereby pointing to diachronic changes in the histories of both Greek and Sanskrit wherein PCR effects have become more restrictive, making the set of licit [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] sequences smaller. In fact, EVS provides a particularly interesting case because it indicates that, although stop+stop and stop+nasal sequences are generally sufficient for cues to C<sub>i</sub>, not all such [C<sub>i</sub>VC<sub>i</sub>C<sub>j</sub>] sequences are in fact permitted.

**2.2 Bigram Phonotactics and PCR Restrictions** Although EVS does not categorically exclude perfect weak stems like [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-] (e.g., [pə-pt-]), the same chronological stratum of the language does rule out such reduplicated forms to some roots containing two stops (e.g., not \*[bəb<sup>h</sup>ɟ-], but [b<sup>h</sup>e:ɟ-]). Hence, a PCR effect alone is insufficient to account for the exclusion of forms like \*[bəb<sup>h</sup>ɟ-]; specifically, the following two stop+stop forms occur in EVS with a perfect weak stem [C<sub>i</sub>e:C<sub>j</sub>-], for which the PCR alone would predict [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-]; to those forms, take note as well of the weak stem [ce:r-] which appears in LS, and does not accord with the generalization that [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-] is licit where [C<sub>i</sub>C<sub>j</sub>] is a stop+liquid sequence:

Table (5): [C<sub>i</sub>e:C<sub>j</sub>-] Predicted Not to Exist in EVS/LS by PCR

Root	Gloss	[C <sub>i</sub> e:C <sub>j</sub> -] Weak Stem
EVS		
/p̥ac-/	‘cook’	[pe:c-]
/b <sup>h</sup> əj-/	‘divide’	[b <sup>h</sup> e:j-]
LS		
/cār-/	‘move’	[ce:r-]

An intuitively plausible hypothesis, supported by anecdotal observations in some cases (e.g., the sequence [b<sup>h</sup>j] is simply absent in Sanskrit), is that the specific [C<sub>i</sub>C<sub>j</sub>] sequences in such forms might be subject to additional markedness penalties resulting purely from bigram phonotactics. In this way, markedness penalties from PCR effects or from specific phonotactics could each serve to rule out [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-] forms.

In order to determine possible phonotactic penalties for [C<sub>i</sub>C<sub>j</sub>] sequences in Sanskrit, I employed the UCLA PHONOTACTIC LEARNER of Hayes & Wilson, 2008, trained on the *samhitāpatha* text of the *R̥gveda*, reduced to one token of each word type.<sup>9</sup> I prepared the appropriately formatted input file using a Python script, and made an appropriately formatted file of phonological features.<sup>10</sup> I allowed the UCLA Phonotactic Learner to acquire and train a maximum of 130 constraints with a maximum gram size of 3. I then fed the resulting grammar a list of 3.PL.PERF forms, both actually occurring and nonce, of the form [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-]. Table 6 gives the penalty score (harmony), MaxEnt value (effectively the form’s probability:  $e^{-Score}$ ), and the constraints violated by those forms. Note also that in all of these forms the violations incurred result solely from the sequence of two consonants [C<sub>i</sub>C<sub>j</sub>].

Table (6): Phonotactic Violations

Form	Score	MaxEnt Value	Constraints Violated
[p̥əp̥cúr]	4.39	$1.2 \times 10^{-2}$	*[-nasal,-coronal][-approximant,+dorsal]; *[-continuant,-dorsal][-approximant,-anterior]
[b̥əb̥ <sup>h</sup> júr]	4.39	$1.2 \times 10^{-2}$	*[-nasal,-coronal][-approximant,+dorsal]; *[-continuant,-dorsal][-approximant,-anterior]
[cəcúr]	3.715	$2.4 \times 10^{-2}$	[-continuant,-voice,-spread glottis,+front][+consonantal,-dorsal]

Thus, a *combination* of both poorly-cued repetition and specific bigram markedness appears sufficient to exclude perfect weak stems of the shape [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-] in EVS. Such a grammar can be implemented with four constraints, using either the strict ranking of constraints (i.e., Optimality Theory) or weighted constraints (e.g., Maximum Entropy; cf. Goldwater & Johnson, 2003). This grammar requires two markedness constraints (one relating to the PCR, the other to phonotactics), and two morphological constraints, which respectively militate in favor of the use of particular morphemes (cf. the USE-/X/ constraints employed in Zuraw, 2000 or the UR=/X/ constraints in Pater et al., 2012).<sup>11</sup> The four constraints employed here are:

- POORLY-CUED REPETITION (PCR): see the description in 3–5 above.
- BADPHONOTACTICS (BPs): a cover constraint; assign violation scores based on the phonotactic ill-formedness of a particular sequence.
- USE-/RED/: assign a violation to any PERFECT form whose underlying representation does not include the morpheme /RED/.
- USE-/C<sub>i</sub>e:C<sub>j</sub>/: assign a violation to any PERFECT form whose underlying representation does not include the morpheme /C<sub>i</sub>e:C<sub>j</sub>/.

An Optimality-Theoretic implementation need only set a ceiling of penalties in phonotactics and the PCR, respectively, to avoid incurring violations of the relevant constraints. For Early Vedic Sanskrit, the relevant ceiling for phonotactics can be treated as 0, while a ceiling of 3 (received by stop+stop sequences) for the

<sup>9</sup> The *samhitāpatha* is the version of the *R̥gveda* that shows all surface sandhi.

<sup>10</sup> Available here: <https://github.com/rpsandell/SandellAMP2016Proceedings>.

<sup>11</sup> The motivation for these morphological constraints will be developed in Section 3.

PCR will work.<sup>12</sup> In a Maximum Entropy grammar, the values seen in 3 can be directly input as violations to the PCR constraint, while the harmony scores seen in 6 can input as violations to **BADPHONOTACTICS**.

Using Optimality Theory, the ranking **PCR**, **BAD-PHONOTACTICS**  $\gg$  **USE-/RED/**  $\gg$  **USE-/C<sub>i</sub>e:C<sub>j</sub>/** can correctly predict the forms of EVS; any form violating either **PCR** or **BAD-PHONOTACTICS** will be excluded, while, in absence of either such violation, forms with **/RED/** are preferred. See the tableaux in (6): a reduplicated form wins in (6).a., since [pəptúr] is subject neither to violations of **PCR** nor of **BAD-PHONOTACTICS**, while in (6).b. and (6).c., a perfect weak stem [C<sub>i</sub>e:C<sub>j</sub>-] is preferred.

(6) Optimality-Theoretic Grammar

a. Perfect Weak Stem to /pət/ ‘fly, fall’

/pət, PERF, úr/	PCR	BPs	USE-/RED/	USE-/C <sub>i</sub> e:C <sub>j</sub> /
a. पृ प॑-प॒त-ú॒र				*
b. प॑-तः-ú॒र			*!	

- The sequence [pt] incurs no violation of bigram phonotactics, and thus no violation is assessed for **BADPHONOTACTICS**.
- The sequence of stop+stop is at or below the ceiling of 3, and thus incurs no violation of **PCR**.

b. Perfect Weak Stem to /səp/ ‘do honor’

/səp, PERF, úr/	PCR	BPs	USE-/RED/	USE-/C <sub>i</sub> e:C <sub>j</sub> /
a. स॑-स॒-प॒-ú॒र	*!			*
b. स॑-पः-ú॒र			*	

- The sequence [pt] incurs no violation of bigram phonotactics, and thus no violation is assessed for **BADPHONOTACTICS**.
- The sequence of fricative+stop exceeds the ceiling of 3 (at 4), and thus incurs a violation of **PCR**.

c. Perfect Weak Stem to /pəc/ ‘cook’

/pəc, PERF, úr/	PCR	BPs	USE-/RED/	USE-/C <sub>i</sub> e:C <sub>j</sub> /
a. प॑-प॒-प॒-ú॒र		*!		*
b. प॑-तः-ú॒र			*	

- The sequence [pc] incurs a violation in bigram phonotactics of 4.39, and thus receives a violation on **BADPHONOTACTICS**.
- The sequence of stop+stop is at or below the ceiling of 3, and thus incurs no violation of **PCR**.

Similarly, a Maximum Entropy grammar trained using the software of Hayes et al., 2009, with no bias or restriction set on the weights of the constraints ( $\mu = 0$ ,  $\sigma^2 = 10000$ ) generates the appropriate categorical outputs of either a [C<sub>i</sub>e:C<sub>j</sub>-] or [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-] stem. The same set of tableaux from (6) is repeated in (7), giving the harmony scores ( $\mathcal{H}$ ) and probabilities of the candidates.

(7) Maximum Entropy Grammar

a. Perfect Weak Stem to /pət/ ‘fly, fall’

/pət, PERF, úr/	PCR	BPs	USE-/RED/	USE-/C <sub>i</sub> e:C <sub>j</sub> /	$\mathcal{H}$	Prob.
a. पृ प॑-प॒त-ú॒र			0 × 1		0	1
b. प॑-तः-ú॒र			66.17 × 1		66.17	0

<sup>12</sup> All actually occurring EVS [C<sub>i</sub>əC<sub>i</sub>C<sub>j</sub>-] sequences are given are harmony score of 0 under the phonotactic grammar trained above.

b. Perfect Weak Stem to /səp/ ‘do honor’

/səp, PERF, úr/		PCR	BPS	USE-/RED/	USE-/C <sub>i</sub> e:C <sub>j</sub> /	$\mathcal{H}$	Prob.
a.	sə-sp-úr	20.55 × 4.5			0 × 1	82.2	0
b.	सः se:p-úr			66.17 × 1		66.17	1

c. Perfect Weak Stem to /pəc/ ‘cook’

/pəc, PERF, úr/		PCR	BPS	USE-/RED/	USE-/C <sub>i</sub> e:C <sub>j</sub> /	$\mathcal{H}$	Prob.
a.	pə-pc-úr		20.26 × 4.39		0 × 1	88.9414	0
b.	पः pe:c-úr			66.17 × 1		66.17	1

### 3 Why [C<sub>i</sub>e:C<sub>j</sub>-] is a Phonologically Conditioned Allomorph

The preceding section has demonstrated that [C<sub>i</sub>e:C<sub>j</sub>-] perfect weak stems in Sanskrit essentially occur in complementary distribution with [C<sub>i</sub>əC<sub>j</sub>-] weak stems, where a stem of the latter type would be blocked either by effects of POORLY-CUED REPETITION or segmental phonotactics. This section is concerned with the question of why and how the sequence [-əC<sub>j</sub>-] can alternate with [-e:] in perfect weak stems. I will argue that the [C<sub>i</sub>e:C<sub>j</sub>-] stem cannot be a *phonologically driven* allomorph of [C<sub>i</sub>əC<sub>j</sub>-], but instead must reflect the availability of an alternative allomorph provided by the morphology, /C<sub>i</sub>e:C<sub>j</sub>-, whose selection is *phonologically conditioned*. I first clarify the distinction between *phonologically driven* and *phonologically conditioned* allomorphs (cf. Carstairs, 1988) at 3.1, then argue against possible analysis of [C<sub>i</sub>e:C<sub>j</sub>-] stems as phonologically driven at 3.2, and then explicitly flesh out the analysis of [C<sub>i</sub>e:C<sub>j</sub>-] as phonologically conditioned and conclude at 3.3

**3.1 Phonologically Conditioned vs. Phonologically Driven Allomorphy** The standard approach to allomorphy in Generative Phonology is to posit a unitary underlying representation as the spell-out of some semantic and (morpho-)syntactic properties, and then derive the surface allomorphy in the phonological component, based on purely phonological conditions that define a complementary distribution of allomorphs (cf. generally Kenstowicz & Kisseberth, 1979, Hayes, 2009). One such classic case is an analysis of the English noun plurals, where the spell-out of the feature PLURAL is posited to be /-z/, which has the allomorphs [-s] (following voiceless obstruents), [-iz] (following [+strident] segments), and [-z] (elsewhere). The allomorphs [-s] and [-iz] that are not fully faithful to the posited UR are taken to be mere phonological variants of the UR /-z/, since both the conditioning context for the allomorphy is phonologically defined, and the featural changes needed to derive the unfaithful allomorphs are broadly coherent with the phonology of the language, seeming to require minimal adjustment to satisfy effects of markedness. These such cases constitute **phonologically driven allomorphy**.

In Optimality-Theoretic terms, phonologically driven allomorphy can always be characterized as the violation of some Faithfulness constraint in order to satisfy a higher-ranking Markedness constraint, which thereby permits the reduction of surface allomorphy to a unitary underlying representation. However, where the combination of MARKEDNESS ≫ FAITHFULNESS + unitary UR can be shown to be insufficient through either over- or under-generation, an analysis employing phonologically conditioned allomorphy can step in: under the phonologically conditioned analysis, some mechanism is presumed to make multiple inputs available to EVAL, and the input that then better satisfies the relevant markedness constraints will be selected as the output. For extensive discussion and examples of such cases in Italian and Dyirbal, see Booij & van der Veer, 2015 and Wolf, 2015. The distinctions between phonologically driven and phonologically conditioned allomorphy are laid out schematically in Table (7) below.



Table (7): Phonologically Conditioned vs. Phonologically Driven Allomorphy

	Phonologically Driven Allomorphy	Phonologically Conditioned Allomorphy
Inputs	Unitary UR	Multiple UR+Allomorph Selection Constraints
Markedness	Drives Faithfulness Violations	Drives Allomorph Selection
Faithfulness	Violated to Satisfy Markedness	Irrelevant

**3.2 Against a Unitary UR** Given the basic data on Sanskrit perfects presented at 1 above, the stem of a perfect can generally be set up as a UR of the form /RED-ROOT-/: a root like /dər/ ‘pierce’ seen in (1).d. thus exhibits the stem allomorphs [də-dər-] and [də-dr-], the latter allomorph being derived through schwa deletion. For a root like /çək/ ‘shape’, which instead presents the allomorphs [çə-çək-] and [çe:k-] in the perfect, how is the latter allomorph to be derived from /RED-çək-/?

Under the hypothesis of a unitary UR /RED-ROOT-/, I see the two plausible interpretations that could account for the surface sequence [C<sub>i</sub>e:C<sub>j</sub>-] as a phonologically driven allomorph:

- [C<sub>i</sub>e:C<sub>j</sub>-] may be interpreted as derived from /RED-C<sub>i</sub>əC<sub>j</sub>-/, where surface [e:] would result from copying of /ə/ with deletion of /C<sub>i</sub>/ and compensatory lengthening.<sup>13</sup>
- [C<sub>i</sub>e:C<sub>j</sub>-] does not realize the underlying morpheme /RED/, and instead lengthens (and fronts) an underlying /ə/.

Analysis a. most straightforwardly resembles a classic case of phonologically driven allomorphy, as described above. Under such an analysis, the input UR (I use the root /çək-/ as an example) /RED-çək-úr/ would have an output [ç<sub>i</sub>ə-ç<sub>i</sub>k<sub>j</sub>-úr-] among its candidate set; this candidate is, however, ruled out by (some combination of) phonotactic constraints and PCR effects. To either delete the /ç/ of the input root, or to insert a vowel between [ç] and [k] would resolve any outstanding phonotactic or PCR violations.<sup>14</sup>

Analysis a. would potentially fit with a repair by deletion of the identical consonant. However, the surface correspondence relations between reduplicant, base, and input become very convoluted under this analysis, because the [C<sub>i</sub>] of the reduplicant would lack a correspondent in the surface base; such an analysis would certainly require the use Input-Reduplicant Faithfulness (cf. McCarthy & Prince, 1995:12–24; 110–7). Analysis b., meanwhile, eliminates the threat of PCR or phonotactic markedness violations by not providing any phonological material to /RED/; phonological alteration of the root by vowel lengthening and fronting could then be motivated by a constraint like REALIZE-MORPHEME: PERFECT, which would require some phonological expression of the morphosyntactic feature PERFECT (see Kurisu, 2001 and Zukoff & Sandell, 2015 for analyses of this sort).

Both of these analyses are, however, fatally undermined by the fact that an [e:] cannot reflect lengthening of /ə/, because processes that lengthen /ə/ in Sanskrit result in [a:], as will be shown in 3.2.1. Furthermore, in addition to the analytical complexity involved, Analysis a. can also be shown to make incorrect predictions, because, under the assumption that the leftmost consonant of the [C<sub>i</sub>e:C<sub>2</sub>-] stem reflects the reduplicant, that segment fails to exhibit certain TETU effects common to Sanskrit reduplicants. Hence, a unitary UR /RED-C<sub>i</sub>əC<sub>j</sub>-/ will not suffice to derive [C<sub>i</sub>e:C<sub>j</sub>-] weak stems.

<sup>13</sup> The question of lengthening of /ə/ in Sanskrit will be addressed at 3.2.1. Intuitively, the lengthening of /ə/ would (sensibly) result in [ə:], but Sanskrit simply disallows [ə:] in outputs. Similar simple exclusion of certain sounds in surface outputs applies likewise to /s/, where the normal processes of glottal state assimilation in the language should be liable to producing [z], but instead, [z] is simply banned from surface representations, resulting in alternative repairs to

satisfy the markedness constraint \*  $\begin{bmatrix} \text{—sonorant} \\ \alpha\text{voice} \\ \text{—}\beta\text{spread glottis} \end{bmatrix} \begin{bmatrix} \text{—sonorant} \\ \text{—}\alpha\text{voice} \\ \text{—}\beta\text{spread glottis} \end{bmatrix}$ .

<sup>14</sup> An epenthesis repair to separate the two consonants of the root can be excluded on the grounds that epenthesis repairs in Sanskrit are highly constrained, being limited to just two morphological contexts: between the root and inflectional endings in some perfects (f. Cooper, 2013, Cooper, 2015:ch. 3) and between the reduplicant and the root in some intensives (cf. Schaefer, 1994, Lubotsky, 1997).

**3.2.1 Lengthened /ə/ is [a:], Not [e:]** Insler, 1997 presents extensive evidence from Vedic Sanskrit to show that a sequence of three light syllables (LLL)<sup>15</sup> is regularly repaired by lengthening of one of the light syllables, preferentially aligning the newly created long vowel with the right edge of a morpheme. For example, if a denominative verb built with the suffix /-jṓ/ is made from the noun /wrkə-/ ‘wolf’, the corresponding 3.SG.PRESENT appears as [vr̥ka:-jṓ-ti] ‘acts like a wolf’. Alternations in vowel length may occur if the third syllable can be either heavy or light, depending upon following suffixes: from /rtə-/ ‘truth’ one finds both lengthened [r̥ta:-jə-té:] (where the third syllable is light) and short [r̥tə-jṓ-ntə] (where the third syllable is heavy). The same general principle applies in compounds as well: /rtə-wfd<sup>h</sup>a:-/ → [r̥ta:vfd<sup>h</sup>a:-] ‘inspired by truth’ vs. /rtə-júk-b<sup>h</sup>is/ → [r̥təjúgb<sup>h</sup>is] ‘yoking truth-INST.PL’.

In the data just presented, a dispreferred phonological structure (three light syllables) is repaired through vowel lengthening. This process does not appear to be triggered by particular morphemes, since it can potentially apply to any morpheme in combination with any other morpheme(s) that result in the dispreferred configuration. This vowel lengthening process thus rises to the level of general phonology in Vedic Sanskrit. Crucially, for present purposes, where the target of the lengthening is a /ə/, the output is always [a:], never [e:]. This fact categorically excludes Analysis b. above, and strongly argues against Analysis a.<sup>16</sup>

**3.2.2 Absence of TETU Effects in [C<sub>i</sub>e:C<sub>j</sub>-] Stems** Vedic Sanskrit reduplicants exhibit two common types of unfaithfulness in reduplicants to stop-initial roots (see generally Steriade, 1988 and Macdonell, 1916 [1993]:123; 147–8; 173–5; 198–205):

- [+spread glottis] stops appear as [–spread glottis] in reduplicants.
- velar stops /k<sup>(h)</sup>, g<sup>(h)</sup>/ appear instead as palatal stops [c, j].

These two generalizations hold not just in reduplicated perfects, but in all reduplicated formations of Vedic Sanskrit, with few exceptions. These two effects can both be treated as instances of THE EMERGENCE OF THE UNMARKED (TETU; McCarthy & Prince, 1995:81–4), resulting from a general constraint ranking FAITH-Input-Output ≫ MARKEDNESS ≫ FAITH-Base-Reduplicant, FAITH-Input-Reduplicant. If Analysis a. above is correct, and the [C<sub>i</sub>] in [C<sub>i</sub>e:C<sub>j</sub>-] is in fact part of the reduplicant /RED/, one might expect to see these effects at work in [C<sub>i</sub>e:C<sub>j</sub>-] forms. Since roots beginning with a velar stop never attest [C<sub>i</sub>e:C<sub>i</sub>C<sub>j</sub>-] (for reasons explained under 2.1 above), the second of these kinds of unfaithfulness cannot be used as a basis to evaluate Analysis a. On the other hand, at least one root, /b<sup>h</sup>ṓj/ ‘divide’, has an initial [+spread glottis] segment and is liable to forming a [C<sub>i</sub>e:C<sub>j</sub>-] stem (see 2.2 above).<sup>17</sup>

On its face, the fact that the perfect weak stem of /b<sup>h</sup>ṓj/ appears as [b<sup>h</sup>e:j-], not \*[be:j-], would appear to argue against the association of (some part) of [b<sup>h</sup>e:j-] with the morpheme /RED/. The avoidance of [+spread glottis] segments in Sanskrit reduplicants is often, however, not treated as the simple avoidance of [+spread glottis] segments (though a markedness constraint \*[+spread glottis]), but rather as the avoidance of successive [+spread glottis] segments in the same or immediately adjacent syllables (\*[+spread glottis]VC<sub>0</sub>[+spread glottis]). However, the characterization of deletion of underlying [+spread glottis] features as dissimilation as a surface-level avoidance of [+spread glottis] stops in the same or adjacent syllables is not accurate (though common: e.g., Bye, 2011:1410); forms like [pat<sup>h</sup>ib<sup>h</sup>is] ‘path-INSTRUMENTAL.PLURAL’ show that a more sophisticated analysis is necessary. In fact, any such [+spread glottis] dissimilation in Sanskrit is descriptively restricted to the domain of the root and reduplicant+root.

To avoid overgeneration by deletion of [+spread glottis] segments in forms like [pat<sup>h</sup>ib<sup>h</sup>is] that a constraint \*[+spread glottis]VC<sub>0</sub>[+spread glottis] would cause, the avoidance of [+spread glottis] segments in reduplicants can, in fact, be more nicely characterized through the TETU ranking given in (8) and illustrated by the tableau in (9).<sup>18</sup>

<sup>15</sup> In Sanskrit, a light syllable is a nucleus [ə], [i], [u], or [r] followed by a single consonant and another syllabic segment; a heavy syllable contains either a long vowel or a vowel followed by two consonants.

<sup>16</sup> Under Analysis a., since /əC/ surfaces as [e:], one might argue that the appearance of [e:] is a effect of the following (deleted) consonant. Why **any** following consonant, regardless of its features, should motivate fronting of /ə/ would remain unexplained.

<sup>17</sup> Two other roots /p<sup>h</sup>ṓj/ ‘hop’ and /p<sup>h</sup>ṓl/ ‘burst’ are reported by grammarians to have perfect weak stems [p<sup>h</sup>e:ṅ-] and [p<sup>h</sup>e:l-], respectively, but these forms do not occur in natural Sanskrit texts.

<sup>18</sup> Space does not permit discussion of (rare) intensives with [+spread glottis] reduplicants such as [b<sup>h</sup>ari-b<sup>h</sup>ar-] to /b<sup>h</sup>ṓr/.

(8) IDENT-IO-[spread glottis] ≫ \*[+spread glottis] ≫ IDENT-BR-[spread glottis], IDENT-IR-[spread glottis]

(9) 1.SG.PERF to /d<sup>h</sup>ər-/ ‘hold’

/RED-d <sup>h</sup> ər-/	IDENT-IO-[s.g.]	*[+s.g.]	IDENT-BR-[s.g.]	IDENT-IR-[s.g.]
a. दृढ द॑-द <sup>h</sup> ॑र-॑		*	*	*
b. द <sup>h</sup> ॑-द <sup>h</sup> ॑र-॑		**!		
c. द॑-द॑र-॑	*!			

When the same ranking is applied to /RED-b<sup>h</sup>əj-úr/ (glossing over all other aspects of the relation between base and reduplicant), the form \*[be:júr] is incorrectly predicted:

(10) 3.PL.PERF to /b<sup>h</sup>əj/ ‘divide’

/RED-b <sup>h</sup> əj-úr/	IDENT-IO-[s.g.]	*[+s.g.]	IDENT-BR-[s.g.]	IDENT-IR-[s.g.]
a. ⊕ b <sup>h</sup> ॑e:j-úr		*!		
b. ⊕ be:j-úr				*

I therefore conclude that the [C<sub>i</sub>e:C<sub>j</sub>-] weak stems fail to exhibit an expected TETU effect, and hence cannot be directly connected to the morpheme /RED/ that typically characterizes the Sanskrit perfect.

**3.3 Analyzing [C<sub>i</sub>e:C<sub>j</sub>-] As a Phonologically Conditioned Allomorph** The principal hypothesis remaining is that stems of the form [C<sub>i</sub>e:C<sub>j</sub>-] are an alternative to /RED/ for the realization the morphosyntactic feature PERFECT. As already shown in Section 2, the distribution of [C<sub>i</sub>e:C<sub>j</sub>-] stems is phonologically predictable on the basis of PCR effects and phonotactics. A tableaux like (6).b above, reproduced as (11), need only be supplemented with the availability of multiple URs for the stem.

(11) /se:p-/ and /RED-səp-/ as Alternative Allomorphs to the Perfect of /səp/

/ {se:p-, RED-səp-} úr/	PCR	BPs	USE-/RED/	USE-/C <sub>i</sub> e:C <sub>j</sub> /
a. sə-sp-úr	*!			*
b. ⊕ se:p-úr			*	

The remaining question of interest is why and how URs of the form /C<sub>i</sub>e:C<sub>j</sub>-/ are made available to the phonology from other components of the grammar. A crucial point of which to take note on this account is that /C<sub>i</sub>e:C<sub>j</sub>-/ URs in Sanskrit appear to be productively generated: were they not, the EVS perfect weak stem [pə-pt-] would not be superseded by the LS weak stem [pe:t-]. This final point suggests that such cases of multiple URs are not merely the historical residue of once productive phonologically driven alternations that have been opacified, but that phonologically conditioned allomorphs can themselves be productive, too.

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