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*Paradigm structure in Sanskrit reduplicants**

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Abstract

Sanskrit reduplicants regulate their vocalism as a function of their size. CV reduplicants prefer high vowels, heavier ones opt for *a*. To meet this *high-iff-light* condition, certain light reduplicants adopt the vocalism of a reduced root allomorph. The latter is not a standard Base: it need not coexist in one word, or in one derivation, with the reduplicant itself. Neither the standard phonological cycle, nor Base-Reduplicant or Input-Output correspondence by themselves explain this pattern, but a variety of Optimal Paradigms (McCarthy 2005; Bjorkman 2010) does, in which reduplicants seek to achieve mutual identity, in a process where Markedness and Faithfulness interact[1].

1. Ablaut and underlying forms

Most Sanskrit roots alternate between a heavy variant, the full grade, and a reduced form, the zero grade. A full-grade syllable contains the root's underlying *a* nucleus, an almost invariant component of verb roots. The zero grade arises when this *a* deletes before an underlying accent (Kiparsky 2010, 2016[2]), if further conditions are met. The full grade is the underlying form of the root. It realizes the contrast between *Ra* and *aR* (R, a sonorant), which neutralizes to R in the zero grade, as seen in (1.a-d). Also neutralized in the zero grade is the contrast between [n] and [m], both of which can reduce to [a], (1.e).

(1) Sanskrit ablaut

	Full grade	Zero grade	Gloss
a.	/baudh-/ [bo:dh]	budh-	awake
	/suap/ [svap]	sup-	sleep

*This paper is dedicated to Andrew Garrett, as a memento for our debates on the synchronic analysis of analogy.

[1]Parts of the analysis of Sanskrit ablaut are adapted from Steriade 1988. Data is from Whitney 1885, 1889 and Kümmel 2000, for the perfect. I adopt some aspects of Whitney's transliteration format (<y> = [j], <j> = [ʤ], <c> = [ʧ]) and I use IPA in other cases.

[2] See Whitney 1889:§238 for a statement that relates the full grade to the presence of a *surface* accent.

b.	/aiṣ-/ [e:ṣ]	iṣ-	move
	/iaj-/ [yaj]	ij-	offer
c.	grabh-	gṛbh-	seize
	gardh-	gṛdh-	chide
d.	dar-	dṛ-	pierce
	drā-	(no zero)	run
e.	ghan-	ghṇ- [gha]	smite
	gam-	gṃ- [ga]	go

Not every root has an *a*-less zero grade, but most roots (92%, N:625[3]) have a form with *a*-vocalism. Of the few that don't, the vast majority have phonotactic reasons to lack the *a*. Further, one can predict from the shape of the full grade whether an *a*-less form is possible, or likely (Steriade 1988), but one can't predict the full grade from the zero grade, as (1) shows. These observations are consistent only with the idea that the full grade, the form containing *a*, is the underlying form. This will be important.

In roots containing a high vocoid, the formation of the zero grade can be accompanied by changes in the height of the root nucleus, because loss of *a* can force a *y* or *v* to vocalize, as in e.g. *svap-* 'sleep' becoming *sup-* in *sup-tá*. The nucleus then shifts from low to high. Reduplication exploits this change: in roots like (1.a-b), zero-grade formation produces a high vowel that reduplication uses for its own purposes. This is the process I analyze.

2. Reduplicants, their weight and height

The reduplicating prefixes of Sanskrit are exponents of several verbal categories: the perfect, a class of presents, one of aorists, the desiderative and the intensive. Most reduplicants differ from the underlying root and from the root adjacent to them on the surface, the form identified here as the reduplicating Base, B_{Red}[4]. Some of these differences follow from general constraints on all Indic REDs: no complex onsets, no consonantal nuclei (Whitney

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[3] 625 is the number of verb roots in Whitney 1885 whose entries cite forms where full and zero grade are morphologically expected, and which are not rejected by Whitney as dubious. I have not attempted to sort this data set – or any other used in this study – by date of attestation, nor to exclude forms supplied only by grammarians. The informal impression is that the major patterns remain largely constant.

[4] Cf. McCarthy and Prince 1995 for most aspects of the theory of correspondence and reduplication assumed here.

1889:§590; §643), no aspirates and no velars in monosyllabic REDs[5]. Other differences – like that between RED *bu*- and root *bo:dh* in the perfect *bu-bo:dh-a* (3.a) – are reminiscent of the full-zero alternations, but the mechanism generating them differs from ablaut, as RED's shape is fixed independently of accent. Thus, if a following underlying accent is the driver of ablaut (Kiparsky 2010), the shape of a light RED like *bu*- is not due to this process: the context for ablaut is almost never met in RED, as most roots aren't underlyingly accented.

Two factors determine the size of RED in this system. One is a rhythmic alternation that favors a heavy RED when a light syllable follows, in the reduplicated aorist and occasionally elsewhere. I set this aside now, to return to it in section 6. The stable determinant of RED's size is its morphological category. Perfect, present and desiderative REDs consist of mono-moraic (C)V̆ units. The aorist RED is a light (C)V̆ by default (§6), while the intensive RED is heavy (*<u>bo</u>:-budh*- (3.a)), or disyllabic (as in *<u>davi</u>-dha:v-a*-, (3.c)), never monomoraic.

The overall size of a Sanskrit RED generally correlates with the height of its vowel. The CV-REDs contain preferably – and, in the desiderative, invariably – a high vowel. The perfect RED contains a high vowel if further conditions discussed below are met. The present and aorist REDs, whose default weight is arguably light, also prefer a high nucleus. On the other hand, intensive REDS are heavy, or a bimoraic CVCi, and always contain a non-high vowel. (2) is a summary of this size-height relation and (3) illustrates it.

(2) Overview of size-height connections in Sanskrit RED

	Size of RED	Height of RED'S V
Intensive	CVR, CV:, CVRi(:)	invariably [-high]
Desiderative	CV	invariably [+high]
Perfect	CV	preferably [+high]
Present	CV	preferably [+high]
Aorist	default CV, but mostly CV:/_light σ	preferably [+high]

(3) Weight-height correlations in three types of Sanskrit REDS

light RED → [+high] V	heavy RED → [-high] V	Root	Gloss

[5] Details on Indic reduplicants as a class: Whitney 1889: §588; Steriade 1988, Kulikov 2005.

	perfect	desiderative	intensive		
a.	bu-bó:dh-, bu-budh-	bu-bhut-s-	bo:-budh-	baudh	wake
b.	di-dvé:ʂ-, di-dviʂ-	di-dvik-ʂ-	de:-dviʂ-	duaiʂ	hate
c.	du-dha:v-, du-dhu-	du-dhu-ʂ-	davi-dhu-, davi-dha:v-	dhau	shake
d.	cu-cyáv-, cu-cyu-	cu-cyu:-ʂ-	co:-cyu-	ciau	move
e.	su-ʂváp-, su-ʂup-	su-ʂup-s-	sa:-svap-, so:-ʂup-	suap	sleep
f.	vi-vyádh-, vi-vidh-	vi-vyat-s-	va:-vyadh-, ve:-vidh	uiadh	pierce
g.	i-yáj-, i:j- </i-ij-/	í-yak-ʂ-	ya:-yaj-	iaj	offer
h.	u-váh-, u:h- </u-uh-/	vi-vakʂ-	va:-vah-	uah	cary

(3) shows that the weight and height of RED are independent of its BRED, the root that follows it. BRED may be in full or zero grade, while RED is generally light in the perfect, with preferred high vocalism. In the intensive, BRED may be in full or zero grade, but RED will always be heavy, with non-high vocalism: e.g. *sa:-sváp-* vs. *so:-ʂup-* (3.e).

3. Analyzing the size-height connection

In Sanskrit, if we ignore the occasional disyllabic intensives, one can think of this size-height relation as one between syllabic weight and height. A Markedness constraint can align a vowel's height to its accentual prominence level, and perhaps to its quantitative prominence. In better known cases, this height-to-prominence alignment is achieved by the reduction of stressless vowels (cf. Crosswhite 1998), but perhaps it can be made independent of reduction.

Alternatively, the effect of RED size on its height is mediated by mechanisms related to the Generalized Template Theory of McCarthy and Prince 1994 (GTT; cf. Urbanczyk 2006). The relevant part of the GTT is that the affixes realized as reduplicants can be assigned in the lexicon to one of two morpho-prosodic categories: *Affix*, a mono-moraic or shorter unit; or *Root*, a bimoraic or longer form. The connection between size and the *Affix*/*Root* distinction expresses generalizations about the typical, often grammar-regulated size of morphemes that are roots and affixes in the common understanding of these notions: roots are typically subject to prosodic minimality conditions, and affixes are frequently subminimal[6]. A reduplicant may be the exponent of a morpho-syntactic feature and thus count as an affix in the common sense of the term, but GTT proposes that it can be assigned to the morpho-prosodic class of *Roots*, which demands a larger size than one mora. That would be the case of the Sanskrit intensive. Another RED, while also an affix in the standard sense, may be categorized lexically as *Affix*. This will restrict its target size to a mora or less. The analysis of Sanskrit reduplication must refer both to the *Affix-Root* distinction, to fix size, and to the morphosyntactic difference between function and content morphs, i.e. affix vs. root, to determine the locus of TETU effects (McCarthy and Prince 1994): the *Root*-sized intensive RED is treated by TETU phenomena as an affix (Steriade 1988). The complete analysis must partly align the two distinctions: all Sanskrit roots are prosodic *Roots* underlyingly, and most affixes, including all REDs but the intensive, are *Affixes* in size. The mechanism that achieves this partial alignment is left unformulated.

This study will present two reasons to invoke the GTT categories of *Affix* and *Root*. The immediately relevant one are the constraints regulating the size-height connection:

(4) HEIGHT IN AFF/ROOT

a. HEIGHT IN AFF: a violation for any *Affix* with a [-high] nucleus.
b. HEIGHT IN ROOT : a violation for any *Root* with a [+high] nucleus.

If the height of RED is determined by the categories *Affix* and *Root,* this predicts that REDs of CVCV size won't raise their vowels, unlike CV REDs. In Sanskrit, the CVCi intensive reduplicants, like *kari-kr̥-* 'make', *tavi:-tu-* 'be strong', *davi-dyut-* 'shine' provide some evidence. The first vowel is always non-high in such REDs, even though located in a light syllable, because they exceed one mora.

Illustrated below are the height adjustements caused by (4) in desiderative and intensive REDs. In these categories, the constraints HEIGHT IN ROOT/AFFIX alone dictate the height of RED: in *pi-pat-iʂ-*, (5.a), the RED is of *Affix* size, so it must raise its vowel; in *ʧe:-kri:ɖ-* (5.b), a

[6] Downing (2006) adds some nuance to this picture and argues for a theory related to the GTT that relies on the canonical size of different morphological units, instead of their moraic count or their ability to generate a foot.

RED of *Root* size must lower its vowel. The height of RED is entirely the effect of HEIGHT IN X constraints in these cases, unlike the more complex patterns analyzed below:

(5) HEIGHT IN AFFIX/ROOT effects: (a) is a desiderative; (b) is an intensive, cf. (3.a)

a.	UR: /pat/ RED$_{\text{desiderative}}$ = *affix*	HEIGHT IN AFF$_{\text{DESID}}$	IDENT [±HIGH] B-RED/I-RED
i.	pa-pat-iʂ-	*!	
ii.	☞pi-pat-iʂ-		*

a.	UR: / kriːɖ/ RED$_{\text{intensive}}$ = *root*	HEIGHT IN ROOT $_{\text{INTENS}}$	IDENT [±HIGH] B-RED/I-RED
i.	ʧiː-kriːɖ-	*!	
ii.	☞ ʧeː-kriːɖ-		*

To limit the effect of HEIGHT IN *AFF/ROOT,* to RED, one can invoke Struijke's (2002) notion of existential faithfulness (∃FAITH) to input. The idea of ∃FAITH is that RED is not the only representative of a given morph and that gives it license to deviate from the input, a license not shared by any other morphemes[7].

4. More on the size-height connection

Evidence for a general size-height connection, unrelated to the weight of individual syllables, is found in Ibirahim's (2010, 2015) exhaustive survey and analyses of West Chadic and Niger Congo reduplication. This body of work shows that a RED of strict CV size is almost always subject to raising its V to high (6.b, c). Disyllabic and monosyllabic heavy C_0VC REDs almost never raise (6.a, 6.d).

(6) Weight of RED and height of RED's vowel in West African languages, after Ibirahim (2015)

a.	full RED: no raising	*kóló-kóló*	being fat	Fon abstract nouns
		kpélé-kpélé	being gathered	(Ibirahim
		bàlà-bàlǎ	being fastened	2015:126ff)
		fúɖá-fúɖá	being light	

[7] One must also restrict the effect of HEIGHT IN ROOT $_{\text{INTENS}}$ to lexical material, to prevent the *i* of intensives like *kari̱-kr̥-* from lowering. How to achieve this result is left undecided.

		kídʒé-kídʒé	searching	
b.	CV-RED: raising	*kú-kóló*	being fat	
		kpí-kpélé	being gathered	
		bì-bàlà	being fastened	
		gbì-gbá	building	
		kú-kó	laughing	
c.	CV-RED: raising	*kí-kér*	INTENS-prick	
		mī-mjār	INTENS-twist	Tarok intensives
		lɨ̀-là	INTENS-speak	(Ibirahim
		mú-mó	INTENS-deflate	2015:99ff)
		lū-lwāy	INTENS-wilt	
d.	CVC- RED: no raising	*vōn-vōn* or *vū-vón*	ODOUR-burn	Tarok olfactive
		ʧàŋ-ʧàŋ or *ʧɨ̀-ʧàŋ*	ODOUR-sweet	adjectives
	~CV- RED: raising	*vjáp-vjàp* or *vī-vjàp*	ODOUR-spoilt	(Ibirahim
		sám-sám or *sɨ́-sám*	ODOUR-sour	2015:101ff)

This data includes alternate ways of realizing RED. In (6.a-b), the deverbal abstracts of Fon have the choice to reduplicate as full copies of their polysyllabic bases, or as reduced CV prefixes. The REDs undergo raising iff they are of CV shape: *kóló-kóló* vs. *kú-kóló*. Both REDs consist of CV syllables but only the short one raises. This supports the decision to condition the constraints in (4) on the overall size of RED, rather than the weight of individual syllables. Fon reduplicants like *gbì-gbá, kú-kó,* (6.b), dispose of an alternative interpretation of the size-height effect, in which raising happens only to the result of truncating a larger B_{Red}[8]. There is no truncation in such forms, but there is still raising. On a different aspect of the analysis, a comparison between alternate RED patterns in Fon (6.a-b) and Tarok (6.d) shows that raising in CV is not the consequence of a morphemic feature in RED, a floating [+high]. A [+high] feature would be present in RED independently of size fluctuations, contrary to what is seen in (6.a-b), (6.d). Rather, these examples, and others in Ibirahim (2015), support a constraint that

[8] McCarthy and Prince 1990:237 on patterns where truncation alone licenses segmental changes in RED. The Fon data in (6) and Makaa data in Ibirahim 2010 show that raising in CV-REDs does not reduce to that.

conditions vocalic height on the reduced size of the entire RED, as (4.a) does[9].

Outside of the West-African territory, the verbal CVC reduplicants of A. Greek also show vowel lowering in heavy syllables, consistent with (4.b): *mor-múrɔ:* 'roar, boil', *por-phúrɔ:* 'surge', *goŋ-gúzdɔ:* 'murmur', *den-díllɔ:* 'turn the eyes' (Schwyzer 1939:646-647; cf. Steriade 1982 on comparable nominal examples). These contrast with the light *Ci*-reduplicants of Greek presents like *ti-thɛ:mi* 'set', *di-dɔ:mi* 'give'[10]. Greek, like Sanskrit, displays a bidirectional link of weight to height: high iff in *Affix*.

4. RED vocalism and zero grade roots

Above, I have motivated the HEIGHT IN AFF/ROOT constraints that cause Sanskrit REDs to alter their vocalic height as a function of their size. These constraints are undominated in the desiderative and the intensive, so height changes are exceptionless there.

The perfect is different. Its CV reduplicants can obtain the high vowels mandated by HEIGHT IN AFF only from root allomorphs containing high vowels. (7-9) present the evidence. In (7), roots that lack a high vocoid, and thus lack zero grades in *i/u,* are shown to always reduplicate in the perfect as *Ca*-. I infer from this that, in the perfect, IDENT [±HIGH] B-R>> HEIGHT IN AFF.

(7) Perfect *Ca* REDs in all roots lacking *i,y* or *u,v*

	Root	Perf. root accented	Perf. root unaccented	Gloss
a.	dhar-	da-dhár-a (1st sg.)	da-dhr-é: (1st. sg. mid.)	hold
b.	math-	ma-má:th-a (3rd sg.)	ma-math-úr (3rd pl.)	shake
c.	pat-	pa-pát-a (1st sg.)	pa-pt-i-má (1st pl.)	fly
d.	dha:-	da-dhá:-tha (2nd sg.)	da-dh-úr (3rd pl.)	suck

The pattern in (7) holds of all but one of the 241 roots in Whitney 1885 that have attested perfects and lack a root allomorph with surface high vocalism[11].

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9 Apparent exceptions in Ibirahim's 2015 survey involve (a) a RED transcribed as CVN in Akan that raises because it is, perhaps, monomoraic; and (b) non-high Vs preserved in CV REDs of languages where they originate as [-ATR]. Ibirahim suggests that non-raising is a strategy to preserve underlying [-ATR], in languages where [+high, -ATR] is impossible. See Faraklas and Williamson 1984 for similar generalizations, and an apparent exception.

10 In the perfect, Greek has CV reduplicants with /e/ vocalism, e.g. *le-lu:-k-a*. This /e/ is a distinct morph (Zukoff 2017). The *Ce-* reduplicants are consistent with (4), if existential faithfulness protects the /e/ morph from raising.

11 The exception is *mimṛkṣus* from *mrakṣ* 'stroke', perhaps a confusion with unrelated *mimikṣus* from *myakṣ* (8.h).

The flip side of the *a*-RED pattern in (7) is that if a root contains an *i* or *u* in its zero grade, and if this vowel is *recoverable in the perfect*, in a sense made precise below, its perfect RED *will* use this *i* or *u* to satisfy HEIGHT IN AFF. We have seen such roots in (3). The list in (8) illustrates the basic point – zero-grade *i/u* surfaces as such in the perfect RED – and addresses two alternative hypotheses about the source of high vowels in these REDs: a harmony hypothesis (e.g. *di-dviṣ-é* would come from basic /*da-dviṣ-é*/ by regressive harmony[12]) and a glide vocalization scenario (e.g. *vi-vyá:c-a* comes from mapping a root-initial sequence *vy* to the CV structure in RED). To evaluate the predictions of such accounts, (8) presents roots with high vocoids in different root positions, pre- or post-nuclear, in a root with two vocoids or just one. These different positions determine which high vocoids can and cannot vocalize in a zero grade root. This is relevant, because only root vocoids that do vocalize can influence the vocalism of RED.

(8) Perfect *Ci/Cu* REDs from roots with alternating y/i, v/u; constructed forms marked by *

	Root	Perf. root full grade	Perf. root zero grade	Other zero grade	Gloss
a.	iauj-	yu-yo:j-a	yu-yuj-é	yuk-tá	join
b.	uaij-	vi-ve:j-a	vi-vij-é	vik-tá	tremble
c.	uiac	vi-vyá:c-a	vi-vic-us	vi-vik-tás (pres.)	extend
d.	duaiṣ	di-dvé:ṣ-a	di-dviṣ-é	dviṣ-ṭá	hate
e.	ciau	cu-cyav-a*	cu-cyuv-é		move
f.	nai:-	ni-ná:y-a	ni-ny-us < /ni-ni:-ús	ni:-tá	lead
g.	uas-	u-vá:s-a	u:ṣús < /u-uṣ-ús/	uṣ-i-tvá:	dwell
h.	miakṣ	mi-myákṣ-a	mi-mikṣ-ús	_	be situated

The first thing to note in the combined data of (7-8) is that affixal vowels are not eligible for inclusion in this RED: it's *pa-pt-ima, da-dh-úr* (7c, d), not **pi-pt-ima,* **du-dh-úr*. I infer that DEP RED-ROOT, a ban on non-root material in RED, must outrank HEIGHT IN AFF. What then is the source of *a* in *da-dh-ur*, *da-dh-ré*? The analysis in §5 will propose that such *a*-REDs indirectly reflect the root vocalism of corresponding full grade perfects, items like *da-dhár-a*. The overall picture will be that both the preferred *i/u* and the dispreferred *a* vocalism of perfect REDs have as their source a root form found in the perfect, though not necessarily the one in their local B_{Red}.

[12] On the idea that harmony is responsible for the *Ci/Cu* REDs see Kulikov 2005:433.

The high vowels in the REDs of (8) don't come from harmony. It is impossible to identify a consistent harmony trigger for the full set of REDS in (8). On one version of this idea, harmony can be triggered by a glide, as in *su-ʂváp-a* (3.d) or *u-va:s-a* (8.g). But glide-triggered harmony also predicts, given the preference for a local trigger, **u-vya:c-a,* **du-dve:ʂ-a,* **i-yó:j-a* instead of *vi-vya:c-a, di-dve:ʂ-a, yu-yo:j-a* (8.c-d). Alternatively, if only vowels induce harmony, one predicts **va-va:s-a,* **ma-myakʂ-a*, **sa-svá:p-a* instead *of u-va:s-a, mi-myakʂ-a, su-ʂvá:p-a*.

Nor can the high vowels in the REDs of (8) be seen as vocalized realizations of glides found in B_{RED}. Here I refer to the possibility that the *i* of RED *vi-* in *vi-vyá:c-a* (8.c) is a syllabic version of the root-internal *y-*. Base glides can vocalize in the reduplicants of other systems (cf. Hayes and Abad's 1989 on Ilocano) but the simplest vocalization mechanism – find the first vocoid and make it RED's nucleus – fails to distinguish those Sanskrit glides that 'vocalize' under copying – in *su-ʂváp-a, u-va:s-a, i-yaj-a* – from those that don't vocalize or are skipped – in *va-vá:ç-a, di-dve:ʂ-a,* not **u-va:ç-a,* **du-dve:ʂ-a*.

In reality, what identifies the glides that do vocalize in the perfect RED is that they *surface as syllabic in a form of the perfect root*: the vowel in REDs like *vi, di* in *vi-vya:c-a, di-dve:ʂ-a* is the nucleus *i* of the zero-grade roots *vic* and *dviʂ* found in related perfect stems *vi-vic-, di-dviʂ-*. The RED of *su-ʂváp-a, u-va:s-a* contains the same *u* as *sup* and *uʂ* in *su-ʂup-, u: ʂ-*. For perfects like *ni-ná:y-a*, the source of RED's high vowel is recoverable in syllabic form in zero grade root allomorphs like that of *ni-ni:-váns* (Whitney 1889:§802). More on this below.

That the *i/u* REDs of the perfect reflect the nuclear quality of a zero grade root is also shown by roots like (9), e.g. *svan*, roots which lack any *a*-less form in zero grade contexts. Their perfects reduplicate only with *Ca-*. The comparison of (8) to (9) confirms that for *u* or *i* to appear in the perfect RED there must exist a *syllabic u* or *i* in a form of that root. If this form is missing, RED adopts the *a* of its $B_{Red.}$ Further details in Steriade 1988[13]. An additional restriction, that a zero grade C_0i/uX root allomorph be found *in the perfect*, is motivated below.

(9) *Ca* REDs from roots with invariant glides; asterisks mark constructed forms

Root	Perfect: accented and unaccented root	No i/u zero grade	Gloss

[13] Whitney (1889:§784, §785.c) seems aware of a narrow version of this idea when he conditions the possibility of *u-/i-* REDs for roots like *vas-* and *vyac-* (8.g, c) on the existence of *other forms* ("various of their verbal forms and derivatives") that "abbreviate *va* to *u*" or *ya* to *i,* i.e. some form with a zero grade vocalization of the glide . In a different partial acknowledgment of our generalization, Kümmel's (2000:589, 21) states that, with two exceptions, no Vedic perfect contains RED *i* unless the zero grade of the relevant root also does.

a.	suan-	sa-svá:n-a	sa-svan-úr	no **sun*	sound
b.	dhuans	da-dhva:ns-a*	da-dhvas-é	no **dhu(n)s*	scatter
c.	khia:	ca-khya:-u	ca-khy-úr	no **khi*	see
d.	ua:ç-	va-vá:ç-a	va-va:ç-é	no **uç*	bellow

Note that the perfect roots of *ca-khy-ús* (9.c) and *ni-ny-ús* (8.f) look identical, *Cy*, in the surface prevocalic context, while their REDs differ, *Ca* vs. *Ci*. Our account differentiates the REDs based on perfect forms with a zero grade root in which an *i*-nucleus surfaces unambiguously, forms like *ni-ni:-vans*. For the root *khya:,* (9.c), a **khi:* zero grade is missing throughout, including in the perfect: its *Ca* reduplicant follows from this fact.

I have argued that the key property identifying roots with perfect RED in *Ci, Cu* is that they have, independently of reduplication, a zero grade with *i, u* vocalism. (10) shows that this correlation is robust. I consider both roots containing a high vocoid, glide or vowel, and the 241 roots C_0aX roots illustrated in (7), which are included in the figure of the bottom right cell.

(10) Zero grade in *CiX, CuX* correlates with perfect RED in *Ci, Cu* among *C_0uaX, C_0auX* roots

	Perfect zero grade: *CiX, CuX*	Perfect zero grade: *CaX*
Perf. RED: *Ci, Cu*	154 e.g. *sváp/sup; su-ṣup-, su-ṣvap-*	12 e.g. *syánd/syad, si-ṣyand-*
Perf. RED: *Ca*	2 e.g. *bháu/bhu:, ba-bhu:-*	291 e.g. *sván/svan-, sa-svan-*

Fischer exact test value: 0.00001

I will analyze only the majority pattern in (10), which lies on the diagonal connecting *su-ṣvap-* to *sa-svan-*. The RED *i* in the exceptional items like *si-ṣyand-* tends to be flanked by T_Ty, T = a coronal: a sporadic local, bi-directional assimilation, possibly combined with the effect of HEIGHT IN *AFF,* is perhaps operating here. Some of these irregular forms have variants with the predicted vocalism: e.g. classical *sa-syand-é.*

A correlation similar to (10), but noisier, between *CiX, CuX* root zero grades and *Ci, Cu* reduplicants is found in the sparse data of class 3 presents: e.g. *ju-hó:-ti, ju-hu-té:* from /*hau*/, /hu/ 'sacrifice'; or *ci-ke:-ṣi, ci-ki-ta:m* from /kai/, /ki/ 'perceive' compared to *sa-sas-ti* from /sas/ 'sleep', *ma-mat-si* from /mad/ be exhilarated'. This observation is made by Sandell 2011, who supplies precise figures. It's likely, however, that the mechanisms generating the present and perfect REDs differ, as seen below.

5. Optimal Paradigms and perfect Sanskrit REDs

To analyze the correlation in (10) between the perfect zero grade vocalism and the perfect RED vocalism, one must explain perfects like *su-şvá:p-a*, where RED and its $\mathrm{B}_{\mathrm{Red}}$ mismatch on the vowel. Such forms are almost always accompanied by zero-grade perfects like *su-şup-ús,* with matched RED and $\mathrm{B}_{\mathrm{Red}}$. The mechanism that can produce identical reduplicants from divergent root allomorphs, as in {*su-şvá:p-a, su-şup-ús*}, is a version of McCarthy's Optimal Paradigms (OP, 2005): perfect reduplicants must be identical.

The OP constraint operating here must affect the perfect REDs only. The reduplicated stems don't match in their entirety, because their roots are differentiated by ablaut: *-şváp-a* vs. *-şup-úr.* Further, there is no tendency towards identity across all reduplicants of any one verb, as (3) shows. Outside the perfect, the identity between reduplicants within any subparadigm is a side effect of other rankings (e.g. HEIGHT IN $\mathrm{AFF}_{\mathrm{DESID}}$ >> IDENT ±HIGH B-R), or is subordinated to rhythmic constraints, as in the aorist, or to IDENT B-R, as in the intensive. To take up this last case, the REDs of intensives must individually match the vocalism of their respective $\mathrm{B}_{\mathrm{Red}}$ for [±front]/[±round], though not for [±high], and this generates divergent RED pairs in intensives differentiated by ablaut: {*da:-dha:-, de:-dhi:-ya-*} on *dha*: 'set', or {*ça:-ca:s, çe:-çiş-*} on *ça:s* 'order'. Only the perfect offers evidence of a uniformity effect among reduplicants, which does not emerge from independent factors. These observations suggest the constraint in (11), which bans differences between perfect REDS.

(11) OP IDENT: PERF RED: a * for any feature mismatch in the vocalism of cognate perfect REDs[14].

OP IDENT: PERF RED is undominated in the perfect. It must outrank IDENT B-R, to allow reduplicative paradigms in which one perfect RED mismatches its $\mathrm{B}_{\mathrm{Red}}$, as *su-* in *su-şváp-a* does. In turn, IDENT B-R must outrank HEIGHT IN AFF, to guarantee that at least one perfect RED

[14] A reviewer notes that other instances of paradigm uniformity constraints govern entire inflectional paradigms (McCarthy 2005 on Arabic; Albright 2011 on Yiddish). My sense is that we are only beginning to explore the range of attested possibilities in the scope of paradigm uniformity constraints. In Latin and Romanian, the perfect subparadigm is rhythmically uniform, while the non-perfect mostly isn't (Steriade 2012, 2022).

matches the nucleus of its B_{Red}. This allows paradigms like {*su-ʂváp-, su-ʂup-*}, while blocking {**su-ʂvan-, *su-ʂvan-*}. The effect of HEIGHT IN AFF amounts then, in the perfect, to this: if a perfect RED satisfies HEIGHT IN AFF and if it also matches the height of its B_{Red}, OP IDENT will generalize its shape to all other perfect forms. (12) presents the analysis of two abbreviated two-member paradigms, each containing a form in full-grade and one in zero-grade, from two root types: an alternating root, *svap/sup*, and an invariant one, *svan/svan*.

(12) OP IDENT: PERF RED, IDENT [±SYLL] B-R >> IDENT [±HIGH] BR >> HEIGHT IN AFF

a.	UR: /suap/ RED_{perf} = aff	OP IDENT	IDENT [±HIGH] B-R	HEIGHT IN AFF
i.	☞su-ʂváp-a, su-ʂup-ús		* (su-ʂváp-)	
ii.	sa-sváp-a, sa-sup-ús		* (sa-sup-)	*!*
iii.	sa-sváp-a, su-ʂup-ús	*!		*

b.	UR: /suan/ RED_{perf} = aff	OP IDENT	IDENT [±SYLL] B-R	IDENT [±HIGH] B-R	HEIGHT IN AFF
i.	su-ʂván-a, su-ʂvan-é			*!* (su^{i}-ʂvá^{i}n-)	
ii.	su-ʂván-a, su-ʂvan-é		*!* (su^{i}-ʂv^{i}án-)		
iii.	☞sa-sván-a, sa-svan-é				**

(12.a) illustrates how OP-IDENT excludes non-uniform candidate paradigms with divergent REDs, like {**sa-sváp-, su-ʂup*}; and how HEIGHT IN AFF selects one uniform paradigm, (a.i), the one with a high RED, over another, (a.ii), with low RED.

(12.b) shows how the constraints IDENT [±SYLL] and IDENT [±HIGH] B-R restrict *Ci/Cu* REDs to roots that have a syllabic *i* or *u* in a perfect zero grade. Candidates (b.i-ii) show the same surface form, but different patterns of failed correspondence, in one case between RED *u* and root *a*, and in the other case between RED *u* and root *v*.

Not illustrated here is the effect of the ablaut constraint that causes a full-grade *a* in the root to delete before an accented morpheme, in forms like *su-ʂup-ús*. In roots like *svan*, ablaut is blocked, hence *sa-svan-é,* not **su-ʂun-é.* For present purposes we can attribute this to a lexically indexed faithfulness constraint which blocks alternations in the *svan*-type roots. The full story is that the blockage of ablaut is weakly predictable (Steriade 1988), but in ways that are not immediately relevant here.

Roots which lack a vocalized *i* or *u* but have an *a*-less zero grade, like *dhar/dhr* (7.a), have perfect REDs of *Ca* shape: *da-dhá:r-a, da-dhr-é*:. For these, the alternative paradigm {**di-dhá:r-a, di-dhr-é*} looks like a contender, because high *i* in **di-dhr-é* can't be blocked by IDENT [±HIGH]: it lacks any root counterpart and that sets it free. In fact, despite their superior satisfaction of HEIGHT IN AFF, such *Ci* reduplicants are blocked by the combination of OP IDENT and IDENT [±HIGH] BR.

(13) Alternating roots without a zero-grade high vowel: *da-dhá:r-a, da-dhr-é:*

a.	UR: /dhar/ RED_{perf} = aff	OP IDENT	IDENT [±HIGH] B-R	HEIGHT IN AFF
i.	☞ da-dhá:r-a, da-dhr-é:			**
ii.	da-dhá:r-a, di-dhr-é:	*!		*
iii.	di-dhá:r-a, di-dhr-é:		*! (i-a)	

This OP-analysis differs from earlier ones, which rely on applying ablaut to RED (Steriade 1988), or on listing full and zero grade root allomorphs and letting RED access these listed forms, as suggested by Sandell 2010 for a similar pattern in the class 3 presents. The chief difference is that, in the OP-analysis, only root allomorphs found in a perfect form can license a *Ci/Cu* perfect RED. That's because the analysis allows the root vocalism to have an effect on RED in only two ways: via IDENT B-R (as in *su-ṣup-úr,* where the B_{red}*ṣup* licenses *su* in RED), or indirectly, through the action of OP IDENT: PERF RED (as in the pair {*su-ṣváp-a, su-ṣup-úr*} where the second RED influences the first). The OP- IDENT constraint can only impose the quality of one perfect RED upon another perfect RED. Any other zero-grade forms – those of unreduplicated words, or those of reduplicated non-perfect forms – are predicted to not matter, as no constraints connect them to any *perfect* RED.

A group of 31 roots allow us to test this prediction. All have zero-grade root allomorphs with *i/u* vocalism *outside the perfect paradigm but not in the perfect*. All these roots have *Ca*- perfect REDs. They form two groups. 14 of them have full grades in *Ca:* and zero grades in C_0*i(:)*. The *-i* surfaces where a zero grade is expected, including in reduplicated forms, *but not in the perfect*. Thus *stha:* 'stand' (14.a), with zero grade *sthi* in the verbal adjective *sthi-tá*, the intensive *te:-ṣṭhi:-ya-* and elsewhere, loses all trace of its zero grade *i* in the perfect: *ta-sth-é*, *ta-sth-ús,* not **ta-ṣṭhy-é, *ta-ṣṭhy-ús.*

(14) *Ca*- perfect REDs from *Ca:/Ci* roots

	Full grade	Zero grade	Perfect: full grade	Perfect: zero grade	Gloss
a.	stha:-	sthi-	ta-stha:-ú	ta-sth-é, ta-sth-ús	stand
b.	ça:-	çi:-	ça-ça:-ú	ça-ç-a:ná	sharpen
c.	ça:s-	çi:ʂ-	ça-çá:s-a	ça-ça:s-ús	order
d.	dha:-	dhi:-	-	da-dh-ús	suck
e.	pa:-	pi:-	pa-pa:-ú	pa-p-é	drink

The loss of *i* in the perfect zero grade of these *Ca:* roots correlates with the vocalism of the perfect RED: it's <u>*ta*</u>*-sthé:,* not *<u>*ti*</u>*-ʂʈh(y)-é:*. Contrast a root like *nai:/ni*: (8.f), whose zero grade *i* does surface in the perfect root and does determine RED's vocalism: *ni-ny-é, ni-ni:-va:ns*[15].

The synchronic mechanism leading to loss of *i*-from-*a:* in the perfect is obscure, but its consequences for reduplication are clear. This data shows that the vowel of a perfect RED comes from the surface root vowel *of a perfect form*. The mere existence of root *i* in *sthi-tá* (14.a) doesn't license an *i* in a perfect RED, hence no **ti-ʂʈh-é*. This detail is predicted by the current analysis and contradicts the account in Steriade 1988, which had attributed the high vowels in perfect REDs to the fact that ablaut applies to RED independently of the root. Data like (14) is one reason to reject that analysis. The other are the complications it entails for the analysis of ablaut.

The data in (14) also confirms a role for surface-oriented correspondence in the analysis. We predict that a vowel that's absent from the surface root – like the *i* of *sthi-tá,* missing in *ta-sth-ús* – can't condition the quality of RED. In a serial analysis this would be possible, because RED could copy the zero-grade *i* of intermediate *-sthi-ús.* That would predict RED *ti*, hence **ti-ʂʈh-ús*. The correct prediction, *ta-sth-ús,* is made by the parallel OP-analysis.

(15) OP IDENT: PERF RED >> IDENT [±HIGH] BR >> HEIGHT IN AFF

a.	UR: /stha:/	OP IDENT	IDENT [±HIGH] B-R	HEIGHT IN AFF
i.	☞ta-stha:-u, ta-sth-é			**
iii.	ti-ʂʈha:-u, ti-ʂʈh-é		*!	

[15] In a perfect participle like *ta-sth-i-vá:ns*, from *stha:* 'stand', the *i* is an epenthetic 'union-vowel' (Whitney 1889:§802). We can tell the difference between a genuine root *i* and a union vowel by finding only the former as a glide in prevocalic position: e.g *ni-ny-úʂ-am* from *nay/ni:* vs. *ta-sth(*y)-úʂ-am.* This detail sheds light on the status of the presuffixal *i* in *ni-ni:-vá:ns* vs. to *ta-sth-i-vá:ns*: it shows that the latter is not a root segment. This difference between root *i* and the union *i* determines the height of RED's vowel, as explained in the text. See also fn. 13.

ii.	ta-ṣṭha:-u, ti-ṣṭh-é	*!		*

In a similar category as the roots in (14), there is class of CarX roots that generate *ir* or *ur* in their zero grade instead of the expected *r/ṛ* (Whitney 1889:§242). These include *kar/kṛ/kir* 'scatter'; *tar/tṛ/tir/tur* 'pass', *par/pṛ/pur* 'fill', *mar/mṛ/mur* 'die' and *sphar/sphṛ/sphur* 'jerk'. When this *ir*/*ur* occurs in the perfect root, and only then, its vocalism appears in Red, generating indicatives like *ti-tir-ús* and optatives like *tu-tur-yá:t,* from *tar/tṛ*; or *pu-sphur-é* from *sphar/sphṛ*. While the zero grade *ir/ur* is synchronically unpredictable, high Reds like *ti-tir-ús* are also predicted by the present analysis. The further prediction is that only the *ir/ur* zero grades of *the perfect* have this effect on perfect Reds. This is also borne out: thus, *kar/kṛ,* has a zero grade, *ki(:)r-* that appears in the present indicative *kiráti,* the participle *ki:r-ṇá*, but not in the perfect. As predicted, the perfect Red is *Ca*: *ca-ká:r-a, ca-kr-é,* not **ci-ká:r-a,*ci-kr-é*. Likewise, *mar/mr*, whose desiderative *mu-mu:r-ṣati* shows a *mu:r-* zero grade, has a perfect *ma-ma:r-a/ma-mr-ús,* analyzable as in (13). The logic of the prediction was laid out above: an *i* or *u* in the root can affect Red only via Ident B-R, so only if the *i* or *u* is contained in the surface form of some perfect B_{Red}.

One prediction of the analysis remains unverified: roots like *tar/tṛ/tir/tur,* which reduplicate in the perfect with *Ci/Cu* when in their zero grade, should keep that *Ci/Cu* reduplicant in their full grade: alongside *ti-tir-ús* we expect *ti-tár-a**, comparable to *su-ṣup-ús, su-ṣváp-a.* The few attested forms show multiple variants: *Ca* Reds in *ta-ta:r-a*, *ta-tar-úṣas*; *Ci* Reds in *ti-tir-vá:ns*, *ti-tir-ús*, without any attested full-grade counterpart; and a *Cu* Red in the optative perfect *tu-tur-yá:-t*. It is unclear if all these variants must be generated by the same lexicon/grammar and it is unclear if predicted items like *ti-tár-a** are systematically missing.

One of the rare roots that lacks a full grade *a*, *jṛmbh* 'gape' has an epic perfect *ja-jṛmbh-é* whose Red vocalism remains unexplained. In the absence of any perfect form with root *a*, the present analysis predicts no reduplication at all (Dep Red Root would block an inserted vowel) or a high vowel in Red, so **ji-jṛmbh-é.* Here too, revisions are possible, but this datum seems too isolated to justify them.

As a last note on uniformity in Sanskrit reduplicants, it is possible that the class 3 presents analyzed by Sandell 2011 offer yet another type of Red correspondence. Sandell (2011:231) suggests that "the vocalism of the [present] reduplicant very closely corresponds to the vocalism of the zero grade allomorph of a given root *as it appears in the past passive participle or other morphological category that regularly takes zero grade of the root*" (italics mine, DS). That would mean that roots like *stha:* 'stand,' with an *i*-zero grade in the passive participle *sthi-tá*, take their *i*-RED in a present like *ti-ṣṭh-ati* from *sthi-tá* and other similar zero-grade forms. Verbs like *mad* 'enjoy,' which lack any *i/u*-zero grade anywhere, reduplicate as *Ca.* This type of correspondence between forms that are lexically related but lack any morphosyntactic connection – e.g. the passive participle and the class 3 present – is not unprecedented[16].

But this conclusion is not secure for the Sanskrit data. Several verbs in *Ca:/Ci* display an *Ci:* allomorph of the root *in the present* (Whitney 1889: §661ff), e.g. *çi-çi:-masi* from *ça:/çi* 'sharpen,' or *mi-mi:-te* from *ma:/mi* 'measure;' or *pi-pi:-te* from *pa:/pi* 'drink'. Such forms, alongside presents like *ma-mat-si* from *mad,* can be analyzed by using a version of OP-IDENT RED limited to the present subparadigm: the *Ci* RED must come from a present *CiX* B_{Red}. The *Ca* RED must be used in its absence. Many other present REDs, like *bí-bhar-ti/bí-bhr-ati* on *bhar/bhr* 'bear', are of *Ci* shape in the absence of any *i*-vocalism in any zero grade form of the root. Their existence suggests a mix of grammars in the reduplicated presents. One of these contains HEIGHT IN AFF >> IDENT B-RED, a ranking comparable to that found in the desiderative, to generate items like *bí-bhar-ti.* A distinct one contains, similar to the perfect, OP-IDENT RED:PRES >> IDENT B-RED >> HEIGHT IN AFF [17]. This one would characterize presents like *ma-mat-si* and *mi-mi:-te:.*

6. Rhythmic alternations and HEIGHT IN AFF

This last section verifies the statement of the constraint HEIGHT-IN-AFF (4.a), which uses RED's morpho-prosodic category *Affix*, rather than the weight of RED's syllable, to control the height of RED's nucleus. This aspect of the analysis was justified earlier by noting that disyllabic reduplicants don't raise their vowels, even in light syllables. The constraints in (4) are not critical to the paradigmatic analysis of RED, but they help explain why CV REDs prefer high vocalism. I

[16] Steriade 2008, Steriade and Yanovich 2015. This is also close to the analysis of perfect RED in Steriade 1988.

[17] Sandell's formalization of the idea that a root *Ci/Cu* zero grade found in any form of the root licenses a *Ci/Cu* reduplicant makes use of Input-Output correspondence, because he takes full and zero grades to be lexically listed for all roots. But listing a stem allomorph is justified only if its relation to the rest of the paradigm is arbitrary, and that's clearly not so for the Sanskrit zero grades. They are only occasionally unpredictable from the full grade, and only in respect to the loss of the *a*-vocalism. What is required is limited lexical indexing of the Faithfulness constraints that prohibit loss of the full-grade *a* or vocalization of an *y/v* from the full grade to *i/u* in zero grade.

show next that the reference to an abstract *Affix* constituent is further justified by contextual variations in the surface weight of RED.

The general effect described next is that the syllable containing a Sanskrit RED can vary in its weight, but this variation does not alter the height of its vowel. The challenge for a parallel analysis is to characterize this combination of variable weight and invariant height. This can be done, if the target size of RED pertains to the unit *Affix*, rather than its associated surface syllable.

Here are the basic facts in need of analysis. Any CC cluster makes a preceding syllable heavy in Sanskrit (Whitney 1889:§79) across almost any boundary, as in other old Indo-European languages. As a result, a light CV RED in a perfect like *su-ʂup-ús* becomes heavy by position in related *su-ʂváp-a*. Consider now roots like *kʂaubh/kʂubh* 'quake', possessed of an invariant initial cluster. This cluster will cause every prefixal syllable attached to this root, including that of a CV-RED, to be heavy. If the perfect RED belongs to the *Affix* category, and this alone determines the height of RED's vowel, according to the constraint HEIGHT IN AFF, the additional mora contributed by an initial CC cluster will not change the predicted outcome: it will not affect the mono-moraic size of the *Affix*, only that of the syllable that contains it. This idea is reflected in the evaluation in (16), and predicts the correct vocalism in the perfect RED of a root like *kʂaubh: cu-kʂo:bh-a, cu-kʂubh-é*. Similarly for the other *Affix*-sized REDs of the aorist, present and desiderative of such a root.

(16) Evaluating HEIGHT IN AFF in CC-initial roots

<table>
<tr><td></td><td>RED$_{aff}$-, kʂaubh, -a</td><td>HEIGHT IN AFF$_{AOR}$</td></tr>
<tr><td>a.</td><td>cu - k ʂo: bh a
\| | \/\ \|
[[μ]$_{Aff}$ μ]$_σ$ [μμ]$_σ$ [μ]$_σ$</td><td></td></tr>
<tr><td>b.</td><td>ca - k ʂo: bh a
\| | \/\ \|
[[μ]$_{Aff}$ μ]$_σ$ [μμ]$_σ$ [μ]$_σ$</td><td>*</td></tr>
</table>

The key point here is that the copied material, RED proper, fits within one mora, as required of an *Affix*. RED's *syllable*, however, contains further material in (16), and that makes it heavy. Had the constraint on RED's height been conditioned by the surface weight of RED's syllable, a root like *kʂaubh* could only reduplicate with *Ca-*, or *Co:*, as in the intensive, since its prefixal syllables are always heavy. A serial analysis can perhaps avoid facing this issue, if it can differentiate the derivational stage where a RED template is satisfied from that when HEIGHT IN AFFIX is enforced. But we're interested in whether a constrained parallel analysis can do as well.

A similar issue arises in the aorist. Here, the weight of RED varies contextually in a more complex way, but its height still does not co-vary with its weight. The aorist RED lengthens to CV: if, left unlengthened, it would be the first syllable in a sequence of two lights. The function of lengthening is rhythmic: to avoid a dibrach sequence in the predesinential stem, a recurrent effect in Sanskrit verb inflection. From the root *svap* we find the aorist *si-ʂvap-as* with short *i* in a syllable made heavy by the following *ʂv*; but also *a-su:-ʂup-at* with lengthened *u:* in an open syllable, before the light *ʂu-*. Similarly, the Sanskrit grammarians report from *manth* 'shake' two aorists, *a-ma-manth-at*, with short RED *ma* before a heavy root, and *a-mi:-math-at*, with lengthened RED *mi:* before a light root syllable[18]. Much more on this is found in Bendahman 1993: 119ff.

The aorist RED is an *Affix*: all else being equal, it aims for mono-moraic size. It never contains a long vowel unless it's light by position and the root syllable is also light. In a few forms, RED remains a short CV even in a sequence of two lights: e.g. *a-su-ʂav-us*, from *sau* 'press out'. Together, these facts suggest that this RED's default size is also CV. Then, being an *Affix*, it too is subject to HEIGHT IN AFFIX. That would explain why more than half of the aorist REDs in Whitney 1885 (N: 287; mostly supplied by grammarians) contain a high *i/u* that mismatches the height of the vowel in B_{Red}. If we focus just on the 195 reduplicated aorists whose B_{Red}s have *a*-vocalism, only 18% of these contain a *Ca* RED corresponding to the height of its B_{Red} (like *a-ma-manth-at*). The vast majority have *Ci* or *Cu* REDs, like *si-ʂvap-as, a-mi:-math-at, a-tu-ʂʈav-am*. This raising pattern is similar to that of the desiderative, i.e. most aorist REDs raise regardless of paradigm structure, not seeking to match in height the vocalism of any root allomorph. Only a few operate with the ranking IDENT [±HIGH] B-R >> HEIGHT IN *AFFIX*.

We now ask if the length variation peculiar to the aorist RED is compatible, in a parallel analysis, with the constraint HEIGHT IN AFFIX. The answer is comparable to that proposed above for perfects like *cu-kʂo:bh-a*. In an aorist like *a-mi:-math-at*, the aorist CV prefix is restricted, qua *Affix*, to occupying one mora. In *a-mi:-math-at* the vowel of this CV prefix is also linked to a

[18] A difference in height-and-weight – *Ca* vs. *Ci:* – in aorist REDs is frequently found in such pairs of forms. It seems to suggest that the *a* in this RED cannot lengthen. Only 2/41 *Ca* aorist REDs in Whitney 1885 contain long *a:*.

second mora, as mandated by the *DIBRACH constraint against light syllable sequences. But the monomoraic *Affix* constituent inside RED remains intact, and it continues to require a high vowel. The analysis in (16) illustrates this scenario: it shows an *Affix* constituent contained in, rather than coinciding with, RED's syllable. This *Affix* requires that its nucleus be raised to high.

(17) *DIBRACH (no σ̆σ̆ sequence), HEIGHT IN AFF_{AOR} >> IDENT [±HIGH] BR

	a, $\text{RED}_{\textit{Affix}}$, math, at	*DIBRACH	HEIGHT IN AFF_{AOR}	IDENT [±HIGH] B-R
a.	a-mi-math-at $[[\mu]_{\textit{Aff}}\,]_{\sigma}$	*!*		*
b.	a-ma:-math-at $[[\mu]_{\textit{Aff}}\,\mu]_{\sigma}$		*!	
c.	☞ a-mi:-math-at $[[\mu]_{\textit{Aff}}\,\mu]_{\sigma}$			*

7. *Conclusion*

This study has developed an Optimal Paradigm (McCarthy 2005) account of the identities observed among Sanskrit perfect reduplicants. An antecedent of this analysis is Bjorkman's (2010) account of correspondence among the reduplicants of Kinande. Bjorkman notes that alternatives are available to the OP/Uniform Exponence approach she develops for Kinande (cf. Downing 2006 and references there). These alternatives are missing for Sanskrit.

The variety of OP IDENT constraint used here differs from earlier ones in that only one subparadigm of the verbal system, the perfect, is targeted. Within it, only REDs are provably driven to be identical[19]. The RED shape generalized by OP-IDENT throughout the perfect is selected in part by Markedness constraints, as in McCarthy's 2005 original cases.

I close on an open question. Inflectional paradigms give rise to two apparently divergent uniformity mechanisms. The prevalent one appears to be analyzable only in terms of an asymmetric form of correspondence, in which one cell determines the shape of all others,

[19] A generalized OP analysis can rank ABLAUT, the constraint triggering zero grade, above a version of OP-IDENT that mandates identity of the entire predesinential stem of the perfect, root plus RED, rather than just identity of RED. Then forms in a perfect will have identical roots only when higher-ranked ABLAUT allows this; but, since RED is unaffected by ABLAUT, all perfect REDs will emerge identical, as in the present analysis. I have not developed this analysis because it requires much additional machinery to prevent ABLAUT from over-applying.

regardless of phonological markedness considerations, in the manner in which derivational bases asymmetrically influence their derivatives (Benua 1997). The mechanisms that identify the base in such cases appear to vary (Albright 2010; Garrett 2008). The less common uniformity type is the one studied here, in which Markedness determines which cell generalizes its properties throughout the paradigm. The use of OP-IDENT is well suited to this class. A unification of these two uniformity mechanisms is perhaps achievable, but this task is left to future work.

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