Accent in Athematic Nouns in Vedic Sanskrit and Its Development from PIE[*]

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abstract

An Optimality Theoretic analysis of accent in Vedic Sanskrit athematic nouns is presented that builds on an analysis of the same nouns in Proto-Indo-European. The two accent patterns of Vedic (columnar and alternating) are explained by the language's preference to realize underlying accent (where underlying accent on a root beats underlying accent on a suffix) and to put accent on the stem-final syllable if there is no underlying accent. The accentless vocative of Vedic is explained if this ending is dominant and causes an accent deletion. This dominant ending was inherited from PIE and is analyzed with OT antifaithfulness constraints.

1. Introduction

Accent as reconstructed for the athematic nouns of Proto-Indo-European (e.g. Pedersen 1926, Kuiper 1942, Schindler 1972, 1975a-c) has been quite controversial. Based primarily on data from Slavic, Lithuanian, Vedic Sanskrit, and Classical Greek (Kiparsky and Halle 1977), its reconstruction has been questioned due to the fact that none of these daughter languages display the variety of accent patterns found in PIE as well as the difficulty this variety presents for phonological theory. In Frazier (2006), I argue that accent in the athematic nouns of PIE is theoretically sound. Using Optimality Theory (OT, Prince and Smolensky 1993), a new type of constraint is developed that can account for the diverse accent patterns of PIE. In this paper, I will show that this new constraint type is also necessary to account for the accentless vocative in

[*] I would like to thank H. Craig Melchert for thorough discussion of many of the points presented here. Thanks are also due to Jennifer L. Smith and the audience at the 2006 UCLA IE conference. All mistakes are of course my own.

Vedic Sanskrit (thus providing support for this constraint type from an attested language). I will also illustrate how the analysis for PIE can, with diachronically sensible modifications, be developed into the analysis for Vedic Sanskrit. The result will thus provide a more thorough account of accent in Vedic (as the accentless vocative is often ignored in other work on this subject, e.g. Kiparsky 1984) and will provide further support for the analysis of PIE.

This paper will proceed as follows. I will first present a brief review of the analysis of PIE athematic nouns in §2. I will then present a new analysis for Vedic Sanskrit in §3. In this section, I will alternate between subsections that present the data with general analysis and those that expand on the analysis with OT tableaux and theoretical discussion. This design is done with both the IEist and OTist in mind: those uninterested in OT details may skip the latter type of subsection, while those interested in such details know where to find them. In §4 I describe the transition from PIE to Vedic, and conclusions follow in §5.

2. Accent in PIE Athematic Nouns

The reader is referred to Frazier (2006) and references therein for a thorough discussion of accent in athematic nouns in PIE. A brief overview will be provided here so that the following sections will be understandable to all. It is clear from the data presented in table 1 that, in PIE, there is a preference for dissimilarity between strong cases (nominative, accusative, vocative) and weak cases (dative, genitive, instrumental, ablative, locative): strong is always distinguished from weak by accent or ablaut (vowel quality or quantity).[1]

[1] Disagreements about the exact segmental content of these words are irrelevant to this topic. Ablaut will be ignored in this paper except to make the point that there is always some difference between strong and weak forms in PIE.

Table 1: PIE athematic nouns (Schindler 1972, 1975ab, Kim 2002, Fortson 2004)

accent class	gloss	strong (*nom sg*)	weak (*gen sg*)
acrostatic	*liver*	*yé ⌉k^w-r̥-Ø	*yék^w-n̥-s
	water	*wód-r̥-Ø	*wéd-n̥-s
proterokinetic	*coming*	*g^wém-tu-s	*g^wm̥-téw-s
	thought	*mén-ti-s	*mn̥-téy-s
hysterokinetic	*male*	*H_2r̥s-é ⌉n (<**-én-s)	*H_2r̥s-n-és
	father	*pH_2t-é ⌉r (<**-ér-s)	*pH_2-tr-és
amphikinetic	*earth*	*d^hég^h-o ⌉m (<**-om-s)	*$d^h g^h$-m-és
	male	*H_2né:r (<**H_2nér-s)	*H_2n̥r-és

Phonological theory has made use of **dominant** affixes to explain such dissimilarities. Alderete (1999) defines dominant affixes as those which cause a base-mutation and creates **antifaithfulness** constraints to account for the behavior of words created with such affixes. The effects of dominance are best illustrated with an example from Tokyo Japanese. The affix *–kko* is dominant and requires the deletion of pitch accent from the base to which it attaches: the word *kóobe* 'Kobe (city)' becomes *koobekko* 'native of Kobe' (Alderete 1999). In the derived word *koobekko*, the root *koobe* is unfaithful to the word *kóobe* as shown by the deletion of the pitch accent. This unfaithfulness is required when a word is formed with a dominant affix.

In the case of the PIE data, we see that, in the output, the stems (root + suffix) of strong forms are always unfaithful to the stems of weak forms, i.e. **g^wém-tu-* ≠ **g^wm̥-téw-*. These differences cannot be accounted for with Alderete's output-output antifaithfulness constraints, however, because these constraints were designed for use with affixes that attach to a base that is itself a word. In the Japanese example, *kóobe* is a word. In the PIE example, the dominant nominative singular ending **-s* attaches to **g^wem-téw-*, which is not a well-formed word. In order to account for these accent alternations, we will thus need an antifaithfulness constraint, defined below, that is designed for use in inflectional paradigms, where dominant affixes attach to stems that are not required to be actual words.

(1) ¬OP-DEP(ACCENT)[2]: realize a dominant ending by inserting accent onto the stem (as compared to the same stem when inflected with a recessive ending).

Thus, for the protero-, hystero- and amphikinetic accent classes, we see that strong forms always have a stem in which accent has been inserted as compared to weak forms, as demanded by ¬OP-DEP(A). Note, for example, the following alternations, with the inserted accent underlined: *$g^{w}\underline{\acute{e}}m$-*tu-s* ~ *$g^{w}\underline{m}$-*téw-s*, *$H_2\underline{r}$-*s-*$\underline{\acute{e}}$ /n ~ *$H_2\underline{r}$-*s-n-és*, *$d^{h}\underline{\acute{e}}g^{h}$-*o* /m ~ *$d^{h}g^{h}$-*m-és*.

The acrostatic nouns, however, are in violation of ¬OP-DEP(A). This is because there is another constraint that outranks ¬OP-DEP(A) that penalizes the deletion of underlying accent from a root. Acrostatic nouns are formed with an underlyingly accented root, and so that accent is never deleted and acrostatic nouns display consistent root stress. This illustrates how OT utilizes the ranking of violable constraints to account for intricate phonological phenomena. The complete constraint ranking that accounts for the placement of accent in PIE athematic nouns is shown in (2). It is always more important to satisfy a higher-ranking constraint than to satisfy a constraint below it.

(2) constraint ranking to account for accent in PIE athematic nouns
- a. MAX(ACCENT)$_{root}$: do not delete underlying accent in a root
- b. ¬OP-DEP(ACCENT): realize a dominant ending by inserting accent into the stem (as compared to the same stem when inflected with a recessive ending)
- c. MAX(ACCENT)$_{deriv}$: do not delete underlying accent in a derivational affix
- d. MAX(ACCENT): do not delete underlying accent anywhere
- e. ALIGN (post-accenting morpheme, R, accented morpheme, L) = POSTACCENT: accent occurs on the morpheme following a post-accenting morpheme
- f. ALIGNLEFT (accented morpheme, prosodic word): accent occurs on the leftmost morpheme

[2] The logical symbol ¬ 'not' is used to denote an antifaithfulness constraint. OP denotes the **Optimal Paradigms** correspondence relation (McCarthy 2005), which means that stems of members of an inflectional paradigm are compared to each other. This is different from the OO (output-output) correspondence relation (Benua 1997) used by Alderete (1999), which compares the base of a derived word to that base as a word itself. For a full description of correspondence theory in OT see McCarthy and Prince (1995).

3. Accent in Vedic Sanskrit Athematic Nouns

The system of accent in Vedic athematic nouns is certainly more simplified than that of PIE, but no less interesting. As shown in table 2, there are two accent patterns in Vedic: columnar (fixed stress on the root) and alternating (stressed roots for strong cases and stressed endings for weak cases). What is most peculiar about these paradigms is that, regardless of whether the accent class is columnar or alternating, the vocative appears in two forms: unstressed or initially stressed. These two forms are conditioned by sentence position, with the initially stressed form appearing sentence (or verse) initial, and the unstressed form appearing elsewhere (Whitney 1889). The location of stress in the vocative is most puzzling when we consider a noun like *marút* 'wind (god)' which has an underlying accent on the *u*. This underlying accent surfaces in every form but the vocative.

Table 2: accent in Vedic athematic nouns (Whitney 1889)

	columnar		alternating	
	marút- 'wind (god)'		vā́c- 'voice'	
	sg	pl	sg	pl
nom	marút	marútas	vā́k	vā́cas
acc	marútam	marútas	vā́cam	vācás
instr	marútā	marúdbhis	vācā́	vāgbhís
dat	marúte	marúdbhyas	vācé	vāgbhyás
abl	marútas	marúdbhyas	vācás	vāgbhyás
gen	marútas	marútām	vācás	vācám
loc	marúti	marútsu	vācí	vākṣú
voc	márut/marut	márutas/marutas	vā́k/vāk	vā́cas/vācas

I will first sketch an analysis of these nouns while ignoring the vocative and then show how the ¬OP constraints can account for this case. Kiparsky (1984) presents a pre-OT analysis of athematic noun accent (ignoring the vocative). He utilizes the Basic Accentuation Principle (BAP, also proposed for PIE (Kiparsky and Halle 1977)), which requires the first underlyingly accented syllable to receive stress and the first syllable to receive stress if there are no

underlyingly accented syllables. He also proposes that weak endings are accented while strong endings are preaccenting. Thus, columnar accent is explained by positing underlying accent on the syllable that always receives stress, as with the second syllable in *marút*. Because the second syllable of this word is always the first underlyingly accented syllable (and there is no member of the paradigm formed without any accent at all), this syllable always receives surface stress.[3] On the other hand, for alternating accent, the root does not have underlying accent, as with *vāc*. When a weak ending is added to a root with no underlying accent, the first accented syllable is in the ending, which thus receives surface stress. When a strong ending is added, this ending places accent on the syllable immediately preceding it, which of course becomes the first accented syllable, receiving surface stress.

What is perhaps puzzling about this analysis is that the second stipulation of the BAP, that stress occurs word initially given no accented syllables, is never utilized. When every ending is either accented or preaccenting, there is always some accent that can surface. In fact, there is no evidence according to the data in table 2 and Kiparsky's proposal about the accent specifications for endings that Vedic has a preference for word initial stress For this reason, I will take a different approach with an OT analysis. Furthermore, I will show in §4 that the analysis presented here is a logical extension of the constraint ranking that accounts for PIE.

I claim that the strong and weak endings are identical to those of PIE in terms of accent: strong endings are unaccented and weak endings are accented. The strong endings have lost their dominance specification, meaning all endings (again, ignoring the vocative for now) are recessive. Following Kiparsky, paradigms with columnar accent are created by underlyingly accented roots and paradigms with alternating accent are created by underlyingly unaccented

[3] There are also polysyllabic nouns with columnar stress on the initial syllable, such as *jágat-* '(all) things that move' = 'humans and animals' (Grassman 1955). For these nouns, the first syllable is underlyingly accented.

roots. In place of the BAP, the Vedic paradigms can be analyzed with the following two principles: root accent is realized over affix accent, and, given no underlying accent, stress will be placed on the last syllable of the stem (the same position where accent would be placed by preaccenting endings). These stipulations can be expressed with the ranked constraints in (3).

(3) constraint ranking to account for accent in Vedic athematic nouns (ignoring vocative)
   a. MAX(ACCENT)$_{root}$: do not delete underlying accent in a root
   b. MAX(ACCENT): do not delete underlying accent anywhere
   c. ALIGNR (accent, stem): for every accented syllable, align its right edge with the right edge of some stem = accent occurs in stem-final position

The monosyllabic root *vāc-*, used as an example of a noun with alternating stress in table 2 above, does not provide sufficient evidence that ALIGNR should be the constraint that determines the default position for stress in Vedic. One may wonder why ALIGNL (used for PIE to dictate the first syllable of the word as the default position for stress) cannot still be used for Vedic. Evidence against this comes from polysyllabic nouns with alternating stress, such as *dātṛ-* 'giver' and *pitṛ-* 'father' (Whitney 1889). These nouns are not underlyingly accented, as shown by the accented ending in the genitive plurals forms: *dātṝṇā́m* and *pitṝṇā́m*. When affixed with a strong unaccented ending, stress falls on the stem-final syllable and not the initial syllable, as in the accusative singular: *dātā́ram* and *pitáram*.[4]

3.1 OT analysis

In this section, I present the relevant tableaux to explain the rankings proposed above in (3). This section and §3.3 are designed to be of interest to those concerned with the theoretical

[4] The paradigms of *dātṛ* and *pitṛ* show different accent alternations than that of the monosyllabic roots like *vāc*, and were thus not included in table 2. As Whitney (1889:¶111, 316-7) describes, when the root is polysyllabic, accent only occurs on "the weakest (and not the middle) cases." For these middle cases (the instrumental, dative, and ablative dual and plural and the locative plural), stress appears in stem final position, though the system developed here predicts stress to appear on the ending. These endings are also those that participate in external sandhi phenomena. This fact suggests that these endings and the preceding stem do not belong to a single phonological word in the same way as other endings. I cannot pursue the full implications of this complication with respect to accent at this time.

workings of Optimality Theory. The reader who is not interested in such details may skip this section without missing any general points of analysis.

In (4), we see a noun with columnar accent affixed with a weak ending. There are two underlying accents, but the one on the root takes precedence over the one on the ending, yielding the output *marútas*. No ranking can be derived from the tableau because candidate (b) is harmonically bounded, but we can appeal to the initial state to determine that the positional faithfulness constraint (MAX(A)$_{root}$) dominates the general one (MAX(A))[5]. When this same noun is affixed with a strong ending, as in *marútas* nom pl, the output is entirely faithful to the input (*marút* + *as*) and also obeys the alignment constraint, meaning all other candidates are harmonically bounded.

(4) 'wind (god)' acc pl: *marútas*

/marút + ás/	MAX(A)$_{root}$	MAX(A)	ALIGNR
a ☞marútas		*	
b marutás	*!	*	*

When a noun with alternating stress is affixed with a strong ending, there is no accent in the underlying form, as shown in (5). This means that some accent needs to be inserted, because the high-ranking CULMINATIVITY demands every prosodic word have some accent (see §3.2 for further discussion of this point), and so a DEP(ACCENT) (do not insert accent) violation is necessary. What is interesting is that accent is inserted onto the root, in accord with ALIGNR, even though this violates the positional faithfulness constraint DEP(A)$_{root}$ (which, again, dominates the general faithfulness constraint). We can thus derive the ranking shown in (6), which tells us that stem final stress is preferable even if that means accent is inserted onto a root.

[5] All positional faithfulness constraints must be ranking above general faithfulness constraints in the initial state of the language learner in order to avoid the subset problem (Smith 2000, Prince and Tesar 1999). Positional faithfulness is only demoted if the language learner encounters evidence that the grammar needs to be that way. The Vedic language learner would never encounter such evidence.

(5) 'voice' nom pl: *vā́cas*

/vāc + as/	ALIGNR	DEP(A)$_{root}$	DEP(A)
a ☞vā́cas		*	*
b vācás	*!		*

(6) ALIGNR » DEP(A)$_{root}$ » DEP(A)

Using the ranking in (6) we can determine the ranking of MAX(A) with respect to ALIGNR by looking at a noun with alternating stress when affixed with a weak ending. In the tableau in (7), we see that underlying accent is realized, even if that accent is on an ending and creates an output without stem final stress. We now have a derived a constraint ranking for Vedic, as first shown in (3), and repeated below.

(7) 'voice' acc pl: *vācás*

/vāc + ás/	MAX(A)	ALIGNR	DEP(A)$_{root}$
a ☞vācás		*	
b vā́cas	*!		*

(8) MAX(A)$_{root}$ » MAX(A) » ALIGNR » DEP(A)$_{root}$ » DEP(A)

3.2 The Vocative

As previously explained, the vocative comes in two forms: unaccented and initially accented. The example sentences in (9) show this in comparison with the nominative form for *Agní-*.

(9) example sentences with the vocative (Whitney 1889:¶314)

sentence initial: ágne yáṁ yajñáṁ paribhū́r ási
Agni! whatever offering thou protectest

elsewhere: úpa tvā 'gna é 'masi
unto thee, Agni, we come

cf. nominative: agníh pū́rvebhir ṛ́ṣibhir; agnír hótā kavíkratuḥ (Lubotsky 1997)

It is clear that the vocative does not behave according to the ranked preferences in (3, 8). In initially accented forms like *ágne*, *márut*, and *vā́k* accent is inserted (and thus DEP(A) is

violated) but ALIGNR is not satisfied (except with *vā́k*). In the unaccented forms *'gna* and *marut*, underlying accent on a root is deleted, which violates the highest ranked constraint. All unaccented forms (including *vāk*) potentially suffer from another problem: they seem to violate CULMINATIVITY (every prosodic word must have an accent (Hayes 1995, Alderete 1999)), which can be assumed to be undominated in Vedic.

I will first address the accentless vocative forms. For these outputs, the issue of CULMINATIVITY can be handled straightforwardly. According to Whitney (1889), the vocative is enclitic.[6] This means that the vocative leans on its host such that it does not form a prosodic word by itself, but rather attaches to another prosodic word. This prosodic word will have some accent, and CULMINATIVITY is thus satisfied.[7]

We still have yet to explain why underlying accent is deleted in forms like *marut*. At this point a comparison can be made with the PIE data. In PIE, there was a demand for dissimilarity between the stems of strong and week forms. While strong and weak forms are different for nouns with alternating accent in Vedic, these dissimilarities are explained by underlying accent and not by dominance. However, it appears that Vedic has not gotten rid of all dominant affixes. I propose that the vocative is the only remaining dominant ending in Vedic, inherited from the dominant vocative ending of PIE. Instead of requiring an accent insertion, the dominant ending of Vedic requires an accent deletion, as dictated by ¬OP-MAX(A).

(10) ¬OP-MAX(ACCENT): realize a dominant ending by deleting accent from the stem (as compared to the same stem when inflected with a recessive ending).

It is important to note that this constraint does not actually delete underlying accent; it

[6] It cannot be assumed that Whitney meant **enclitic** in a strict sense, as opposed to **proclitic**. Thus, the important point to take from Whitney is that the vocative is a clitic and not its own prosodic word.

[7] As used here, CULMIN only assigns violation-marks to those candidates without accent. In Vedic it is not always the case that a prosodic word has only one accent, e.g. the particle *vā́vá* (Whitney 1889:¶94). Because there seems to be no general ban on multiple accents, the accentless vocative cannot simply be explained by its clitic status.

demands a difference between two **outputs**. Thus, in the case of *marut*, it is not the underlying accent on the second syllable that must be deleted according to ¬OP-MAX(A), but rather the output *marút* is unacceptable as a vocative form because it has the same accent as, for example, the nominative *marút*. Underlying accent does in fact get deleted (or we would see stress on the second syllable), but it is deleted because of its appearance in the outputs of the other case forms and not because of its appearance in underlying form. Thus, the same thing happens with *vāk*, even though this word is formed with no underlying accent. The nominative output *vā́k* does have stress, and this same stress cannot appear in the vocative form because of ¬OP-MAX(A). Furthermore, because in paradigms like that of *marút-* deletion of underlying accent is required to satisfy ¬OP-MAX(A), we know that this constraint must dominate $\text{MAX(A)}_{\text{root}}$. This yields the constraint ranking for Vedic shown in (11). Recall that only the vocative is dominant, and so it is the only ending that triggers the highest ranked constraint, ¬OP-MAX(A).

(11) final constraint ranking for Vedic
- a. ¬OP-MAX(ACCENT): realize a dominant ending by deleting accent from the stem (as compared to the same stem when inflected with a recessive ending)
- b. $\text{MAX(ACCENT)}_{\text{root}}$: do not delete underlying accent in a root
- c. MAX(ACCENT): do not delete underlying accent anywhere
- d. ALIGNR (accent, stem): for every accented syllable, align its right edge with the right edge of some stem = accent occurs in stem-final position

While the above ranking does not account for the initially-accented vocative, it is clear from its consistent sentence initial position that this form is controlled by the constraints that derive sentential accent. Development of a ranking to account for sentence accent is beyond the scope of this paper. However, I will briefly point out that the above ranking is useful in explain why the vocative receives initial accent in sentence initial position but other forms do not, as in the example sentence in (9): *Agníh pū́rvebhir r̥̄ṣ́ibhir*. In this sentence the nominative form *Agníh* retains its underlying accent, as demanded by $\text{MAX(A)}_{\text{root}}$. When the vocative begins a

sentence, it's underlying accent has been deleted as demanded by ¬OP-MAX(A), and so it is free to bear sentence accent.

3.3 OT Analysis of the Vocative

This section will explore in more detail the claims made about the constraint ranking for the vocative. It is first important to note that the ¬OP constraints (like the OP constraints) operate in a system where all members of an inflectional paradigm are evaluated simultaneously.[8] This is necessary because the ¬OP constraints compare paradigm members formed with a dominant affix to paradigm members formed with a recessive affix. Thus, these paradigm members need to be evaluated together in order for this comparison to be made.

The tableau in (12) evaluates the paradigm created with the root *marút-*. Instead of looking at all paradigm members, the tableau has been simplified so that only three representative members are used: the vocative, the nominative (strong ending), and the genitive (weak ending) all in the singular. There are thus three inputs and each candidate set is composed of three outputs. Violation marks are added together for each member of the candidate set such that the violation marks for the set represent the total of violation marks incurred by each member. The ¬OP constraint only compares the vocative to the two other forms, while the OP constraint (which demands similarity among each and every member) compares the stem of each member to the stem of every other member.

Tableau (12) tells us that candidate set (a) is optimal because it does not incur any violations of ¬OP-MAX(A). Candidate set (b) fares better on every other constraint, resulting in the ranking shown in (13). This ranking tells us that Vedic prefers to delete underlying accent if that is what is necessary to make a stem inflected with a dominant ending different from stems inflected with recessive endings. We also see that the antifaithfulness constraint must dominate

[8] See McCarthy (2005) for full description of the OP system and Frazier (2006) for the ¬OP system.

the corresponding OP faithfulness constraint, which is expected if an antifaithfulness constraint does work in a language.

(12) 'wind': *marut* voc sg (dominant ending), *marút* nom sg (recessive unaccented ending), *marútas* gen sg (recessive accented ending)

	/marút/ + {$Ø_{dom}$, $Ø_{rec}$, $ás_{rec}$}	¬OP-MAX(A)	OP-MAX(A)	MAX(A)$_{root}$	MAX(A)	ALIGNR
a	☞ **marut**, marút, marútas		**	*	**	
b	**marút**, marút, marútas	**!			*	
c	**marút**, marút, marutás	*!	**	*	*	*

members formed with a dominant affix are bold; stems are underlined

(13) ¬OP-MAX(A) » OP-MAX(A), MAX(A)$_{root}$

The analysis of nouns with alternating accent, like *vāc-*, will require altering an assumption made in Frazier (2006) about the ¬OP model. Because the PIE data did not present any evidence to the contrary, I previously assumed that all affixes are either dominant or recessive, i.e. that dominance is binary. However, the Vedic data presents evidence that this cannot be the case. The problem arises because the ¬OP constraint requires the vocative (formed with a dominant affix) to be different from every case formed with a recessive affix, which is every other case if dominance is binary. However, when nouns display alternating accent, the members of the paradigm formed with weak endings have stress on the ending. Because these forms do not have stress on the stem, there is no accent that can be deleted to satisfy ¬OP-MAX(A). The problem is illustrated in (14). In this tableau, a bomb marks the winning candidate set, though this candidate set does not represent the actual outputs of Vedic. In this set the underlying accent of the genitive singular ending has been deleted and accent has been inserted on the stem. Because there is now accent on the stem in this form, the set incurs no violations of ¬OP-MAX(A) and is optimal according to this tableau.

(14) 'voice': *vāk* voc sg (dominant), *vā́k* nom sg (recessive unaccented), *vācás* gen sg (recessive accented)

/vāc/ + {Ø$_{dom}$, Ø$_{rec}$, ás$_{rec}$}	¬OP-MAX(A)	MAX (A)$_{root}$	MAX(A)	ALIGNR	DEP (A)$_{root}$	DEP(A)
a **vāk**, vā́k, vācás	*!			*	*	*
b 💣 **vāk**, vā́k, vā́cas			*		**	**

members formed with a dominant affix are bold; stems are underlined

The problem presented by tableau (14) is remedied if dominance is not binary. Instead, I propose that the default accent specification is null in terms of dominance, i.e. not dominant nor recessive. If necessary, affixes can be either dominant or recessive. For Vedic, the vocative is necessarily dominant. For the system to work, any of the strong endings can be recessive and all of the weak endings must be null with respect to dominance. The simplest analysis is one that posits only the nominative singular, i.e. the least marked form, as recessive. By using this system, the problem of tableau (14) is fixed, as shown in (15). In this tableau, the same candidate sets are used and neither incurs any violations of ¬OP-MAX(A). Candidate set (b) is correctly ruled out by its unnecessary violation of MAX(A).

(15) 'voice': *vāk* voc sg (dominant), *vā́k* nom sg (recessive unaccented), *vācás* gen sg (accented)

/vāc/ + {Ø$_{dom}$, Ø$_{rec}$, ás}	¬OP-MAX(A)	MAX (A)$_{root}$	MAX(A)	ALIGNR	DEP (A)$_{root}$	DEP(A)
a ☞ **vāk**, vā́k, *vācás*				*	*	*
b **vāk**, vā́k, *vā́cas*			*!		**	**

members formed with a dominant affix are bold; members formed with a null affix are italicized; stems are underlined

3.4 Summary of Analysis

In this section I have presented an OT analysis of accent in Vedic athematic nouns that makes three important claims about the grammar of this language. First, accent is (almost) never deleted from a root, in accord with MAX(A)$_{root}$. This means that nouns with columnar accent are created by nouns with underlying accented roots (in agreement with Kiparsky 1984). Second,

the default position for stress is stem final, in accord with ALIGNR. This means that nouns composed of a root that is not underlyingly accented will have stem final stress when inflected with an unaccented ending. Third, and perhaps most importantly, the vocative ending is dominant, meaning it triggers ¬OP constraints. In Vedic, dominance is manifested through the requirement of accent deletion (¬OP-MAX(A)). The result is an accentless vocative, unless the vocative is in sentence initial position, in which case initial stress appears due to constraints controlling sentential accent.

4. The Transition from PIE to Vedic

Though there appear to be many differences between mother and daughter languages, in this section I will show how the system of Vedic can be derived from the system of PIE with diachronically sensible modifications. There are five changes that need to be accounted for: four accent classes become two (columnar and alternating), a preference for word initial stress (as dictated by ALIGNL) becomes a preference for stem final stress (as dictated by ALIGNR), the dominance specification on nominative and accusative endings is lost, the dominant vocative requires accent deletion (¬OP-MAX(A)) not insertion (¬OP-DEP(A)), and the remaining dominant affix becomes more demanding, i.e. ¬OP-MAX(A) dominates $\text{MAX(A)}_{\text{root}}$.

The Vedic system of accent is certainly simpler than the PIE system: the four accent classes of PIE are reduced to two in Vedic. I believe the reduction in number of accent classes is due to morpheme reanalysis such that many of the PIE dimorphemic stems are monomorphemic in Vedic. Consider the example of 'father': ***peH₂-ter- > *pH₂ter- > pitṛ-*. The form ***peH₂-ter-* is a hysterokinetic noun (see table 1), following the standard pattern of suffix accent in strong forms and ending accent in weak forms. After fusion of the root and suffix into one morpheme, as in **pH₂ter-*, the accent pattern of this noun can no longer be described as having

suffix accent in strong forms because there is no suffix. Instead the best description is that the noun now has root accent in strong forms. This is exactly the pattern of amphikinetic root nouns ("root nouns with alternating stress", see Frazier 2006 for their analysis). Amphikinetic root nouns like *male* *H_2né ‿r < **H_2nér-s* nom sg, *H_2n̥r-és* gen sg have root stress in strong forms and ending stress in weak forms (just like suffixed amphikinetic nouns). Thus, after the morpheme reanalysis of **peH_2-ter- > *pH_2ter-*, 'father' is now an amphikinetic root noun. Fusion of roots and suffixes from hysterokinetic nouns into monomorphemic units would lead to the loss of the hysterokinetic accent, i.e. the hysterokinetic and amphikinetic nouns would have merged into one class. In this manner, a system with four accent classes could eventually be reduced to two through morpheme reanalysis. Furthermore, we know the reanalysis did indeed take place, because Vedic does not show evidence of the same morpheme boundaries posited for PIE.

Morpheme reanalysis can also explain another feature of the transition from PIE to Vedic. In PIE, the alignment constraint ALIGNL was high-ranking, but this was replaced by ALIGNR in Vedic. In other words, PIE has a preference for word initial stress while Vedic has a preference for stem final stress. The change can again be illustrated with the word for 'father'. Consider the intermediate stage *pH_2ter-*. In this stem there is only one potential stress bearing unit – the syllable headed by *e*. This means that both ALIGNL and ALIGNR would place stress in exactly the same location, yielding *pH_2tér*. Stems with only one possible location for stress were not uncommon even in PIE, due to the occurrence of root nouns. Furthermore, considering the output forms resulting from the syncopation of non-high vowels, e.g. **nék^{w}t*, children born into this language would be free to construct a grammar that utilizes either ALIGNL or ALIGNR. All of this evidence points to the same conclusion: at some point in the transition from PIE to Vedic,

the predictions made by ALIGNL and ALIGNR were similar and eventually the latter replaced the former.

The loss of dominant nominative and accusative endings can be explained by the loss of accent classes. Quite simply, these dominant endings would have been ineffective in a system with only two accent classes. For columnar nouns with underlying root stress, dominance will not allow the deletion of that accent as long as MAX(A)$_{root}$ outranks the antifaithfulness constraint, and for nouns with alternating accent, dominance is unnecessary to make the stems of strong forms different from the stems of weak forms. In other words, there would be no reason for children learning the system with two accent classes to develop a grammar that utilizes dominance.

However, the dominance specification did remain on the vocative. While I cannot explain why the vocative remained dominant nor why the realization of its dominance changed in form from PIE, I can provide reasons why this is not surprising. It is reasonable to assume speakers would want to mark vocative forms in some manner. In a language where the vocative affix is null, this marking is not achieved through a phonologically overt affix, but can be achieved through dominance. Thus, the vocative remains dominant, but it triggers a new constraint (¬OP-MAX(A)) that requires accent deletion, and this new constraint dominates even the constraint that penalizes deletion of accent from a root (MAX(A)$_{root}$). Considering the clitic status of the vocative in Vedic, it is reasonable that the vocative ending would want to delete accent instead of inserting it.

5. Conclusions

An analysis of the Vedic Sanskrit athematic nouns has been presented that makes use of dominant affixes that trigger antifaithfulness constraints that work within inflectional paradigms.

This analysis is advantageous in that it explains why the vocative is the only case to appear without accent (and also why the vocative is the only case to appear in two forms). Furthermore, this analysis was shown to be derivable from a similar analysis for PIE athematic nouns. The differences between the two systems are logical if one assumes that a main catalyst for language change is the construction of a grammar by children, who must use the evidence they are given by people speaking the language they are born into. Due to morpheme reanalysis and other factors, as some point in the transition from PIE to Vedic, the language learner is given ambiguous input, resulting in a change in the constructed grammar. Finally, because the analysis of Vedic makes use of a type of constraint (the ¬OP constraint) that was proposed to account for PIE, this constraint type is now evidenced by an attested language, which provides significant support for the use of ¬OP constraints in Optimality Theory.

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