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Floating, but ordered: An account of Sye verb root alternations*

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1. Introduction

This paper presents an argument in favor of the Parallel Structures Model (PSM) of feature geometry (Morén 2003, 2007), based on an analysis of verb root mutations marking the non-past in Sye, an Erromangan language of Vanuatu (Lynch & Capell 1983, Crowley 1998, 2002). We argue that the Sye non-past morpheme consists of two floating features affixed to the left edge of a stem. The floaters crucially stand in a fixed order with respect to each other, and we model this situation by assuming that the floating features are linked to higher-order floating feature-geometric nodes on the same tier. Sye thus presents evidence for an ordering relation between two seemingly unrelated features – nasality and vowel height. This ordering relation follows directly from the PSM, where both kinds of features attach under the C-MANNER node. The proposed analysis captures several generalizations about the behavior of Sye non-past, which remain mysterious on the alternative accounts that postulate suppletion (Inkelas & Zoll 2005).

2. The data

Sye is an Oceanic language spoken in the Tafea province on the Erromanga Island (Southern Vanuatu) by approximately 1400 speakers. The primary sources on Sye include Lynch & Capell (1983) and Crowley (1998, 2002). The transcription in this article has been adapted to adhere to the IPA. Sye has five vowels /a, e, i, o, u/ and 14 consonants. The consonant inventory of Sye is given in (1) below.

Most syllables in Sye follow the pattern (C)V(C). Root-initial CC sequences, however, are allowed if they are of rising sonority or include a nasal. Triconsonantal clusters occur only intervocalically and always include a nasal, e.g. *nimprau* 'semen'.

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(1) *Sye consonant inventory (Crowley 1998, 9)*

	Labial	*Alveolar*	*Velar*	*Glottal*
Stop	p	t	k	
Fricative	v	s	ɣ	h
Nasal	m	n	ŋ	
Lateral		l		
Tap/Flap		ɾ		
Glide	w	j		

Sye verb roots appear in one of the two forms, depending on the morphological context. The first root form (hence called *basic*) appears following imperative, past tense subject, negative, purposive, instrumental and derivational prefixes. It is also used in compounds and causative constructions. The other form (henceforth referred to as *modified*) appears following future tense subject, present tense, conditional and habitual prefixes (Crowley 1998, 77-80). For the purpose of this study, we will adopt the convention of Lynch & Capell (1983) and refer to the former as *past* and to the latter as *non-past* contexts.

Example (2) shows how basic and modified roots are used in full verb forms. Note that the shape of the root depends on the prefix directly adjacent to the root. Thus the forms in both (2a) and (2b) contain the recent past prefix, but the root nevertheless appears in the modified form in (2b) since the closest prefix is NEG:FUT in this case.

(2) a. *ɣ-* ***aruvo***
3SG:RECPAST- sing(BASE ROOT)
'(s)he has just sung' (Crowley 1998, 77)

b. *ɣo-* *etwo-* ***naruvo***
3SG:RECPAST- NEG:FUT- sing(MODIFIED ROOT)
'(s)he will not sing' (Crowley 1998, 79)

We now take a closer look at the shape of verbal roots themselves. It should be kept in mind that these roots typically require additional morphemes to form a licit word. The systematic patterns of verb root alternations in Sye are shown in (3) below (Crowley 1998, 77-85). The root modifications in (3a) and (3b) show addition of a nasal or prenasalization of the first root consonant. A number of roots attach a prefix /a-/ or change their first vowel to /a/ in the modified form (3c) and (3d). Some roots which begin in a lateral or a glide in the basic form exhibit no change in the modified form ((3e)–(3f)). Finally, yet other roots exhibit both the initial low vowel and prenasalization of the first consonant of the root ((3g)–(3h)).

(3) a. *owi* ∼ *nowi* 'plant'
b. *tovop* ∼ *ntovop* 'laugh'
c. *mah* ∼ *amah* 'die'
d. *owi* ∼ *awi* 'leave'
e. *lau* ∼ *lau* 'be dry'
f. *wesisar* ∼ *wesisar* 'slip'
g. *pat* ∼ *ampat* 'blocked'
h. *vaŋ* ∼ *ampaŋ* 'eat'

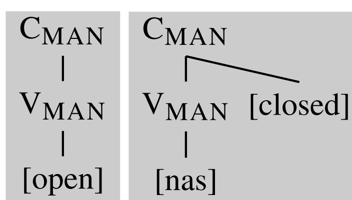
Note that the modified form of a root is not entirely predictable from the (surface) basic form. Thus, the verbs ‘to plant’ and ‘to leave’ both have the basic form *owi* but they differ in their modified forms (see (3a) and (3d)).

3. Preview of the account

Our account relies on autosegmental representations and floating material to capture the allomorphy patterns discussed in the previous section. The proposed analysis thus falls within the broad research program of Generalized Non-linear Affixation (Bermúdez-Otero 2012, Bye & Svenonius 2012, Trommer 2011). While we implement our proposal in Optimality Theory (Prince & Smolensky 1993), the representations are a major part of our analysis. We therefore start by reviewing the proposed representations and illustrating the main argument of the paper.

The data in (3) suggest that the Sye non-past can have two effects: prefixation of an open vowel or lowering of an initial vowel and prefixation of a nasal or prenasalization (sometimes with concomitant mutation). We formalize this by assuming that the modified verb roots are derived from the basic roots by attaching the non-past morpheme in (4). The non-past morpheme contains two independent floating features – the feature [open] responsible for vowel lowering and the feature [nasal] responsible for nasalization. We thus propose to add the feature [nasal] which was originally absent in PSM, but is necessary to account for complex partially nasal segments.

(4)



↔ [–pst]

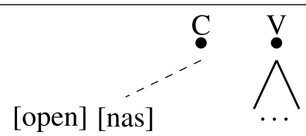
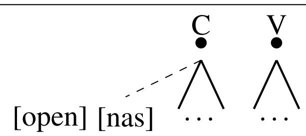
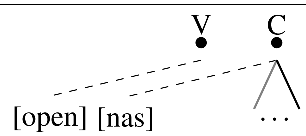
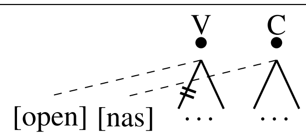
Although the two floating features are not associated to a segmental root node, both are associated to an underlying V_{MAN} node dominated by an underlying C_{MAN} node. The existence of a C_{MAN} node as argued in PSM (Morén 2003, 2007) is crucial for our account: both floating treelets are linked to a node on the same tier, and hence they behave as ordered with respect to one another.

On our account, the shapes of the modified forms depend on the phonological properties of the stem. We assume that some stems in Sye start with an initial defective root node (Zoll 1996), i.e. a root node not dominating any features. Furthermore, we follow McCarthy (1988) in assuming that major class features such as [consonantal] reside in the root node, and hence these features have to be specified even for defective root nodes. In what follows, we will distinguish between stems starting in four kinds of segments: those starting in fully specified consonants and vowels, as well as those starting in a defective root node, which may be [–cons] (abbreviated •V) or [+cons] (abbreviated •C).

While we are mostly concerned with the synchronic verb root alternations, it is worth pointing out that there is some additional motivation for assuming an initial defective root node in certain Sye verb stems. Lynch & Capell (1983, 25) present evidence for a diachronic change by which certain verbs in Sye lost their initial consonant, cf. *eni* < **kani* ‘eat’. The modified forms of verb stems that underwent this process tend to display the initial nasal synchronically: *eni* ∼ *neni* (Crowley 1998, 119). Furthermore, the stem-initial defective root node also plays a role in hiatus resolution after /u/-final prefixes (Crowley 1998, 31f).

The non-past prefix has a distinct effect on each of the four classes of roots, as summarized in table (5). Stems starting with an underlying consonant (either healthy or defective) always fail to realize the feature [open] of the prefix, since this would incur crossing of association lines. On the other hand, stems with an initial vowel always realize both floaters, and this sometimes leads to delinking of the original features of the initial vowel (vowel lowering). Finally, the floating [nasal] can be realized on all kinds of stems, but only if it attaches to consonants which can be prenasalized, such as obstruents.

(5) *Realization of the Sye non-past morpheme*

Schema	Examples		Comment
	/•owi/ → nowi	(3a)	Nasality realized on C• Realizing [open] would incur line crossing
	/tovop/ → ntovop /lau/ → lau	(3b) (3e)	Prenasalize first C if possible
	/•mah/ → amah /•pat/ → ampat	(3c) (3g)	[open] realized on V• Prenasalize next C if possible
	/owi/ → awi	(3d)	[open] realized on V First V’s features delinked Prenasalize next C if possible

4. Analysis

Our account is framed within Coloured Containment Theory (van Oostendorp 2006, Trommer 2011, Zimmermann 2014). We thus assume that no input material can be deleted (Prince & Smolensky 1993), and that apparent deletion corresponds to an operation of marking an association line as unpronounced. We also assume that each morpheme has a unique identifier (color) present both in the input and in the output (van Oostendorp 2006). We use grey shading to highlight the material coming from the non-past prefix.

Our analysis uses the faithfulness constraints in (6). (6a) militates against establishing new association lines, while (6b) prohibits marking existing lines as unpronounced.

(6) a. DEP-AL : Assign one violation mark for each epenthetic association line between a segmental root node and a C_{MAN} node

b. MAX-AL : Assign one violation mark for each unpronounced association line between a segmental root node and a C_{MAN} node

The markedness constraints we use are defined in (7). The constraint *FLOAT-CMAN requires that a C_{MAN}-node be properly integrated in the structure. The NOCROSSINGCONSTRAINT (NCC) in (7b) militates against crossing association lines (see Kimper 2014 on the violability of this constraint). The constraint *MULT-CMAN in (7c) ensures that the floating treelets are realized fully, i.e. by associating their highest node (C_{MAN}) to a segmental root node, instead of e.g. linking [nas] to a V_{MAN} from the stem. Both (7b) and (7c) are never violated in Sye and are thus undominated.

(7) a. *FLOAT-CMAN : Assign one violation mark for each C_{MAN}-node not dominated by a segmental root node

b. NOCROSSINGCONSTRAINT (NCC): Assign one violation mark for each intersection of association lines which are not marked invisible

c. *MULT-CMAN : Assign a violation for each feature that is dominated by more than one C_{MAN}-node

d. NASAL CONDITION (NASCON): Assign one violation mark for each root node dominating two C_{MAN} nodes, such that the first C_{MAN} dominates [nas] and the second C_{MAN} dominates something other than [closed]

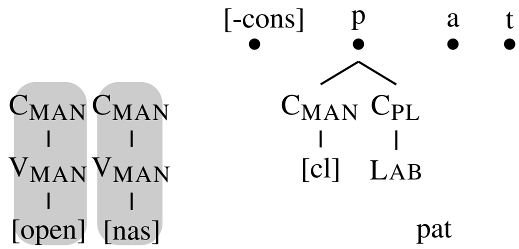
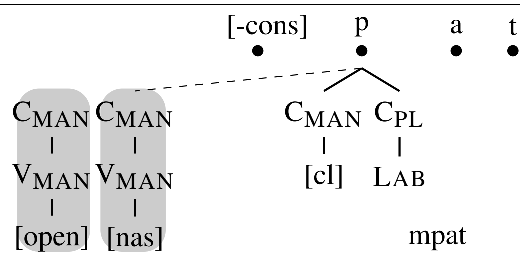
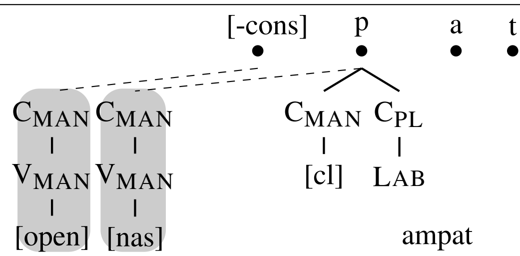
The constraint in (7d) is intended as a formalization of the idea that prenasalized continuants are highly marked (Padgett 1994). We represent prenasalized segments as having two C_{MAN}-nodes, the first one specified [nasal], and the second one being the equivalent of a stop, i.e. having C_{MAN}–[closed] (Clements 1987). NASALCONDITION thus militates against prenasalized segments where the second C_{MAN}-node is not a stop.

4.1 Sample evaluations

This section illustrates our analysis at work by presenting several sample OT evaluations. To save space, we will only include the constraints which differentiate between candidates in the evaluations.

The tableau in (8) illustrates our analysis of an example where both floating treelets end up being realized: *pat* ∼ *ampat* 'blocked' (3g). In this case, the non-past morpheme attaches to a stem that starts with a defective vocalic root node followed by a stop consonant. The faithful candidate in (8a) leaves the initial •V defective and the two floating structures unassociated and thus incurs two violations of *FLOAT-CMAN, which in Sye is worse than inserting association lines. Associating only one floating structure, e.g. the [nasal] in (8b), would result in one violation of *FLOAT-CMAN, and this is still suboptimal. The candidate which would only associate the vocalic floating structure loses in an analogous way. Finally, the winning candidate realizes both floating structures, only violating DEP-AL. Observe that the winning candidate starts in a placeless vowel. We assume that this is the specification of /a/, following Morén (2007) who presents a similar analysis of Hawaiian vowel inventory.

(8) *[open] realized on V-initial stems:* pat ∼ ampat *‘blocked’*

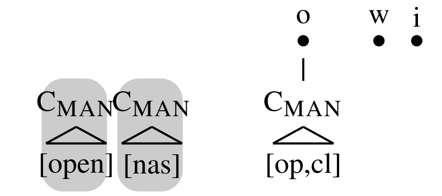
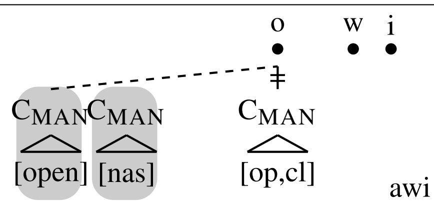
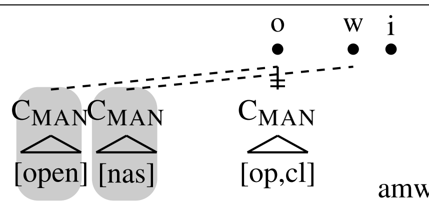
		Input: /•pat/, as in a.	*FLOAT-CMAN	Dep-AL
	a.	 pat	*!*	
	b.	 mpat	*!	*
☞	c.	 ampat		**

In the tableau in (8) we have spelled out all the relevant featural structures, but in all following tableaus, the V_{MAN} layer will no longer be included in representations, and irrelevant C_{PL} nodes will not be shown due to space considerations.

While in (8) both floating treelets are realized, Sye also presents many examples where only one of the floaters surfaces. The tableau in (9) analyzes just such an example: *owi* ∼ *awi* ‘leave’ (3d). In this case, the affix feature [open] overwrites the conflicting specification of a stem’s first vowel, but the [nasal] feature fails to be realized. This example also serves to illustrate how our analysis captures the difference between *owi* ∼ *awi* ‘leave’ and *owi* ∼ *nowi* ‘plant’: the crucial difference lies in the representation of the basic stem.

The stem in (9) has an initial full vowel /o/ which in the PSM approach is specified with V_{MAN} features [open] and [closed]. When the non-past morpheme is attached, the underlying C_{MAN} of the first vowel is delinked in order to realize the floating treelet. Not realizing any of the floating structures as in candidate (9a) is suboptimal since *FLOAT-CMAN dominates MAX-AL. Candidate (9c) attempts to realize the floating [nasal] by associating it to the first consonant of the stem. This however is impossible since continuants cannot be prenasalized in Sye (due to NASCON). Observe that (9c) does not involve line-crossing at the C_{MAN} level, since the first C_{MAN} of the stem is delinked, or more technically connected by an unpronounced association line. The constraint against line crossing only cares about pronounced (non-delinked) association lines (Goldsmith 1976). Note that since Sye lacks nasalized vowels, realizing [nasal] on the first vowel is not permitted, either.

(9) *[nas]* not realized on V-initial ~~*realized on C-initial*~~ *stems:* owi ∼ awi *‘leave’*

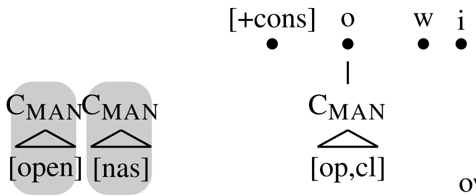
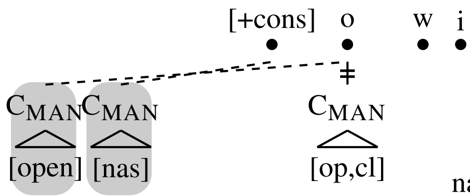
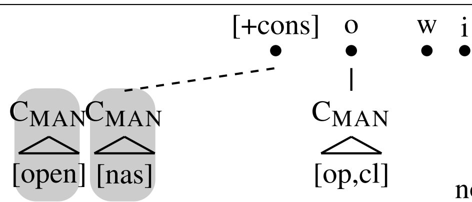
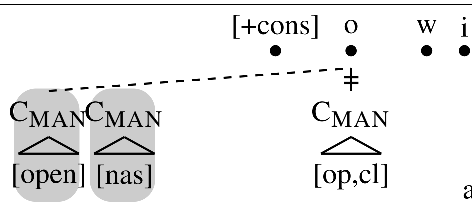
	Input: /owi/, as in a.	NAS CON	*FLT CMAN	DP AL	MX AL
a.	 owi		**!		
☞ b.	 awi		*	*	*
c.	 amwi	*!		**	*

We now move on to an example that illustrates a crucial ordering between floaters. In *owi* ∼ *nowi* ‘plant’ (3a), it is the floating [nasal], and not the floating [open], that is realized (see (10)). On our account, the stem in this case starts with a defective consonantal root node, which ends up hosting the treelet containing [nasal]. However, because the first root node of the stem associates to the [nasal] treelet, the vocalic treelet hosting [open] now cannot link to the second root node of the stem, i.e. to a vowel.

More technically, the association line established between the right floating structure and the initial root node would intersect with an association line linking the left floater and the second root node. Candidate (10b) results in crossing of association lines, and fatally violates the NCC. Without the NCC, the model would predict **nawi*, and not *nowi*, to be the modified form. Candidate (10a) is fully faithful, and it loses because of a failure to realize one of the floaters. Finally, candidate (10d) realizes the [open] feature by delinking the C_{MAN} of the first stem vowel – this candidate leaves the first root node defective and also violates MAX-AL.

To summarize, we have illustrated several core properties of our analysis. First, we have shown that the mutations in Sye non-past can be fruitfully analyzed as phonological alternations triggered by two floating featural structures. Second, the two floating treelets crucially have to be ordered. The ordering of floaters captures the asymmetry between the stems starting with a vocalic root node, which can realize both floaters (8), and stems starting with a consonantal root node, which can realize only nasality (10).

(10) *Crucial ordering of floating structures:* owi ∼ nowi *'plant'*

	Input: /•owi/, as in a.	NCC	*FLT CMAN	DP AL	MX AL
	a.  owi		**!		
	b.  nawi	*!		**	*
☞	c.  nowi		*	*	
	d.  awi		*	*	*!

Whenever [nasal] is realized on a stem-initial consonantal root node, it stands in the way of realizing the vocalic feature [open]. Importantly, such an analysis is made possible by the existence of the C_{MAN} node in feature geometry. Our account thus presents an argument for the PSM (Morén 2003, 2007).

4.2 Analysis of consonant mutation

One further complication related to Sye prenasalization that the analysis presented so far has not addressed is consonant mutation. Some continuants such as [w,l] categorically block prenasalization in the non-past, which is why there is no alternation in *wesisar* ∼ *wesisar* 'slip' (3f) and *lau* ∼ *lau* 'be dry' (3e). However other continuants may be changed into a stop, to yield a prenasalized segment as in *vaŋ* ∼ *ampaŋ* 'eat' (3h). Space limitations do not allow us to spell out a full account here, so this section presents an overview.

Associating the floating [nasal] treelet to continuants is generally prohibited by NASCON, and there are two possible responses to this constraint, differing in the features that have to be delinked. In the case of *wesisar*, prenasalization would have to yield something like [mp], which on our account means that the glide would have to disassociate both its continuancy feature (C_{MAN}–[open]) and the part that identifies it as a liquid, i.e. the non-empty

V_{MAN} node. These featural changes are penalized by the respective MAX-AL constraints. For that reason, the [nasal] treelet remains unassociated with glide-initial stems.

On the other hand, the basic stem *vaŋ* 'eat' needs to lose only its specification for continuancy (C_{MAN}–[open]) to become prenasalized, which is possible under the Sye constraint ranking. An additional quirk in the case of *vaŋ* ∼ *ampaŋ* 'eat' pertains to the loss of voicing in the stem-initial consonant. We assume that the change in continuancy automatically triggers the loss of voicing because Sye has a general ban on voiced stops.

To summarize, we have argued that the Sye ranking of featural faithfulness constraints from the family MAX-AL allows certain featural changes on the way to prenasalization, but disallows other changes, resulting in a non-uniform behavior of certain consonants with respect to prenasalization.

5. An alternative account

It has been proposed that the modified forms of Sye verbs are lexically listed, i.e. suppletive for all verbs (Inkelas & Zoll 2005) or for some (Lynch & Capell 1983). However, the suppletion account misses some important generalizations about Sye non-past formation. First of all, the Sye non-past alternations involve alternating nasality and vowel height, but never anything else. This fact follows from our phonological account, but is entirely accidental on the suppletion account. Moreover, the Sye consonant mutations obey a typologically well-attested dispreference against prenasalized continuants (Padgett 1994). This dispreference regulates consonant mutations in all modified forms, resulting in parallels between vowel-initial and consonant-initial stems. Thus, the same underlying principle is responsible for /w/ avoiding prenasalization in both *wesisar* 'slip' (3f) and *awi* 'leave' (3d). In general, the postvocalic consonants of vowel-initial basic forms pattern the same as the first consonants in consonant-initial forms. While in our account the two processes result from the same mechanism, such a generalization would not be possible under the suppletion account.

6. Conclusion

From the point of view of Autosegmental Phonology (Goldsmith 1976) and featural affixation (Akinlabi 1996, Zoll 1996), it is expected that featural affixes may contain more than one floater, and that the floaters do not have to be reduced to just a single feature. Both of these predictions are instantiated in Sye where the non-past is marked by a morpheme consisting of two floating treelets. Furthermore, the Sye floaters are strictly ordered with respect to each other, since they contain material on the same tier. This rare case of ordered floaters presents an argument in favor of the Parallel Structures feature geometry (Morén 2003, 2007), since only this theory assumes a parallel manner node for both consonants and vowels – C_{MAN}.

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